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CONTENT

Human-machine Resonance Analysis of Multi-position Lower Limb Rehabilitation Exoskeleton

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Abstract: In view of the fact that most medical rehabilitation training equipment is fixed or level, patients at the initial stage of training do not have the problem of standing ability. According to the gait characteristics of the human body, a multi-position rehabilitation training lower limb exoskeleton is designed to effectively prevent the occurrence of orthostatic hypotension. Multiple lower extremity rehabilitation exoskeleton is a kind of mechanical equipment connected with the lower extremities of the human body. Under the premise of normal operation, it helps hemiplegic patients to complete joint movement and realize lower extremity rehabilitation training. Biomechanics studies have proved that when the natural frequency of each part of the body is close to the vibration frequency from the outside world, it will cause resonance in the human body. The natural frequency of the whole exoskeleton should be avoided as far as possible, so it is necessary to carry out modal analysis on the whole exoskeleton of multiple lower limbs.
Keywords: Exoskeletons; Natural Frequency; Modal Analysis

1. INTRODUCTION

According to the "Guidelines for Blood Pressure Management in Stroke Prevention and Treatment in China" issued by the National Health and Family Planning Commission in May 2017, cerebrovascular disease is the first cause of disability and death in China.[1][2] According to the results, research shows that hypertension is the first risk factor for stroke. With the development of science and the improvement of technology and life standards, more and more people own private cars, which leads to frequent traffic accidents. More and more patients have lower limb paralysis due to diseases or traffic accidents.[3][4] The lower limb rehabilitation exoskeleton can accurately and repeatedly help patients to carry out rehabilitation training, accomplish the purpose of long-term training and solve the shortcomings of traditional rehabilitation treatment.

2. STRUCTURAL DESIGN

Based on the exploration of the physiological structure of the human lower limbs, a lower limb rehabilitation exoskeleton with a variety of positions and postures is designed, which can allow patients to perform joint rehabilitation training or single-joint training of the lower limbs. Meanwhile, the design of the rising bed realizes the 0-90° rotation of the bed body, the lifting of the hip joint and the adjustment of the span, which can meet the training requirements of different positions such as lying, tilting and standing of the patient, and prevent the occurrence of postural hypotension. As shown in Figure 1.
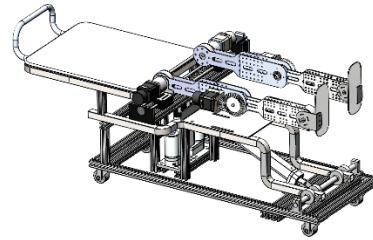
Figure 1. Multi-position lower limb exoskeleton

The lower limb rehabilitation exoskeleton is formed by connecting the various joints by connecting rods. The D-H method is used to establish a single-leg kinematics model. The homogeneous transformation matrix is used to connect the spatial coordinates of each joint, and the lower extremity rehabilitation exoskeleton phase is calculated. The homogeneous transformation matrix of the adjacent two bars is solved. Simplify the rotational degrees of freedom of the joints and establish an exoskeleton dynamic model, as shown in Figure 2. The Lagrangian equation is:[5][6]

$$\frac{d}{dt}\left(\frac{\partial L}{\partial q_j}\right) - \frac{\partial L}{\partial q_j} = Q_j (j = 1, 2 \dots N) \tag{1}$$

Where L is the Lagrangian function, q_j is the rotation angle a_j of the j joint, Q_j is the driving torque n_{ii} acting on the joint, N is the number of exoskeleton joints.

Thigh link:

$$\frac{d}{dt}\left(\frac{\partial L}{\partial q_1}\right) = m_2 l_2^2 \ddot{q}_1 + m_3 l_3^2 \cos^2 q_3 \ddot{q}_1 + m_3 a_2^2 \ddot{q}_1 - 2m_3 l_3^2 \cos q_3 \sin q_3 \dot{q}_3 \dot{q}_1$$

$$+ 2m_3 a_2 l_3 \cos q_3 \ddot{q}_1 - 2m_3 a_2 l_3 \sin q_3 \dot{q}_3 \dot{q}_1 - 2m_4 a_3^2 \cos q_3 \sin q_3 \dot{q}_3 \dot{q}_1$$

$$+ m_4 l_3^2 \cos^2(q_4 + q_3) \ddot{q}_1 - 2m_4 l_3^2 \cos(q_4 + q_3) \sin(q_4 + q_3)(\dot{q}_4 + \dot{q}_3)\dot{q}_1$$

$$+ m_4 a_2^2 \ddot{q}_1 + 2m_4 a_2 a_3 \cos q_3 \ddot{q}_1 - 2m_4 a_2 a_3 \sin q_3 \dot{q}_3 \dot{q}_1$$

$$+ 2m_4 a_2 l_4 \cos(q_4 + q_3)\ddot{q}_1 + m_4 a_3^2 \cos^2 q_3 \ddot{q}_1$$

$$- 2m_4 a_3 l_4 \cos q_3 \sin(q_4 + q_3)(\dot{q}_4 + \dot{q}_3)\dot{q}_1 - 2m_4 a_2 l_4 \sin(q_4 + q_3)(\dot{q}_4 + \dot{q}_3)\dot{q}_1$$

$$- 2m_4 a_3 l_4 \sin q_3 \cos(q_4 + q_3)\dot{q}_3 \dot{q}_1 + 2m_4 a_3 l_4 \cos q_3 \cos(q_4 + q_3)\ddot{q}_1 \tag{2}$$

Calf link:

$$\frac{d}{dt}\left(\frac{\partial L}{\partial q_3}\right) = m_3 l_3^2 \ddot{q}_3 + m_4 a_3^2 \ddot{q}_3 + m_4 l_4^2 (\ddot{q}_4 + \ddot{q}_3)$$

$$+ m_4 a_3 l_4 \cos q_4 (\ddot{q}_4 + \ddot{q}_3) - m_4 a_3 l_4 \sin q_4 (\dot{q}_4 + \dot{q}_3)\dot{q}_4$$

$$+ m_4 a_3 l_4 \cos q_4 \ddot{q}_3 - m_4 a_3 l_4 \sin q_4 \dot{q}_3 \dot{q}_4 \tag{3}$$

Sole link:

$$\frac{d}{dt}(\frac{\partial L}{\partial \overset{\cdot}{q}_4}) = m_4 l_4^2(\overset{\cdot\cdot}{q}_4 + \overset{\cdot\cdot}{q}_3) + m_4 a_3 l_4 \cos q_4 \overset{\cdot\cdot}{q}_3$$

$$- m_4 a_3 l_4 \sin q_4 \overset{\cdot}{q}_3 \overset{\cdot}{q}_4 \qquad (4)$$
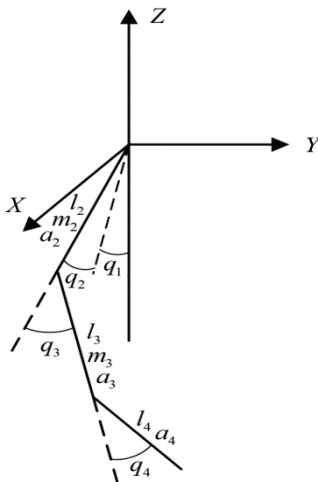
Figure 2. Exoskeleton dynamic model

3. THEORETICAL NATURAL FREQUENCY OF THE HUMAN BODY

In the various analyses of multi-position lower limb rehabilitation exoskeletons, modal analysis is essential. Modal analysis is mainly to simulate the vibration characteristics of its structure and parts. If only static analysis is carried out in the simulation process, it is easy to cause the unreasonable conditions in the contact movement of the parts, and the parts may fall due to vibration during in the use process. In the analysis process, human muscles are equivalent to elastic bodies, and human muscles are soft and elasticity. Human bones are solid, but relatively fragile. Biomechanical research has proved that when the natural frequency of each part of the body is close to the vibration frequency from the outside, it will cause resonance of the human body. At this time, the harm to human organs will be the greatest, while the whole body vibration is due to the vibration of the seat, the contact vibration of the human body's lower limbs or buttocks, which is transmitted to the whole body through the lower limbs. Whole body vibration may cause certain harm to various human systems, which may cause vestibular organ irritation and autonomic nerve dysfunction symptoms, strong whole body vibration may make the sympathetic nerves in a state of tension, with symptoms such as increased blood pressure, increased heart rate and gastrointestinal discomfort, etc.[7]

To conclude, the natural frequency of the exoskeleton should be avoided as much as possible, so it is necessary to carry out modal analysis on the multi-position exoskeleton designed in this paper.

Because the natural frequency of the human body is closely related to the mass, the position of the center of mass changes after the mass of the human body changes, and the natural frequency is calculated according to the change of the center of mass. The position of the center of mass of the whole body and each part can be calculated by the binary regression equation.[8]

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$$Y = -32.2975 - 0.443X_1 + 0.478X_2 \qquad (5)$$

Where Y is the displacement of the center of mass, X_1 is the mass, and X_2 is the height.

The natural frequency of human theory is calculated by formula (2).

$$[M]\{\overset{\cdot\cdot}{Y}\} + [K]\{Y\} = 0 \qquad (6)$$

Where [M] and [K] are 16x16 order positive definite mass matrix and semi-definite stiffness matrix respectively.

In order to study the natural frequencies of the human body, related studies show that the natural frequency of various parts of the human body can be determined, according to the mechanical properties of soft and hard tissue materials of the human body, the geometric shape parameters of the human body, and the values of various elements in the human body.[7] The natural frequencies of various parts of human body can be obtained by measuring and calculating the static model of the human body. Through the theoretical research, the natural frequency of each part is a definite value. As shown in Table 1.

Table 1 Theoretical natural frequencies of various parts of the human body

Position	Natural frequency	Position	Natural frequency
Head	35Hz	Left hand	36.67Hz
Shoulder	6.14Hz	Right hand	37.26Hz
Trunk	12.20Hz	Left thigh	49.26Hz
Hip	14.69Hz	Right thigh	50.94Hz
Upper left arm	19.52Hz	Left calf	73.63Hz
Upper right arm	20.30Hz	Right calf	73.64Hz
Left forearm	30.77Hz	Left foot	91.40Hz
Right forearm	30.78Hz	Right foot	91.40Hz

4. MODAL ANALYSIS AND PROCESSING METHODS

The modal analysis in ANSYS/Workbench is mainly carried out under the Mechanical module. The first step is to establish a three-dimensional model in ANSYS or Solidwork, and use Workbench to carry out finite element analysis; after determining the materials of each part, first define the contact mode, divide the mesh and apply the load, and then set the modal order and frequency range, and finally solve it. Before the sixth order modal analysis, a fixed constraint must be established at the fixed point of the bracket. The results of modal analysis are shown in Figure 3-8, and the corresponding data parameters are shown in Table 2.
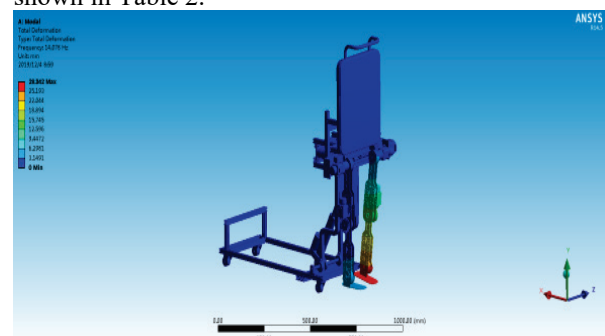
Figure 3. First order mode
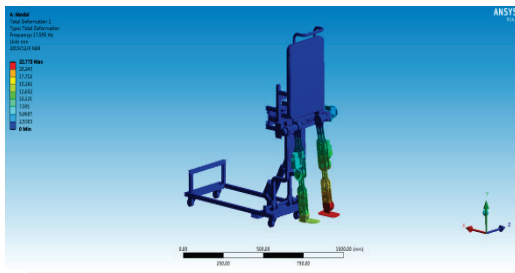
Figure 4. Second order mode
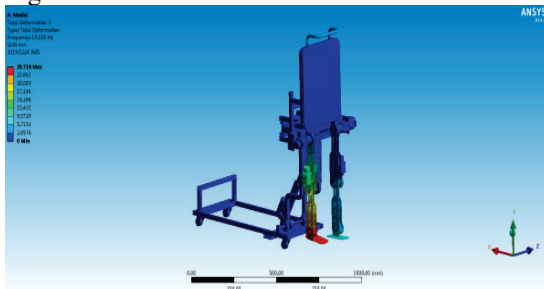
Figure 5. Third order mode
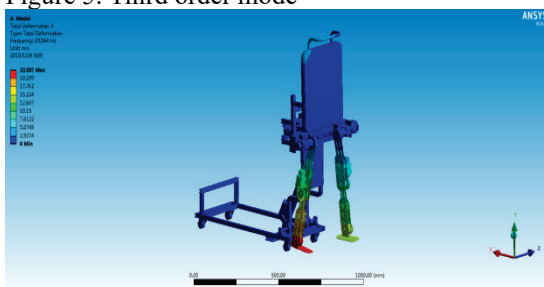
Figure 6. Fourth order mode
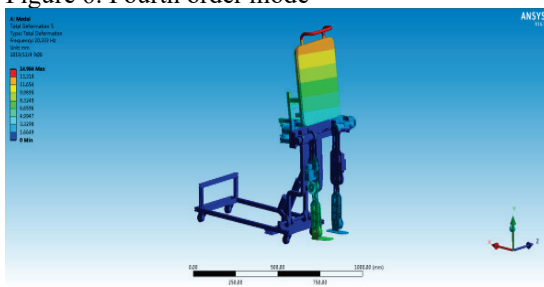
Figure 7. Fifth order mode
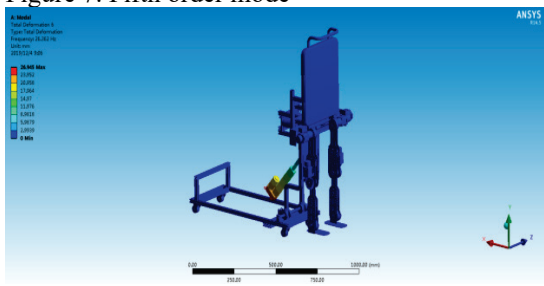
Figure 8. Sixth order mode

Table 2 Modal analysis results

Order	Frequency/Hz	Maximum displacement/mm
1	14.078	28.342
2	17.595	22.773
3	19.165	25.719
4	19.544	22.837
5	20.333	14.984
6	26.362	26.945

According to the results in the table, the minimum natural frequency of the model is 14.078 Hz in the first order

calculation, and the maximum natural frequency is 26.362 Hz in the sixth order calculation. By comparing Table 2, it can be seen that the multi-position lower limb rehabilitation exoskeleton avoids all natural frequencies of the human body except the shoulder natural frequencies in the fifth order mode. Therefore, the multi-position lower limb rehabilitation exoskeleton should be avoided during training. In order to avoid the natural frequency of the fifth order mode from being equal to the excitation frequency, it is necessary to add a part of seismic material, such as sponge or soft rubber, between the multi-position lower limb bone bed and the human body. In the first order mode, the prototype is bent in the negative direction of the Z-axis. In the second order, third order, and fourth order modes, the multi-position lower limb rehabilitation exoskeleton all bends symmetrically to the Y-axis. Many lower limb exoskeletons bend in the positive direction of the Y-axis, and the multi-position lower limb rehabilitation exoskeletons in the sixth order mode are bent in the negative direction of the Z-axis. The largest displacement in the fifth order mode shape occurs at the upper suspension of the multi-position standing bed, the sixth order mode shape has the largest displacement value at the position of the standing push rod, and the first order to fourth order mode shape has the largest displacement value at the end of the calf.

5. CONCLUSION

According to the structure and movement characteristics of the human lower limb exoskeleton robot, a new multi-position lower limb rehabilitation exoskeleton mechanism is designed. The natural frequencies of various parts of the human body are calculated theoretically, and the finite element modal analysis of the entire exoskeleton of multi lower limbs is carried out. Through the analysis of the simulation results, the safety requirements are clarified and provides a reference for the next step of the exoskeleton movement simulation and control.

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Transportation and Distribution Model of Large-scale Chain Supermarkets Based on Linear Programming

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Abstract: With the increasing number of large chain supermarket stores and the expansion of store size, the logistics cost of distribution center inventory and store distribution occupies an important proportion in the total operating cost. Reducing the inventory costs and distribution costs of large chain supermarket is the key to improve enterprise profit. In this paper, we take a large-scale chain supermarket as an example. Considering the inventory costs and transportation costs from the distribution center to each store, the transportation costs from each store to each supermarket, we built a transportation and distribution model described by the linear programming and use the LINGO software to solve the model. The optimal solution of this model can provide a reasonable distribution project of the large-scale chain supermarket.
Key words: Linear programming; Distribution problems; Large-scale chain supermarkets.

1. INTRODUCTION

Based on the current situation of the booming development of large chain supermarkets, chain enterprises put forward higher requirements for the reasonable control of operating costs.[1] In the operation of chain supermarkets, there still exist many drawbacks in the logistics distribution system of chain supermarkets, such as low rate of unified distribution, inability to obtain supply demand in a timely and rapid manner, high inventory costs at the store. These drawbacks increase the operating cost of large chain supermarkets. In order to decrease the inventory costs and distribution costs of large chain supermarkets, we built a linear programming model and use LINGO software to compute the optimal solution of the model. We can obtain a reasonable distribution project of large chain supermarkets.

2. QUESTIONS RAISED

Now we choose a large-scale chain supermarket K with seven supermarkets in Shenyang. This supermarket has set up store in 1 and 2 respectively. There is a large distribution center O which is far away with the two stores. Each day, the distribution center supplies sufficient goods for two stores. According to the demand of seven supermarkets, the two stores deliver the goods to each supermarket every day. How to minimize the inventory costs and transportation costs of goods on the premise of meeting the demand of the seven supermarket?

3. TRANSPORTATION AND DISTRIBUTION MODEL

At the beginning, the two stores have a certain amount of inventory respectively. After receiving and carring out the goods of the two stores every day, there will be a certain amount of surplus goods to meet the demand of seven supermarkets if the distribution center fails to deliver the goods to the two stores on time the next day. The surplus goods also meet the urgent needs of someone of seven supermarkets. It will reduce the loss of the supermarket as no goods have been received in time. Under entirely normal circumstances, the two stores will be uniformly transported to each supermarket after the distribution center finishes distributing the goods.

According to the situation in previous years, the distance from distribution center to two stores and the total supply of distribution center can be obtained as shown in Tab. 1.

Table 1 Distance between distribution center and two stores and total supply of distribution center

	O→1	O→2	
Transportation costs	1yuan/100kg*100km	1yuan/100kg*100km	Total supply of distribution center (unit: 100kg) 300
istance/km	25	20	

According to the actual situation of the daily incoming and outgoing of the stores, the initial inventory, stock capacity and remaining stock storage cost of the stock points can be obtained as shown in Tab. 2.

Table 2 The initial inventory and inventory capacity of the two stores, the unit inventory cost, and unit transportation costs

Inventory point	Initial inventory	Inventory capacity	inventory cost	Unit ransportation costs
unit	100kg	100kg	Yuan/100kg	Yuan/100kg*100km
1	180	350	9	1
2	140	300	5	1

According to the minimum distance between the two point, [2] the distance between two stores and seven supermarkets and the supply quantity of each store are shown in Tab. 3. The daily demand of each supermarket

is shown in Tab. 4. In order to minimize transportation cost and inventory storage cost, we need design a distribution project which includes the quantity of goods

Table 3 Distance between each store and each supermarket (unit: 100km) and supply quantity of each store

supermarket / store	A	B	C	D	E	F	G	Total supply/100kg
1	4	9	13	17	14	25	36	250
2	9	13	11	20	18	27	30	200

Table 4 Daily demand of each supermarket

Supermarket chain	A	B	C	D	E	F	G	total
Daily requirement (100kg)	45	40	70	60	65	90	80	450

According to the above data, we built the linear programming model about transportation and distribution of the large-scale chain supermarket K. [3] -[4]

Model hypothesis:

x_i: the quantity of goods which the distribution center supplies the store i $(i = 1, 2)$,

y_{ij}: the quantity of goods which the store i supplies the supermarket $j (i = 1, 2; j = 1, 2, 3, 4, 5, 6, 7)$,

a_i: the unit transportation cost which the distribution center supplies the store i $(i = 1, 2)$,

b_{ij}: the unit transportation cost which which the store i supplies the supermarket $j (i = 1, 2; j = 1, 2, 3, 4, 5, 6, 7)$,

c_i:the supply quantity of the store i $(i = 1, 2)$,

d_i:the initial inventory of the store i $(i = 1, 2)$,

e_i: the unit inventory cost of the store i $(i = 1, 2)$,

f_i:the inventory capacity of the store i $(i = 1, 2)$,

g_j : daily demand of the supermarket $j(j = 1, 2, 3, 4, 5, 6, 7)$.

The mathematical model of the transportation and distribution can be expressed as

$$Opt\ min\ Z = \sum_{I=1}^{2} a_i x_i$$
$$+ \sum_{i=1}^{2} \sum_{j=1}^{7} b_{ij} y_{ij}$$
$$+ \sum_{i}^{2} (x_i - \sum_{j=1}^{7} y_{ij} + d_i) e_i$$

$$s.t \begin{cases} \sum_{j=1}^{7} y_{ij} \le c_i \ i=1, 2 \\ \sum_{i=1}^{2} y_{ij} \ge g_j \ j=1, 2, 3, 4, 5, 6, 7 \\ \sum_{i=1}^{2} x_i = 300 \\ x_i \le f_i - d_i \ i=1, 2 \end{cases}$$

4. RESULTS AND DISCUSSION

We use our model to deal with the transportation and distribution problem of the large-scale chain supermarket K, bring the data given in Tab. 1- Tab. 4 into the above model, and use LINGO to program the procedure as follows:

```
model:
sets:
inventory/1, 2/:x, a, c, d, e, f;
supermarket/1..7/:g;
link(inventory, supermarket):y, b;
endsets
data:
a=25, 20;
b=4, 9, 13, 17, 14, 25, 36, 9, 13, 11, 20, 18, 27, 30;
c=250, 200;
d=180, 140;
e=9, 5;
g=45, 40, 70, 60, 65, 90, 80;
f=350, 300;
enddata
min=@sum(inventory(i):a(i)*x(i))+@sum(link(i,    j):b(i,
j)*y(i,
j))+@sum(inventory(i):e(i)*x(i))+@sum(inventory(i):e(i
)*d(i))-@sum(link(i, j):e(i)*y(i, j));
@for(inventory(i):
@sum(supermarket(j):y(i, j))<=c(i));
@for(supermarket(j):
@sum(inventory(i):y(i, j))>=g(j));
@sum(inventory(i):x(i))=300;
@for(inventory(i):
x(i)<=f(i)-d(i));
end
```

The calculated results are as follows:

X(1)=140, X(2)=160, Y(1, 1)=45, Y(1, 2)=40, Y(1, 4)=60, Y(1, 5)=65, Y(1, 6)=40, Y(1, 7)=40, Y(2, 3)=70, Y(2, 6)=50, Y(2, 7)=80 . The optimal solution is 15820.00 yuan.

The supply quantity from the distribution center to each store and the supply quantity from each store to each supermarket are shown in Tab. 5.

Table 5 Details supply quantity from each store to each supermarket

A	B	C	D	E	F	G
1→45	1→40	2→70	1→60	1→65	1→40	2→50	2→80

The above results show that the minimum cost of transportation and inventory is 15820.00 yuan. The quantity of goods which the distribution center supplies the store 1 is 14000 kg. The quantity of goods which the

distribution center supplies the store 2 is 16000 kg. The quantity of goods which the store 1 supplies the supermarket A is 4500 kg. The quantity of goods which the store 1 supplies the supermarket B is 4000 kg. The quantity of goods which the store 2 supplies the supermarket C is 7000 kg. The quantity of goods which the store 1 supplies the supermarket D is 6000 kg. The quantity of goods which the store 1 supplies the supermarket E is 6500 kg. The quantity of goods which the store 1 supplies the supermarket F is 4000 kg. The quantity of goods which the store 2 supplies the supermarket F is 5000 kg. The quantity of goods which the store 2 supplies the supermarket A is 8000 kg. According to the analysis and verification of the final results, when the distribution center supplies 140 and 160 (unit: 100kg) for the two stores respectively, with the initial stock of the stores, the supply demand of each supermarket can be ensured. It is calculated that the remaining inventory of the two stores on the day is 7000 kg and 10000 kg respectively. It can ensure the turnover of the goods of individual supermarkets under special circumstances the next day.

Based on the linear programming theory, this paper analyzes and models the transportation and distribution system of large-scale chain supermarket K in Shenyang, uses the mathematical software to analyze and solve the model, and gives the optimal distribution project. The establishment and solution of the model is practical significance for solving the problem, and they can also be the reference for other practical problems such as reasonable allocation of goods and optimal path planning.

ACKNOWLEDGMENT

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Control Design of Automatic Welding Equipment Suitable for Rotating Parts

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Abstract: Automatic welding is an important part of the welding processing field, and it plays an important role in the welding quality and processing efficiency of the product. The traditional manual welding method has been difficult to meet the requirements of modern welding manufacturing. Taking the circular welding task of rotating parts as the research object, and aiming at the characteristics of high quality of circular welding welds and difficulty in ensuring the quality of manual welding, a PC+ motion control card structure is designed, using a 2D laser displacement sensor to measure weld data through a serial port Passed to the control system, real-time measurement and real-time welding are realized, achieving fast processing speed, high control accuracy, and stable operation, which verifies the reliability of semi-closed loop control and provides a theoretical basis for intelligent control of welding. The test verifies that the system realizes the high-efficiency and high-precision welding of rotating parts, proves its feasibility and correctness, and is applied in production.
Keywords: semi-closed loop control system; quality control; rotating parts; automatic welding

1.INTRODUCTION

With the development of modern industry and the continuous progress of welding technology, the quality requirements for welding products are getting higher and higher. Rotary welding parts are widely used in many industrial fields. The rotary welding products need to be formed by welding of multiple components to form rotary welding components. However, in the welding process, the technical level of the operator has a greater impact on the welding quality and speed [1]. When the rotating parts have a large jump in the axial and radial directions while welding. Automatic welding is not easy to achieve, and the quality is difficult to guarantee. The traditional welding process has disadvantages such as low automation, low production efficiency, and high rejection rate[2].

In the industrial transformation and upgrading, the automation of the manufacturing industry has developed rapidly, and the welding equipment for rotating parts is also developing in the direction of intelligence and modularization to meet the needs of continuously transforming the production capacity of enterprises [3]. Aiming at the problems of axial and radial run out in the welding process of rotating parts, the process is relatively complicated and requires multiple workers to work together to complete the entire process. In order to improve welding efficiency and quality, and reduce production costs, this paper adopts modular design method, carries out process flow planning and overall scheme design, and explores real-time detection, judgment and control of the entire welding process based on certain control technology, and real-time adjustment of welding Parameters and welding paths are extremely important to ensure the welding quality and process stability of rotary parts, and effectively reduce welding defects[4].

2. DEVICE STRUCTURE DESIGN

The first is the construction of an intelligent welding system. Aiming at the problems existing in the actual welding technology of rotating parts, a system based on laser measurement technology is built as shown in Figure 1. The designed welding system is composed of hardware part and software part. According to the requirements of welding accuracy, design the appropriate mechanical and mechanical parts, select the appropriate measurement system, control (servo) system and other auxiliary equipment, main control computer, etc., and establish the hardware system. The system designs an open CNC system with a motion control card as the core to control the coordinated movement of the welding gun and the workpiece. This method realizes the synchronous operation of the two to ensure the welding quality.
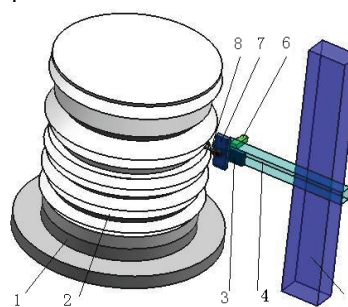
1. Rotary table 2. Part workpiece 3. X axis 4. U axis
5. W axis 6. Laser profile measuring instrument 7. Z axis 8. Welding gun
Fig. 1. Schematic diagram of mechanical system

The structure of the platform is shown in Figure 1. The welding torch is installed on the two-dimensional numerical control platform (X-axis and Z-axis), which can follow the welding seam of the parts for radial and axial small displacement movement; the platform and the laser profile measuring instrument are fixed on the U-axis together The upper part can be moved in a large distance in the radial direction according to the change of the diameter of the part; the horizontal turntable (C axis) is

composed of a rotating tray and an AC servo drive and transmission mechanism, and the part is completed through the positioner base, AC gear motor and other components Rotation around its central axis. The height is adjusted with the height of the weld. XZC three-axis linkage during the work process, the welding torch reaches the corresponding precise position required by the welding work, which meets the movement of different workpieces and realizes the needs, and this structure is also common on a variety of machine tools and measuring mechanisms, so it has a good Portability.

3. CONTROL SYSTEM

The welding process is a time-varying nonlinear system with multiple parameters coupled with each other. There are many factors influencing the welding seam formation, with obvious randomness, which is difficult to describe with accurate mathematical models[5]. This makes the previous control methods have disadvantages such as poor adaptability and large dependence on experience to varying degrees. The control system adopts "PC+motion control card structure". The system specifically consists of industrial computer, PMAC motion control card, AC servo drive and various electrical appliances (air switch, AC contactor, limit switch, etc.) to realize welding motion path planning, Welding plane anti-collision and anti-interference control, real-time fault handling of arc welding and other functions. The industrial computer is responsible for the planning of the measurement trajectory and the calculation and processing of the measurement results of the laser side head[6].
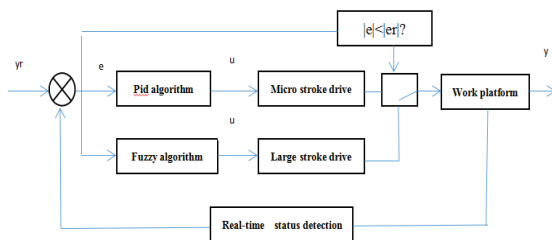
Fig. 2. Controller working principle structure

In order to achieve the stability of the processing process, the macro and micro coordinated control strategy is adopted. Regarding the macro motion that needs to be moved for large strokes, the platform and laser profile measuring instrument can perform macro motion in the radial direction according to the change of the part diameter. The welding torch can follow the welding seam of the part to perform radial and axial micro motions to meet the gap servo adjustment the real-time requirements of the system.It can achieve the advantages of high response frequency and accuracy, which can meet the real-time requirements of the gap servo adjustment.

The coordinate positions of the X and Z directions are constantly changing due to the continuous welding seam. In order to accurately track the position of the measured weld profile, the X and Z directions of the initial weld on the profile waveform are restricted at the beginning of the measurement and the initial measurement area is set. After the initial weld position is locked, the subsequent weld position to be measured is automatically tracked through an algorithm. By analyzing the enlarged images of the

extracted welds, according to the characteristics of different images, the center points of the welds are defined to extract the appropriate weld feature points, and the accurate weld center and edge positions are obtained, so that the welding gun is always aligned with the center of the weld.

The weld coordinates obtained from the original measurement profile after data preprocessing are initial values with errors and sudden changes. Therefore, it is necessary to perform secondary processing on the preprocessed data to obtain stable and continuous effective welding coordinates. Here, the least square method is used to fit and predict the preprocessed coordinates[7].

In this model, the first 8 points obtained after continuous measurement and preprocessing are used to predict the 9th actual welding coordinate position, and then the coordinates are sent to the motion control card and the action is executed; after the welding torch action is completed, the 2-9th point is used Continuously measure the pre-processing points, predict the coordinates of the 10th welding action, and execute it by analogy.

The weld seam detection adopts the HJ-G high-precision two-dimensional laser displacement sensor of Japanese KEYENCE company. The measuring instrument control system uses a laser profile measuring instrument based on laser triangulation to detect the axial section of the part on-line, and accurately follow the welding gap of the part in the X and Z directions. The laser beam is expanded into a strip by the cylindrical objective lens, and then the laser is diffused on the surface of the part. The reflected light is focused on the CMOS to measure the changes in the radial and axial directions of the welding seam of the part. The measurement system is based on the principle of optical triangulation to detect the target contour surface to obtain two-dimensional information, namely X, Z Coordinates (the axial coordinate of the X coordinate part, the radial coordinate of the Z coordinate part). The configuration software of the measurement system is required to be connected to the computer via the IEEE1394 cable, and all data transmission is via the IEEE1394 interface. Through the analysis and processing of the measured data, the data that meets the accuracy requirements can be obtained.
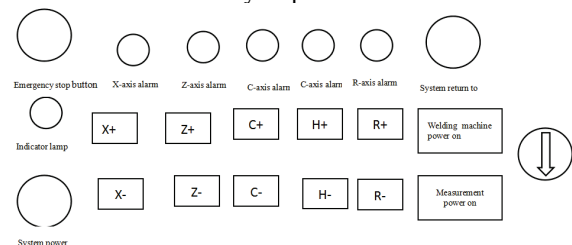
Fig. 3. Control panel structure diagram

Laser scanning products are used for welding seam data collection, which is transmitted to the industrial computer through the serial port, and after calculation and analysis, it is transmitted to the motion control card to control the movement of the welding gun along the radial and axial directions of the workpiece. The control system uses a laser profile measuring instrument based on laser triangulation to detect the axial section of the part on-line,

and accurately follow the welding gap of the part in the X and Z directions.

According to the operation and control requirements, a corresponding man-machine interface is designed for the operation and monitoring of automatic welding equipment. The interface mainly includes login interface, main interface, system debugging interface, parameter setting interface, model selection interface and alarm information interface.

4. REALIZATION OF MOTION CONTROL

The WINDOWS operating system and the CNC application software system of the PMAC card installed on the industrial PC complete the real-time module and the non-real-time management module[8]. Control card and axis setting function, independent movement, interpolation movement, front and rear limit, position and status query function, error event processing, etc. Realize various motion control through these functions and their combinations:

(1) Realization of operation and stop function during movement

When you click the run button on the panel, the main control program will execute the motion function mover[axis number] and movea number dogo[axis number] to control the relative and absolute motion of each axis. When the set displacement is completed, it will automatically stop the movement. If you need to stop the movement immediately during the movement, you can click the stop button to let the main control program execute the stop[axis number] instruction to stop immediately, or by executing driveneable[The axis number] =0 statement causes the execution unit to stop running immediately.

(2) Real-time display function

Real-time display refers to the real-time supervision and display of the current running position and running speed of the motor during operation. Because in this system, it is transmitted through serial communication. This needs to be used as the function comms register instruction to realize the exchange between the data in the control card and the PC, and the above functions are realized in VB language.
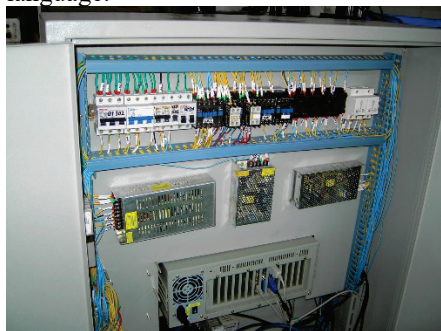
Fig. 4. Control circuit device

5. CONCLUSION

This paper designs an automatic welding machine control system for the automatic welding of rotating parts. Through experiments, the least square method is used to process the coordinates of the weld seam, so that there is no obvious deviation in the whole tracking welding process, which overcomes the interference of uncertain factors, ensures the continuous and stable operation of the welding torch, and meets the welding process requirements of rotary parts. The system realizes The following expected functional goals: At the same time, the following performance can be obtained:

(1) The automatic positioning of the welding torch realizes continuous welding, and the welding line is formed uniformly without waves. At the same time, a good man-machine interface was built, and the command sending and working status monitoring were well completed.

(2) Compared with manual welding, the welding time of this process is only 1/5 of manual welding (including auxiliary time), and the welding efficiency of this system is improved. The actual application proves that this set of welding system has strong adaptability, reliability and anti-interference ability, and can be produced and promoted.

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Teaching Innovation of Composite Materials Polymeric Matrix in Composite Materials Specialty

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Abstract: According to the features of composite materials specialty, teaching innovation was introducing about composite materials polymeric matrix. Teaching innovation include teaching concept, methods and means and examination.
Keywords: Composite Materials; Polymeric Matrix; Teaching Concept; Methods and Means

1. ESTABLISH A DEMOCRATIC AND REALISTIC TEACHING CONCEPT

Innovation is the requirement of the times, the core of the nation and the soul of the nation. Quality education is required for social development, but innovation education is the core, deepening of quality education and the soul of higher education [1]. In today's world, mankind driven by the rapid development of high-tech waves is entering the information society. Having the quality of innovation will become the most important condition for the survival and development of people in the information society. Therefore, carrying out innovative education is an inevitable trend of the development of the times, an inevitable requirement for training high-quality professionals, and an inevitable choice for deepening teaching reform [2-4].

The goal of the composite materials major of our school is to cultivate technical talents who have basic theory and practical knowledge of composite materials. At the same time, who can independently engage in production and design in composite materials related fields. Polymer matrix composite materials have been widely used in various fields of the national economy. Its physical and chemical properties depend to a large extent on the polymer matrix. Therefore, the subject of polymer matrix for composite materials has an important position, and it is also an important part of the training plan for college students majoring in composite materials. It plays a pivotal role in improving professional knowledge, professional quality and professional innovation ability [5]. However, the current college education model has disadvantages such as emphasis on knowledge transfer and ignoring the main body of learning. It emphasis on professional education and ignorance of the improvement of comprehensive abilities. This mode has suppressed students' innovation potential to a certain extent[6-9]. It hinders the development of students' subjectivity, initiative and creativity. it is not conducive to cultivating high-quality professionals with innovative capabilities. To solve these problems, it is necessary to carry out reforms and innovations in teaching concepts, methods, and assessments.

Teaching is the responsibility of teachers, and learning is what students need for development. Only when teachers and students jointly change their concepts, innovate thinking, establish a democratic and realistic teaching concept, and form a harmonious teaching atmosphere, it can give them full play to the initiative, mobilize their enthusiasm, and achieve the best teaching effect. The first is to respect the student's dominant status. Before teaching starts, a "conference meeting" should be held . it needs to solicit students' opinions and formulate a scientific teaching design. After the teaching, a "problem meeting" was held to continuously improve teaching methods. The second is to create an atmosphere of equal exchanges. Teachers establish a sense of ownership, and actively conduct academic exchanges. Teachers are encouraged to step down from the podium and become one with the students. They are from the "master" of the classroom to the "dominant" of the classroom, and from the simple "I speak and you listen, I teach you to do" to "You speak and I listen, you do and I teach " So that teachers and students can communicate on an equal and harmonious basis. The third is to advocate a truth-seeking and pragmatic academic attitude. The current composite material polymer matrix textbooks have a complete structure, rigorous system, and strong levels, but they were all compiled more than ten years ago, or even twenty years ago, and their content is quite different from the latest developments and practical applications of the subject. Therefore, it is necessary to appropriately adjust the teaching content according to actual needs, increase cutting-edge content, and increase the proportion of practical teaching content.

2. REFORM AND INNOVATE TEACHING METHODS

The teaching method is very important for effective the teaching. The past teaching mode did not meet the requirements of cultivating innovative talents. Such as indoctrination, nanny, and apprenticeship restrained students' initiative and creativity to a large extent Therefore, they must "sublate", absorb the essence of tradition, and create science. According to the characteristics of the course of polymer matrix for composite materials, the following three methods can be adopted.

Courseware guided learning style. It means that the teacher prepares the content of each lesson into courseware, listing in detail the teaching purpose, main content, key and difficult points of this section. Students

can have an overall and preliminary understanding of the content by watching the teaching courseware demonstration. Then, the teacher focused on explaining key and difficult issues. This can not only complete the study of basic theoretical knowledge, but also conduct in-depth thinking on key content. It can increase students' interest in boring professional pure theoretical learning and improve classroom utilization efficiency. But this requires teachers to be detailed, focused, and distinct when they make courseware. Let the students understand at a glance. Students are required to prepare before class and have an initial impression of what will be learned.

Goal guided is that the teacher decomposes the overall goal of the course into several stage goals, and stipulates the standards that need to be met for the learning tasks of each stage. Let students take the goal as the traction, give full play to their subjective initiative and complete tasks independently. Teachers follow up and guide, feedback in the implementation phase, guide students to digest and understand all the content of the subject and consciously complete the overall goal of the subject. This will improve students' ability to complete tasks independently and lay a good foundation for the next step of practical operation.

Study and seminar style is that the teacher puts forward the key and difficult questions in each chapter, allows students to study one by one and then discuss and exchange. The teacher should classify and comment on the students' analysis of the problem and the ideas for studying and solving the problem. Through these links, students can improve their ability to analyze and research problems. These can train students' cultivate interest in researching problems.

3. CARRY OUT TWO-WAY TEACHING ACTIVITIES

Classroom is the main position of teaching. It plays a leading role in teaching. Coordinated activities are modifiers. They play a supporting role. If the two can be combined with each other, it can get twice the result with half the effort. One is to carry out activities of discussing education and learning. Teaching seminars are organized before the start of each learning stage. Teachers and student representatives conduct collective discussions on teaching plans and teaching guarantees and solve teaching problems in time. That can ensure the smooth completion of teaching tasks. The second is to carry out teaching evaluation activities. There is a "two-way comment" between teachers and students, It is allowing students to give their opinions to teachers, and teachers to make requirements to students. Thus the inner motivation of teachers and students is stimulated. Which can improve teaching and learning. The third is to carry out activities to help teach and learn. Students were divided into groups. They carry out extensive mutual learning, mutual help and mutual teaching activities, so that students can deepen their understanding and mastery in mutual learning and complement each other's strengths, and solve puzzles.

4. ESTABLISH MULTIPLE ASSESSMENT METHODS

Reasonable and scientific assessment methods can mobilize students' learning interest and motivation, and improve students' ability to learn actively. We combine the professional characteristics of polymer matrix for composite materials and adhere to the traditional and effective knowledge assessment methods to form specific methods for quality and ability assessment. The students' learning situation not only makes a quantitative assessment, but also makes a macro qualitative conclusion. Specifically, the three-in-one test method. One is to insist on combining closed-book examinations with open-book examinations. The former helps students to strengthen their memory, but it often leads to rote memorization. The open-book test can stimulate students' enthusiasm for learning, and it is more conducive to cultivating students' ability to consult literature, data and comprehensive analysis. Because this method is more in line with the psychological requirements of students, it has stimulated students' interest to a certain extent, and it is conducive to the cultivation of innovative personality, so it has achieved good teaching results. The second is to adhere to the combination of test results and usual results. The student's final score is composed of test scores (70%), test scores (10%) and usual scores (20%). The usual scores are divided into four parts: attendance rate, classroom performance, homework completion, and usual quiz scores. This method urges students to study in normal times and conducive to the accumulation of knowledge. Many students no longer engage in temporary surprises and can better test their comprehensive abilities. The third is to adhere to the combination of practical test and oral test defense. The third is to adhere to the combination of practical test and oral test defense. The experimental class is mainly to cultivate students' hands-on ability. It also examines students' application ability and understanding of basic theoretical knowledge. In the experimental assessment, we not only examine whether students can perform accurate operations in accordance with the experimental conditions and experimental procedures, but also ask relevant questions about the relevant knowledge points and precautions of each link of the experiment. Students are required to make oral defenses to test their mastery of experiments and their understanding and application of theories. This can promote students to know what they are and why they are.

5. PRINCIPLES TO BE GRASPED IN INNOVATIVE TEACHING

The first is the principle of combining theory with practice. Theory is derived from practice and it is higher than practice. At the same time, it has a certain guiding role for practice. On the basis of practice, it can enrich and develop theory. For example, teachers make full use of case such as teaching, physical teaching, simulation teaching in teaching, so that students can greatly enhance their perceptual understanding and knowledge on the basis of learning theory. At the same time, it can enable students to greatly enhance their perceptual understanding and knowledge on the basis of learning theories. The second is the principle of exploratory nature. It is required that teacher's education and teaching activities should be exploratory, create exploration situations for students and improve students' ability to think. The third is the principle of individualization. Teachers' education and teaching activities are required to teach students in accordance with

their aptitude to stimulate students' initiative and independence. Teachers must not only cultivate students' innovative talents, but also cultivate innovative personalities. The fourth is the principle of two-way communication. In teaching activities, we should not only pay attention to students' absorption of knowledge, but also pay attention to students' innovation and application of knowledge. We must not only give play to the leading role of teachers in the classroom, but also pay attention to mobilizing the main role of students in the classroom. We truly do "Teach people how to fish".

6. CONCLUSION

Teaching reform is a long-term work and a process of continuous exploration. It requires careful consideration, serious research and gradual implementation in all aspects of the professional course teaching process. Through teaching reforms, we have introduced modern educational technology into the teaching methods of the course of composite materials specialty polymer matrix, and integrated modern educational theories into teaching ideas. Essentially, it is a question of how to organize teaching, rather than replacing teachers. The organizational form stimulates students' initiative and creativity in innovation and enhances the effectiveness of teaching. Therefore, we cannot completely deny the essence of tradition. We must carry forward the essence, discard the shortcomings and integrate them organically.

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Research on The Application of Multiple Teaching Methods in The Teaching Reform of Fundamentals of Optoelectronic Physics

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Abstract: The course of Fundamentals of Optoelectronic Physics for Optoelectronic Information Science and engineering major involves many contents, strong theory, and students 'lack of understanding of the course', which causes the actual teaching effect is not ideal. Guided by these problems, this paper adopts a variety of teaching methods to promote the learning of the course.
Key words: Fundamentals of Optoelectronic Physics; teaching reform; flipped classroom

1. INTRODUCTION

As one of the most potential industries in the world today, optoelectronic information science and engineering major affects various high-tech industries, and the state attaches great importance to the cultivation of talents in this major. Fundamentals of Optoelectronic Information Physics, edited by Shen Weimin and other editors of Electronic Industry Press, is a textbook for optoelectronic specialty planning in the 12th Five Year Plan. It covers electromagnetic theory, quantum knowledge, semiconductor physics and other knowledge. It is an optional textbook for Optoelectronic Information Science and engineering specialty of Zhoukou Normal University. Learning the fundamentals of Optoelectronic Physics well plays a strong supporting role in the follow-up courses of optoelectronic specialty. Due to the content of this course is more, abstract theory, resulting in students' understanding difficulties, lack of interest in learning [1].

2. PROBLEMS IN TEACHING

2.1 Unreasonable class hour allocation

Fundamentals of Optoelectronic Physics course covers three knowledge links: electromagnetic theory, quantum theory and fundamentals of solid optoelectronics, and each link is an original independent course. 63 theoretical hours are relatively limited for this course. It is difficult to understand and master a large number of physical concepts and professional terms in a limited time. However, there are some unreasonable problems in the current curriculum system, for example, the repetition of the contents of this course and other courses such as *electromagnetic field and electromagnetic wave* and *physical optics* in the same period, and the different teaching emphasis, there are contradictions in the order of courses and the allocation of class hours in the course setting, which lead to students' repeated learning of the same content [2].

2.2 Students lack of understanding of the course

As one of the core professional basic courses of optoelectronic specialty, *Optoelectronic Information Physics Foundation* is the cornerstone of other professional courses. However, this course is characterized by strong theoretical knowledge. For engineering students who pay attention to practicality and interest, it is not necessary to set up this course. There is a serious misunderstanding here. Engineering students think that they should set up a subject with strong application and good employment prospects, and just deal with the examination for basic courses [3-4]. In fact, theory is the pioneer of practice, and practice is to test the truth of theory. The two complement each other. The progress of modern science and technology is inseparable from the support of theory.

2.3 Lack of interest in learning

First of all, this course is a theoretical course, and the textbook examples and exercises are less, it is difficult to attract students' interest. Secondly, this course needs to have more basic knowledge of physics and mathematics. Students' College Physics and advanced mathematics foundation is relatively weak, resulting in students' low interest in learning and teachers' unsatisfactory teaching effect. Thirdly, the motivation of learning is self-need, students should fully self-study, take the initiative to seek. However, because students are not familiar with the professional personnel training program, they do not fully understand the necessary knowledge and employment prospects of this major. Fourthly, students' fear of the final exam. Under the background of new engineering, this course integrates three independent parts into one textbook [5]. The content span is large and the knowledge points cover a wide range. It is very difficult to cover all aspects. The single form of examination makes students take passing the examination as the ultimate goal and lose the initiative in learning, thus the examination is also meaningless.

3. SOLUTION

In view of some problems existing in the teaching process of *Fundamentals of Optoelectronic* Information *Physics*, we try to integrate a variety of teaching methods to overcome the shortcomings of traditional teaching mode, so as to stimulate students' learning enthusiasm, cultivate students' innovation ability, and truly realize the innovative education advocated by the state [3, 4]. In classroom teaching, we use the combination of teaching method, multimedia teaching method and flipped

classroom teaching method to guide students to carry out active learning and exploratory learning, which can not only promote students' understanding and mastery of basic knowledge, but also cultivate students' ability of autonomous learning and inquiry knowledge, and achieve good teaching results. Then we will introduce our innovative concept of multi teaching method integration.

3.1 Teaching method

In order to learn *the Fundamentals of Optoelectronic Information Physics,* we need to grasp the overall knowledge framework and highlight the key points and difficulties of teaching. Because this course involves many courses, such as electromagnetic theory, quantum mechanics physics, solid physics and so on, it is difficult for students to understand some basic knowledge points and it is difficult to learn. First of all, we will present the overall framework of the course to the students, and give a brief introduction to each part of the content, hoping that the students can have an overall grasp of the course, which is also conducive to weakening the students' fear and fear of difficulties. Secondly, in the part of quantum physics, we add the introduction of the development history and frontier of quantum physics, briefly explain the emergence and rise of quantum physics, improve students' learning enthusiasm by introducing the contradiction between quantum physics and classical physics, make students aware of the limitations of classical physics, and observe the micro world from the perspective of quantum. In the later specific knowledge explanation, students can understand that the corresponding knowledge can be used to explain various phenomena in the micro world, which promotes students' thirst for knowledge. Finally, we should make clear the main line of knowledge, strengthen the connection of knowledge, weaken the specific derivation process of formula, and adopt the learning method of understanding first and then in-depth, so as to achieve the purpose of clear thinking and clear concept. For example, in the explanation of carrier concentration in semiconductor physics, we should start from the main line of how to calculate the carrier concentration at equilibrium to find the required physical quantities, such as density of state, Fermi distribution function, etc. In this way, it is not only conducive to the training of students' logical thinking, but also conducive to strengthening the understanding of relevant physical quantities.

3.2 Multimedia teaching method

Multimedia teaching is to present the physical process of semiconductor more vividly in the form of animation and pictures, so that students can understand the changes better. Therefore, the use of multimedia teaching can solve the problems of abstract process and difficult understanding in conventional classroom teaching. We use multimedia to demonstrate and explain to students in class, which has good teaching effect. Compared with the boring traditional blackboard writing, the way of multimedia display content is convenient and intuitive, with strong sense of vision, which effectively improves students' understanding of knowledge points. For example, when talking about the unbalanced carriers generated by light, students can intuitively feel how the electrons in the valence band absorb the external energy and jump to the conduction band through the animation process, so that students can better distinguish the concepts of balanced carriers and unbalanced carriers. It is worth noting that in the teaching of Optoelectronic Physics Foundation, we can not blindly rely on multimedia courseware and ignore the guiding role of teachers in the teaching process. Therefore, in the classroom teaching, we first pave the way for the follow-up difficulties. After the students' interest is stimulated, we use multimedia technology to show the difficulties in teaching to the students. Only when the teacher's guiding role and multimedia technology are organically combined, students can really gain knowledge from the classroom.

3.3 Flipped classroom teaching method

Flipped classroom teaching method means that teachers give the initiative to students, guide students to carry out exploratory learning, and cultivate the ability of autonomous learning. This teaching method can change the traditional passive learning mode, adopt the student-centered mode, teachers arrange problems in advance, organize students to consult the information, and solve the problems existing in the course. This teaching method requires teachers and students to prepare in advance, teachers will issue the content and tasks to students in advance, and students will consult the information before class. The students in class study and discuss the problems, or present them to you in the form of PPT report. In the process of discussion, teachers should pay attention to the order of the scene, guide appropriately, and avoid deviating from the theme. In this process, teachers should guide students to express their views skillfully by using the theories and opinions they have learned, so that students can effectively establish the connection between the two on the basis of mastering the existing knowledge and experience, so that students' understanding can change from phenomenon to essence, from known to unknown, from hypothesis to argument, and make sure that students can fully and profoundly understand the topic discussed. At the end of the course, the teacher summarizes the students' research contents and results. Finally, for students' understanding deviation or neglect, the teacher will focus on the supplement. Through the joint efforts of teachers and students, we can not only have a clearer understanding of the subject, but also help to cultivate students' good scientific research literacy. In this way, through the students' own research, personal participation and the teacher's on-demand, students can integrate the knowledge they have learned under the guidance of the teacher and use it to solve practical problems; at the same time, students can also feel the importance of the course, broaden their academic vision and enhance their innovative thinking.

4. CONCLUSION

To sum up, in the process of photoelectric physics teaching, in view of some problems existing in it, we have made practical exploration and reform of classroom teaching methods. In practical teaching, teachers should apply various teaching methods flexibly in order to get better teaching effect. In the future, we will continue to

develop and improve the teaching method of research-based learning for the purpose of cultivating students' innovative consciousness and scientific inquiry ability, and strive to cultivate innovative talents.

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Research on Electric Control System and Power Distribution Model of Hybrid Vehicle

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Abstract: This paper aims to transform the hybrid drive system of traditional locomotive based on brushless DC motor. The design of hybrid drive system is based on two functions of brushless DC motor power generation and power drive. On the one hand, it can provide driving force for the motorcycle to drive the wheels, and on the other hand, it can also serve as a generator to provide charging power for the motorcycle battery. The research mainly designs the control system of brushless DC motor and the charging circuit of brushless DC generator to ensure the reuse of brushless DC motor. In hybrid mode, the optimal power distribution output of motor and engine can be realized by power allocation decision model system. At the same time, the motorcycle instrument panel is reformed to a certain extent, and humanized man-machine interface is designed to realize the display of fuel quantity, electric quantity, speed and switching control of working mode, so as to create objective economic and social value for the industry and local economy.
Keywords: Hybrid electric vehicle; Power distribution; Electronic control system; Optimize

1.INTRODUCTION

At present, the world is faced with two major: energy and environmental problems. The industrial development model of consuming non-renewable energy is no longer sustainable. In particular, the industrial development mode that relies on oil resources has become the industrial development path that every country rejects vigorously with the increasing scarcity of oil and the pollution caused to the environment. With the increasing shortage of energy and the aggravation of environmental pollution, the vehicle powered by electricity has become a trend with its advantages of energy saving and environmental protection [1]. As a kind of clean energy, the pollution-free emission of electric power energy consumption has a broad space in the application of replacing petroleum energy [2-3]. Hybrid electric vehicles have a promising market. Environmental protection and energy saving products with clean and green energy as power source have become the main battlefield of industrial innovation in various countries.

In recent years, the research of oil-electric hybrid has become a hot spot in the field of vehicle drive technology. The automobile industry represented by the developed industrial countries has started to study electric vehicles and electric and oil hybrid electric vehicles early, and has launched commercial products. There are four main structures of hybrid electric vehicles: tandem, parallel, hybrid and composite. With parallel hybrid power source,

the vehicle can be powered individually or jointly. Through the coordination of the two power sources, the vehicle's requirements on power performance and economy can be realized, and the efficiency of the vehicle system can be maximized. The working mode of parallel hybrid electric vehicle realizes the most efficient power drive configuration through the free switching of pure electric drive, engine drive, combined drive, vehicle charging and energy feedback. Parallel hybrid electric vehicle has become a hot spot in many research fields of new energy vehicles due to its high efficiency [4].

Zhang Xin proposed a new hybrid drive system, and analyzed and modeled parameters such as the working principle, driving mode, and the speed torque of the engine motor, proving that the hybrid drive system has good realizability [5].Hou Liming and Chen Wei made a simple study of the current petrol-electric hybrid technology, and introduced the configuration form of petrol-electric hybrid, system logic control, and the analysis of the working mode of petrol-electric hybrid vehicle under different working conditions. The test proved the realizability of petrol-electric hybrid with low fuel consumption [6]. Yan Fuwu and Pan Qingqing et al. described the engine speed regulation method of hybrid electric vehicle in their paper, and proved that the dynamic control method under hybrid electric vehicle improved the switching performance and effect of driving mode and reduced fuel consumption by establishing the dynamic torque model of motor compensation engine and conducting simulation analysis [7].

The motor is the pivot of the whole hybrid power system, which is directly related to the system performance and pollutant emission index. Su Tao et al. took AC permanent magnet synchronous motor as the research object, designed the hardware and software of the drive system in the controller, and verified the correctness and feasibility of the drive system design through simulation [8]. Wu Zhiguo and Gong Yimin et al. took brushless DC motor as the research object, took the main control chip and vector transformation PWM as the motor control method, and proved that the hybrid power system based on brushless DC motor could meet the driving needs and improve the fuel economy through the electrical system test and the whole machine test [9].

2. DESIGN SCHEME

As a relatively mature driving technology, hybrid power technology has been proved to be feasible and economical in the application of automobile field. But it has not been introduced into the motorcycle industry. No similar concept hybrid motorcycle has been found on the market.

Domestic motorcycle manufacturers also did not develop in this respect. Through the survey of market customers, it is reflected that hybrid motorcycles are popular because of their advantages such as light weight, energy saving and economy.

(1) Electronic control system design technical route

①The main control system based on 89S51 MCU and the brushless DC motor drive control system based on SPMC652404A MCU are designed. The main control system mainly completes the instrument panel, throttle handle and other man-machine equipment control, oil volume, battery power, engine speed, speed detection, body vibration detection, battery charging and discharging circuit control, engine switching circuit control and other functions. The drive control system mainly completes the closed-loop feedback control of the brushless DC motor. The communication between the main control system and the drive control system is realized through RS232. The whole composing principle block diagram of the electronic control system is shown in Figure 1.
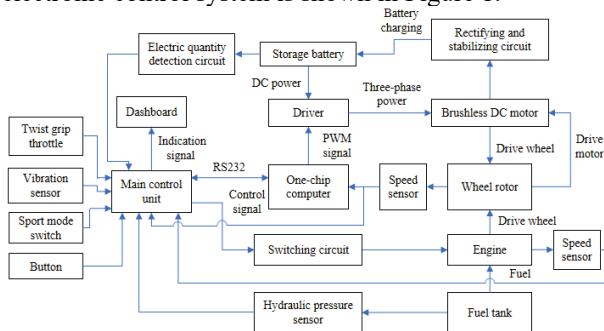
Fig.1 Block diagram of electronic control system

②The brushless DC motor drive control system uses SPMC652404A as the control unit, and uses the dedicated integrated intelligent module IRAMS06UP60A as the motor drive circuit. SPMC652404A specially designed four-way PWM output is designed for motor drive, with strong anti-interference ability. The IRAMS06UP60A integrated power module consists of a three-phase power inverter, a gate driver, and an auxiliary circuit. It integrates a low-loss IGBT (insulated gate bipolar transistor) circuit with a high-voltage, high-speed, three-phase drive integrated circuit. Its composition principle block diagram is shown in Figure 2.
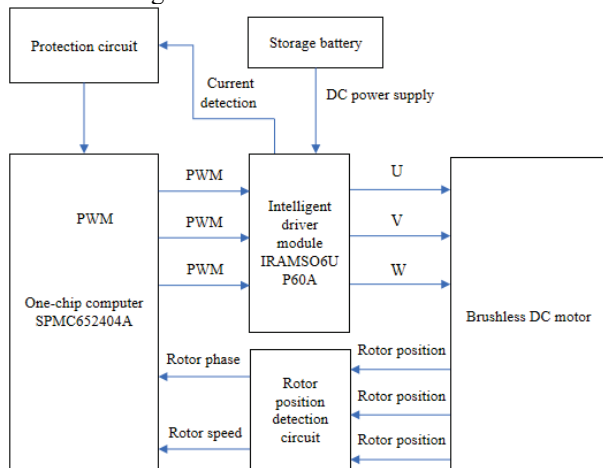
Fig. 2 Schematic diagram of motor drive control system

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③Battery charging circuit is composed of bridge rectifier circuit, low-pass filter, DC/DC converter and other circuits, which completes the conversion of AC voltage output by brushless DC motor into stable DC voltage output and provides the battery charging power supply. The bridge rectifier adopts three-phase bridge rectifier circuit, the low-pass filter adopts passive LC filter circuit, and the DC/DC converter adopts Buck chopper circuit to control the voltage output. The charging circuit is shown in Figure 3.
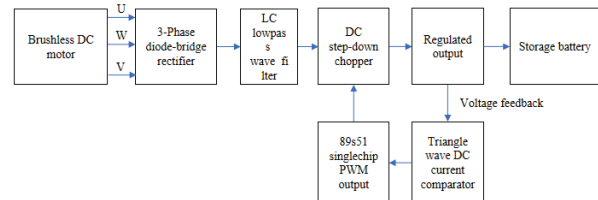
Fig. 3 Battery charging circuit

④The MCU of main control unit is mainly responsible for man-machine interface circuit input and output signal processing and sensor interface circuit input signal processing. Using 89S51 MCU as the processor, the internal integration of multiple A/D conversion, as well as PWM/ counter, so that the sensor interface peripheral circuit design. The circuit diagram principle block diagram is shown in Figure 4.
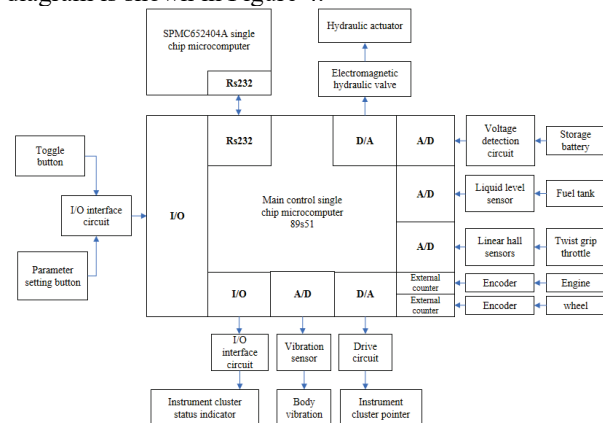
Fig. 4 Block diagram of peripheral circuit composition of main control unit

⑤The speed of motorcycle is controlled by PID feedback control algorithm. The feedback control block diagram of the system is shown in Figure 5.
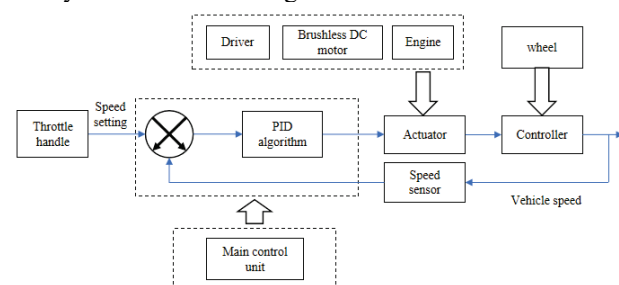
Fig. 5 Block diagram of speed control system

⑥Using C language to write the program of electronic control system.The main modules are the master control unit module programming and the motor drive module programming and the decision-making model

programming based on neural network. The two modules realize data communication between them through RS232 serial interface. The block diagram of system program is shown in Figure 6.
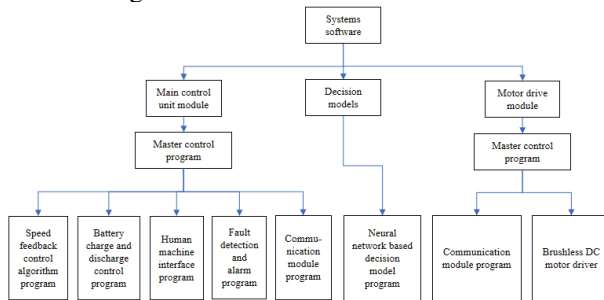
Fig. 6 Block diagram of system program composition

(2) Research on the decision-making model of power output allocation based on neural network

The power output allocation decision model based on neural network takes the vehicle body vibration signal as the input, extracts the amplitude and frequency characteristic values of vibration signal as the input, and takes the speed as the input. A hidden layer is set in the middle, and the output layer is the power output of motor and engine. It is difficult to obtain the expected distribution of motor power and engine power in the sample. In this project, repeated test runs was carried out under the same road conditions to find a certain power distribution to minimize energy consumption. This set of experimental data was used as training samples of a set of neural networks, and the samples record vibration signals, speed and expected power distribution. The structure of the three-tier double-output decision model is shown in Figure 7.
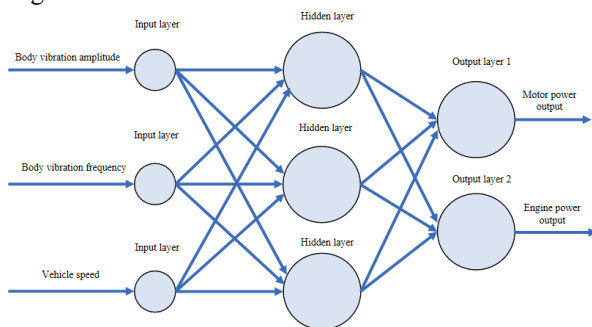
Fig. 7 Decision-making model of neural network

3. RESEARCH AND DISCUSSION

The research focuses on the optimization of electric and engine power configuration in hybrid drive mode. How to maximize the efficiency of a motorcycle in different stages of driving is a difficult problem for the optimization of motor and engine in hybrid driving mode.

The motor and engine are required to automatically adjust their respective driving modes in the process of starting up to running normally in order to achieve maximum efficiency. In the start-up stage, the motor powered by battery energy is used to make use of the motor's high efficient and sensitive start feature.

In the middle and low speed stage, the efficiency of the engine is not ideal, and it needs to be driven by the motor as the dominant power. After normal driving, low fuel consumption can be used motor and engine joint drive. It is difficult to choose the demarcation point from medium speed to high speed here. Even in the fuzzy phase of velocity transition, the power output distribution of the motor and engine at different speeds should be considered. In this paper, a three-layer, three-input and two-output neural network decision-making model, which takes body vibration signal and vehicle speed as input and motor power and engine power as output, is studied to control the power output distribution of motor and engine power under different vehicle speeds to achieve low fuel consumption and high performance motorcycle running.

4. CONCLUSION

(1)Based on the brushless DC motor PWM drive technology, with high power density, high efficiency and other characteristics are widely used in the industrial field, mainly to solve the problem of brushless DC motor torque ripple, torque ripple to reduce the reliability of the drive system and bring vibration, noise, etc. By designing an electromagnetic torque estimator based on the adaptive control principle, the output current waveform of the current regulator was determined by the error between the measured value and the estimated value, and the torque ripple minimization control was realized.

(2)The battery is charged at a constant voltage. For the three-phase AC output of the brushless DC motor, through a series of processes such as three-phase rectifier bridge, low-pass filter, DC/DC converter and PWM output control circuit, the stability of the charging power supply and the prevention of overcharging and over discharge of the battery can be ensured to meet the expected requirements.

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Analysis of the Impact of Residents' Energy-saving Awareness on the Popularity of Green Energy-saving Home Appliances Based on Logistic Regression

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Abstract: In view of the ecological environment deterioration, waste of resources situation nowadays, this article through to the citizens, the questionnaire survey to explore residents' understanding of China's energy efficiency label level and in popularization of green energy saving appliances, select the typical household electrical appliances, such as SPSS software to analyze the questionnaire data, and the generalized linear model established on the basis of binary Logistic regression model, it is concluded that the residents' awareness of energy saving of the popularity of green energy-efficient appliances.
Keywords: Green home appliances; Energy-saving awareness; Energy efficiency mark; Lgoistic regression; SPSS

1. INTRODUCTION

Nowadays, many countries in the world continue to discuss and reflect on the problems of greenhouse effect and resource shortage, in order to remedy the deteriorating ecological environment and ensure the sustainable development of green environment. For China, the significance of energy conservation is not only to ensure energy security, but also to reduce emissions of greenhouse gases such as carbon dioxide, reduce greenhouse effect and reduce environmental pollution through energy conservation. Therefore, it is of great significance to use energy-saving household electrical appliances to save resources and protect the environment[1].

Green home appliances refer to those household appliances that are highly efficient and energy saving on the premise of qualified quality and do not cause harm to the human body and the surrounding environment in the process of use. They can also be recycled after being scrapped. For the definition of green home appliances, there is no unified detection and assessment standard in our country at this stage. This paper takes the energy efficiency grade as the index to quantify the environmental protection degree of green home appliances[2]The popularization degree of green energy-saving home appliances is analyzed, and reasonable suggestions are given for promoting the application of energy-saving home appliances.

2. DATA SOURCE AND PREPROCESSING

"Questionnaire on Popularization Status and Suggestions of Green Energy Saving Household Appliances" was distributed to collect data. Based on the combination of simple random sampling and multi-stage sampling, the original data were collected through one-to-one questionnaires, and statistical analysis was conducted on the status quo and attitude of various types of residents in Bengbu City, Anhui Province towards the use of new energy-saving home appliances. In the end, 200 questionnaires were issued and 186 questionnaires were effectively recovered.

After the questionnaire results are obtained, the reliability and validity of the questionnaire are analyzed. The Klonbach ALPNA coefficient of the questionnaire was 0.9861>0.8, and the reliability of the questionnaire was good. The KMO value was 0.925, greater than the standard of the minimum test coefficient of 0.9, and the P value was close to 0.000. The questionnaire had good validity. Delete blanks, fill in the wrong unnecessary information, clean the data.

The main contents of this survey include the popularity of new energy-saving appliances in Bengbu residents, their cognition of energy-saving appliances, their awareness of energy-saving appliances and their views on energy-saving appliances.

3. DESCRIBE STATISTICAL ANALYSIS

3.1 DISTRIBUTION OF UNDERSTANDING OF ENERGY EFFICIENCY LABELS IN CHINA
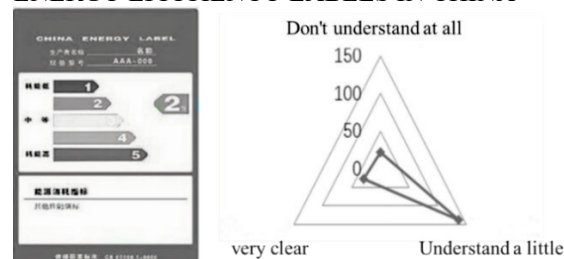
Fig. 1 Distribution of energy efficiency labeling and understanding degree in China

By understanding residents' understanding of China's energy efficiency label, this paper represents residents' awareness of green consumption when purchasing home appliances. Figure 1 shows China's energy efficiency label. 1-5 on the left of the icon represents the efficiency level. The smaller the number is, the higher the technical level is and the less energy consumption is. [3].

In this survey, the distribution of respondents' understanding of the meaning of China's energy efficiency label is shown in Figure 2. Those who have a little understanding of the meaning of China's energy efficiency represent the largest proportion of respondents, while those who have a very clear or complete understanding of the meaning of China's energy efficiency account for a very small number. This shows that most people are more or less familiar with the meaning of China's energy efficiency labeling.

3.2 ENERGY EFFICIENCY LEVELS OF COMMON HOUSEHOLD APPLIANCES

This survey selects air conditioning, refrigerator, washing machine as the representative of three types of household appliances as the objects of this survey. The distribution of energy efficiency labeling levels of air conditioners, refrigerators and washing machines in this survey is shown in Figure 3. The distribution of energy efficiency levels of the three electrical appliances reflects the popularity of energy-efficient electrical appliances.

Can be seen from figure 3, the use of air conditioners, refrigerators, washing machines present situation, the energy efficiency of grade 1 and grade 2 energy efficient green home appliance overall accounted for about 60%, although more than half of the people began to use energy-efficient appliances, but its penetration rate is still low, the use of energy-saving home appliances cause unnecessary waste of energy.
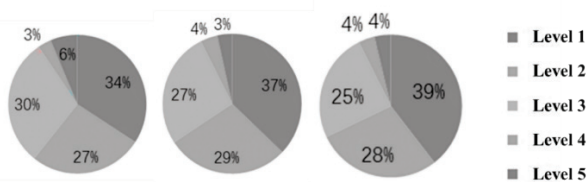
Fig. 2 Distribution diagram of energy efficiency labels of air conditioners, refrigerators and washing machines

4 INFERENTIAL STATISTICAL ANALYSIS -- THE CHOICE OF THE DEGREE OF COGNITION OF ENERGY EFFICIENCY LABEL ON THE DEGREE OF ENERGY SAVING OF HOME APPLIANCES

Sometimes people's lack of awareness of energy efficiency labels may reduce the proportion of energy-

efficient products they buy. We looked at the percentage of people with different levels of awareness of energy efficiency labels who bought appliances with different levels of energy efficiency. Take the refrigerator as an example:
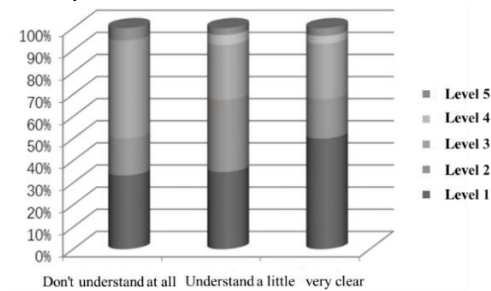
Fig. 3 Selection of refrigerator energy saving degree based on cognition degree of energy efficiency label

In order to explore whether there is a significant difference between the awareness of energy efficiency labels and the energy efficiency level of electrical appliances purchased, a series analysis of multiple independent samples was used for testing. The contingency analysis can judge the trend of change and the degree of correlation between samples. In the contingency analysis, the chi-square test is used to measure the correlation: the null hypothesis (H0) is that: the awareness degree of energy efficiency label is unrelated to the energy efficiency grade of air conditioning purchased. The statistic of the chi-square test is, where A is the actual frequency, T is the theoretical frequency, and I and j represent the number of the row and column respectively. χ^2 The larger the value, the more obvious the difference between the actual frequency and the theoretical frequency is. The degree of freedom is V = (R-1)(C-1), R and C represent the number of rows and columns, respectively, and the significance level is 0.05. When the significance level was less than 0.05, the null hypothesis was rejected [4].

4.1 THE AIR CONDITIONING

As can be seen from Table 1, the P values of this test are all far less than 0.05, thus rejecting the null hypothesis, indicating that there is a significant difference between the awareness of energy efficiency label and the energy efficiency grade of air-conditioning purchase. It can be intuitively seen from the figure below that the higher the awareness of the energy efficiency level, the higher the proportion of people buying Level I air conditioning. Therefore, the awareness of the energy efficiency label is proportional to the proportion of people buying Level I air conditioning.

Table 1 Chi-square test results of awareness of energy efficiency labeling and willingness to buy air conditioning energy efficiency grade1

statistic	value	Degrees of freedom	Evolutionary value (bilateral)
Pearson chi-square	19.327a	10	0.036
Likelihood ratio	20.456	10	0.025
Linear and linear combinations	11.509	1	0.001
N in the valid case	187	-	-

4.2 THE REFRIGERATOR

As can be seen from Table 2, the P value of this test is also far less than 0.05, thus rejecting the null hypothesis,

indicating that the recognition degree of energy efficiency label is significantly different from the energy efficiency grade of refrigerators purchased. It can be seen intuitively

that the higher the awareness of energy efficiency level is, the higher the proportion of people buying first-level refrigerators will be. Therefore, the awareness of energy efficiency label is proportional to the proportion of people buying first-level refrigerators.

Table 2 Chi-square test results of awareness of energy efficiency labeling and willingness to purchase energy efficiency grade of refrigerators 2

statistic	value	Degrees of freedom	Evolutionary value (bilateral)
Pearson chi-square	30.153 a	8	0.000
Likelihood ratio	24.993	8	0.002
Linear and linear combinations	9.881	1	0.002
N in the valid case	187	-	-

4.3 WASHING MACHINE

In the same step as above, it can be seen from Table 3 that the p-value tested between the recognition degree of energy efficiency label of washing machines and the purchase intention is also far less than 0.05, thus rejecting the null hypothesis, indicating that the recognition degree of energy efficiency label of washing machines is also significantly different from the energy efficiency grade of purchasing washing machines.The higher the awareness of the energy efficiency rating, the higher the proportion of people buying tier 1 washing machines, and the awareness of the energy efficiency label of washing machines is proportional to the proportion of people buying tier 1 washing machines.

Table 3 Chi-square test results of awareness degree of energy efficiency labeling and willingness to buy energy efficiency grade of washing machine 3

statistic	value	Degrees of freedom	Evolutionary value (bilateral)
Pearson chi-square	23.053a	8	0.003
Likelihood ratio	17.593	8	0.024
Linear and linear combinations	9.184	1	0.002
N in the valid case	187	-	-

5 LOGISTIC REGRESSION MODEL ON THE INFLUENCE OF COGNITION OF ENERGY EFFICIENCY LABEL ON SELECTION BEHAVIOR

5.1 RESEARCH IDEAS

After determining that the cognitive degree of residents' energy efficiency labeling has an impact on the selection of refrigerator energy saving degree, the generalized linear model (GLM) model was established by SPSS software with the data results of refrigerators as an example[5], the influence of residents' cognition of energy efficiency sign on the choice of different refrigerators was modeled for further discussion. Firstly, the questionnaire data were further sorted out. According to whether a green energy-saving refrigerator was purchased, the data results of refrigerator energy efficiency rating 1 and 2 were classified as "Yes", and the data results of refrigerator energy efficiency rating 3 to 5 were classified as "No". In combination with the awareness of energy efficiency labeling, a new tandem table was obtained, and a logistics regression model of dichotomy data was established to solve the problem[6].The new contingency table is as follows:

Table 4 Relationship between cognition of energy efficiency symbol and refrigerator selection 4

Cognition of energy efficiency labeling	Choose a green energy-saving refrigerator		Combined
	is	no	
Have no idea	5	8	13
To understand a little	73	68	141
Know very well	22	10	32
A combined	122	64	186

For the two categories of response variables, the binary response variable is denoted as Y, and the possible results are denoted as 0 (no) and 1 (yes).For n independent observations, the number of successes follows a binomial distribution. Since the relationship between $\pi(x)$ and π is usually not linear, logistics regression model is established as follows:

$$\log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \alpha + \beta x$$

5.2 RESULT ANALYSIS

SPSS software is used to fit the data in Table 4, and the logistics regression model for selecting awareness degree of energy efficiency labels for residents' refrigerators is as follows:

$$\text{Logit}(\pi(x)) = -1.226 + 0.657x$$

It can be concluded from the above formula that the better residents' understanding of energy efficiency signs is, the more inclined they are to buy refrigerators with higher energy efficiency levels. Similar results can be extended to other household appliances. It can be concluded that the higher residents' awareness of green energy saving is, the stronger the green consumption will be, and they are more inclined to energy-efficient and environment-friendly household appliances.

6. CONCLUSION

In view of the current resources waste, ecological deterioration of the environment present situation, this article through to China's energy efficiency label of

bengbu people cognition and special investigation, green home appliance popularity is based on the perspective of urban residents survey data, process and the result of the questionnaire describing statistical analysis, combined with the contingency table chi-square concluded that residents of the energy efficiency label between cognition and the choice of home appliance energy saving level, the relationship between the use of binomial Logistic regression model analysis the cognitive level of energy efficiency of appliances energy-saving choice behavior, found by bengbu three line city green home appliance popularity is still not high, Residents have a certain understanding of energy efficiency grade marks, but they do not fully understand them. And according to the conclusion of the model, residents' understanding of energy efficiency grade marks has a positive effect on the popularization of green home appliances. Therefore, to promote the popularization of green home appliances in the future, the government and enterprises have the responsibility and obligation to promote the relevant knowledge of energy-saving home appliances, improve residents' awareness of green consumption, and promote environmental protection and sustainable development.

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Empirical Analysis of the Influencing Factors of Anhui CPI Based on Multiple Regression and Autoregression

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Abstract: The consumer price index is used to comprehensively reflect the changes in the price level of residents' purchase of goods and services, and has an important reference role for the country's macroeconomic policy control. In view of the factors affecting the consumer price index of Anhui Province, we selected 24 years of data from 1996 to 2019 in Anhui Province, and used the two methods of multiple regression analysis and autoregressive model to comprehensively analyze the consumer price index of Anhui Province from various aspects. Empirical research on the influencing factors. There is a positive correlation between gross domestic product and commodity retail price index and consumer price index, while the relationship between money supply and consumer price index is negatively correlated, of which commodity retail price index has the greatest influence on CPI.
Keywords: Consumer Price Index; Influencing Factors; Multiple Regression; Vector Autoregression

1.INTRODUCTION
The Consumer Price Index (CPI) covers the prices of goods and services involved in the daily consumption of urban and rural residents, such as clothing, food, housing, education, culture and entertainment, communications, and medical care. The consumer price index not only reflects the consumption level of residents, and is closely related to the lives of the people, but also reflects the degree of inflation and deflation. At the same time, it is a reference for the country's economic decision-making and price control, and it occupies an important position in the national economic system. . In addition, the level of CPI has an important impact on financial markets.
According to the statistics of the National Bureau of Statistics of my country in 2020, from a month-on-month perspective, the consumer price index of Anhui Province in November 2020 decreased by 0.9%, and the decline increased by 0.4% from the previous month. Looking at the residents of Anhui Province in November 2019 from a year-on-year basis Consumer prices rose by 0.1%. The CPI in November 2020 was down 1% year-on-year, and it was 0.2% lower than the CPI in November 2018. Compared with the national consumer price index, the CPI of Anhui Province in November 2020 was 0.3% lower than the national CPI. From August to November this year, the consumer price index of Anhui Province was lower than the national consumer price index. From 2018 to 2020, the consumer price index of Anhui Province has the

largest increase in January 2020, rising by 1.7%, and the largest decline in March 2018, falling by 1.6%. The rise in CPI shows that prices have risen and currency purchasing power has decreased, but the income level of residents has not risen correspondingly, and life pressure has increased. In order to control the consumer price index to reach its expected range and maintain stability, it is necessary to understand the nature of the rise and fall of the CPI, and what factors affect the excessive rise and fall of the consumer price index. These factors actually affect the CPI. What a shock.
Many scholars at home and abroad have conducted a lot of research on the influencing factors of the consumer price index. L. Lin [1] believes that the total retail sales of consumer goods and CPI are positively correlated, and the impact of the purchase price index of industrial producers on CPI is also More significant. C. J. Feng [2] shows that the relationship between social commodity retail prices and total import and export volume and CPI is positively correlated, and the impact of industrial product ex-factory prices on CPI is negative. In the research on the influencing factors of the consumer price index, [3-6] most scholars currently study the issue of consumer price index, and most of them are studying the current status of the CPI of the entire country and its influencing factors. Only a few people choose Research on a province. Since the country's CPI is weighted by the national consumption level and population size, it reflects the consumer price index of the entire country, which is different from the CPI of each province. Therefore, this article selects the CPI of Anhui Province for research, and more specifically finds out the factors that have a greater impact on CPI. In terms of research methods, most scholars choose methods such as multiple regression analysis or ARIMA model, but only one method is selected, and a single method is not enough to reflect the nature of the problem. Therefore, in order to analyze the accuracy of the analysis, this paper chooses the two methods of multiple regression analysis and autoregressive model to comprehensively study the influencing factors of the consumer price index of Anhui Province from many aspects.

2.DATA SOURCE
In the process of variable selection, combined with the existing research results of many scholars, the following five independent variables are selected. The increase in the supply of money will lead to a decline in the purchasing power of the renminbi, affecting the consumer price index, and GDP also has an important impact on the

CPI. This article selects 24 years of data from Anhui Province from 1996 to 2019. The data comes from the "China Statistical Yearbook" and "Anhui Statistical Yearbook". Specific indicators are shown in Table 1. Due to the difference in dimensions between different variables, the five explanatory variables are processed in logarithm. Obtain the GDP sequence (lnX1), the money supply sequence (lnX2), the total retail sales sequence of consumer goods (lnX3), the RMB exchange rate sequence against the US dollar (lnX4), and the commodity retail price index sequence (lnX5).

Table 1 Statistical indicators

Variable	Symbol	Unit	Mean
CPI	Y	-	102.19
GDP	X1	100 million yuan	12303.8
Currency supply	X2	100 million yuan	224797
The total retail sales of social consumer goods	X3	Ten thousand yuan	4.50e+07
RMB against U.S. dollar exchange rate	X4	-	737.9433
Commodity retail price index	X5	-	101.3167

3.Analyze the main influencing factors of Anhui's CPI based on multiple linear regression models

3.1 Research ideas

First, establish a multiple linear regression model between the consumer price index and five variables, observe whether the model has multicollinearity, eliminate multicollinearity, and then modify the model. White test and BP test are used for heteroscedasticity test, and DW test and BG test are used for autocorrelation test, and finally the revised model is obtained.

3.2 Model establishment and revision

Performing multiple linear regression through Stata software can get the initial model of multiple linear regression between the consumer price index and five variables [7-10]. Establish a multiple linear regression model:

$$Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 \quad (1)$$

In the regression estimation, R2 is 0.9473, and the adjusted R2 is 0.9326, indicating that the regression equation can explain the consumer price index to 93.26%. The F statistic value is 64.66, and the corresponding p value of the statistic is 0.000, indicating that the regression equation is more significant, and the overall regression effect of the model is better, that is, gross domestic product, money supply, total retail sales of consumer goods, RMB exchange rate against the US dollar, and commodities The five indicators of the retail price index together play a significant role in the consumer price index. However, when the equation was established, the test of four coefficients was not significant, and the coefficients of some variables did not conform to the realistic economic significance, so the model was considered to have multicollinearity. In order to eliminate multicollinearity, when introducing variables, they are gradually introduced according to the degree of

significance, and insignificant variables are discarded. Stata was used to perform stepwise linear regression, and the regression results obtained are shown in Table 2.

Table 2 Regression results

Variable	Coefficient	Root Mean Squared Error	t statistic	p value
LnX1	3.435	1.113	3.08	0.006
LnX2	-3.829	1.081	-3.54	0.002
LnX5	99.009	5.543	17.86	0.000
Constant term	-340.332	25.607	-13.29	0.000

It can be seen from Table 2 that at a significance level of 5%, the coefficients of GDP, total retail sales of consumer goods, and retail price index of commodities are all particularly significant. In the regression estimation, R2 is 0.9442, and the adjusted R2 is 0.9358, indicating that the revised regression equation can explain the consumer price index to 93.58%. The F statistic value is 112.75, and the corresponding p value of the statistic is 0.000, indicating that the revised regression equation is more significant and the overall regression effect of the regression model is better.

3.3 Model checking

Since economic phenomena are generally continuous and persistent, there are usually two problems of autocorrelation and heteroscedasticity in time series economic data. Therefore, these two tests are performed on the revised regression model. If the model has these two problems Such problems will further modify the model.

In order to test the accuracy of the results when performing heteroscedasticity, two test methods of White test and BP test are used to test. The test results are shown in Figure 1 and Figure 2.

```
White's test for Ho: homoskedasticity
       against Ha: unrestricted heteroskedasticity

    chi2(9)      =     11.18
    Prob > chi2  =     0.2638

Cameron & Trivedi's decomposition of IM-test

          Source       chi2     df       p

  Heteroskedasticity   11.18     9     0.2638
          Skewness      5.24     3     0.1552
          Kurtosis      0.27     1     0.6052

           Total       16.68    13     0.2143
```

Figure 1 White test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
       Ho: Constant variance
       Variables: fitted values of Y

    chi2(1)      =      1.07
    Prob > chi2  =     0.3003

. estat hettest ,rhs iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
       Ho: Constant variance
       Variables: lnX1 lnX2 lnX5

    chi2(3)      =      1.36
    Prob > chi2  =     0.7139
```

Figure 2 BP test

The null hypothesis of White test and BP test is homoscedasticity. It can be seen from Figure 1 that the chi-square value of the statistic is 11.18. The null hypothesis is accepted at the 5% significance level, and the model is considered to have no heteroscedasticity. It

can be seen from Figure 2 that the p value of the first BP test form is 0.3003, and the p value of the second BP test form is 0.7139. Both accept the null hypothesis and are consistent with the results of White's test. According to the review, it is believed that there is no heteroscedasticity in the model.

In order to avoid unnecessary errors during the autocorrelation test, DW test and BG test are also used for testing. The DW value is 1.903 when using Stata software to test the autocorrelation. When the sample size is 24 and the number of variables is 4, the DL value can be obtained by checking the upper and lower bounds of the DW test under the condition of a significance level of 0.05. 1.10, the D_U value is 1.66, satisfying $D_L < D_W < 4 - D_U$, it can be judged that the model does not have autocorrelation. The null hypothesis of the BG test is no autocorrelation. The chi-square value of the statistic obtained through software calculation is 0.026, and the p value is 0.8707. At the 5% significance level, we cannot reject the null hypothesis, so we accept that the model has no autocorrelation. Null hypothesis. In summary, there is no error in the model setting, and the model is reasonable. The final revised regression model results are as follows:

$$\hat{Y}_t = -340.332 + 3.435 \ln X_{1t} - 3.829 \ln X_{2t} + 99.009 \ln X_{5t} \quad (2)$$

According to the revised model, it can be seen that the three factors of GDP, money supply and commodity retail price index have a greater impact on CPI than other factors. There is a positive correlation between GDP and consumer price index. The relationship between the money supply and the consumer price index is negative, and the consumer price index decreases as the money supply increases. The retail price index of commodities has a positive impact on the consumer price index, and among the three influencing factors, the retail price index of commodities has the largest impact on CPI, and it is far greater than the other two factors.

4. Vector autoregressive model

4.1 Research ideas

According to the regression, it is found that the correlation between X4 and CPI is weak. In order to avoid excessive data dimensionality, the model accuracy is reduced, so the variable X4 is deleted. Carry out stationarity test and determination of the lag order of the vector autoregressive model, and build the model. Test the stability of the model and perform variance decomposition to obtain the contribution rate of each variable to the variance of the prediction error, and then conduct further comparative analysis

4.2 Stationarity test and determination of lag order of VAR model

In order to avoid false regression, it is necessary to use Eviews software to test the stability of the variables before establishing the vector autoregressive model. The test results are shown in Table 3.

Table 3 ADF inspection

Variable	ADF inspection value	p value	Critical result
lnX1	11.727	1.000	Non-stationary
DlnX1	-3.219	0.032	Stationary
lnX2	8.979	1.000	Non-stationary
DlnX2	-3.471	0.019	Stationary
lnX3	2.695	0.997	Non-stationary
DlnX3	-2.934	0.057	Stationary
lnX5	0.273	0.755	Non-stationary
DlnX5	-5.374	0.0003	Stationary

According to the data in Table 3, at a significance level of 10%, the data of the 4 variables that have taken the logarithm are not stable, and the data that have taken the logarithm belong to the first-order single integer, which meets the conditions for constructing the VAR model. According to the test results of the unit root test, a five-dimensional vector autoregressive model can be constructed on the variables of consumer price index, GDP, money supply, total retail sales of consumer goods, and retail price index variables, [11, 12] and the minimum value of the model can be determined according to the lag order selection criteria. The best lag order.

Table 4 Lag period selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	61.044	NA	4.22e-09	-5.095	-4.847	-5.036
1	184.195	179.129*	6.03e-13*	-14.018	-12.530*	-13.667
2	213.291	29.096	6.34e-13	-14.390*	-11.662	-13.748*

It can be seen from Table 4 that under the test of the likelihood ratio, the final prediction error and the Schwarz criterion, the lag period is selected as the optimal choice, and the lag is selected under the test of Akaike Information Criterion and Hannan Quinn criterion. The second phase is the best choice. Therefore, the first order of lag is selected and the VAR(1) model is established.

4.3 Model stability test

After the vector autoregressive model is established, its stability needs to be tested. The test results are shown in Figure 3. All the characteristic roots in the figure fall in the unit circle, and the reciprocal of the characteristic roots are all less than 1, so VAR(1) can be considered stable.

Inverse Roots of AR Characteristic Polynomial
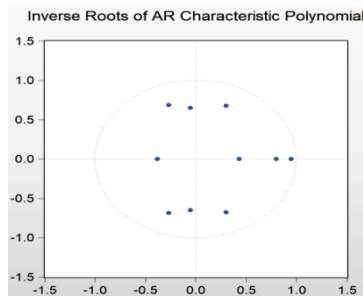
Figure 3 AR root map

4.4 Variance decomposition

The variance of each variable in the vector autoregressive system can be decomposed into the perturbation terms through variance decomposition, so as to obtain the contribution rate of each variable to the variance of the prediction error, and then conduct further comparison and analysis. The variance decomposition of the model is performed, and the results are shown in Table 5.

Table 5 Variance decomposition diagram

Period	Var	CPI	GDP	Currency supply	The total retail sales of social consumer goods	Commodity retail price index
1	1.59	100.0	0.00	0.00	0.00	0.00
2	2.08	60.93	1.72	33.53	2.42	1.40
3	2.27	63.50	1.79	28.48	2.15	4.07
4	2.32	60.71	4.02	28.94	2.18	4.15
5	2.54	50.97	7.96	34.91	1.82	4.34
6	2.58	50.73	8.11	34.63	2.25	4.28
7	2.61	49.66	8.20	35.54	2.24	4.35
8	2.61	49.51	8.19	35.61	2.31	4.38
9	2.62	49.27	8.44	35.60	2.28	4.40
10	2.63	49.16	8.46	35.66	2.32	4.39

It can be seen from Table 5: (1) The fluctuation of the consumer price index in the first period is only affected by itself, and when considering the overall contribution rate to the fluctuation of the consumer price index, the contribution rate of the consumer price index itself is the largest However, its contribution rate has shown a gradual decrease trend. After the fifth period, there will be basically no major changes, remaining at about 50%, and the contribution rate reached the minimum 49.16% in the tenth period; (2) From the GDP From the point of view of the contribution rate of this influencing factor, the impact of GDP on CPI gradually increased to a stable level. By the 10th period, the contribution rate reached the maximum of 8.46%; (3) The contribution of money supply to the consumer price index is relatively large., Showing a trend of volatility, but by the 10th period, the contribution rate reached a maximum of 35.66%, second only to the contribution rate of the consumer price index itself; (4) The contribution rate of the total retail sales of social consumer goods, gradually from the second to the fifth period Decrease, after the 6th period, the contribution rate is basically stable, roughly maintaining around 2.25%. (5) The contribution rate of commodity retail price index to CPI shows a gradually increasing trend as a whole, only the second period has a small contribution rate, and the contribution rate of the third period to the tenth period is about 4.3%.

Among the four influencing factors, the largest contribution to the consumer price index is the money supply, and the remaining three influencing factors are GDP, the retail price index of commodities and the total retail sales of consumer goods in order of their contribution rates. This shows that the money supply in Anhui Province has a greater impact on the consumer price index, and the gross domestic product has a certain impact on the consumer price index to a certain extent in terms of overall control. It shows that at this stage, the money supply in Anhui Province has a greater impact on

the consumer price index.

5. Conclusion

This article uses multiple linear regression on the influencing factors of the consumer price index of Anhui Province, and establishes an autoregressive model for variance decomposition, and draws the following conclusions. Compared with other influencing factors, the effects of GDP, money supply and commodity retail price index on consumer price index are more representative. There is a positive correlation between the GDP and the retail price index of commodities and the consumer price index, while the relationship between the money supply and the consumer price index is negative. Among the three influencing factors, the retail price index of commodities has the greatest influence on CPI, and it is far greater than the other two factors. This article further analyzes the factors that affect CPI fluctuations and selects four main factors: GDP, money supply, retail price index of commodities, and total retail sales of consumer goods. According to the variance decomposition, it is believed that the money supply is the main reason for the increase in CPI, and the influence of commodity retail price index on CPI has increased. This is because an increase in the money supply will reduce the purchasing power of the currency in the hands of residents, and the currency will depreciate, which will cause the consumer price index to continue to rise. The commodity price index has almost no effect on the CPI in the early stage, but the influence gradually increases in the later stage because as the retail price index of commodities increases, the purchasing power of the currency held by residents gradually decreases, which in turn causes the consumer price index to rise, causing economic imbalance. For the sake of social and economic stability, the money supply can be controlled to keep it within a certain range, and the commodity price index can be controlled to keep the consumer price index within a stable range.

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Evaluation of Sponge City Regional Pilot Construction Level Based on Analytic Hierarchy Process

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Abstract: Sponge city is a new generation of urban rainwater management concept, which means that cities, like sponges, have good flexibility in adapting to environmental changes and natural disasters brought by rainwater. Considering that the sponge city design scheme of the construction community has not formed a unified evaluation scheme. In this paper, through the selection of representative evaluation indexes in the process of sponge city in the construction community, through the analytic hierarchy process model, the index scoring standard and evaluation result grade are established, and the sponge city in the construction community is scored item by item, so as to realize the comprehensive evaluation of quantitative and qualitative indexes.
Keywords: sponge city; analytic hierarchy process; evaluation system; regional pilot; city planning

1. INTRODUCTION

In recent years, due to the impact of global climate change, China's environmental deterioration, especially the rainfall weather, urban waterlogging problem is obvious, seriously affecting the lives of the majority of residents. The ability of cities to resist environmental pollution, lack of water resources and water ecological environment is becoming more and more important. General secretary Jin-Ping Xi pointed out clearly at the 2013 central urbanization conference that to solve the city's water shortage problem, we must comply with nature and give priority to the limited rain left. We should give priority to the drainage of natural forces and build sponge city with natural accumulation, natural infiltration and natural purification. Through the construction of sponge City, comprehensive measures such as "infiltration, stagnation, storage, purification, utilization and drainage" are taken to minimize the impact of urban development and construction on the ecological environment, and 70% of the rainfall is absorbed and utilized locally.[1] By 2020, more than 20% of the built-up area in Beijing will meet the target. In the process of sponge city construction, it is more important to establish a comprehensive evaluation system in the aspects of project planning, design, bidding, construction and completion acceptance, so as to provide decision-making basis for the government and review direction for planning and construction management departments. Therefore, this paper takes the sponge city in Beijing as an example, establishes the evaluation system

through the analytic hierarchy process, and finally evaluates and analyzes the construction of sponge city by establishing the evaluation index scoring standard and determining the result grade.[2-4]

2. CONSTRUCTION OF SPONGE CITY EVALUATION SYSTEM

2.1 EVALUTION METHODS SELECTION

The process of sponge city project construction should be adapted to local conditions. The evaluation of sponge city construction should not be absolute and should not be quantified with isolated standards. Otherwise, it is difficult to be convincing. The evaluation of sponge city construction is multi-faceted and multi-dimensional. Therefore, this paper proposes a fuzzy comprehensive evaluation model based on AHP.

Analytic hierarchy process (AHP) is a combination of qualitative and quantitative analysis method. For different types of indicators of sponge city construction evaluation, we classify them, determine different positive and negative matrices under different categories, determine the weight of various indicators, and finally establish the evaluation standard to determine the evaluation standard, so as to form an evaluation system.

2.2 EVALUATION INDEX SELECTION

The evaluation index system of sponge city should be all-round, accurate and reliable. Based on the construction process of sponge city and the benefits of all aspects after completion, this paper chooses the evaluation system which is independent and has joint effect. Therefore, this paper makes a fuzzy comprehensive evaluation from three levels of building facilities benefit, rainwater utilization efficiency and social benefit.
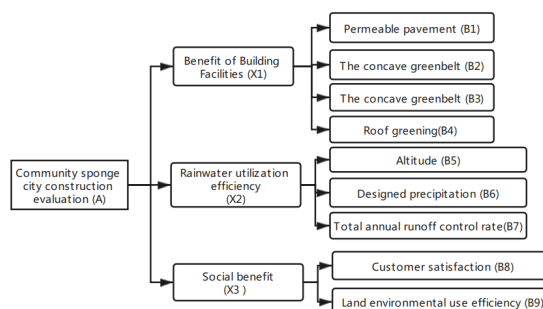
Figure 1 Comprehensive Index System
The benefit level of building facilities is mainly based on the construction of infrastructure in sponge City, including

permeable pavement, concave green space, storage capacity and roof greening. Rainwater use efficiency is mainly affected by altitude, precipitation and total runoff control rate. The level of social benefits is achieved through the investigation of user satisfaction and land environmental use efficiency. As shown in Figure 1.

2.3 CONSTRUCTION OF COMPARISON

Table 1 Discriminant Matrix

Element	Scale	Meaning
a_{ij}	0.1	Indicates that the latter is more important than the former
	0.3	Indicates that the latter is significantly more important than the former
	0.5	Indicates that two elements are more important than one
	0.7	Indicates that the former is significantly more important than the latter
	0.9	Indicates that the former is more important than the latter
	0.2, 0.4, 0.6, 0.8	The importance level is between 0.1, 0.3, 0.5, 0.7 and0.9.

The sponge city in the community solves the problem of urban waterlogging and ponding by building facilities, controls the rainwater from the source, and takes the ecological environment construction as the main goal to solve the problem of urban development. Through the above analysis, the importance of the criterion layer is: building facilities benefit > rainwater utilization efficiency > social benefit. The positive reciprocal matrix is shown in Table 2.

Table 2 A and X Judgment Matrix

A	X1	X2	X3
X1	1	1/2	1/3
X2	2	1	1/2
X3	3	2	1

In the aspect of building facilities benefit, permeable pavement is an important measure to save water resources and improve the environment. Permeable ground can collect a large amount of rainwater and absorb dust, which is cooler than conventional road in summer, effectively replenishing regional groundwater and alleviating urban thermal conductivity effect. The realization of no road area water in rainy days can also purify the rainwater. The infiltrated rainwater can be purified through the filtration of permeable pavement and permeable cushion, so that the infiltrated rainwater can be purified. Concave green space is a kind of public green space whose elevation is lower than the surrounding road surface, also known as low potential green space. On the contrary, the idea of "flower bed" is to use open space to receive and store rainwater, so as to reduce runoff discharge. Generally speaking, low potential green space has certain requirements for concave depth, and its soil quality is mostly not improved. The regulation and storage volume is mainly to store the peak flow of rainwater runoff in the regulation and storage tank temporarily, and then slowly discharge the rainwater from the regulation and storage tank after the maximum flow drops. It can not only avoid the flood peak of rainwater, improve the utilization rate of rainwater, but also control the pollution of initial rainwater to the receiving water body. Roof greening is of great significance to increase the area of urban green space, improve the deteriorating space of human living environment, improve the urban heat island effect caused by various waste gas pollution and the harm of Sandstorm to human beings, open up

DISCRIMINANT MATRIX
Firstly, the influence of criterion layer on target layer is analyzed. In this paper, nine indexes are divided into three categories, so there are three factors x1, X2 and X3, which correspond to the benefits of building facilities, rainwater utilization efficiency and social benefits respectively. The discriminant matrix is shown in Table 1 below.

human green space, build garden city, improve people's living conditions, improve the quality of life, beautify the urban environment and the construction of regional sponge city Righteousness. Therefore, in the construction facilities benefit evaluation index importance: permeable pavement > concave green space > storage capacity > roof greening. The positive reciprocal matrix is shown in Table 3.

Table 3 X1 and B Judgment Matrix

X1	B1	B2	B3	B4
B1	1	3	4	5
B2	1/3	1	2	3
B3	1/4	1/2	1	3
B4	1/5	1/3	1/3	1

In the aspect of rainwater utilization efficiency, in Beijing, the altitude has a certain relationship with precipitation. When the altitude rises, the cloud layer thickens. When the warm and humid unstable airflow meets the mechanical obstacles of the mountain system in the process of moving, it will cause the airflow to rise, strengthen the convection, and easily generate cloud and rain. The higher the altitude in Beijing, the greater the precipitation. At the same time, the altitude promotes the infiltration of rainwater. The index of annual total runoff control rate refers to the proportion of the accumulated annual rainfall controlled in the site to the total annual rainfall through natural and artificial enhanced infiltration, storage, utilization, evaporation and transpiration. In the first year, the total amount of runoff is controlled according to the schedule. Therefore, the importance of rainwater utilization efficiency is as follows: altitude > annual total runoff control rate > design rainfall. The positive reciprocal matrix is shown in Table 4.

Table 4 X2 and B Judgment Matrix

X2	B5	B6	B7
B5	1	3	2
B6	1/3	1	1.5
B7	1/2	2/3	1

In terms of social benefits, user satisfaction has a more intuitive impact on the construction and promotion of sponge city. Green land in the construction area reflects the city appearance and environment, and indirectly affects the life of users. Therefore, the importance of user

satisfaction is greater than the land use efficiency. The positive reciprocal matrix is shown in Table 5.

Table 5 X3 and B Judgment Matrix

X3	B8	B9
B8	1	1/2
B9	2	1

2.4 CONSISTENCY AND TEST WEIGHT CALCULATION

Using MATLAB to find the maximum eigenvalue of the matrix, get λ_{max};T. Lsaaty consistency index was used to test the consistency of positive reciprocal matrix:

$$CI = (\lambda - n)/(n - 1)$$

Formula: n is the order of positive reciprocal matrix or row number, then the consistency ratio CR is calculated. According to the Saaty's random consistency index, the RI is obtained, and the result is shown in Table 6.

Table 6 Consistency Test Results

Index	A	X1	X2	X3
λ	3.009	4.051	3.074	2
CI	0.005	0.017	0.037	0
RI	0.580	0.900	0.580	
CR	0.008	0.019	0.064	

It can be seen from table 6 that the CR of A and X, X1 and B and X2 and B is less than 0.1, which indicates that the consistency test of these three judgment matrices has passed, and the CI of X3 and B judgment matrix is equal to 0, which has complete consistency. The formula for solving the weight of judgment matrix is as follows:

$$W = \frac{1}{n}\left(\sum_{j=1}^{n} a_{ij} + 1 - \frac{n}{2}\right), i - 1, 2, \cdots, n$$

W is the ranking vector of fuzzy complementary matrix A, and A is the fuzzy consistent judgment matrix. Take the normalized eigenvector corresponding to the maximum eigenvector m. $\{w_1, w_2, \cdots, w_7\}$. $\sum w_i = 1, w_i$ is the weight of the influence degree of the i-th factor in the lower layer on a certain factor in the upper layer. See table 7

Table 7 Common Factor Varianc

Destination layer	Criterion layer	Index level	Weight	Comprehensive weight
Community sponge city construction evaluation (A)	Benefit of Building Facilities (X1) weight 0.539	Permeable pavement (B1)	0.542	0.292
		The concave greenbelt (B5)	0.233	0.126
		The concave greenbelt (B5)	0.140	0.075
		Roof greening(B4)	0.085	0.046
	Rainwater utilization efficiency (X2) weight 0.297	Altitude (B5)	0.544	0.162
		Designed precipitation (B6)	0.243	0.072
		Total annual runoff control rate(B7)	0.213	0.063
	Social benefit (X3) weight 0.164	Customer satisfaction (B8)	0.667	0.109
		Land environmental use efficiency (B9)	0.333	0.055

From Table 3, the extracted values of the common factor variances of the re-scaled variables are all greater than 0.6, indicating that the original data explains the information of the original data to an acceptable degree, and at the same time compress the dimensions of the data.

3. SCORING STANDARD

2.1 ESTABLISH INDEX SCORING STANDARD

For the above scoring rules, qualitative indicators need to be quantified to establish scoring rules.

For the four indicators in the benefit of building facilities, permeable pavement (B1), concave green space (B2), storage capacity (B3) and roof greening (B4), taking Beijing data as an example, using the difference of 4 points to determine the position of upper quartile and lower quartile data. When the data is in the upper quartile, the full score of this single item is set to 100; when the data is in the lower quartile, the sub single item is set to 0; the other single items are set to 60.

The higher the altitude is, the higher the infiltration effect of rainwater will be; for low altitude areas, most of the rainwater will flow into the river, then volatilize and drain, so the rainwater utilization effect is poor. Take Beijing as an example, when the altitude reaches 100m, the full score of this single item is 100; when the altitude is 50-100m, the single item is 80; when the altitude is below 50m, the single item is 60. For the total runoff control rate (B7), if the total annual runoff control rate is greater than or equal to 85%, 100 points will be obtained; when the total annual runoff control rate of the newly built sponge city is less than 50%, 0 point will be calculated; for the data of more than 50%, the score will be calculated by linear interpolation, and the comprehensive score is S7 = single score*weight. Social benefits, customer satisfaction (B8). The construction of sponge city should be able to effectively enhance and improve the living environment of regional residents, and enhance residents' satisfaction and happiness. This score is mainly based on the design questionnaire survey, from the user's landscape water environment, regional water pollution control, rainstorm, regional road area water situation, green plant design layout, rainwater resource utilization five aspects to set the question, each aspect of the total score of 20 points, through the collection of user satisfaction for comprehensive score. Comprehensive score calculation S7 = single score × weight. According to the proportion of green land in the total land use of sponge cities in Beijing, the efficiency of land environmental use is calculated. R = [(cultivated land + garden land + woodland + grassland + water area and water conservancy facilities land)/(cultivated land + garden land + woodland + grassland + urban village and industrial and mining land + transportation land + water area and water conservancy

facilities land + other land), comprehensive score = R*100

3.2 DETERMINATION OF EVALUATION RESULTS

By adding the comprehensive scores of each index, the comprehensive scores s of 8 indexes of sponge city planning and design scheme in construction area can be obtained.

$$S = S_1 + S_2 + S_3 + S_4 + S_5 + S_6 + S_7 + S_8 + S_9$$

Based on the comprehensive score of each evaluation index, the grade is divided as follows: 80-100 is grade I, and the construction effect is evaluated as good; 60-80 is grade II, and the construction effect is evaluated as qualified; lower than 60 is grade III, and the construction effect is evaluated as unqualified.

4. CONCLUSION

The evaluation method system constructed in this paper can realize the evaluation and scoring of many construction projects on the same standard and scale, so that the evaluation of the construction effect of sponge city can be quantified as a specific score, and the evaluation of the construction effect of regional sponge city is more intuitive. This evaluation system not only attaches importance to the achievements of regional sponge city construction, but also attaches importance to the needs of the masses. In order to improve the evaluation system, this paper considers the rainwater infiltration capacity of different areas and different altitudes, and systematically evaluates the construction of regional sponge city.

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Evaluation of the Health Status of Higher Education Based on Fuzzy Neural Networks

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Abstract: To evaluate and predict the development of higher education health status, we analyze the data of various indicators of higher education in several countries, establish AHP fuzzy comprehensive evaluation model, BP neural network model and Markov prediction model, use MTATLAB software to program the solution to derive the rating and grading of national higher education health status, and use Bulgaria as an example to predict the development of its higher education health status, etc.
Keywords: Higher education health status evaluation; AHP; fuzzy integrated evaluation; BP neural network; Markov

1. INTRODUCTION

The level of development of higher education is an important indicator of a country's comprehensive national power and development potential. In the era of globalization, knowledge and technology have become decisive factors for economic development. Higher education can train various types of higher specialists and bring a large number of highly qualified workers, which is a key step to promote sustainable social development. Currently, the health of the higher education environment has received attention from various countries. The purpose of this paper is to develop a model to assess the health of national higher education systems and to make corresponding policy recommendations as well as to predict their development.

The data in this paper were obtained from the World Bank website as well as relevant journals and major databases. In order to facilitate the research questions, the following hypotheses are proposed: (1) it is assumed that the data collected in this paper are real and reliable and can reflect the actual problems; (2) it is assumed that the selected indicators can cover the main aspects of the national higher education health assessment index system; (3) it is assumed that the policy can be implemented successfully after it is proposed; (4) it is assumed that there are no force majeure effects such as natural disasters in Bulgaria during the implementation of the policy and the society is quite stable.

2. NATIONAL HIGHER EDUCATION HEALTH STATUS EVALUATION FACTOR SYSTEM

The rapid development of higher education in a country is closely related to the health and sustainability of the higher education system in that country. In order to assess the health of the higher education system, this paper refers to the CIGE Model and integrates the studies of several scholars[1-7], and selects 10 relevant factors in three aspects of financial investment, higher education penetration, teaching resources and environment in a targeted manner. Through factor analysis and dimension reduction, the final stratified and refined factor system was obtained as shown in Figure 1.
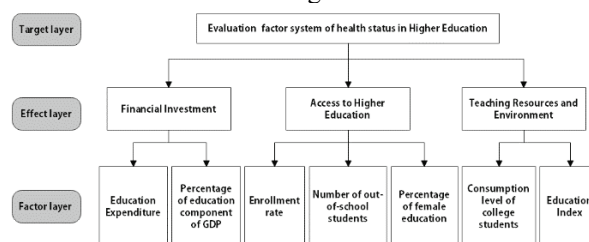
Figure 1: Evaluation factor system

3. EVALUATION OF HIGHER EDUCATION HEALTH STATUS BASED ON AHP FUZZY COMPREHENSIVE EVALUATION

3.1 RESEARCH IDEAS

The values of each factor for countries at different stages of development are statistically compiled, and the data related to higher education in each country are analyzed based on the AHP-fuzzy comprehensive evaluation model [8-9]to make a correct, reasonable and realistic evaluation of the health of their higher education.

3.2 RESEARCH METHODOLOGY

Let the set of evaluation factors [10]be $U = \{u_1, u_2, u_3, u_4, u_5, u_6, u_7\}$ and the set of comments be $V = (V_1, V_2, V_3)$. According to the goals of higher education training of human resources, the writer divided the health of the national higher education system into 3 categories, so the set of rubrics was determined as

$$V = (V_1, V_2, V_3) = (Healthy, Normal, Unhealthy) \quad (1)$$

3.2.1 ESTABLISH THE RELATIVE DEVIATION FUZZY MATRIX R

By analyzing and calculating the data, a fuzzy matrix R was derived to represent the relationship between the set of rubrics and each evaluation factor,

$$R = \begin{bmatrix} r_{11} & r_{12} & r_{13} \\ \vdots & \vdots & \vdots \\ r_{71} & r_{72} & r_{73} \end{bmatrix} \quad (2)$$

where r_{ij} represents the i-th factor about V_j the membership function value of the grade.

3.2.2 ESTABLISH THE WEIGHTS OF EACH EVALUATION FACTOR

Seventeen experts were engaged to score each element between the effect layer and the factor layer according to the principle of judgment matrix scaling, determine the relative importance of each indicator, and calculate the judgment matrix comprehensively.Next,, the maximum characteristic root and the corresponding characteristic vector of each comparison matrix need to be calculated.

The maximum characteristic root λmax of the matrix is calculated and the matrix is tested for consistency using the formula $CR = CI/RI$, where CI is the consistency index; CR is the consistency ratio. The average random consistency index RI of the matrix of order 1 to 9 are: 0, 0, 0.58, 0.89, 1.12, 1.24, 1.32, 1.41 and 1.45, respectively.

when $CR < 0.1$, the judgment matrix satisfies consistency, indicating that the constructed judgment matrix is reasonable. On the contrary, it does not meet the consistency and needs to make appropriate adjustments to the judgment matrix to make it consistent.

After the calculation and processing of the expert evaluation, the final weights are obtained in the Table 1.

Table 1: Weight distribution table of evaluation indicators of higher education health status

Comprehensive evaluation	Effect layer	Weights	Factor layer	Weights
The Health of Higher Education	Financial Investment	0.1692	Education Expenditure	0.1354
			Percentage of education component of GDP	0.0338
	Access to Higher Education	0.3874	Enrollment rate	0.2090
			Percentage of female education	0.1151
			Number of out-of-school students	0.0633
	Teaching Resources and Environment	0.4434	Consumption level of college students	0.1478
			Education Index	0.2956

That is, the weight vector of the factor layer
W
$= (0.1354, 0.0338, 0.2090, 0.1151, 0.633, 0.1478, 0.2956)$

3.2.3 BUILDING A COMPREHENSIVE EVALUATION MODEL

Multiplying the weight vector W with the relative deviation fuzzy matrix R, the fuzzy comprehensive judgment matrix B is obtained, which takes the form of:

$$B = W \cdot R = [b_1, b_2, b_3] \qquad (3)$$

In order to establish the scale measures of the series $V = (V1, V2, V3)$, the results were processed and calculated using the parametric weighted average method to obtain the final evaluation function of the health status of higher education.

$$C = \frac{\sum_{j=1}^{3} b_j \cdot j}{\sum_{j=1}^{3} b_j} \qquad (4)$$

Finally, the health status of higher education was rated according to the evaluation function value C, against the Table 2.

Table 2: Rating scale corresponding to evaluation function scores

Score	Comments
$C > 2.4$	Healthy
$1.9 < C < 2.4$	Normal
$C < 1.9$	Unhealthy

3.3 ANALYSIS OF RESULTS

According to the set of evaluation factor weights and the relative deviation fuzzy matrix R, thehe results of the fuzzy composite evaluation matrix B for each country are shown in Table 3.

Table 3: Fuzzy Judgment Matrix for each country

Country	V_1	V_2	V_3
Argentina	0.2261	0.1435	0.4904
Czech Republic	0.0318	0.6123	0.366
Hungary	0.1573	0.5473	0.3054
Ireland	0.0007	0.5562	0.4531
Israel	0.0329	0.437	0.5402
Italy	0.304	0.3035	0.4025
Kyrgyz Republic	0.4831	0.2969	0.23
Poland	0.0829	0.387	0.54

The resulting data were substituted into the final evaluation[11] function to obtain a score for the health of higher education in each country, and the final evaluation results are presented in the Table 4.

Table 4: Higher Education Health Status Scores and Grades

Country	Score of multilevel fuzzy integrated evaluation	Comments
Argentina	2.307326	Normal
Czech Republic	2.330858	Normal
Hungary	2.146634	Normal
Ireland	2.447921	Healthy
Israel	2.502228	Healthy
Italy	2.097525	Normal
Kyrgyz Republic	1.749406	Unhealthy
Poland	2.452619	Healthy

4. BP NEURAL NETWORK-BASED EVALUATION OF HIGHER EDUCATION HEALTH STATUS

4.1 RESEARCH IDEAS

Using the results of AHP fuzzy comprehensive evaluation, the training set of BP neural network is constructed.Six sets of relevant data of countries are selected as the training sample data, and two sets of data are added as the test sample data to ensure that the output results are close to the expert evaluation results, thus illustrating the feasibility of our comprehensive evaluation index and comprehensive evaluation results.

4.2 BP NEURAL NETWORK

BP neural network[12-16] is a neural network model with a wide range of applications, which is a multilayer feedforward neural network with forward propagation of signals and backward propagation of errors. BP network can learn a large number of mapping relationships between input and output, and backward propagation to obtain the optimal weights and thresholds through the learning rules of the most rapid descent method, which minimizes the error of the network.

The topology of the BP neural network includes an input layer, a hidden layer, and an output layer, as shown in Figure 2.
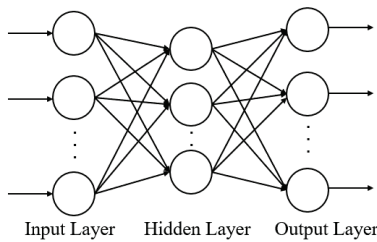
Figure 2: BP neural network architecture diagram

The three-layer BP network has 7 input nodes, 1 output node, and 6 hidden nodes. The Sigmoid function is used as the activation function from the input layer to the hidden layer, the linear function Purelin function is used as the activation function from the hidden layer to the output layer, and the relationship between the network input and output can be obtained as shown below.

$$\hat{y}_k = \sum_{j=1}^{r} v_j \cdot f\left[\sum_{i=1}^{m} w_{ij} \cdot P_i + \theta_j\right] \quad (k = 1, 2, \cdots N) \tag{5}$$

where w_{ij} is the connection weight, θ_j is the threshold, y_k is the desired output, $\hat{y}_k$ is the actual output of the network.

4.3 DATA PROCESSING
The factor values of each country are used as the input layer, and the corresponding scoring of each country is used as the output layer.
The parameters in the BP neural network time series prediction model mainly include: maximum training steps, learning rate, training target error, and the parameters in the BP neural network prediction model set in this paper are shown in Table 5.

Table 5: Parameters in BP neural network prediction model optimized by genetic algorithm

Number of population sizes	Number of evolutions	Crossover probability	Mutation probability
10	50	0.4	0.2

The results of the genetic algorithm optimized BP neural network prediction model are shown in Figure 3, corresponding to the output scoring of different countries of the neural network are 2.3068, 2.3870, 2.0961, 2.4504, 2.4985, 2.0938, 1.8328, and 2.4002. From the figure, it can be seen that the prediction values of the genetic algorithm optimized BP neural network prediction model are similar to AHP fuzzy integrated evaluation results with little error.
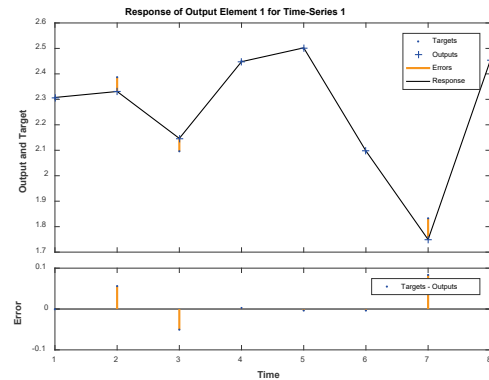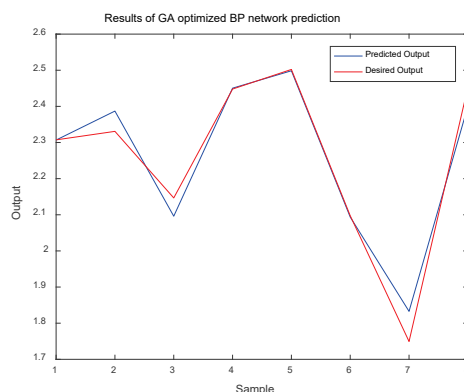
Figure 3: Predicted versus expected values

4.4 ANALYSIS AND COMPARISON OF RESULTS
We compared the health status evaluation scores obtained based on the AHP fuzzy evaluation method with 8 evaluation scores obtained from the optimized BP neural network method, and the results are found in Table 6, The results calculated by the two methods basically match, indicating that the indicators of the evaluation model are appropriately selected and the comprehensive evaluation results are feasible. Therefore, we can use the trained BP neural network as our evaluation system of the health status of higher education system, and input the corresponding index data of each country to get the health status score of the corresponding higher education system of that country.

Table 6: Comparison of higher education health status scores and grades by two methods

Country	Score of multilevel fuzzy integrated evaluation	Score of the BP neural network	Comments
Argentina	2.307326	2.3068	Normal
Czech Republic	2.330858	2.3870	Normal
Hungary	2.146634	2.0961	Normal
Ireland	2.447921	2.4504	Healthy
Israel	2.502228	2.4985	Healthy
Italy	2.097525	2.0938	Normal
Kyrgyz Republic	1.749406	1.8328	Unhealthy
Poland	2.452619	2.4002	Healthy

5 MARKOV MODEL PREDICTS DEVELOPMENT OF HIGHER EDUCATION HEALTH STATUS
5.1 DATA COLLECTION AND RESEARCH IDEAS
The values of the Bulgarian indicators were calculated using a trained BP neural network model and the corresponding comments were given. The specific values are shown in Table 7.

Table 7: Values of various factors in Bulgaria

	CLCS	ER	EE	EI	PFE	NOOSS	PFC of GDP	Score	Comments
Bulgaria	0.147	0.250	0.449	0.329	0.238	0.628	0.434	1.5808	Unhealthy

Remark 1: For the convenience of writing, the eight indicators Consumption level of college students, Enrollment rate, Education Expenditure, Education Index, Percentage of female education, Number of out-of-school students, Percentage of education component of GDP are abbreviated as CLCS, ER, EE, EI, PFE, NOOSS, PEC of GDP
The model of BP neural network shows that the health of

higher education in Bulgaria is not ideal. Drawing on the development experience of advanced countries such as Germany and Japan, the authors propose several specific implementable policies for the specific situation in Bulgaria in two stages. Based on this, a Markov prediction model is developed to predict the changes in the values of the factors. Then, the predicted values of the factors are used as the input layer of a BP neural network as a way to predict the development of the health status of higher education in Bulgaria.

5.2 POLICY PROPOSED

The defeat of Germany in World War II led to a massive loss of leading scientific and technological talent and a continuing economic downturn in the country. In order to alleviate the shortage of the higher education workforce, Germany expanded its universities. At the same time, the establishment of multidisciplinary universities promoted vocational education for young people, thus contributing to the development of Germany's industrial and technological level. Between 1955 and 1980, the number of students at most universities quadrupled, the enrollment rate increased from 32% to 69%, and the ratio of education spending to GDP increased from 2.34% to 4.90%. A variety of data are available to show that Germany has a very healthy higher education environment.

Japan has also experienced the loss of a large number of male young adults in the country and the continued downturn of the domestic economy, and is in dire need of a large number of highly educated and skilled personnel. Unlike Germany, Japan chose to change the traditional backward concept that only men could receive education and encouraged women to receive education. Politically, women were added to the Diet, and women were recruited for special positions in various departments. In education, special women's colleges were opened in various regions to improve the national situation by increasing the proportion of women in education. According to statistics, by 1951, the percentage of women in education had increased from 10% before the war to 45% throughout Japan.

Bulgaria has also suffered from a large loss of young and middle-aged labor force and poor domestic infrastructure due to various factors, very similar to the situation in Germany and Japan at that time. Therefore, this paper proposes the following policies with reference to some policies of German and Japanese higher education systems.

Phase I (2021 to 2025).

Scholarship policy: for domestic higher education institutions, the government will increase funding for scholarships and bursaries by 2% per year for five consecutive years.

Women's education reform policy: opening of women's colleges and universities to increase female enrollment.

Secondary education improvement policy: the government will open additional national secondary schools in educationally underdeveloped areas for four consecutive years to provide more talented people for higher education institutions.

Phase II (2026 to 2030).

Female employment policy: create more female employment positions.

Enrollment mechanism improvement policy: reforming the higher education enrollment system and establishing a comprehensive enrollment evaluation mechanism to provide students with diversified entry pathways.

On-the-job education policy: increase social re-education opportunities by creating additional exams related to the admission of working people to higher education institutions.

5.3 MARKOV

5.3.1 MARKOV PROCESS

In the probabilistic transition process of an event, the result of each trial depends and only depends on the result of its immediate predecessor, which is a Markov process [17]. The whole of a series of transitions is called a Markov chain. Thus, we can describe a Markov process in terms of the probability of transferring one state to another.

5.3.2 TRANSFER PROBABILITY MATRIX

Assume that the Markov chain has $a_1 \backslash a_2 \dots a_n$ states, if P_{ij} denotes the probability of state a_i to state a_j after one transfer, then the set of all the probabilities of one transfer forms a matrix called transfer probability matrix, and its expression is

$$P = \begin{pmatrix} P_{11} & P_{12} & \cdots & P_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ P_{n1} & P_{n2} & \cdots & P_{nn} \end{pmatrix} \qquad (6)$$

The state transfer probability matrix P has the following properties.

$$\begin{cases} \sum_{j=1}^{n} P_{ij} = 1, i = 1, 2, \dots, n \\ P_{ij} \geq 0, i, j = 1, 2, \dots, n \end{cases} \qquad (7)$$

Markov analysis is the analysis of the evolution trend and state of Markov chain to predict the future state and movement of things. Markov model predicts by studying the state transfer probability of the system object, so the determination of the state transfer probability matrix becomes the key to model prediction.

5.4 DATA PROCESSING

We use a Markov prediction model to make forecasts of changes in the health of the Bulgarian higher education system in the following procedure.

First, determine the initial vector $P_{(V_0)}$

$$P_{(V_0)} = (0.147\ 0.250\ 0.449\ 0.329\ 0.238\ 0.628\ 0.434)$$

Next, establish the transfer probability matrix.

We have investigated the data after the implementation of similar policies in Germany and Japan, and analyzed the findings and combined them with the reality in Bulgaria to obtain the transfer probability matrix $P_{(1)}$ for the initial vector $P_{(V_0)}$ to the end of the first stage, and the transfer probability matrix $P_{(2)}$ for $P_{(V_0)}$ to the end of the second stage, with the following values.

$$P_{(1)} = \begin{pmatrix} 0.169 & 0.214 & 0.056 & 0.205 & 0.188 & 0.156 & 0.012 \\ 0.086 & 0.107 & 0.193 & 0.089 & 0.080 & 0.279 & 0.166 \\ 0.135 & 0.116 & 0.094 & 0.150 & 0.161 & 0.190 & 0.154 \\ 0.177 & 0.060 & 0.095 & 0.203 & 0.066 & 0.148 & 0.252 \\ 0.049 & 0.226 & 0.250 & 0.114 & 0.280 & 0.042 & 0.039 \\ 0.046 & 0.098 & 0.226 & 0.219 & 0.135 & 0.058 & 0.219 \\ 0.195 & 0.198 & 0.215 & 0.030 & 0.077 & 0.101 & 0.184 \end{pmatrix}$$

$$P_{(2)} = \begin{pmatrix} 0.069 & 0.057 & 0.177 & 0.301 & 0.141 & 0.087 & 0.169 \\ 0.087 & 0.065 & 0.101 & 0.281 & 0.146 & 0.173 & 0.147 \\ 0.121 & 0.112 & 0.241 & 0.113 & 0.022 & 0.182 & 0.210 \\ 0.082 & 0.111 & 0.312 & 0.040 & 0.093 & 0.079 & 0.283 \\ 0.204 & 0.223 & 0.133 & 0.062 & 0.194 & 0.028 & 0.156 \\ 0.083 & 0.182 & 0.264 & 0.173 & 0.012 & 0.126 & 0.160 \\ 0.062 & 0.051 & 0.161 & 0.163 & 0.254 & 0.087 & 0.222 \end{pmatrix}$$

Then, the factor values for the subsequent stages are predicted

This is obtained by multiplying the initial vector by the transfer probability matrix.

The state vectors $P_{(V_1)}$ and $P_{(V_2)}$ at the completion of the first and second stages are predicted below using $P_{(1)}$ and $P_{(2)}$, respectively:

$$P_{(V_1)} = P_{(V_0)} \cdot P_{(1)}$$
$$= (0.290\ 0.332\ 0.424\ 0.364\ 0.326\ 0.316\ 0.422)$$

$$P_{(V_2)} = P_{(V_0)} \cdot P_{(2)}$$
$$= (0.240\ 0.301\ 0.529\ 0.372\ 0.262\ 0.287\ 0.483)$$

Finally, the predicted data were evaluated using the health status assessment model. The assessment results are shown in the following table.

Table 8: Results of health status assessment

Years	Score	Comments
2025	1.92542	Normal
2030	2.46314	Healthy

Obviously, the health status of the current system changes from "Unhealthy" to "Normal" when the first phase is completed. This indicates that its indicators have basically reached the average level. When the second phase was developed, the system was assessed as "Healthy". These data show that the above-mentioned policies have had a significant impact on improving the health status of higher education in Bulgaria.

6. CONCLUSION

This paper makes a system of assessment indicators on the health of higher education in the country, and the model uses a combination of AHP, fuzzy integrated evaluation and BP neural network for qualitative and quantitative analysis of the data. And a Markov prediction model is established to make a specific analysis for the development of higher education in Bulgaria, which is relevant and has strong applicability. However, this paper ignores the influence of some secondary factors, and there is some objective error. If the accuracy of the model is to be improved, more factors should be considered and more data should be sought. The model innovatively reconstructs the national higher education health assessment system to make its index settings at all levels more reasonable and the whole evaluation system more objective. The model and research method established in the article are also applicable to the research on the health status and development prediction of higher education in other countries, and can also be extended to the economic transportation and medical fields of the country, which has high research and development value.

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Homology Group of Small Cover on Scutoids

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Abstract: Scutoids is a new geometric shape, but from the perspective of algebraic topology, it is a familiar monoconvex polyhedron in algebraic topology. In this paper, we calculate the homology group of small cover on Scutoids. Firstly, according to the Morse function on the convex polytope P^n, We can give the cell deco position of the corresponding small cover M^n over P^n, and the cellular chain complex $\{D_i(M^n(\lambda)), \partial_i\}$ of M^n. Secondly, considering the relationship between the boundary homomorphism $\{\partial_i\}$ and the characteristic function λ, we can give the principle of how to determine the boundary homomorphism is given. Finally, the homology groups are computed by $\{H_i \cong \frac{\ker \partial_i}{\text{Im} \, \partial_{i+1}}\}$, we can give the corresponding results.
Key words: Small Cover; The Homology Group; Scutoids

1. INTRODUCTION

In 1991, Davis and Januszkiewicz introduced the Toric variety theory of torus clusters in detail, and gave the definition of small cover manifold: under the action of local standards $z_2^n -$, the orbital space is an n-dimensional singly convex polyhedral P^n of manifold M^n, It is $\pi: M^n \to P^n$ called a small cover.[1] Besides, it points out that all small covers manifolds can be constructed from (P^n, λ), among which λ is color z_2^n on the singular convex polyhedron P^n, which is called a characteristic function of the upper P^n. Regarding the calculation of the homology of the small cover, the literature mainly discusses the torsion coefficient.[2] The literature uses the cell chain complex calculation.[3] In the paper, the homology group of the small cover on the scutoids is calculated using the complex of the cell chain in the literature, and the corresponding results are obtained.[3]

2. PRELIMINARY KNOWLEDGE

Definition 2.1 Suppose that P^n is an n-dimensional convex polyhedron. If each vertex of it has exactly n faces with a codimension of 1, we call this convex polyhedron a single convex polyhedron.[1]

Definition 2.2 The function $\lambda: F \to Z_2^n$ is called an indicative function, if λ satisfies the following conditions: any $v = F_1 \cap F_2 \cap \ldots \cap F_n$ is any vertex of P^n there is $|\lambda(F_1), \lambda(F_2), \ldots, \lambda(F_n)| = \pm 1$.

Definition 2.3 (Morse function) single convex polyhedron P^n the upper Morse function refers to a height flow function on a certain dimensional skeleton. Denote $ind(v)$ the number of flow directions v at the vertices of the singular convex polyhedron P^n, let $h_i = |\{v | ind(v) = i\}|$, denote $h(P^n) = (b_1, b_2, \ldots, b_n)$. [1]

Lemma 2.1 Let $\pi: M^n \to P^n$ is the small cover on the singular convex polyhedron P^n, and let $b_i = dim H_i(M^n, Z_2^n)$, then $h(P^n) = (h_0, h_1, \ldots h_n) = (b_1, b_2, \ldots, b_n)$.[1]

Let $M^n(\lambda)$ is the small cover of the characteristic function λ on the singular convex polyhedron P^n, we can write the cell chain complex on the $M^n(\lambda)$ as:
$0 \to D_n(M^n(\lambda)) = Z(v) \xrightarrow{\partial_n} D_{n-1}(M^n(\lambda)) = \bigoplus_{ind(v')=h_{n-1}} Z(v) \xrightarrow{\partial_{n-1}} \ldots \xrightarrow{\partial_2} D_1(M^n(\lambda)) = \bigoplus_{h_1} Z \xrightarrow{\partial_1 = 0} D_0(M^n(\lambda)) = Z \to 0.$

Lemma 2.2 Suppose that $M^n(\lambda)$ is a small cover on a singular convex polyhedron P^n with a characteristic function, and the cell chain M^n complex of is $\{D_i(M^n(\lambda)), \partial_i\}$. [3] We have the following conclusions:

(1) There are the following forms of $\partial_n: Z(v) \to \bigoplus_{v' \in I(n-1)} Z(v')$:
$\partial_n: x \to (\ldots, a_{v'} x, \ldots) \quad a_{v'} \in \{0, 2\}$
Let $\lambda(F_{v'}) = (a_1, \ldots a_n)$, if the sum of $a_1 + \ldots + a_n$ is odd, then $a_{v'} = 0$; if the sum of $a_1 + \ldots + a_n$ is even, then $a_{v'} = 2$.

(2) $\{\partial_q\}_{1 \le q \le n}: \bigoplus_{v \in I(q)} Z(v) \to \bigoplus_{v' \in I(q-1)} Z(v')$ An element on $Z(v)$ has the following form:
$\partial_q: x \to (\ldots, a_{v'} x, \ldots) \quad a_{v'} \in \{0, \pm 2\}$
If $F_{v'} \not\subset F_v$, then, there is $a_{v'} = 0$.

3. HOMOLOGY GROUP OF SMALL COVER ON SCUTOIDS

3.1 INTRODUCTION TO SCUTOIDS

Researchers from the Department of Molecular Biology of the University of Seville in Spain and the Institute of Biomedicine of Seville (IBiS) recently published their latest findings in Nature Communications: As the degree of bending of biological tissue increases, nature has also adopted a more unique geometric shape to solve the spatial arrangement of epithelial cells. This kind of geometry is similar to a prism. The upper and lower bases are parallel, and each face is a polygon. However, a triangle will split the prism along a vertex, so that the number of upper and lower base sides are different, and a vertex appears between the two bases. In addition, the surface of this geometry can be curved, or concave or convex. Because of the horny scales (Scutum/Scutellum) resembling the shield-shaped back of the beetle, this geometry is named Scutoids. As shown in Figure 1. Scutoids are widely found in the epithelial tissues of many organisms such as fruit flies, zebrafish, and humans. During embryonic development, cells grow and differentiate into tissues and organs with complex structures and functions, and epithelial cells need to be arranged rationally to ensure that these tissues and organs grow into their final form. The research on the arrangement of epithelial cells is at the intersection of biology, physics and mathematics. It plays an important role in understanding the arrangement of cells and the formation of biological organs. In addition, if further research discovers the molecules that control the shape of

cells, it will help to generate artificial tissues and organs in the laboratory, and mimic the most effective way of cell arrangement adopted by nature.
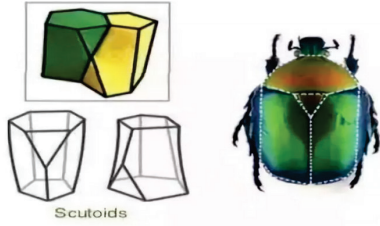
Figure 1. Scutoids

3.2 COMBINATION STRUCTURE OF SCUTOIDS AND CELL CHAIN COMPLEX

Scutoids are made up of 8 faces. Remember these 8 faces as $e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8$.

Figure 2 below is the height flow function (Morse function) on the shield (Scutoids), and the index on each vertex is calculated:
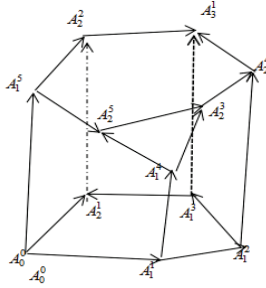
Figure 2. Height flow function (Morse function) on Scutoids

$$ind(A_0^0) = 0, ind(A_1^1) = ind(A_1^2) = ind(A_1^3)$$
$$= ind(A_1^4) = ind(A_1^5) = 1,$$
$$ind(A_2^1) = ind(A_2^2) = ind(A_2^3) = ind(A_2^4) = ind(A_2^5)$$
$$= 2, ind(A_3^1) = 3.$$

Given a certain type of coloring on 8 faces of Scutoids:
$$\lambda(e_1) = (1,0,0), \lambda(e_2) = (0,1,0), \lambda(e_3)$$
$$= (0,0,1), \lambda(e_4) = (1,1,1)$$
$$\lambda(e_5) = (0,1,0), \lambda(e_6) = (1,0,1), \lambda(e_7) =$$
$$(1,1,0), \lambda(e_8) = (1,0,1).$$

Note: The paper takes this kind of dyeing calculation, we can also calculate for other kinds of dyeing.

Cellular chain complex on Scutoids:

Suppose that $M^n(\lambda)$ is the small cover whose characteristic function λ is on the Scutoids, and the complex of the cell chain on $M^n(\lambda)$ is:

$$0 \to C_3(M^3(\lambda)) \xrightarrow{\partial_3} C_2(M^3(\lambda)) \xrightarrow{\partial_2} C_1(M^3(\lambda)) \xrightarrow{\partial_1=0} C_0(M^3(\lambda)) \to 0$$

Among which $C_3(M^3(\lambda)) = Z(A_3^1), C_2(M^3(\lambda)) = \oplus_{i=1}^5 Z(A_2^i), C_1(M^3(\lambda)) = \oplus_{i=1}^5 Z(A_1^i), C_0(M^3(\lambda)) = Z(A_0^0)$

The generator is described as follows:

$Z(A_2^1)$ means $\pi^{-1}(e_8) = \pi^{-1}(A_0^0A_1^1A_1^2A_1^3A_2^1), Z(A_2^2)$ means $\pi^{-1}(e_4) = \pi^{-1}(A_1^5A_0^0A_2^1A_2^2)$,

$Z(A_2^3)$ means $\pi^{-1}(e_6) = \pi^{-1}(A_2^5A_1^4A_2^3), Z(A_2^4)$ means $\pi^{-1}(e_7) = \pi^{-1}(A_2^3A_1^4A_1^1A_1^2A_2^4)$,

$Z(A_2^5)$ means $\pi^{-1}(e_5) = \pi^{-1}(A_1^5A_0^0A_1^1A_1^4A_2^5), Z(A_1^1) =$

$\pi^{-1}(A_0^0A_1^1), Z(A_1^2) = \pi^{-1}(A_1^1A_1^2),$
$Z(A_1^3) = \pi^{-1}(A_1^1A_1^3), Z(A_1^4) = \pi^{-1}(A_1^1A_1^4), Z(A_1^5) = \pi^{-1}(A_0^0A_1^5).$

3.3 PROOF OF THE MAIN CONCLUSIONS OF SCUTOIDS

Given a certain type of coloring on 8 faces of Scutoids:
$$\lambda(e_1) = (1,0,0), \lambda(e_2) = (0,1,0), \lambda(e_3)$$
$$= (0,0,1), \lambda(e_4) = (0,0,1)$$
$$\lambda(e_5) = (0,1,0), \lambda(e_6) = (1,0,1), \lambda(e_7)$$
$$= (1,1,0), \lambda(e_8) = (1,0,1)$$

The homology group of the small cover $M(\lambda)^3$ corresponding to the coloringλon Scutoids is:

$$H_0 \cong \frac{Ker\partial_0}{Im\,\partial_1} \cong Z(A_0^0) = Z,$$

$$H_1 \cong \frac{Ker\partial_1}{Im\,\partial_2} \cong Z_2\langle A_1^1, A_1^4\rangle \oplus Z(A_1^2) \oplus Z(A_1^3) \oplus Z(A_1^5),$$

$$H_2 \cong \frac{Ker\partial_2}{Im\,\partial_3} \cong Z_2(A_2^1) \oplus Z(A_2^2) \oplus Z_2(A_2^3) \oplus Z_2(A_2^4) \oplus Z(A_2^5),$$

$$H_3 \cong \frac{Ker\partial_3}{Im\,\partial_4} \cong Z(A_3^1) = Z.$$

Proof: Step 1: Calculate the coloring of edges. Take e_8 as an example, the specific calculation process is as follows: Given the *Morse* flow of e_8 and the five intersecting plane of e_8, as shown in Figure 3 below:
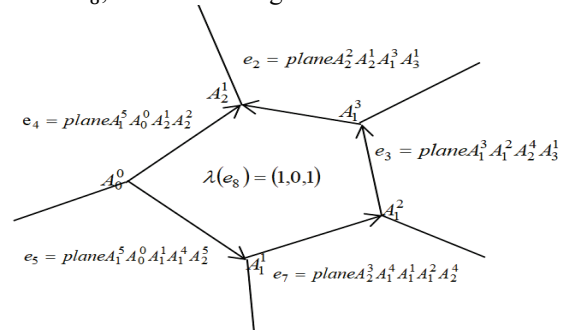
Figure 3.$e_8 = A_0^0A_1^1A_1^2A_1^3A_2^1$

Then the five sides of $e_8$are:
$$A_0^0A_2^1 = e_4 \cap e_8, A_2^1A_1^3 = e_2 \cap e_8, A_0^0A_1^1 = e_5 \cap e_8, A_1^1A_1^2$$
$$= e_7 \cap e_8, A_1^2A_1^3 = e_3 \cap e_8.$$

Secondly, there is a unique vertex A_2^1 on e_8 so that $ind(A_2^1) = 2$ and $A_2^1 = A_0^0A_2^1 \cap A_1^3A_2^1$, it does not lose generality,

Let $\lambda(A_0^0A_2^1) = (1,0), \lambda(A_1^3A_2^1) = (0,1)$ be the standard basis of Z_2^2, mark the coloring of the five plane that $e_8$intersect with e_8 and the standard basis of edges on the graph, as shown in Figure 4 below:
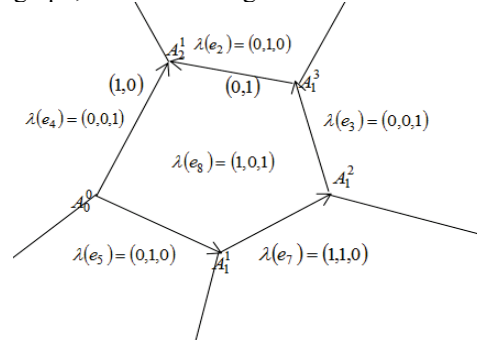
Figure 4. Coloring of the five plane that $e_8$intersect with e_8

Finally, calculate the coloring of each edge one_8, the

process is as follows:

Since is the highest point of $ind(A_2^1) = 2$ the flow direction of the vertices on the plane e_8, it is taken as the base point A_2^1, where there is $A_0^0 A_2^1 = e_4 \cap e_8$, $A_1^3 A_2^1 = e_2 \cap e_8$.

Make a homomorphism as follows: $\lambda(e_8) = (1,0,1) \rightarrow (0,0), \lambda(e_2) = (0,1,0) \rightarrow (0,1), \lambda(e_4) = (0,0,1) \rightarrow (1,0)$.

Because of $A_0^0 A_1^1 = e_5 \cap e_8$, there is $\lambda(e_5) = (0,1,0) \rightarrow (0,1) = \lambda(A_0^0 A_1^1)$,

Because of $A_1^1 A_1^2 = e_7 \cap e_8$,

There is $\lambda(e_7) = (1,1,0) = (1,0,1) + (0,0,1) + (0,1,0) \rightarrow (0,0) + (1,0) + (0,1) \rightarrow (1,1) = \lambda(A_1^1 A_1^2)$,

Because of $A_1^2 A_1^3 = e_3 \cap e_8$, then $\lambda(e_3) = (0,0,1) \rightarrow (1,0) = \lambda(A_1^2 A_1^3)$.

From the above calculation results, we can know the coloring of each edge on the edge e_8, as shown in Figure 5 below:
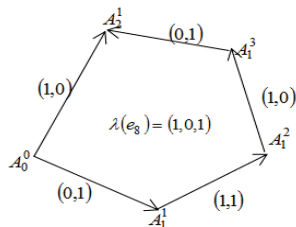
Figure5. The coloring of each edge on the plane e_8

(3) plane e_4, e_6, e_7, e_5 , According to the previous calculation method, mark the coloring of each edge on the graph, as shown in Figure 6 below:
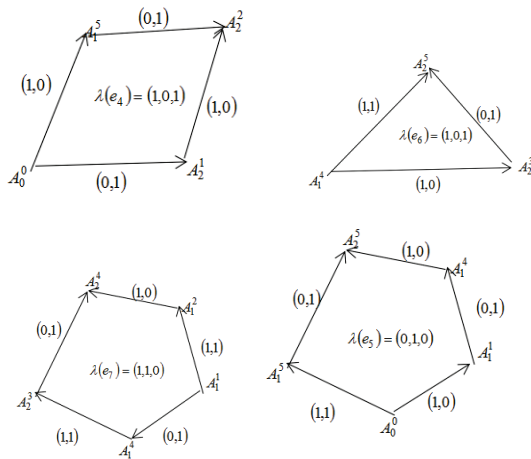
Figure 6. dyeing on the plane e_4, e_6, e_7, e_5

Step 2: Calculate the edge homomorphism $\partial_q (q = 2,3)$

(1) The calculation of ∂_3:

Let $x \in \lambda(Z(A_3^1))$, because of $\lambda(Z(A_2^1)) = \lambda(e_8) = (1,0,1)$, and $1 + 0 + 1 = 2$ is even, $\lambda(Z(A_2^2)) = \lambda(e_4) = (0,0,1)$, and $0 + 0 + 1 = 1$ is odd,

$\lambda(Z(A_2^3)) = \lambda(e_6) = (1,0,1)$, and $1 + 0 + 1 = 2$ is even, $\lambda(Z(A_2^4)) = \lambda(e_7) = (1,1,0)$, and $1 + 1 + 0 = 2$ is even,

$\lambda(Z(A_2^5)) = \lambda(e_5) = (0,1,0)$, and $0 + 1 + 0 = 1$ is even.

It can be seen from the conclusion of Lemma 2.2:

$\partial_3 : x \rightarrow (\pm 2x, 0x, \mp 2x, \pm 2x, 0x)$.

(2)The calculation of ∂_2:

Let $x \in \lambda(Z(A_3^1))$, because of $\lambda(Z(A_1^2)) = \lambda(A_1^1 A_1^2) = (1,1)$ and $1 + 1 = 2$ is even.

It can be seen from the conclusion of Lemma 2.2:

$$\partial_2 : x_1 \rightarrow (0x_1, 2x_1, 0x_1, 0x_1, 0x_1)$$

Similarly, $x_2 \in \lambda(Z(A_2^2)), x_3 \in \lambda(Z(A_2^3)), x_4 \in \lambda(Z(A_2^4)), x_5 \in \lambda\left(Z(A_2^5)\right)$

$$\partial_2 : x_2 \rightarrow (0x_2, 0x_2, 0x_2, 0x_2, 0x_2)$$
$$\partial_2 : x_3 \rightarrow (0x_3, 0x_3, 0x_3, 0x_3, 0x_3)$$
$$\partial_2 : x_4 \rightarrow (0x_4, 2x_4, 0x_4, 0x_4, 0x_4)$$
$$\partial_2 : x_5 \rightarrow (0x_5, 0x_5, 0x_5, 0x_5, 0x_5)$$

In summary, it was organized into the form of a matrix:

$$\partial_3 : x \rightarrow (\pm 2x, 0x, 2x, \pm 2x, 0x)$$

$$\partial_2 : \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{pmatrix} \rightarrow \begin{pmatrix} 0x_1 + 0x_2 + 0x_3 + 0x_4 + 0x_5 \\ \pm 2x_1 + 0x_2 + 0x_3 \mp 2x_4 + 0x_5 \\ 0x_1 + 0x_2 + 0x_3 + 0x_4 + 0x_5 \\ 0x_1 + 0x_2 + 0x_3 + 0x_4 + 0x_5 \\ 0x_1 + 0x_2 + 0x_3 + 0x_4 + 0x_5 \end{pmatrix}$$

The third step: calculation of homology group:

Cellular chain complex on Scutoids:

Suppose that $M^n(\lambda)$ is the small cover whose characteristic function λ is on the Scutoids, and the complex of the cell chain on $M^n(\lambda)$ is:

$$0 \rightarrow C_3(M^3(\lambda)) \xrightarrow{\partial_3} C_2(M^3(\lambda)) \xrightarrow{\partial_2} C_1(M^3(\lambda)) \xrightarrow{\partial_1=0} C_0(M^3(\lambda)) \rightarrow 0$$

The homology group of the small cover $M(\lambda)^3$ corresponding to the coloring λ on Scutoids is:

$H_0 \cong \dfrac{Ker\partial_0}{Im\,\partial_1} \cong Z(A_0^0) = Z$,

$H_1 \cong \dfrac{Ker\partial_1}{Im\,\partial_2} \cong Z_2\langle A_1^1, A_1^4 \rangle \oplus Z(A_1^2) \oplus Z(A_1^3) \oplus Z(A_1^5)$,

$H_2 \cong \dfrac{Ker\partial_2}{Im\,\partial_3} \cong Z_2(A_2^1) \oplus Z(A_2^2) \oplus Z_2(A_2^3) \oplus Z_2(A_2^4) \oplus Z(A_2^5)$,

$H_3 \cong \dfrac{Ker\partial_3}{Im\,\partial_4} \cong Z(A_3^1) = Z$.

Among which:

$ker\,\partial_1 = Z(A_1^1) \oplus Z(A_1^2) \oplus Z(A_1^3) \oplus Z(A_1^4) \oplus Z(A_1^5)$,

$ker\,\partial_2 = Z(A_2^1) \oplus Z(A_2^2) \oplus Z(A_2^3) \oplus Z(A_2^4) \oplus Z(A_2^5)$,

$ker\,\partial_3 = Z(A_3^1)$,

$Im\,\partial_2 = 2\langle Z(A_1^1), Z(A_1^4) \rangle$,

$Im\,\partial_3 = 2Z(A_2^1) \oplus 2Z(A_2^3) \oplus 2Z(A_2^4)$.

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Influencing Factors of Graduation Destination of College Students Based on Multiple Logistic Regression Model

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Abstract: For college graduates to go abroad, work and graduate study of different graduation destinations. In this paper, the university graduates as the research object, using the serial analysis, multi-category Logistic regression model to analyze the graduation whereabouts of graduates and the influence of relevant factors on their whereabouts, such as professional course scores, English scores, gender, economic situation, and so on, and predict the graduation whereabouts of future graduates. The results show that students with poor economic background are more likely to find employment directly after graduation, and students with good economic background and high English scores are more likely to go abroad for further study after graduation. Students with higher grades in major courses are more likely to attend graduate school after graduation. To analyze and predict the graduation choice of college graduates, and to consider the enrollment service, process guidance and employment service jointly, is of certain significance to relieve the employment pressure and create social talents.
Keywords: College students; Graduation destination; Multiple Logistic regression model; Factors affecting

1. INTRODUCTION

In recent years, the number of college graduates in China has increased by a large margin every year. The employment of college students has become a hot topic of discussion every year. The report to the 19th National Congress of the Communist Party of China points out that employment is the most important aspect of people's livelihood. We need to adhere to the strategy of giving top priority to employment and a proactive employment policy to achieve higher quality and more full employment. The employment of college graduates concerns the vital interests of students and their families. In recent years, the employment situation in China is becoming more and more serious, and the choice of graduation destination of college students has been seriously affected. In this era, we need to make reasonable and effective use of information in the growth stage of students, guide college students to make reasonable choice of graduation destination, predict the graduation destination of students, so as to provide accurate employment services. [1] There are three ways for college students to graduate: to work, to go to graduate school and to study abroad. What is the pattern of graduation? What are the factors that influence graduation destination and how do they work? In this paper, list analysis, multinomial Logistic regression and other model methods are used to discuss this problem.

2. RESEARCH DESIGN AND IDEAS

2.1 DATA SOURCES

The data in this paper came from a survey on the whereabouts of undergraduate students in a university. The survey method combining online and offline was adopted, and invalid questionnaires such as quick filling and blank were removed. Finally, 40 graduates had school data.

2.2 VARIABLE SELECTION

Take the graduation destination as the dependent variable and set it as Y, which is a multi-classification variable. Students' graduation destinations fall into three categories: work, graduate school and study abroad. The factors that affect the graduation destination of college students are taken as independent variables, and there are 4 in total, including professional course scores, English scores, gender and monthly living expenses in order, which are set as X1, X2, X3 and X4 respectively. The monthly cost of living is changed into sequential data, and the monthly cost of living is 1 in the interval [500, 750], 2 in the interval (750, 1000), 3 in the interval (1000, 1250), and 4 in the interval (1250, 1500)[2].

Table 1 independent variable explanation and assignment table

Variable symbol	Variable name	assignment
Y	Where are you going to graduate	Job = 1; postgraduate = 2; study abroad = 3
X1	Results of professional courses	-
X2	English achievement	-
X3	Gender	Boys = 1; girls = 2
X4	Monthly living expenses	[500, 750]=1;(750, 1000)=2;(1000, 1250]=3;(1250, 1500]=4

2.3 THEORETICAL BASIS OF MODEL

In this study, the dependent variable (response variable) is the nominal variable. When the nominal dependent variable has more than one category, it is generally analyzed by a method called the Generalized Logit Model. Namely: Multi-Class Logit Model. Let J represent the

number of categories of Y, $\{\pi_1, \cdots, \pi_j\}$ represents response probability, meet $\sum j\pi_j = 1$. In the multinomial logistic model, each category is paired with a reference category, and the last category is usually called baseline/reference category, which is called baseline category logistic. The baseline category logit model with predictive variable X was as follows:

$$ln(\frac{\pi_j}{\pi_J}) = \alpha_j + \beta_j x, j = 1, \cdots, J - 1 \qquad (1)$$

There are J-1 equations in the model, and each equation has different parameters. These effects vary according to the category matched with the baseline. For the multi class logistic model, the software fitting all the equations in (1) at the same time has smaller standard error than fitting each equation in (1) with binary logistic regression software. Under the condition of simultaneous fitting, no matter which category is used as the baseline, there will be the same parameter estimation for the direction pair category, that is, the selection of baseline category is arbitrary. In this study, the dependent variable y is a categorical variable, the number of categories is 3, and there is no order among the categories. Assuming that the value of Y is 1, 2, 3 respectively, and y = 1 is selected as the common reference group of 2 and 3, the following model can be established [3]

$$log\, i\, tP_1 = ln[\frac{P_1}{P_2}] = ln\, 1 = 0 \qquad (2)$$

$$log\, i\, tP_2 = ln[\frac{P(Y=2)}{P(Y=1)}] = \alpha_2 + \beta_{11}x_1 + \cdots + \beta_{1p}x_p \qquad (3)$$

$$log\, i\, tP_3 = ln[\frac{P(Y=3)}{P(Y=1)}] = \alpha_3 + \beta_{21}x_1 + \cdots + \beta_{2p}x_p \qquad (4)$$

$P_1 + P_2 + P_3 = 1$, In essence, three classification cases can be dealt with by two two-dimensional logistic regression equations. If we want to compare two groups of two and three groups, we can get the corresponding functions by subtracting the above two equations directly.

3 DESCRIPTIVE AND INFERENTIAL STATISTICAL ANALYSIS

3.1 SAMPLE POPULATION ANALYSIS

Among the 40 samples, 18 are male, accounting for 55%, and 22 are female, accounting for 45%. The proportion of graduates who went to work, study for a master's degree, and study abroad accounted for 42.5%, 40.0%, and 17.5% respectively. Therefore, it can be seen that the first choice of graduates is to work and take the entrance examination for a master's degree. Studying abroad is limited by various factors, so it is rare. The proportion of monthly living expenses in the interval [500, 750], (750, 1000], (1000, 1250] and (1250, 1500] respectively is 47.5%, 42.5%, 5.0% and 5.0%. The vast majority of graduates live on between 500 and 1, 000 yuan a month. Sample data specific distribution is as follows: a minimum of 60 professional class X1 variables, a maximum of 96, with a mean of 77.8750, the standard deviation is 10.8112, English X2 variable scope for 43, 53, its minimum value is the maximum value is 96, the average is 77.6750, the standard deviation is 12.0818, gender X3 for qualitative variables, 0 said the boy, said the girl; The range of monthly living expenses X4 variable is 1000, the minimum value is 500, the maximum value is 1500, the mean value is 823.75, the standard deviation is 206.3068;

The response variable Y of graduation destination is also an attribute variable. The value 1 represents work, the value 2 represents continuing to study in graduate school, and the value 3 represents studying abroad.

3.2 THE RELATIONSHIP BETWEEN GENDER AND GRADUATION DESTINATION

Among the graduates who choose to work and study abroad, there are more female graduates than male graduates, but the proportion difference is not big. The number of men and women who choose to take the postgraduate entrance examination is the same. Therefore, in the choice of graduation destination, the proportion of men and women is more balanced.
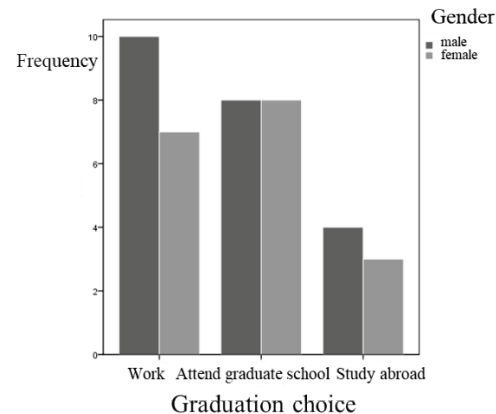
Figure 1 Distribution of gender and graduation destination frequency

3.3 THE RELATIONSHIP BETWEEN MONTHLY LIVING EXPENSES AND GRADUATION DESTINATION

A two-dimensional cross contingency table is compiled based on the data of graduates' whereabouts, and the frequency distribution of different monthly living expenses and different graduates' whereabouts is obtained. The results showed that among the 17 graduates who chose to work, the monthly living expenses were 58.8%, 35.3%, 5.9% and 0% in the range of [500750], (7501000], (10001250) and (12501500), respectively; among the 16 graduates who chose to take the postgraduate entrance examination, the monthly living expenses were in the range of [500750], (7501000), (10001250) and (12501500), respectively, 0%, 37.5%, 6.3% and 6.3% respectively. Among the 7 graduates who chose to study abroad, the monthly living expenses were 14.3%, 71.4%, 0% and 14.3% in the range of [500750], (7501000], (10001250], (12501500)].

Thus, with the increase of monthly living expenses, the fewer people choose to work and take the postgraduate entrance examination. The monthly living expenses of students can show their family circumstances. People with low monthly living expenses have poor family circumstances and tend to choose jobs after graduation. People with higher monthly living expenses have better family circumstances, so they choose to study abroad. People with moderate monthly living expenses choose postgraduate entrance examination more, because the cost of postgraduate entrance examination is less than that of studying abroad [4].

4. CONSTRUCTION AND ANALYSIS OF MULTI

CATEGORY LOGISTIC REGRESSION MODEL
4.1 MODEL ANALYSIS
Based on the data of graduation destination, we use SPSS statistical software to carry out multi category logistic regression analysis on four independent variables. The results of likelihood ratio test of model explanatory variables show that if the given significance level is 0.1, the p value of gender X3 is 0.715, which is greater than the significance level, we should accept the hypothesis that the regression coefficient is 0, which indicates that the influence of this variable is not significant. However, professional courses, English and monthly living expenses have significant effects on logit P. Therefore, the gender variable X3 was eliminated and regression was performed again [5]. The regression results show that, taking graduation work as the benchmark, the intercept coefficient value of postgraduate entrance examination options is 2.305 and the standard error is 5.533, the coefficient value of X1 variable of professional courses is 0.166 and the standard error is 0.057, and the coefficient value of X2 variable of English is 0.026 and the standard error is 0.040. The coefficient value of monthly cost of living in the first interval is -17.72, and the standard error is 2.391. The monthly cost of living is 2, the coefficient value in the second interval is -16.90, and the standard error is 2.311; the coefficient value in the third interval is -18.57, and the standard error is 3.204; The coefficient in the fourth interval has a value of 0 as a comparison term. Similarly, taking graduation work as the benchmark item, the intercept coefficient of the option of studying abroad is 9.74, and its standard error is 5.983. The X1 variable coefficient value of professional course is 0.013, and the standard error is 0.064. The coefficient of English X2 variable was 0.123, and the standard error was 0.062. The coefficient value of monthly living cost 1 is -23.27, and the standard error is 1.392. The coefficient value of monthly cost of living in the second interval is -20.41, and the standard error is about 0. The coefficient value of the monthly cost of living in the third interval is -39.89, and the standard error is 0. The monthly cost of living in the fourth interval is the comparison item.

Through careful observation, it is found that the regression coefficient of the variable "monthly living expenses" is negative, significantly not zero. The regression coefficients of the variables "professional course achievement" and "English achievement" are positive. According to the likelihood ratio test results of the total model, it can be seen that compared with the initial model with only constant terms, the - 2ll value of the final model decreased from 82.816 to 55.557, decreased by 27.259, and the p value of the likelihood ratio chi square test was 0.002, less than 0.05, indicating that the model as a whole was significant and the model selection was correct. Through goodness of fit test, the zero hypothesis of the test is that the model can fit the original data well, and the p value is far greater than 0.05, so the original hypothesis can not be rejected, that is, the significant establishment of the final model. The pseudo R-square of goodness of fit test index is 0.494, 0.565, 0.329, all between 0.3 and 0.5, and the fitting effect of the model is very good. According

to the parameter estimation table, the following two generalized Logit Equations can be obtained:

$$log\,i\,t\,P_2 = ln[\frac{P(Y=2)}{P(Y=1)}]$$
$$= 2.305 + 0.106x_1 + 0.026x_2$$
$$- 17.718x_4(1) - 16.896x_4(2)$$
$$- 18.565x_4(3) \quad \cdots (5)$$

$$log\,i\,t\,P_3 = ln[\frac{P(Y=3)}{P(Y=1)}]$$
$$= 9.714 + 0.013x_1 + 0.123x_2$$
$$- 23.272x_4(1) - 20.410x_4(2)$$
$$- 39.891x_4(3) \quad \cdots (6)$$

Among them, equation (5) is the natural logarithm model of the probability ratio of choosing postgraduate entrance examination and choosing work. It can be seen that the ratio of natural logarithm to monthly cost of living X4 = 1 is 17.718 units less than that of monthly cost of living X4 = 4 (reference category), and the probability ratio of X4 = 1 is 0.000 times that of X4 = 4. The monthly living expenses in the interval of [500750] are lower than those in the interval of (12501500), which is statistically significant. That is to say, the monthly living expenses in the interval of [500750] have a significant difference in the monthly living expenses in the interval of (12501500). For postgraduate students, the order of professional course scores, English scores and monthly living expenses is: monthly living expenses (x4), professional course scores (x1) and English scores (x2).Formula (6) is a natural logarithm model of the probability ratio of choosing to study abroad and choosing work. It can be seen that the monthly living expenses x4=1 are 23.272 units less than the natural logarithm compared with the monthly living expenses x4=4 (reference class). The probability ratio of x4=1 is 0.000 times of x4=4. The monthly living expenses in the interval [500750] are lower than those in the monthly living expenses (1250500], and statistically significant, that is, the monthly living expenses in the interval [500750] have significant differences in the range (1250500). For studying abroad, the results of professional courses, English scores and monthly living expenses are sorted according to the influence: the monthly living expenses (x4), English scores (x2), professional course scores (x1). Therefore, the higher the professional course scores, the more likely the graduates to study abroad.

4.2 MODEL PREDICTION
The model was used to predict the whereabouts of graduates, and the prediction effect was shown in Table 2. The table reveals the degree of agreement between the predicted results and the actual results. The overall prediction accuracy of the model is 75.0%, of which, the actual selection work and correct prediction of the sample size is 14, the accuracy of 82.4%. The correct prediction of the actual selection of graduate school was 12, and the correct rate was 75.0%. The actual number of samples that choose to study abroad and predict correctly is 4, and the correct rate is 57.1%. It can be seen that the model has a high accuracy in predicting jobs, which is partly related to the distribution of samples on brands. The proportion of the samples choosing jobs is much higher than the other

two choices. It can be seen that this model has a strong ability to predict the destination of graduates.

Table 2 Comparison of model prediction results and actual results

observations	Predictive value			
	1	2	3	Percentage correction
1	14	3	0	82.4%
2	2	12	2	75.0%
3	1	2	4	57.1%
The total percentage	42.5%	42.5%	15.0%	75.0%

5. CONCLUSION

This paper analyzes the direction of the graduates of a university. In this paper, a multi category logistic regression model is established to analyze the influence of four factors on the graduates' Graduation destination, which are professional course achievement, English achievement, gender and monthly living expenses, and effectively predict the future graduates' Graduation destination. As for the influencing factors of graduation destination, the research has the following findings: professional course scores, English scores, monthly living expenses and other factors have a significant impact on graduation destination. Specifically, compared with the students who take part in the work, the students who take part in graduate school have better scores in professional courses, but there is no significant difference in foreign language scores and monthly living expenses; there is no significant difference between the students who study abroad and the students who take part in the work, but the foreign language scores and monthly living expenses are better. The students with poor financial situation prefer to work directly after graduation, while the students with good financial situation and high English scores prefer to go abroad for further study after graduation. Students with high scores in professional courses tend to go to graduate school after graduation [6].

Part through the above analysis, we believe that in the present case, the surge of employment and entrance pressure of colleges and universities can find some indicative index, targeted projections for college graduates to choose, on the one hand, actively communicate with all kinds of good society enterprise platform, cooperation projects, on the other hand for different graduates personalized guidance education, which can be admissions service, process guidance and employment services for linkage consider. It has certain value for the government to formulate relevant employment policies to relieve employment pressure and create social talents.

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Optimization of Anhui Technology Finance and Regional Industrial Structure Based on DEA Model

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Abstract: Science and technology finance has brought a strong impetus to promote the upgrading of industrial structure. Through the establishment of DEA-BCC model to explore the development efficiency of science and technology finance in Anhui Province, there are development differences among regions, but the overall trend of growth; Analyze the coupling coordination degree of sci-tech finance and the service-oriented and sci-tech development of industrial structure, and it is found that the coupling coordination degree keeps growing in recent years. Finally, it summarizes and puts forward some suggestions to further promote the advanced development of science and technology finance and industrial structure.
Key words: efficiency of sci-tech finance; Industrial structure; DEA model; coupling relationship

1. INTRODUCTION

Under the new normal of economy, science and technology, as the primary productive force, plays an important role in promoting economic development. As the two core factors of modern economic development, the deep integration of science and technology and finance resources can effectively promote industrial upgrading and economic structural adjustment, and promote the high-quality development of China's economy.

The development of science and technology finance in China started late, and most of the scholars' researches in this field found that there is unreasonable resource allocation. Zhong-Yan Sun [1] used DEA-BBC model to study the dynamic and static changes of sci-tech finance efficiency in eight provinces and cities, and found that there were significant differences in the development of sci-tech finance among economic circles and unreasonable resource allocation. Tian-Wu Chen [2] found that the development efficiency of sci-tech finance in central and western China was low through DEA model and index analysis. Based on the data from 2009 to 2011, Jun-Mei Chen [3] concluded that the combination of finance and science and technology in Ningxia was not ideal. Yi Cui, Yun-Qi Zhao, Li-Ping Yang, et al. [4] established a DEA model to study the efficiency of sci-tech finance in Guangdong Province from 2006 to 2007, and found that there was a problem of incoordination between input and output. In addition, a large number of scholars have studied the relationship between industrial structure and its development from multiple perspectives.

Jian-Guo Zou and Ming-Xian Li [5] established SLM model and found that sci-tech finance promoted the upgrading of industrial structure and the spillover effect was most obvious in the eastern region. Through GMM two-step method, Ya-Nan Chen and Hui-Na Bao [6] concluded that the development of sci-tech finance can promote the upgrading of China's industrial structure. Tao He[7] established the PVAR model based on the data of six provinces in central China, and found that the two have a positive interaction, but their influence on the rationalization of industrial structure is not significant. Based on the panel data, Wei-Hua Xu [8] studied whether the scientific and technological innovation foundation of different regions in China could promote the optimization of the regional industrial structure.

Reviewing relevant literatures, there are few literatures on the correlation between S&T finance efficiency and industrial structure characteristics. Taking Anhui Province as an example, this paper explores the relationship between the development of science and finance in Anhui Province and the upgrading of industrial structure in recent years, so as to promote the coordinated development of the two.

2. INDEX SYSTEM CONSTRUCTION AND DATA SOURCE

2.1 Index selection and System Establishment

The R & D fund and the number of R & D personnel were selected as the input indexes. The total output value of high-tech industries and the number of patent applications were selected as output indexes. S & T financial indicators include the total fixed asset investment of the year and the total planned investment of the year . The detailed input and output indicators are shown in Table 1.

TABLE 1: Input index and output index.

Serial number	pointer type	index content	index code
1	input indicators	R&D funding	X1
2	input indicators	number of R&D personnel	X2
3	Output indicators	Gross output value of high and new technology industries	Y1
4	Output indicators	the number of granted patents	Y2

2.2 Data Sources

The index data came from the Statistical Yearbook of Anhui Province (2002-2019) and the Statistical Bulletin of High-tech Industry of Anhui Province (2002-2019).

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3. Anhui Science and Technology Finance Development Efficiency

3.1 Research Thought

Data envelopment analysis [9-11] is used to evaluate the efficiency of multiple decision making units. It is a non-parametric evaluation method and has been widely used in the analysis of multi-input and multi-output problems in various industries and departments. Through reviewing relevant literature, many scholars have established DEA models to study related issues. Since the change of investment scale affects the efficiency of science and technology finance, DEA-BBC analysis method is used here.

3.2 Modeling

Comprehensive efficiency is equal to pure technical efficiency times scale efficiency.

$$min[\theta - \varepsilon(\hat{e}^T s^- + e^T S^+)] = V(DE),$$
$$s.t. \sum_{j=1}^{n} xj\,\lambda j + s^- = \theta xj0, \sum_{j=1}^{n} yj\,\lambda j - s^+ = yj0, \sum_{j=1}^{n} \lambda j = 1.$$

Where in, $\theta, \lambda, s^+, s^- \geq 0$.

Suppose there are N DMU, and each DMU has M input indexes and S output indexes, xij is the ith type input of the JTH DMU, Yrj is the RTH species yield of the JTH DMU. $e_M^T = (1, 1, …, 1) \in Em, e_S^T = (1, 1, ..., 1) \in Es, \theta$ is the efficiency value of decision making unit, s^+ and s^- is the relaxation variable, ε is Archimedes infinitesimally small, λj is the index weight of input and output of decision unit j.

3.3 Empirical Analysis

3.3.1 Measure Results. According to the effective data, the comprehensive efficiency, pure technical efficiency and scale efficiency in a specific period of time are measured respectively. As can be seen from Table 2, the overall comprehensive efficiency of Anhui Province shows an upward trend. Although the comprehensive efficiency of some regions shows a downward trend in some time periods, it increases rapidly afterwards. As shown in Table 3, the change trend of pure technical efficiency and comprehensive efficiency in all cities from 2013 to 2017 is basically the same. Although the pure technical efficiency in some regions showed a downward trend in some time periods, the pure technical efficiency of Anhui Province showed an upward trend on the whole, which also indicates the effectiveness of science and technology policies in Anhui Province in recent years. As shown in Table 4, the change trend of scale efficiency of all cities in Anhui Province from 2013 to 2017 is consistent with the change of comprehensive efficiency and pure technical efficiency. Only Haozhou City has been in an effective state, while other cities have been in an obviously ineffective state.

TABLE 2: Comprehensive efficiency value of each city from 2013 to 2017.

region	vintage					region	vintage				
	2013	2014	2015	2016	2017		2013	2014	2015	2016	2017
Hefei	0.588	0.417	0.426	0.575	0.937	Huainan	1	0.259	0.347	1	0.754
Huaibei	0.505	0.709	0.677	0.644	0.659	Fuyang	0.485	0.532	0.5	0.779	0.971
Suzhou	0.618	1	1	0.881	0.658	Xuancheng	0.56	0.591	0.635	0.636	0.648
Chuzhou	0.797	0.734	0.756	0.88	0.95	Chizhou	0.995	0.858	0.897	0.954	0.989
Luan	1	0.633	0.875	0.892	1	Huangshan	0.753	0.564	0.503	0.694	0.635
Wuhu	0.996	0.679	0.78	1	1	Anqing	0.596	0.647	0.639	0.772	0.835
Tongling	0.687	0.559	0.538	0.564	0.68	Maanshan	0.674	0.395	0.353	0.446	0.743
Bengbu	0.46	0.485	0.491	0.644	0.766	Haozhou	0.618	1	1	0.881	0.658
average value	0.732	0.629	0.651	0.773	0.827	average value	0, 732	0.629	0.651	0.773	0.827

TABLE 3: Pure technical efficiency values of cities from 2013 to 2017.

region	vintage					region	vintage				
	2013	2014	2015	2016	2017		2013	2014	2015	2016	2017
Hefei	1	1	1	1	1	Huainan	1	1	1	1	0.763
Huaibei	0.636	0.885	0.792	0.707	0.677	Fuyang	0.565	0.584	0.554	0.782	1
Suzhou	1	1	1	1	0.866	Xuancheng	0.74	0.749	0.77	0.773	0.802
Chuzhou	0.94	1	1	1	1	Chizhou	1	0.898	0.937	1	1
Luan	1	0.684	0.959	0.894	1	Huangshan	0.998	0.785	0.82	0.984	1
Wuhu	1	1	1	1	1	Anqing	0.733	0.777	0.75	0.847	0.866
Tongling	0.766	0.779	0.714	0.703	0.773	Maanshan	0.676	0.539	0.424	0.487	0.746
Bengbu	0.578	0.644	0.637	0.755	0.906	Haozhou	1	1	1	1	1
average value	0.852	0.833	0.835	0.871	0.9	average value	0.852	0.833	0.835	0.871	0.9

TABLE 4: Scale efficiency of cities from 2013 to 2017.

region	vintage					region	vintage				
	2013	2014	2015	2016	2017		2013	2014	2015	2016	2017
Hefei	0.588	0.417	0.426	0.575	0.937	Huainan	1	0.259	0.347	1	0.988
Huaibei	0.793	0.417	0.426	0.575	0.973	Fuyang	0.858	0.91	0.902	0.996	0.971
Suzhou	0.618	1	1	0.881	0.76	Xuancheng	0.756	0.79	0.825	0.823	0.808
Chuzhou	0.848	0.734	0.756	0.88	0.95	Chizhou	0.995	0.955	0.957	0.954	0.989
Luan	1	0.924	0.912	0.998	1	Huangshan	0.755	0.718	0.613	0.705	0.635
Wuhu	0.996	0.679	0.78	1	1	Anqing	0.813	0.832	0.852	0.912	0.964
Tongling	0.898	0.717	0.753	0.802	0.88	Maanshan	0.997	0.732	0.832	0.916	0.997
Bengbu	0.797	0.754	0.771	0.852	0.846	Haozhou	1	1	1	1	1
average value	0.857	0.764	0.786	0.888	0.919	average value	0.857	0.764	0.786	0.888	0.919

3.3.2 Outcome Analysis. According to the above measurement results, the efficiency index of Anhui

Province in each year generally changes more than 1, and the development of science and technology finance in Anhui Province shows a trend of accelerated development in recent years, and the overall efficiency of science and technology finance shows an increasing trend .However, regional differentiation is relatively obvious, and the input output efficiency of science and technology finance in some regions is not high, such as northern Anhui, Hefei, Ma 'anshan, Anqing, Xuancheng, Huangshan and Tongling.

4. Coordinated Development Level of Science and Technology Finance and Advanced Industrial Structure in Anhui Province

4.1 Research Thought

Coupling coordination degree analysis [12-14] can be carried out according to the weight of indicators at all levels, so as to explore the internal development relationship and change trend between sci-tech finance and industrial structure upgrading in Anhui Province from 2003 to 2018, and promote the development of the two

from low coupling to high coupling.

4.2 Modeling

Coefficient of variation method and comprehensive fraction were used to evaluate the coupling degree. The formula is as follows:

$$M = [Ni \times Gi/(\frac{Ni+Gi}{2})^2]^2.$$
$$T = 0.5 \times Ni + 0.5 \times Gi.$$
$$Q = \sqrt{M \times T}.$$

Wherein, the coupling degree is M, the efficiency of science and technology finance is N, the coupling coordination degree is Q, and the industrial structure degree is G.

The value of coupling degree obtained from this calculation is small, but in fact there is a closely related contradiction between sci-tech finance and industrial structure advancement. Therefore, the optimized coupling degree Q is reintroduced, and the values are divided into Table 5 according to the actual characteristics.

TABLE 5: Classification of coupling degree and coupling coordination degree.

M	degree of coupling	Q	degree of coupling coordination	M	degree of coupling	Q	degree of coupling coordination
[0.0, 0.3)	Low coupling	[0.0, 0.2)	serious imbalance	[0.0, 0.3)	Running-in stage	[0.6, 0.7)	primary coordination
		[0.2, 0.3)	Severe disorder			[0.7, 0.8)	Intermediate coordinate
[0.3, 0.6)	Antagonism phase	[0.3, 0.4)	Mild disorder	[0.0, 0.3)	highly coupled	[0.8, 0.9)	good coordination
		[0.4, 0.6)	Tiny misadjustment			[0.9, 1.0)	Advanced coordination

4.3 research results
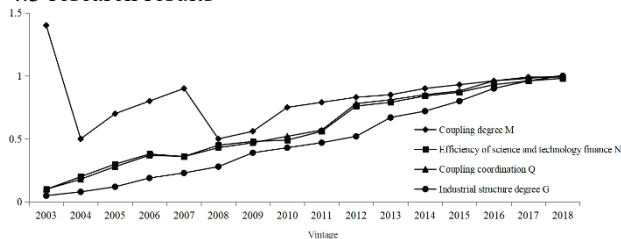
Fig.1: Trend diagram of coupling degree and coupling coordination degree

As shown in Fig.1, both coupling degree and coupling coordination degree are on the rise.In comparison, the coupling degree fluctuated more from 2003 to 2018, and dropped sharply in 2004, indicating that the development of Anhui science and technology finance and industrial structure was not optimistic in that year. After 2008, the coupling degree is on the rise, and there is a linkage effect on the upgrading of the economic and industrial structure, which reflects that the government and the public have an obvious understanding of the effectiveness of the existence of sci-tech finance. Considering that the coupling degree calculated by the coefficient of variation is not scientific, the coupling coordination degree is needed to be realized reasonably. When its development trend is relatively stable, the coupling relationship between sci-tech finance and industrial advancement is more convincing. As can be seen from Fig.1, the coupling coordination degree between the two continued to grow from 2008 to 2018, and there is room for further

improvement of Anhui sci-tech finance.

5. Conclusion

For science and technology in Anhui province in recent years the financial investment continues to increase, based on the statistical data in Anhui province from 2002 to 2019, establish DEA-BCC model after the empirical analysis found that there is an upward trend in Anhui science and technology financial efficiency index, shows that in recent years in Anhui science and technology of financial input and output of coordination degree is good, but the difference of economic development, the distribution of a variety of complex factors, development differences between regions, and in some parts of the efficiency problem is more serious, so know a lot of investment is not necessarily cause high-tech financial efficiency, for this phenomenon still need to make efforts in Anhui province; According to the coefficient of variation method, the coupling degree and coupling coordination degree between science and technology finance and industrial structure upgrading in Anhui Province are generally on the rise in recent years, which has a great development potential.

Based on the above research results, the following suggestions are put forward: 1. Give full play to the guiding role of the government, and pay attention to the efficiency of transformation of scientific and technological achievements while vigorously supporting the development of science and technology finance; 2. Reasonable allocation of R&D funds, continuous training and introduction of scientific research talents, promotion

of talent flow between regions, and narrowing the differences in the development levels of science and technology and finance between regions; 3. Improve the coordination system between finance and science and technology, promote the reasonable and balanced industrial structure upgrading among regions through the development of high and new technology industries, and realize the coordinated development of the three industries.

Data Availability

The data used to support the findings of this study are included within the article.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Prediction of Water Resources and the allocation model Based on ARMA-Model

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Abstract: In order to address problems above and provide a thirteen-year water strategy (2013-2025) for the leadership of China, we conclude three sub-problems and its solution in our paper: First of all, model building of Time Series Regression, prediction of the supply and demand of water in a period of thirteen years based on historical data. Secondly, model building of national water storage and movement strategy to solve China's uneven distribution of water in time and space. Thirdly, through the analysis, we determine the optimal water strategy then come to a conclusion. Meanwhile, provide accurate information and the effective solution then give advice to related government departments.
Key words: Time Series Regression Model; Water Strategy; SAS Program; Min-cost Max-flow algorithm

1.INTRODUCTION

In order to indicate the origin of the toll way problems, the following background is worth mentioning. Water, the magic encounter between one hydrogen and two oxygen atoms, is vital for all kinds of life forms in the earth.[1] The human body, myriad ecological systems and the big biosphere of our entire planet, all of these can't live without the beautiful gift from our Almighty God. However, in many parts of the world nowadays, we human are facing severe water problems.[2] Take China for example. With more than 20 percent of world's population but less than 7 percent of its freshwater, China is continuously facing issues associated with water.[3] Please build a model, make out an effective, feasible and cost-effective water strategy in 2013, to predict the water demand and plan out the optimal water strategy in 2025[4]. Specially, the Mathematical model must solve the problem of storage and movement, desalination and protection. If possible, use your model to discuss what the physical, economic and environmental effects on your strategy. And then write a non-technical position paper method to the head of the government to introduce your method, and its feasibility as well as its cost, and why it is "the optimal water strategy choice".[5]

2.MODELING SOLVING

2.1.THE ESTABLISHMENT OF THE MODEL AND SOLYTION

For the first problem, according to the average water, to classify the region of China, on the base of this, we choose the representative area as sample, according to the national bureau of statistics data, using the SAS, carries on the analysis and prediction, obtained per capita water resources quantity and total amount of water from 2013 to 2025.

2.1.1.THE ANALYSIS OF THE MODEL

In time series analysis, the need to establish a time series model testing data of the quantitative change rule. There are many commonly used time series model, such as AR-Model, MR-Model, ARMA-Model.

AR-Model

For order P autoregressive model (AR (P)), the model expression is

$$y_t = \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \cdots + \varphi_1 y_{t-1} + \varphi_p y_{t-p} + \varepsilon_t \quad (1)$$

Meanwhile, y_t is stable time series, $\phi_1, \phi_2, \cdots, \phi_q$ are moving average coefficients, ε_t is the noise sequence of regression model.

X_i: donate the amount of bring up water of I area.
Y_i: donate the amount of Call in the water of I area.
A_i: donate the amount of total water of I area.
D_i: donate the total population of I area.
P: donate the regional total transfer the water ratio of regional water resources constraints

MR-Model

For q order of moving average (MA) (q) model, the expressions for the model is $y_t = \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \cdots + \varphi_1 y_{t-1} + \varphi_p y_{t-p} + \varepsilon_t + \phi_1 \varepsilon_{t-1} + \phi_2 \varepsilon_{t-2} + \cdots + \phi_q y_{t-q}$ (2)

Meanwhile, y_t is stable time series, $\phi_1, \phi_2, \cdots, \phi_q$ are moving average coefficients, ε_t is the noise sequence of regression model.

ARMA-Model.

For the order p autoregressive - q order moving average models (ARMA (p, q)), for its expression

$$y_t = \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \cdots + \varphi_1 y_{t-1} + \varphi_p y_{t-p} + \varepsilon_t + \phi_1 \varepsilon_{t-1} + \phi_2 \varepsilon_{t-2} + \cdots + \phi_q y_{t-q} \quad (3)$$

Meanwhile, y_t is stable time series, $\phi_1, \phi_2, \cdots, \phi_q$ are moving average coefficients, ε_t is the noise sequence of regression model.

2.1.2.THE ESTABLISHMENT OF THE MODEL AND SOLYTION
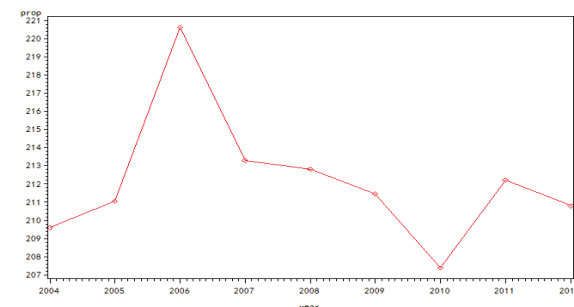
Figure 1 The water consumption per capita sequence diagram of Beijing

In this paper, according to the all provinces and cities of the country's average water, the provinces and cities is

divided into seven areas all over the country, we set up the time series model and forecast the seven zone, to find the solution by using SAS.

Draw the sequence diagram

The sequence diagram shows that the per capita of water consumption in Beijing are always in 212, fluctuate smoothly.

Map the descriptive statistics

Figure 2 is descriptive statistics figure, ten sets of data are given the basic descriptive statistical results, meanwhile including observation of sample, standard deviation and mean value, As shown below:

```
            SAS 系统

      The ARIMA Procedure

   Name of Variable = prop

Mean of Working Series      212.1444
Standard Deviation            3.435485
Number of Observations               9
```

Figure 2 Time series analysis of descriptive statistics

Autocorrelation Test

Investigate the sequence of sample autocorrelation figure, further inspect of the stable of the sequence.

```
                         Autocorrelations

Lag   Covariance   Correlation   -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1   Std Error
 0    11.693867     1.00000                          |********************|         0
 1     0.702558     0.06008                           .     |*             .       0.333333
 2    -1.449688    -.12397                           .   **|              .       0.334534
 3    -1.540800    -.13176                           .   ***|             .       0.339600
 4    -4.677460    -.39999                           .  ********|         .       0.345234
 5     0.644783     0.05514                           .     |*            .       0.393371
 6    -0.036756    -.00314                           .      |             .       0.394229
 7     0.152565     0.01305                           .      |            .       0.394232
 8     0.357864     0.03060                           .     |*            .       0.394280

                    "." marks two standard errors
```

Figure 3 Autocorrelation Figure of Time Series Analysis

The autocorrelation coefficient of sample autocorrelation figure have been within two standard deviations, and delay after one order autocorrelation coefficient of the fluctuation near the zero value. This is a very typical short-term autocorrelation figure related sample. By sequence diagrams and the properties of the sample autocorrelation figure can be thought of as the sequence is smooth.

Randomness Test

```
               Autocorrelation Check for White Noise

To     Chi-           Pr >
Lag   Square   DF    ChiSq   --------------------Autocorrelations--------------------
 6     3.79     6    0.7048   0.060   -0.124   -0.132   -0.400   0.055   -0.003
```

Figure 4 Randomness Test Chart

Test results show that, under various order delay P value is very large (> 0.7048), so we can believe that the sequence as part of the white noise sequence.

The stationary test results, at the front of the combination of the sequence can be regarded as not only is smooth, but also contains the worth we extract the relevant information.

The model fitting

Inspects the sequence of sample autocorrelation figure, autocorrelation figure shows delay after four order autocorrelation coefficient attenuation to two times the standard deviation, fluctuations in all this shows that the sequence clearly related in the short term. But sequence by significant nonzero correlation coefficient of attenuation for the small value of volatility process is continuous, quite slow, to further determine the sequence of smooth. At the same time, the autocorrelation coefficient as not truncated.

```
                              Autocorrelations

Lag   Covariance   Correlation   -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1   Std Error
 0    11.693867     1.00000                          |********************|         0
 1     0.702558     0.06008                           .     |*             .       0.333333
 2    -1.449688    -.12397                           .   **|              .       0.334534
 3    -1.540800    -.13176                           .   ***|             .       0.339600
 4    -4.677460    -.39999                           .  ********|         .       0.345234
 5     0.644783     0.05514                           .     |*            .       0.393371
 6    -0.036756    -.00314                           .      |             .       0.394229
 7     0.152565     0.01305                           .      |            .       0.394232
 8     0.357864     0.03060                           .     |*            .       0.394280

                    "." marks two standard errors
```

Figure 5 Series Autocorrelation Figure

Re-inspect the sequence figure sample partial autocorrelation coefficient, partial autocorrelation figure are within two standard deviations for random fluctuations small values, so the partial autocorrelation coefficient is not truncated.

```
                       Partial Autocorrelations

Lag     Correlation    -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
 1       0.06008                         .        |*          .
 2      -0.12804                         .      ***|          .
 3      -0.11802                         .       **|          .
 4      -0.41478                         .  ********|         .
 5       0.05904                         .        |*          .
 6      -0.17145                         .      ***|          .
 7      -0.07029                         .        *|          .
 8      -0.19963                         .     ****|          .
```

Figure 6 The sequence of partial autocorrelation figure

Therefore, we can consider to using ARMA (1, 1) model to fitting this observation sequence.

2.2.INSPECTION OF THE MODEL

2.2.1. RESIDUAL TEST

Figure 7 residual white noise test shows that delay order six LB test statistics P values were significantly greater than 0.05, so the ARMA (1, 1) model is significantly effective

```
              Autocorrelation Check of Residuals

To     Chi-           Pr >
Lag   Square   DF    ChiSq   --------------------Autocorrelations--------------------
 6     3.63     4    0.4591   0.045   -0.111   -0.133   -0.393   0.057   -0.007
```

Figure 7 Residual White Noise Test

2.2.2. SIGNIFICANCE TEST

Figure 8 significance test results show that three parameters t statistic P values are less than 0.05, the three parameters were significantly.

```
                    The ARIMA Procedure

               Maximum Likelihood Estimation

                         Standard             Approx
Parameter   Estimate      Error     t Value   Pr > |t|   Lag
MU          212.14754    1.38085    153.63     <.0001      0
MA1,1        -0.99964  140.77120     -0.01     0.9943      1
AR1,1        -0.88827    2.36518     -0.38     0.7072      1
```

Figure 8 Parameter Significance Test (Maximum Likelihood Estimation)

The figure eight for a quick for the model:

$$prop = 212.14754 + \frac{\varepsilon_t}{1 + 0.99964B_1 + 0.88827B_2} \quad (4)$$

2.3.PREDICTION OF THE TOTAL WATER IN 2025

Taking the average water consumption of Beijing district for example, get the forecast data.

```
          Forecasts for variable prop

Forecast    Std Error    95% Confidence Limits
212.0049     3.8699      204.4200    219.5898
212.1334     3.8766      204.5354    219.7313
212.1409     3.8766      204.5429    219.7388
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
212.1413     3.8766      204.5434    219.7393
```

Figure 9 The Per capita water consumption forecast of Beijing from 2013 to 2025

The sequence of fitting and forecasting diagram as shown

below:
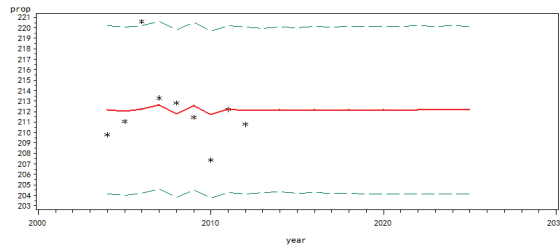
Figure 10 Per capita water consumption fitting and prediction in Beijing.

In the Figure 10, the asterisk observations on behalf of the sequence, continuous curve on behalf of the curve fitting of sequences, dotted line represents the fitting sequence of upper and lower confidence limit of 95%.

Table 1: The relevant data of the all provinces

province	The total water	The toal population	province	The total water	The toal population
Beijing	16.6227	806.4931	Henan	229.4498	9798.0799
Tianjin	8.0110	405.9844	Hubei	269.1735	5683.2909
Hebei	185.7236	6560.3546	Hunan	416.8247	8264.9864
Shanxi	51.1101	2859.6133	Guangdong	363.2791	7521.1793
Neimeng	168.3811	2277.6903	Guangxi	336.2107	5212.5446
Liaoning	128.1091	4000.2486	Guizhou	137.1098	5085.0712
Jilin	106.4822	2675.1195	Sichuan	230.9745	8519.4314
Heilongjiang	303.9912	3795.2883	Chongqing	73.6269	2662.1197
Shanghai	78.8950	1277.5475	Yunnan	130.4855	4042.9818
Jiangsu	506.7467	7107.4692	Gansu	118.3450	2512.4309
Zhejiang	163.7044	4141.2413	Hainan	38.1516	712.5239
Anhui	276.0151	6628.8555	Qinghai	27.5847	496.4215
Fujian	172.7409	3177.1815	Xizang	25.5442	226.3933
Jiangxi	209.0230	3984.6767	Ningxia	58.2650	494.7471
Shanxi	79.4931	3569.7673	Xinjiang	435.5642	1740.7302
Shandong	196.1819	8390.1527			

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3.CONCLUSION

Because we have less water volume data of the provinces, only nine years of data, if use 'Time Series Regression' predict the water consumption in 2025, error will be big. And explain the variable population (ten thousand people), regional GDP (one hundred million yuan), agricultural water use (hundreds of millions of cubic meters), industrial water (hundreds of millions of cubic meters), we have more data for years. So, we will use the time series curve regression, predict 2025 provinces of population (ten thousand people), GDP (one hundred million yuan), agricultural water use (billions of cubic meters), industrial water (billions of cubic meters) and ecological water (hundreds of millions of cubic meters) value, and then put in the provinces of the regression equation obtained before, to predict water amount. The prediction as follows:

Price Forecast of Qinhuangdao Steam Coal Based on RBF Neural Network

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Abstract: Coal is a bulk commodity, and its price is affected by many factors. In order to accurately predict the coal price, this paper takes Qinhuangdao Port steam coal as an example, collects the relevant coal price data from May 1, 2019 to April 30, 2020, uses the principal component analysis method to screen out four indicators such as "crude oil price" which is closely related to the coal price, and introduces multiple linear stepwise regression model Combined with the historical data of steam coal in Qinhuangdao port, the coal price prediction model is established, and the change law of steam coal price with time is obtained. At the same time, the prediction model of steam coal price based on RBF neural network is established under emergency, and the fluctuation trend of coal price under different influence degrees of main factors is obtained. Finally, in view of the problems existing in the coal industry, this paper gives reasonable and effective countermeasures and suggestions. Key words: Multi linear regression; principal component analysis; RBF neural network of steam coal price

1. INTRODUCTION

In the development environment of the new era, accelerating innovation in the coal industry is an effective way to improve the open economic system and achieve sustainable development.[1][2] At present, in the study of energy consumption, coal consumption accounts for more than half, oil and natural gas account for about 30%, and the rest is shared by other energy sources. The coal industry is a basic industry of the national economy, which is related to the overall situation of economic development and social stability. In recent years, the demand for coal has fallen sharply and the supply capacity has continued to surplus, resulting in a general decline in corporate efficiency, which has adversely affected economic development and social stability.[3][4] Therefore, exploring the changes in coal prices under the influence of different factors and the environment is the top priority for adjusting the development strategy of the coal industry and maintaining the stable operation of the national economy.

2. DATA COLLECTION AND PROCESSING

In this paper, Qinhuangdao steam coal as an example, data from the China coal market network, to "week" as a unit, the price of coal is the price of the week of the date. We have collected seven representative indicators that affect the price of Qinhuangdao steam coal, including the energy price index in the international market from May 1, 2019 to April 30, 2020, the stock of Qinhuangdao Port's steam coal depot (10000 tons), the throughput of Qinhuangdao Port's steam coal (10000 tons), the output of natural gas (100 million cubic meters), the price of crude oil (USD/barrel), the air quality index and the power generation (100 million kwh).

At the same time, it puts forward a hypothesis: these indicators are enough to explain the main trend of coal price. The data were standardized by MATLAB 2018 and SPSS 24.

3. COAL PRICE MODEL BASED ON PRINCIPAL COMPONENT REGRESSION ANALYSIS

3.1 APPLICATION PRINCIPLE

Principal component regression analysis is a basic method to analyze multicollinearity.[5] It overcomes the instability of multicollinearity in data matrix. In this paper, the price of Qinhuangdao steam coal is taken as the dependent variable, set as y, and seven representative indexes of energy price index in the international market, the stock of Qinhuangdao Port's steam coal depot (10000 tons), the throughput of Qinhuangdao Port's s team coal (10000 tons), the output of natural gas (100 million cubic meters), the price of crude oil (USD/barrel), the air quality index and the power generation (100 million kwh) are taken as the independent variables.[6][7] Principal component analysis is used to reduce dimension and determine the weight of each index. According to its absolute value, the main factors are screened out and the secondary factors are eliminated. The data sheet is shown in Table 1

Table 1. data of steam coal price and different influencing factors in Qinhuangdao Port

Time	Coal price	Energy price index in international market	Storage capacity of Qinhuangdao Power coal depot	Qinhuangdao thermal coal throughput	Natural gas production	Crude oil price	Air quality index	Power generation
May 2019	619	81.8	611	58.3	4.7	66.8	90	180.3
June 2019	596	73.1	564	58.1	4.6	67.5	93	194.5
July 2019	608	74.9	583.5	52.1	4.5	64.1	92	212
August 2019	596	70.4	585.25	48.6	4.5	61	63	215.6
…	…	…	…	…	…	…	…	…

Step 1: construct sample matrix

$$X = \begin{bmatrix} x_1^T \\ x_2^T \\ \vdots \\ x_n^T \end{bmatrix} = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1p} \\ x_{21} & x_{22} & \cdots & x_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{np} \end{pmatrix}. \quad (1)$$

Among them, x_{ip} express Group i in the sample data of the value of the variable p.

Step 2: transform the sample matrix X to get the $Y = [y_{ij}]_{np}$, among

$$y_{ij} = \begin{cases} x_{ij}, Justification\ index \\ -x_{ij}, Contrarian\ indicator \end{cases} \quad (2)$$

Step 3: A normalized matrix is obtained by making a normalized transformation of Y

$$Z = \begin{bmatrix} z_1^T \\ z_2^T \\ \vdots \\ z_n^T \end{bmatrix} = \begin{pmatrix} z_{11} & z_{12} & \cdots & z_{1p} \\ z_{21} & z_{22} & \cdots & z_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ z_{n1} & z_{n2} & \cdots & z_{np} \end{pmatrix}. \quad (3)$$

Among them, and they are in the array Y mean and standard deviation of column j.

Step 4: calculate the sample correlation coefficient matrix of standardized matrix Z

$$R = [r_{ij}]_{p\times p} = \frac{Z^T Z}{n-1} \quad (4)$$

Step 5: find the eigenvalue $|R - \lambda I_p| = 0$, solution p characteristic value $\lambda 1 \geq \lambda 2 \geq \ldots \geq 0$.

Step 6: determine the m value, so that the utilization rate of information can reach more than 85%. The method of determination is as follows:

$$\frac{\sum_{j-1}^{m} \lambda_j}{\sum_{j-1}^{p} \lambda_j} \geq 0.8, j=1, 2, \ldots, m \quad (5)$$

Solving equations $Rb = \lambda_j b$, get the unit vector.

Step 7: find out T m principal component components of, and the decision matrix is obtained.

3.2 MODEL CONSTRUCTION
Determine the primary principal component weight model.

$$\begin{cases} F_1 = u_{11}w_1 + u_{12}w_2 + \cdots u_{L1}w_L \\ F_2 = u_{21}w_1 + u_{22}w_2 + \cdots u_{L2}w_L \\ \cdots \\ F_m = u_{m1}w_1 + u_{m2}w_2 + \cdots u_{Lm}w_L \end{cases} \quad (6)$$

Where, m principal components are obtained after analysis $F1, F2, \ldots, Fm$; αij is the coefficient in the decision matrix. It is necessary to point out that when using SPSS software to analyze the principal component, it is not the decision matrix coefficient uij, but the initial factor load fij, which satisfies the following relationship

$$u_{ij} = \frac{f_{ij}}{\sqrt{\lambda_j}}, j=1, 2, \ldots, m \quad (7)$$

On this basis, the comprehensive evaluation function is constructed

$$F_z = \sum_{j=1}^{m}(\lambda_j/k)F_j = \alpha_1 w_1 + \alpha_2 w_2 + \cdots + \alpha_L w_L \quad (8)$$

$$k = \lambda_1 + \lambda_2 + \cdots + \lambda_m \quad (9)$$

By $V_{Zi} = \sum_{j=1}^{L}\alpha_j p_{ij}$, $i=1, 2, \ldots, h$ the weight of each index is

$$w_i = V_{Zi}/\sum_{i=1}^{h} V_{Zi} \quad (10)$$

To sum up, a two-level weight model can be obtained

$$\begin{cases} F_z = \sum_{j=1}^{m}(\lambda_j/k)F_j = \alpha_1 w_1 + \alpha_2 w_2 + \cdots + \alpha_L w_L \\ V_{Zi} = \sum_{j=1}^{L}\alpha_j p_{ij} \\ w_i = V_{Zi}/\sum_{i=1}^{h} V_{Zi} \end{cases} \quad (11)$$

3.3 RESULT ANALYSIS
According to Table 2 and Table 3, the weight set corresponding to the index set is(0.120, 0.155, 0.011, 0.095, 0.161, -0.192, 0.199). That is to say, the price model of Qinhuangdao steam coal is

$$Y = 0.120w_1 + 0.155w_2 + 0.011w_3 + 0.095w_4 + 0.161w_5 - 0.192w_6 + 0.199w_7 \quad (12)$$

Table 2. explanation of variance

component	Initial eigenvalue			Extract the load sum of squares		
	total	Variance percentage	Cumulative%	total	Variance percentage	Cumulative%
1	4.005	59.217	59.217	4.005	59.217	59.217
2	1.238	27.691	86.908	1.238	27.691	86.908
3	0.840	12.004	86.912	-	-	-
4	0.489	6.984	93.896	-	-	-
5	0.281	4.011	97.907	-	-	-
6	0.136	1.944	99.851	-	-	-
7	0.010	0.149	100.000	-	-	-

Table 3. composition matrix

	Component	
	1	2
Energy price index in international market	0.926	-0.088
Crude oil price	0.931	-0.088
Air quality index of Qinhuangdao	0.670	-0.438
Storage capacity of power coal depot in Qinhuangdao port	-0.373	0.741
Throughput of steam coal in Qinhuangdao port	0.852	0.167
Natural gas production	-0.826	-0.339
Power generation	0.535	0.582

According to the absolute value of the original independent variable coefficient, it can be seen that crude oil price, Qinhuangdao thermal coal throughput, natural gas production and power generation are the main factors affecting the thermal coal price of Qinhuangdao port. The importance of these four factors from high to low is power generation, natural gas production, Qinhuangdao thermal coal throughput and crude oil price.

In general, the output of clean energy has a great impact on the price of coal, indicating that the maintenance of the ecological environment plays an important role in national development and residents' life. At the same time, the import and export of coal is also one of the main factors affecting its price. Appropriate exploitation of domestic coal resources and appropriate import of foreign coal resources are also important measures for production

development.

4. COAL PRICE FORECASTING MODEL BASED ON STEPWISE REGRESSION METHOD

4.1 MODEL ESTABLISHMENT

It can be seen from the above results that the irrelevant variables with lower importance can be eliminated, and the main indicators with greater influence can be retained, namely, crude oil price, Qinhuangdao thermal coal throughput, natural gas production and power generation. From the principle of stepwise regression, this method is the combination of multiple linear regression and multiple polynomial regression, which can automatically make the factor setting of the equation reasonable.[8][9]

The multiple linear regression model involving p independent variables can be expressed as follows:

$$\begin{cases} y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_p x_p + \varepsilon \\ \varepsilon \sim N(0, \sigma^2) \end{cases} \quad (13)$$

For convenience, this paper introduces matrix notation through the group of n actual observation data:

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} \quad (14), \quad X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1p} \\ x_{21} & x_{22} & \cdots & x_{2p} \\ \vdots & \vdots & & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{np} \end{bmatrix} \quad (15), \quad \beta =$$

$$\begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{bmatrix} \quad (16), \quad \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix} \quad (17).$$

Among them X are model design matrix, Y and ε are random vectors, and $Y \sim N_n(X\beta, \sigma^2 I), \varepsilon \sim N_n(0, \sigma^2 I)$, Where I is the unit matrix of order n, ε is an unobservable random error vector, β is a vector of regression coefficients, is an unknown constant vector.

4.2 LEAST SQUARE ESTIMATION OF REGRESSION COEFFICIENT

Select an estimate β, and note that $\hat{\beta}$, the sum of squares of random errors ε is minimized, namely

$$\min_{\beta} \varepsilon^T \varepsilon = \min_{\beta} (Y - X\beta)^T (Y - X\beta) = (Y - X\hat{\beta})^T (Y - X\hat{\beta}) \stackrel{\text{def}}{=} Q(\hat{\beta}) \quad (18)$$

According to the requirements of the least square method, the necessary conditions for obtaining the extremum from the multivariate function can be used to solve the standard equation of regression parameters as follows:

$$\begin{cases} \frac{\partial Q}{\partial \beta_0} \big|\beta_0 = \hat{\beta}_0 = 0 \\ \frac{\partial Q}{\partial \beta_i} \big|\beta_i = \hat{\beta}_i = 0 \quad (j = 1, 2, \cdots, p) \end{cases} \quad (19)$$

It can be proved that any given $X \backslash Y$, normal system of equations has solutions, when the rank X is not satisfied, the solution is not unique, But for any group of solutions $\hat{\beta}$, the sum of squares of residuals can be minimized, namely

$$Q(\hat{\beta}) = \min_{\beta} Q(\beta).$$

In particular, when the rank X is full, namely $r(X) = r(X^T X) = p$, then the solution of the normal equations is $\hat{\beta} = (X^T X)^{-1} X^T Y$, which is the estimated value of regression coefficient.

4.3 STEPWISE REGRESSION ANALYSIS

When establishing the regression model, not every factor has a great influence. So we use the method of stepwise regression to screen the factors.[10] The specific process is as follows:

Step1: Multiple linear regression equation was established;

Step2: The significance of regression coefficient is tested, and the value corresponds to the maximum probability value;

Step3: judge P_{max} whether it is 0.05, if it is satisfied, enter step 5, if not, enter step 4;

Step4: acceptable H_0, that is, the linear relationship between the indicator and the dependent variable is not significant, so the indicator will be removed and returned

Step5: If H_0 is rejected, the linear relationship between all indicators and dependent variables is significant, input equation and end.
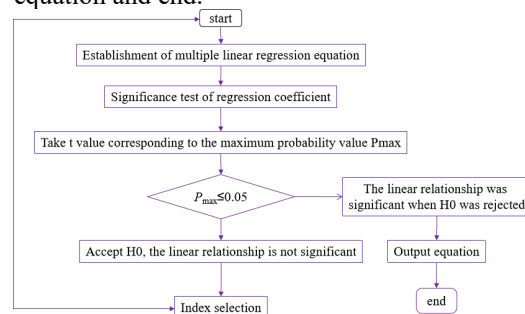
Figure 1. flow chart

In this process, Matlab is used for stepwise regression, and the results are shown in Table 4 and Table 5.

Table 4. model summary

Model	R	Adjust R side	Error of standard estimation
0.86324	0.85764	0.83140	1.5754

Table 5. regression coefficient table

Model	Nonstandard coefficient		t	Sig.
	B	Standard error		
Crude oil price	-0.109679	0.016	-0.2871	0.142
Throughput of steam coal in Qinhuangdao	0.167227	0.704	0.4651	0.000
Natural gas production	-42.5514	0.058	-4.4005	0.000
Generating capacity	-0.307719	0.060	-0.8417	0.009

According to the table, the model is as follows:

$$Y = -0.110 w_3 + 0.167 w_4 - 42.551 w_5 - 0.308 w_7 + 850.503 \quad (20)$$

Next, we construct the linear functional relationship between these four factors w_3, w_4, w_5, w_7, and time, It is convenient to determine the specific data of these four variables at a certain time in the future, so as to carry out the prediction of steam coal price combined with multiple linear model. The fitting function of each factor was obtained by SPSS software.

$$\begin{cases} w_3 = -3.453t + 78.521 \\ w_4 = -1.456t + 58.791 \\ w_5 = 0.094t + 4.303 \\ w_7 = -2.143t + 204.798 \end{cases} \quad (21)$$

Table 6. Forecast of steam coal price in Qinhuangdao

Time	Power coal price	Time	Power coal price
January 2022	500.168	July 2022	480.193
February 2022	496.973	August 2022	480.998
March 2022	493.778	September 2022	477.803
April 2022	490.583	October 2022	474.608
May 2022	487.388	November 2022	471.413
June 2022	484.193	December 2022	468.218

4.4 SIGNIFICANCE TEST OF REGRESSION PARAMETERS

To examine whether the influence of each independent variable on the dependent variable is significant or not is to test whether each population parameter is significant or not. Take β_3 as an example, the assumptions are as follows:

$H0: \beta_3 = 0, H_1: \beta_3 \neq 0$ (22)

The test statistics are as follows:

$t_3 = \frac{\beta_3}{s(\beta_3)}$ (23)

Test statistics t_3 when $\beta_3 = 0$ is assumed to be true, Obey the distribution of t degree of freedom$(n - 2)$.For a given test levelα, the critical value of the statistic t can be found through the t_3 distribution table $t_{\frac{\alpha}{2}} = (n - 2)$.

The decision rules are:

If $|t_3| \leq t_{\frac{\alpha}{2}}(n - 2)$, then accept $H0$, it is considered that the significance of β is zero; If $|t_3| > t_{\frac{\alpha}{2}}(n - 2)$, Then refuse$H0$, consider β significant not zero.

When you refuse $H0$, when we think that β is not significantly zero, then β Passed the test of t.

In this paper, the absolute value of the statistical value of the explanatory variable w_3 is 0.2871, greater than critical value $t_{\alpha/2}(N - K)$ =0.1843, The corresponding value of$prob(t)$ is 0.0015, obviously less than$\alpha = 0.05$. Therefore, we reject the original hypothesis and consider that the regression coefficient is not significantly 0, which indicates that the impact on the quality of life is significant. The other variables also passed the t test.

5. STEAM COAL PRICE PREDICTION BASED ON RBF NEURAL NETWORK IN EMERGENCY

5.1 RESEARCH IDEAS

Although the above stepwise regression model is the best multivariate linear estimation of coal price, the structure and weight of influencing factors will change according to the actual situation and future emergencies. In view of this, this paper selects RBF neural network and uses MATLAB to establish a prediction model, in order to achieve better prediction effect.

5.2 MODEL ESTABLISHMENT

RBF neural network has strong ability of learning speed and classification. Its working principle is that the network is regarded as the approximation of the unknown function. Any function can be expressed as the weighted sum of a group of basis functions, that is, the transfer function of each hidden layer is selected to form a group of basis functions to approximate the unknown function. RBF artificial neural network consists of an input layer, a hidden layer and an output layer.

Build a general model: Set the input layer as$X = [x_1, x_2, \cdots, x_n]$, and the actual output layer as$Y = [y_1, y_2, \cdots, y_p]$. The input layer realizes the nonlinear mapping from X to $R_i(X)$, the output layer realizes the linear mapping from$R_i(X)$ toy_k, and the output of the k-th neuron network in the output layer is

$\hat{y}_k = \sum_{i=1}^{m} w_{ik} R_i(X), k = 1, \cdots, p$ (24)

In the equation: n is the number of input nodes, m is the number of hidden layer nodes; p is the number of output layer nodes; w_{ik} is the connection weight between the i-th neuron in the hidden layer and the k-th neuron in the input layer; $R_i(X)$ is the hidden layer The action function of the i-th neuron in the layer, namely:

$R_i(X) = exp(-\|X - C_i\|^2/2\alpha_i^2), i = 1, \cdots, m$ (25)

In the equation: $X$is the n-dimensional input vector; $C_i$is the center of the i-th basis function, a vector with the same dimension as$X$; $\alpha_i$is the width of the i-th basis function; m is the number of perceptual units; The norm of the vector $\|X - C_i\|$, which usually represents the distance between$X$and C_i; The unique maximum value of $R_i(X)$ atC_i. A s $\|X - C_i\|$ increases, $R_i(X)$ decays rapidly to 0. For a given input, only a small portion near the center of X is activated. Once the clustering centers C_i, weights w_{ik} and α_i of the RBF network are all determined, the corresponding output values of the network can be given for a certain input.

In this paper, there are four independent variables and one dependent variable. Therefore, the number of input neurons is four, the number of output neurons is one, and the number of hidden layer neurons is one. RBF network will be adaptively determined in the training process.

5.3 MODEL TEST AND PREDICTION

In this paper, Matlab is used to import data, and RBF neural network is used for fitting and merging prediction. In order to verify the accuracy of the simulation fitting, the data from May 2019 to April 2020 are randomly selected to establish the RBF neural network model, and the steam coal price of Qinhuangdao in 2021 is predicted. The prediction results are compared with the data of May 2019 in the sample to verify the rationality of the model. Finally, the predicted value of Y is 552.8894, which is close to the historical data 547.5. Secondly, taking the data from May 2019 to April 2020 as samples, the RBF neural network is reconstructed in MATLAB as the final prediction model of steam coal price.

Next, this paper makes a simple prediction of the

structural and weight changes of various influencing factors under the emergency. Some examples are predicted as follows:

(1) When crude oil prices get higher, other factors stay on average

(2) Qinhuangdao steam coal throughput becomes low, other factors remain at an average level

(3) Natural gas production increases, other factors remain at an average level

(4) Power generation is lower and other factors remain at an average level

Input separately p1=[75, 50, 5, 180], p2=[60, 35, 5, 180], p3=[60, 50, 7, 180], p4=[60, 50, 5, 165]

obtain:y1=[572.9987], y2=[563.2258], y3=[564.3453], y4=[545.2884]

The above results can be directly substituted into RBF neural network to predict the price of steam coal, and the fitting effect is good.

6. CONCLUSION

We use multiple linear regression to fit and use principal component analysis to eliminate irrelevant variables, and establish that crude oil price, Qinhuangdao steam coal throughput, natural gas production and power generation are the main factors affecting Qinhuangdao Port steam coal price. Secondly, we construct the correlation matrix. According to the ranking of each coefficient after treatment, we determine that from May 1, 2019 to April 30, 2020, the ranking of the main factors affecting the thermal coal price in Qinhuangdao port from high to low is power generation, natural gas production, Qinhuangdao thermal coal throughput and crude oil price.RBF neural network prediction model can objectively predict the price of steam coal in Qinhuangdao Port considering the future emergencies. This paper comprehensively considers the prediction results of stepwise regression and RBF neural network, makes a more accurate prediction of the current coal market price, and gives play to the government's macro-control direction, so as to make the market develop healthily and steadily.

7. COUNTERMEASURES AND SUGGESTION

Through the changes in the factors that affect coal prices in the event of emergencies, and predicting the participation of various situations in the future, we now give suggestions to relevant government departments based on the prediction results:

(i) Give full play to the role of market regulation mechanisms and the guiding role of the government. Use macro-control and free market development to resolve excess production capacity. Especially when market competition in the coal industry is not standardized enough, competition among enterprises is fierce, and the industry's development trend is not healthy enough, the important role and significance of macroeconomic policies for market prices should be precisely controlled.

(ii) The price development trend of the coal industry is greatly affected by the prices of relevant alternative commodities, such as crude oil prices and electricity prices. New clean energy is a more preferred item for policy implementation and market demand, and coal demand for traditional fuels is on a downward trend compared to the past. In the face of such industry development challenges, structural transformation is imperative.

(iii) Coal prices are related to the cost, power and other development factors of many types of upstream and downstream enterprises. Therefore, controlling the development trend of coal prices is a powerful condition for controlling business risks for related companies such as power generation companies that use coal as fuel.

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Public Opinion Analysis of Sponge City Construction and Operation Based on Factor Analysis

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Abstract: At this stage, the development and construction of Chinese cities has entered a white-hot stage, and water environment problems such as urban water use and drainage are becoming increasingly prominent. Sponge city is regarded as an excellent strategy to solve these problems because of its good role in water conservation, flood control and rain retention. The development of the concept and practical experience of sponge city plays a decisive role in its construction effect, but the support of city citizens for the construction of sponge city is also essential. Understanding the public's opinions on the construction and operation of sponge city is the work that the government and relevant construction units need to do. This paper uses factor analysis, combined with quantitative analysis of questionnaire data, to understand the factors that affect people's opinions on the construction of sponge City, and puts forward the summary and suggestions.
Keywords: sponge city; public opinion survey; construction evaluation; factor analysis

1. INTRODUCTION

With the continuous improvement of the level of urbanization in my country, the growth of urban scale and urban population has put forward higher requirements for urban construction, and the shortage of water resources has become an important issue among them. In April 2012, at the "2012 Low-Carbon City and Regional Development Technology Forum", the concept of "sponge city" was first put forward. Like sponges, cities have good "flexibility" in adapting to environmental changes and responding to natural disasters. When it rains, it absorbs water, stores water, seeps water, and purifies water. When needed, the stored water is "released" to improve the function of the urban ecosystem and reduce the occurrence of urban flooding. Since the establishment of 30 sponge city pilot cities in 2015 and 2016, the construction of sponge city has become the main direction and trend of urban planning and development at this stage. According to the current research situation of sponge City, flood control and drainage, low impact development, rain and flood management, annual total runoff control rate are the theme content of sponge city construction and operation, and the related research content literature has shown a continuous upward trend in recent ten years, theoretical research and construction practice go hand in hand.[1]

2. BACKGROUND AND CURRNT SITUATION

Sponge city is the concept of a new generation of urban management. my country is absorbing advanced foreign construction experience. In April 2012, the concept of "sponge city" was put forward for the first time. Cities, like sponges, have good flexibility in adapting to environmental changes and natural disasters. When it rains, they absorb, store, infiltrate and purify water. When necessary, they "release" and use the stored water to improve the function of urban ecosystem and reduce the occurrence of urban floods. In 2013, a sponge city construction strategy was formally proposed. Since the concept of sponge city has been proposed in a relatively short period of time, and the research on sponge city is still in the preliminary stage, it will take a long time to study and practice before the extensive construction and implementation of sponge city.[2-5]

3. ANALYSIS OF PUBLIC OPINIOM ON SPONGE CITY CONSTRUCTION

According to people's personal characteristics and their cognition and opinions on sponge City, the questionnaire is designed as follows:

Table 8 Sponge City Public Opinion Questionnaire

Question Number	Question
1	What's your age?
2	What's your gender?
3	What is your education level?
4	What's your identity, please?
5	What do you think of the current situation of China's urbanization development?
6	Have you ever experienced urban waterlogging in your living or working area?
7	What do you think of the ability of cities to store and discharge rainwater and resist floods at the present stage in China?
8	Do you know "sponge city"?
9	Do you support the construction of sponge city?
10	In your opinion, in the short term, what measures should the government take first to build a sponge City, or what attitude should the people take to support the development of a sponge city?
11	Where do you want to start the construction of sponge city?
12	Which party (or parties) do you want to manage the construction and operation of sponge city?
13	Which of the following projects do you pay most attention to in the construction of sponge city?
14	Do you think it is necessary to popularize and implement sponge city?

3.1 RELIABILITY AND VALIDITY TEST

First, the reliability and validity of the questionnaire must be tested. Reliability analysis is also called reliability analysis, which is used to measure whether the sample

answer is reliable, that is, whether the sample has true answer scale items. Validity analysis, in simple terms, is the validity and accuracy of the questionnaire design, which is used to measure whether the item design is reasonable. Here the reliability test uses the Kronbach alpha coefficient test:

$$\alpha = \frac{K}{K-1}(1 - \frac{\sum S_i^2}{S_x^2})$$

In the formula, α is the reliability coefficient, K is the number of test items, S_i^2 represents the score variation of all subjects on the i item, and S_x^2 is the variance of the total scores obtained by all subjects. The calculated Cronbach alpha coefficient is 0.73. Generally speaking, the higher the coefficient, the higher the reliability of the questionnaire. In basic research, the reliability should be at least 0.80 before it is acceptable. In exploratory research, the reliability should reach 0.70 as long as it is acceptable. The reliability between 0.70 and 0.98 is high reliability, and less than 0.35 is low reliability., Must be rejected, so the questionnaire reliability test passed. The following uses exploratory factor analysis to conduct KMO and Bartlett Sphericity Test to test the validity of the questionnaire.

Table 9 KMO and Bartlett Sphericity Test

KMO and Bartlett Sphericity		
KMO Sampling Suitability Quantity		0.644
Bartlett Sphericity Test	Approximate Chi-Square	148.964
	DOF	91
	P	0.000

In the table, the KMO Sampling Suitability Quantity is 0.644 greater than 0.60, and the significance is less than 0.05, so the questionnaire validity test can be used for factor analysis.

3.2 FACTOR ANALYSIS

In order to understand the validity structure of the questionnaire and understand and analyze the public opinion of sponge city construction and operation, factor analysis method was used to analyze the commonness and contribution of each factor. Enter the data into IBM-SPSS24 for factor analysis, and use the maximum variance method for rotation.

Table 10 Common Factor Variance

	Initial	Extract
Q1	1.000	0.738
Q2	1.000	0.481
Q3	1.000	0.596
Q4	1.000	0.776
Q5	1.000	0.518
Q6	1.000	0.699
Q7	1.000	0.644
Q8	1.000	0.635
Q9	1.000	0.554
Q10	1.000	0.641
Q11	1.000	0.406
Q12	1.000	0.586
Q13	1.000	0.737
Q14	1.000	0.775

From Table 3, the extracted values of the common factor variances of the re-scaled variables are all greater than 0.6, indicating that the original data explains the information of the original data to an acceptable degree, and at the same time compress the dimensions of the data.

Table 11 Explanation of Total Variance

	Initial Cigenvalue			Rotating Load Sum of Squares		
Ingredient	Total	Variance Percentage	Cumulation (%)	Total	Variance Percentage	Cumulation (%)
1	1.889	13.496	13.496	1.629	11.638	11.638
2	1.777	12.691	26.187	1.588	11.344	22.983
3	1.516	10.826	37.013	1.587	11.335	34.317
4	1.244	8.886	45.900	1.309	9.347	43.664
5	1.132	8.083	53.983	1.242	8.873	52.537
6	1.027	7.338	69.431	1.230	8.784	71.321
7	0.963	6.879	73.200			
8	0.899	6.424	74.624			
9	0.748	5.345	79.969			
10	0.672	4.803	84.772			
11	0.607	4.338	89.110			
12	0.544	3.885	92.995			
13	0.526	3.761	96.755			
14	0.454	3.245	100.000			

According to the data in the total variance interpretation table, when the number of factors is 6, the original eigenvalue is extracted by 69.43% cumulatively; when the number of factors is 6, the sum of squares of the original (not rescaled) extracted loads and the sum of squares of the rotating loads are both 71.32%; when the number of factors is 6, the sum of squares of the extracted loads and the sum of squares of the rotating loads are both 71.32%, which means that when the number of factors is 6, the original eigenvalue and the sum of squares of the rotating loads are both 71.32% When the number of subgroups is 6, 71.32% of the original data can be interpreted, and the original data can be compressed to a large extent. At the

same time, the above table shows the contribution rate of each component:

$$T = 0.1632f_1 + 0.1591f_2 + 0.1589f_3 + 0.1311f_4 + 0.1244f_5 + 0.2634f_6$$

Among them, T is the total amount of data information, and f_i represents the amount of data information for component i.

Table 12 Rotated Component Matrix

	Component					
	1	2	3	4	5	6
Q1	-0.088	0.192	-0.725	-0.054	-0.070	-0.399
Q2	-0.108	0.310	0.439	0.140	-0.392	0.087
Q3	-0.144	0.044	0.738	-0.046	0.096	-0.132
Q4	0.057	0.000	0.110	0.064	-0.028	0.869

Q5	-0.011	0.458	-0.183	-0.255	-0.071	0.452
Q6	0.791	-0.002	0.137	0.009	-0.220	-0.082
Q7	0.765	-0.021	-0.143	0.049	0.144	0.123
Q8	0.444	0.365	-0.264	0.105	0.151	0.037
Q9	0.051	0.644	0.131	0.193	0.278	0.069
Q10	-0.051	0.790	-0.042	0.022	-0.096	-0.058
Q11	-0.406	0.227	0.115	0.356	-0.218	-0.052
Q12	0.092	0.034	0.184	0.696	-0.211	-0.114
Q13	-0.017	0.081	-0.295	0.742	0.233	0.194
Q14	0.017	0.112	0.126	-0.033	0.862	-0.036

Using the Caesar normalized maximum variance method to rotate the component matrix, obtain the data in the above table, re-scale the component eigenvalues, combine the results of the factor analysis component matrix from a subjective point of view, and perform the following factor integration of each variable, as shown in Table 6.

Table 13 Sponge City Construction Public Opinion Index System

First-Level Indicators	Secondary Indicators	
	Question Number	Question overview
Personal Characteristics	1	Age
	2	Gender
	3	Educational level
	4	Identity and occupation
Awareness	5	Cognition of the current situation of Urbanization
	6	Water environment of living area
	7	Cognition of urban flexibility
	8	Understanding of sponge City
Support Degree	9	Support level
	10	Development trend
Personal Opinion	11	Construction direction
	12	Operation Manager
	13	Focus on projects
Universal Necessity	14	The necessity of popularization

Therefore, people's support for the sponge city is affected by people's personal characteristics (including gender, age, identity, occupation and education level) on the one hand, and by their cognitive level on the other hand, which leads to different opinions on the construction direction and support level of the sponge city.

4. SUMMARY AND SUGGESTIONS
In the process of sponge city construction, advanced technology theory and practical experience of construction and operation are the basic conditions, but the opinion and support of city people for sponge city construction and operation are also very important. According to the questionnaire survey, 58.44% of the local people are troubled by urban waterlogging. According to the research, roof greening is an important direction for the development of sponge City, but only 10.39% of the people are willing to carry out roof greening. Therefore, it is very important for the popularization of sponge city. According to the model results, the suggestions are as follows:
（1） Strengthen the infiltration drainage system and improve the operational effectiveness of the sponge city project.
The construction of sponge cities requires cities to have good flexibility in adapting to environmental changes and responding to natural disasters. It can absorb, store, seep and drain water in time when it rains. At this stage, great attention should be paid to water-permeable paving. At the same time, prevent the accumulation of small particles such as sand, dust, plastic and so on for a long time from causing a drop in water permeability, and strictly control the materials used for permeable paving. In addition, the drainage system is also an important part of the sponge city's public infrastructure, and attention should be paid to optimizing the allocation of various resources to maximize the efficiency and quality of sponge city drainage.
（2） Real-time monitoring of the construction process, and timely feedback of the sponge city project dynamics.
At present, the construction of the sponge city project still has problems in different stages such as preparation, design, and construction: the top-level design of the sponge city is not perfect for the time being, and the construction process is relatively extensive; the construction of the sponge city requires coordination among multiple departments. Joint completion, but the coordination between various departments is still very difficult, and the cooperation is not close and perfect; in addition, the construction of the sponge city has mixed good and bad, and the construction and performance evaluation must be strictly monitored in real time, and timely feedback on the progress of the sponge city project.
（3） Focus on risk response measures to ensure the stable operation of sponge city projects.
There are still some unpredictable risks in the construction of the sponge city project. Many sub-items of the sponge city technology have been applied and matured abroad, but they still need to be improved in our country. Some process and material problems should be prepared to deal with problems such as Subgrade subsidence caused by substandard quality or groundwater erosion reduces the possibility of crisis. In addition, some external uncontrollable extreme environmental factors have also become the main reasons for risk. Focus on risk response, strengthen risk protection measures, and maintain the stability of sponge cities run.
（4） Call on all people to respond positively and advance the construction progress of the sponge city project.
The construction of sponge cities is multifaceted, not only refers to the construction of related facilities, but also the construction of professionals and the people's thoughts in each sponge city. For professionals, it is not only required to have strong professional skills, but also to obey the distribution and work hard. It is also essential to do well in the ideological work of the masses. It is necessary to reduce their misunderstanding and resistance to the sponge city and let the masses understand the sponge city. Construction is not just about drainage, it promotes the benefits of sponge city construction, calls on the masses to actively respond to the sponge city construction, and pay attention to the psychology of the masses in real time to provide protection for the masses.

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Research on Credit Decision of Small and Medium-sized Enterprises Based on Optimal Solution Model

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Abstract: In view of the credit decision-making problems of small and medium-sized enterprises based on the data given in the appendix. Besides, it used the fuzzy analytic hierarchy process, the average principle, the weighting method, the fuzzy comprehensive evaluation method, the fuzzy judgment matrix and the excel software. The optimal solution model was established from various perspectives such as average profit, average annual loan interest rate of enterprises and unexpected causes. It obtained the maximum profit and the best annual loan interest rate obtained by banks under different problems. It customized adaptations based on this credit strategy of small, medium and micro enterprises.
Keywords: Fuzzy Analytic Hierarchy Process; Optimal Solution Model; Credit Risk Rating; Excel; Bank Credit Strategy

1. INTRODUCTION

According to the characteristics of small and micro enterprises, the paper refers to the mature risk control systems at home and abroad, and builds a realistic and feasible risk control rating system for small and micro enterprises based on the fuzzy analytic hierarchy process. This paper analyzes the problems in the credit rating of small and micro enterprises in my country, and then constructs a credit rating model for small and micro enterprises, according to the characteristics of the credit ratings of small and micro enterprises. Based on the calculation method of fuzzy analytic hierarchy process[1], the weight of each level of the rating is calculated, and a set of rating model is constructed. This paper focuses on the research method of combining qualitative and quantitative, cites the fuzzy judgment matrix[2] to establish the credit rating system of small and micro enterprises. It combines real cases to test and verify. The results show that the credit rating of small and micro enterprises constructed in this paper is feasible. It can provide a certain reference for the construction of credit ratings of small and micro enterprises in the financial system. Based on the empirical results, the paper proposes a series of preventive measures, including pre-lending preventive measures, during-lending preventive measures, post-lending management measures and other preventive measures.

Compared with medium and large enterprises, small and micro enterprises often have small investment scale, and family members directly participate in production and operation. The entrepreneur's own talents and qualities have a great impact on the survival and development of the enterprise. Although small and micro enterprises are small in scale, they have an important influence on my country's economy due to their large numbers. Under the influence of globalization and economic crisis, small and micro enterprises are facing tremendous pressure to survive. Helping small and micro enterprises to break through difficulties is conducive to the sustainable development of China's economy. China's small and micro enterprises usually face a series of problems such as difficulty in loans and expensive loans during their growth. One of the main reasons for this problem is that commercial banks lack effective mechanisms for identifying and preventing small and micro enterprise risks. Small and micro enterprises themselves are small in scale, limited in corporate management capabilities, and incomplete financial systems. There are too many uncertain risks in the credit business of small and micro enterprises. Commercial banks lack the ability to identify and evaluate this risk. As a result, it has been difficult for commercial banks to operate in small and micro businesses. Major business breakthroughs were made in corporate credit business.

Internationally, credit risk assessment is mainly through credit rating. Credit rating is usually qualitative analysis and quantitative analysis. My country's domestic credit risk control also refers to the mainstream international method[3]. Qualitative evaluation refers to the evaluation of the credit quality status of economic entities, and quantitative evaluation refers to the evaluation of indicators that economic entities can calculate in terms of amount. In China today, credit risk assessment generally combines qualitative and quantitative analysis. Credit rating has been developed for nearly 30 years, and evaluation models have been formed in theory and practice. But there is still a lot of room for improvement. The paper studies the credit risk evaluation model of China's small and micro enterprises on the basis of a large number of domestic and foreign literatures related to credit rating models, and validates them with examples[4]. The paper attempts to construct a credit rating model to effectively lend to clear customer targets, and to provide credit institutions with credit programs that meet the corresponding risk conditions. The purpose of the paper is to enhance the credit institutions' ability to control the credit risk of small and micro enterprises, improve credit quality, and improve the credit rating mechanism, hoping to play a reference role for the credit risk control of small

and micro enterprises and the development of credit business.

2. MODEL ESTABLISHMENT AND SOLUTION

2.1 Research Ideas

Question 1 requires quantitative analysis of the credit risks of 123 companies. It establishes a mathematical model when the bank's annual total credit is fixed to determine the bank's credit strategy for these companies. We calculated the profits of 123 companies in the past few years based on the bank's loan line for certain lending companies of 100, 000 to 1 million yuan, and an annual interest rate of 4%-15%. To simplify the model, we only consider credit ratings and customers, the impact of the churn rate on the profitability of the bank, through the establishment of a mathematical model is to obtain the optimal solution.

2.2 Bank Profit Optimal Solution Model

We first eliminate the companies that have the two indicators of invalid invoices and negative invoices. Then it constructs the intervals according to the customer churn rate table in Appendix 3 to construct [0.1, 0.2], [0.2, 0.3], [0.3, 0.4], [0.4, 0.5], [0.5, 0.6], [0.6, 0.7], [0.7, 0.8], [0.8, 0.9]. It uses the principle of average to calculate the annual interest rate of loans in the range, and it finds the average annual interest rate of loans. According to the input invoice information and output invoice information in the appendix, the selected companies are classified into three categories: A, B, and C. It can calculate the average profit separately. Then it determines the bank's loan amount to the enterprise according to the following rules.

(1) When the average profit value of the enterprise is higher than 1 million, the loan amount shall be 1 million;

(2) When the average profit value of the enterprise is between 100, 000 and 1 million, the loan amount shall be the average profit value;

(3) When the average profit value of the enterprise is below 100, 000, the loan amount is 100, 000.

Then we use the following formulas (1) and (2) to calculate the average corporate profit according to the three categories of A, B, and C, and specify the loan amount. Use formula (3) to calculate the product of the loan amount and the average annual interest rate. Use the formula (4) to count the number of companies that have cancelled their contracts.

$$y_{2016} - x_{2016} = L_{i2016} \quad (1)$$
$$L_{i2016} + L_{i2017} + L_{i2018} + L_{i2019} = \overline{L_l} \quad (2)$$
$$max\ z_b = E_i * \overline{a} \quad (3)$$
$$123 * k = E_e \quad (4)$$

Note: x_m represents the total input plus tax, y_m represents the total output plus tax, L_{im} represents the profit of a certain company in a certain year, $\overline{L_l}$ represents the average corporate profit of a certain company, $max\ z_b$ represents the maximum profit of the bank, E_i represents the loan amount, $\overline{a}$ represents the average annual loan interest rate, and k represents the loss of customers rate, which E_e represents the number of companies that have cancelled their contracts.

Through the above formula, we use excal to draw the following table to obtain the maximum profit of the bank for the three types of enterprises A, B, and C.

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Fig.1 Profit of A, B and C enterprises at different interest rates

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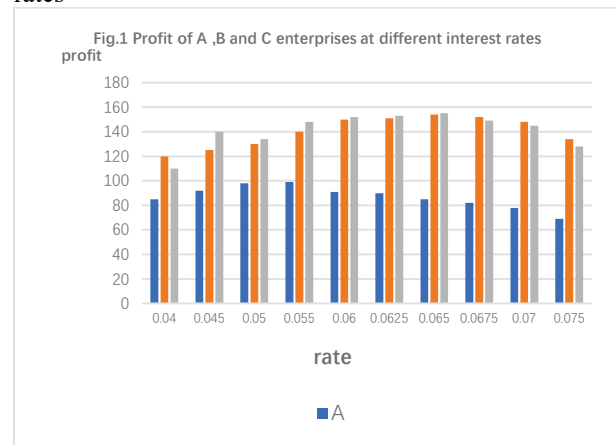
We are analyzing Figure 1 and using the weighting method, we find that when the annual loan interest rate is 0.0665, the bank can make the maximum profit, which is 3.931 million yuan, and write the following credit strategy:

(1) For companies with a negative average profit value, no loans will be granted regardless of the company's credit rating;

(2) For companies whose average profit value is positive, and the average value is more than 1 million in a stable state or in a trend of rising year after year. High loans will be given;

(3) For companies with a positive average profit value, but the average value is between 100, 000 and 1 million. A quota close to the average profit value will be given to the company;

(4) For an enterprise with a positive average profit value, but the average value is below 100, 000, a loan of 100, 000 will be granted to the enterprise.

3. ANALYSIS OF CREDIT RISK OF 302 COMPANIES AND BANK CREDIT STRATEGY

3.1 Research Ideas

Question two requires a credit risk analysis of the 302 companies in Appendix II on the basis of question one. We first used the fuzzy analytic hierarchy process to predict the credit rating of this type of enterprise based on the characteristics of small, medium and micro enterprises, and then solved it according to the optimization model in problem 1.

3.2 Model Establishment and Solution

We first collected some factors that affect the credit of small and micro enterprises, considering the availability of small and micro enterprise data, using the analytic hierarchy process. It selected a number of non-financial indicators and financial indicators and divided them into 2 primary indicators and 5 secondary indicators. It can be to construct the hierarchical structure of the rating indicator system for small, medium and micro enterprises[5], the detailed levels are shown in table 1[6]as follows:

Table 1 Hierarchical structure of credit rating system for small, medium and micro enterprises

First-level index Second-level index	First-level index Second-level index
Non-financial indicators	Management ability B1
	Industrial Policy B2
Financial indicators A2	Solvency B3

		Profitability B4		
		Profit growth ability B5		

Then use the relevant indicator data in Appendix II and the rating structure hierarchy table. Table 1 is to determine the weight of each relevant indicator to carry out a fuzzy evaluation, introduce a score set, calculate and determine the credit rating of small and micro enterprises according to the formula. The establishment of fuzzy analytic hierarchy process relies on the priority relationship matrix and the fuzzy judgment matrix. The priority relation matrix (G) is a three-valued matrix $G = (g_{ij})_{n*n}$ on a finite universe. When $g_{ij} = 1$, it means u_i is more important than u_j, when $g_{ij} = 0.5$, means u_i and u_j is equally important, when $g_{ij} = 0$, means u_j is more important than u_i.

Note: u_i, u_j are all expressed as corporate rating factors, with limited scope $u = \{u_1, u_2, \ldots, u_n\}$.

The fuzzy judgment matrix (H) is a multi-valued matrix on the finite universe $u = \{u_1, u_2, \ldots, u_n\}$, $H = (h_{ij})_{n*n}$ and $0 < h_{ij} < 1$. Among them: When $h_{ij} = 0.5, u_i$ and u_j is equally important, when $0 < h_{ij} < 0.5, u_j$ is more important than u_i, when $0.5 < h_{ij} < 1, u_i$ is more important than u_j.

Then use formula (5) to sum the finite relation matrix:
$$r_i = \sum_{k=1}^{n} g_{ik}, (i = 1, 2, \ldots, n) \quad (5)$$
Using formula (6) again, let:
$$h_{ij} = \frac{r_i - r_j}{2n} + 0.5 \quad (6)$$
$$H = (h_{ij})_{n*n} \quad (7)$$
Note: h_{ij} indicates the element of the fuzzy judgment matrix.

Then H is the fuzzy judgment matrix[7].

Through the cost, tax and profit of each enterprise's order, the small, medium and micro enterprises are scored and counted. The proportion of each indicator in the credit rating system is obtained. The proportion of financial indicators is 60% and the proportion of non-financial indicators is 40%. Then calculate the fuzzy judgment matrix according to formula (7), and use formula (8) to calculate the weight of this level of index:

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$$w_i = \frac{\overline{h_i}}{\sum_{i=1}^{m} \overline{h_i}}, (i = 1, 2, \ldots, m) \quad (8)$$

Formula:
$$\overline{h_i} = \sqrt[n]{\prod_{j=1}^{n} h_{ij}}, (j = 1, 2, \ldots, n) \quad (9)$$

According to the above, the weight coefficient of the first-level financial index A_2 is calculated, and the results are shown in Table 2:

Table 2 The Fuzzy Judgment Matrix of Financial Indicators and its Weight Coefficients

A_2	B_3	B_4	B_5	W

B_3	0.5	0.375	0.625	0.2169
B_4	0.625	0.5	0.75	0.2854
B_5	0.375	0.25	0.5	0.1450

Use formulas (10), (11), (12) to calculate A_2 the weights of the following secondary indicators, B_3, B_4, B_5, and the specific formulas are as follows:
$$B_3 = 60\% * 0.2169 = 0.13014 \quad (10)$$
$$B_4 = 60\% * 0.2854 = 0.17124 \quad (11)$$
$$B_5 = 60\% * 0.1450 = 0.087 \quad (12)$$
In the same way, the weights of other indicators are obtained: $B_1 = 0.0580, B_2 = 0.1142$

The fuzzy comprehensive evaluation method is used to combine the rating indicators to synthesize the rating indicators, and the fuzzy comments are set in the form of $v = (v_1, v_2, \ldots, v_n)$. The paper divides the credit ratings of small, medium and micro enterprises into four levels, a set of well-defined comments $v = (A, B, C, D)$, and the meaning of each level is as follows [8]:

Level A: The comprehensive scoring scope $85 < v < 100$ of the enterprise. The business situation is good and the development prospect is broad.

Level B: The comprehensive scoring range $75 < v < 85$ of the enterprise. The business situation is stable.

Level C: The comprehensive scoring range $65 < v < 75$ of the enterprise. The business situation is average.

Level D: The comprehensive scoring range $0 < v < 65$ of the enterprise. The business situation is average.

Among them, the rating pre-set $v = (100, 85, 75, 65, 0)$, the weight value of each factor of the second-level indicator refers to the relative importance of this factor to the upper-level indicator, and the weight of each level indicator is:

First-level indicator weight set $A = (0.4, 0.6)$.
Secondary index weight set $B = (0.13014, 0.17124)$.
Using formula (13), the comprehensive score is obtained by adding the scores of financial indicators M_i and non-financial indicators M_{ii} to obtain a rating scale M, namely $M = M_i + M_{ii}$, among $M_i = B_i + (V + R_i)$, $M_{ij} = B_{ii} + R_{ii}$ (13)

Note: R_i is a single-factor matrix formed by the degree U_{ij} of membership of the second-level indicators to the corresponding first-level indicators, where $U_{ij} = T_n/t$ (represents the number of indicators participating in the evaluation), $R_{ii} = (B_3, B_4, B_5)$ is the standard value matrix.

Assuming that the non-financial indicators of the companies in Annex II are the same, in order to meet the randomness of this indicator of each company, the average grade index is selected according to the weight of the three indicators B_3, B_4, B_5 Table 3:

Table 3 Summary of non-financial indicators evaluation

Non-financial indicators	Membership level			
	A	B	C	D
B_1	5	4	1	0
B_2	5	2	2	1

The non-financial index membership degree of the company is obtained according to the ratio of the grade index of each membership grade of each non-financial index obtained in the above table to the sum of the membership grade index of each non-financial index. The

membership degree calculated is (0.5, 0.4, 0.1, 0) has a membership degree of (0.5, 0.2, 0.2, 0.1).

From the value of the weight of each financial indicator, plus the standard value rating score calculated by the degree of membership and their product, the risk grade scores of each enterprise are calculated respectively. The risk grades of each enterprise are obtained by referring to Annex 2. Sort by the three credit ratings of A, B, C, and calculate the average annual profit of the remaining various types of enterprises from the excel table. It uses the optimization model to calculate the maximum profit that the bank can obtain for each type of credit rating enterprise. Figure 2 is drawn as follows :

Fig.2 Profit of A ,B and C enterprises at different interest rates
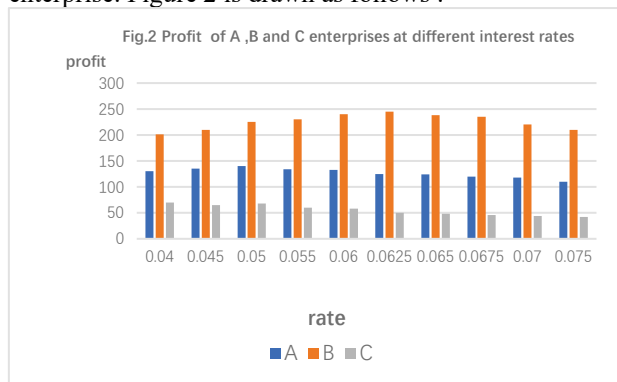
According to the optimization model of problem 1, we calculated the weight ratios of various enterprises. In the end, we concluded that when the annual loan interest rate is 0.0525, the bank can make the maximum profit. The maximum profit is 4, 168, 500 yuan writing it out. The following credit strategies:

(1) Enterprises with a negative average profit value are not granted loans.

(2) For the three types of credit ratings A, B, and C, the proposed A-level credit limit range is 70w to 100w, the B-level credit limit range is 40w to 70w, and the C-level credit limit range is 10w to 40w.

(3) The annual total profit continues to rise, and the average annual profit is positive for companies that give high loans to such companies.

(4) The annual total profit remains stable, and the company whose average annual profit is positive gives relatively low loans to such companies.

4. ANALYSIS OF SUDDEN FACTORS ON CORPORATE CREDIT RISKS AND BANK CREDIT STRATEGIES

4.1 Research Ideas

For this issue, we need to add the impact of the sudden factor of the new crown epidemic to the final credit strategy of Question 2 to judge the final credit strategy, and roughly classify and rank 302 companies.

4.2 Model Establishment and Solution

Regarding the impact of the new crown epidemic on bank lending, the impact of the epidemic is divided into the following five levels:

Level a is the level that has the greatest negative impact on the company, and decreases in order. When level c is reached, the epidemic has no impact on the company. Levels d and e are the levels where the epidemic has a positive impact on the company.

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We roughly divided the 302 companies into six categories except bankrupt companies, and calculated the number of various types of companies as shown in Table 4. For construction companies, cross-distance transportation trade and live poultry trade cannot be carried out. It is a grade. Technology companies do not have strong demand in terms of supply and demand, and are ranked b. Cultural companies do not require close contact with people to operate, which is C-level. Daily necessities are indispensable things for people, and they have a positive impact, which is d level. Medical companies have played a major role and are e-class.

Table 4 the impact of the Epidemic on Various Companies

Company category	Number of companies	The impact of the epidemic on companies
Construction company	67	a
Technology company	24	b
Trading manufacturing company	112	a
Life-related	26	b
Culture	9	c
Medical	6	d
total	244	

Due to too much data, we enumerate the following six data representing companies from the companies that have been classified in the second question to illustrate, as shown in Table 5:

Table 5 Representative Company Data

Enterprise code	Enterprise type	Estimated profit/10, 000 yuan	Enterprise rating	Loan line/10, 000 yuan
E297	Construction	87.4	C	24
E328	Technology	173	C	37
E278	Trading	55	C	16
E307	Lifestyle	69.5	C	21
E165	Culture	550	B	60
E195	Medical	964	B	64

Let N the sudden factor be the impact ratio T, Let Y be the predicted profit of the enterprise before the impact, and Z be the profit after the impact, so as to establish the formula (14):

$$Z = T * Y \quad (14)$$

Judge whether the profit Z of the enterprise after the impact is less than the original loan amount and not less than. Then it is considered that the enterprise still has the ability to repay the loan after being affected by unexpected factors. Then the enterprise carries out the credit strategy that has been drawn up in question 2. After calculation, the following table lists the expected profits and the original credit limit of the affected enterprises.

Table 6 Comparison of Affected Profits with the Original Credit Line

Enterprise code	Enterprise impact degree	Impacted profit Z/10, 000 yuan	Loan line/10, 000 yuan
E297	0.5	43.7	24
E328	0.8	138.4	37
E278	0.5	27.5	16
E307	1.2	83.4	21
E165	1	550	60
E195	1.5	1419	64

From the above table, it can be concluded that the estimated profits of the representative enterprises in

different industries after the impact are greater than the original credit limit. It is judged that the six enterprises have the ability to repay credit after the impact. Therefore, the problem two credit strategies are given to the specific enterprises credit line standards to allow these companies to make loans. Otherwise, the loan qualification will be cancelled.

5. CONCLUSION

By using excel to process the total annual price and tax of various enterprises, we have accurately formulated the bank's credit strategy for 123 enterprises when the total annual credit is fixed and the annual interest rate of the loan that allows the bank to obtain the most profit. Using the fuzzy analytic hierarchy process, we roughly evaluated the credit rating of 302 companies, and then using the optimization model in question 1, we also accurately obtained the annual interest rate of the loan that allows the bank to obtain the most profit, and determined that the bank's total annual credit is 1 Credit strategy for 302 companies at RMB 100 million. We roughly classified 302 companies, quantified the unexpected factors into numbers, combined with the actual situation to determine the impact of the sudden factors on the company, listed formula calculations and judged whether the loan should still be granted.

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Research on Global Food System Based on Principal Component Analysis

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Abstract: This paper aims to study the influencing factors of the global food system and construct a comprehensive evaluation model. Based on PCA (Principal Component Analysis), this paper constructs the S.F.E.P food system model and we use SPSS software to analyze and obtain the contribution rate of each component. According to the analysis of the results, the four major influencing factors of the food system can be summarized as: sustainability, fairness, profitability and efficiency. Next, this paper analyzes the benefits and costs of changing the priority of the food system. Finally, it uses a time series model to initially predict that if the current food system is successfully transformed to sustainable development. Between 2030 and 2035, global environmental issues and food security issues will be effectively improved.
Keywords: Global Food System; Principal Component Analysis; Time Series Forecast

1. INTRODUCTION

The food system is the network needed to produce, process, and ensure that food reaches consumers. A defective or dysfunctional food system can affect food safety in many ways. In fact, our global food system is unstable, allowing relatively cheap and efficient production and distribution of food, giving priority to efficiency and profitability. About 800 million people in the world are hungry for a long time. This fact shows that the current food system cannot meet the needs of a large part of the society [1]. According to a sustainability research article published in Nature, scientists have established a global food system model. Through analysis, they pointed out that if we do not take action to deal with the expected changes in population and income levels, the food system (for The impact of the process of participating in the process of providing food and infrastructure by the world's population may rise from 50% to 90% [2]. Therefore, further improving the food system to meet the needs of the poorest while achieving sustainable development is now a major direction of our actions. This paper uses principal component analysis to explore the influencing factors and sizes of the global food system, and uses time series analysis to predict the time required to improve the severe hunger situation in some parts of the world by optimizing the current food system.

2. INDICATOR SELECTION AND DATA SOURCES

2.1 Indicators

After consulting a large number of documents, the researchers used a strict inclusion/exclusion agreement to refine the list of indicators, and finally left 11 indicators [3] (Figure 1), which they will use as preliminary indicators in this paper.
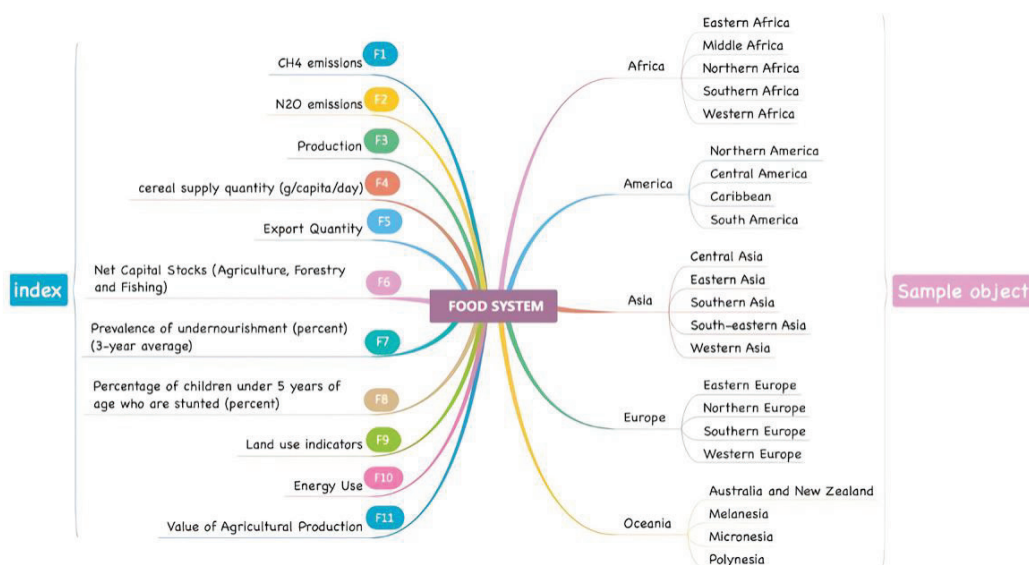
Figure 1: Sample object

2.2 Sample object

We divide the world into 22 parts by region, and these 22 parts are the sample objects of this model. The advantages of this approach are as follows: The climate situation in

the same region is similar, which eliminates the influence of climate on the grain system in this region to some extent. Follow the principle of randomization to narrow the difference between the sample data and the total data. The sample content is enough to enhance the credibility of the analysis results.

2.3 Source of data

The data in this question are all from the official website of the Food and Agriculture Organization of the United Nations (FAO). Considering the uniformity of the data, we control the termination section of the data to 2017.

3. ANALYSIS OF INFLUENCING FACTORS OF GLOBAL FOOD SYSTEM BASED ON PRINCIPAL COMPONENT ANALYSIS

3.1 Basic principles and steps

Principal component analysis (PCA) is a multivariate statistical analysis method that eliminates overlapping information in the coexistence of many information by reducing the dimensionality of the data, and transforms multiple indicators into a few unrelated comprehensive indicators [4, 5]. PCA can be used to analyze the main influencing factors from complex phenomena, reduce evaluation indicators, simplify the evaluation process, and apply to the comprehensive analysis of multiple indicators [6].

Step 1: In order to eliminate the dimensional influence of different variables, the variables are first standardized and centered.

There are a total of 11 indicators involved in this section, with 22 sample objects. The $i-th$ indicator value of the $j-th$ sample is F_{ij}. The indicator values are standardized as follows to $\widetilde{F_{ij}}$:

$$\widetilde{F_{ij}} = \frac{F_{ij} - \overline{F_i}}{s_i} \quad (1)$$

In the formula, $\overline{F_i}$ and s_i are the mean and standard deviation of the index respectively. The purpose of standardization is to eliminate the dimensionless effects of different variables without changing their correlation coefficients.

Step 2: Calculate the correlation coefficient matrix of the standardized data, and find the eigenvalues and eigenvectors of the correlation coefficient matrix.

Let the correlation coefficient between the $i-th$ index and the $i'-th$ index be $r_{ii'}$, and the calculation method is:

$$r_{ii'} = \frac{\sum_{k=i}^{22} \widetilde{F_{ik}} \widetilde{F_{i'k}}}{22-1} \quad (2)$$

Then the correlation coefficient matrix $R = (r_{ii'})_{11x11}$, where $r_{ii} = 1, r_{ii'} = r_{i'i}$.

Step 3: Calculate eigenvalues and eigenvectors.

Calculate the eigenvalues of the correlation coefficient matrix $\lambda_1 > \lambda_2 > \cdots > \lambda_p \geq 0$, and its corresponding eigenvectors are $\xi_1, \xi_2, \cdots, \xi_p$, where $\xi_1 = (\mu_{1,i}, \mu_{2,i}, \cdots, \mu_{11,i})^T$ constructs 11 linear combinations of x:

$$\begin{cases} Y_1 = \mu_{1,1}\widetilde{F_1} + \mu_{2,1}\widetilde{F_2} + \cdots \mu_{11,1}\widetilde{F_{11}} \\ Y_2 = \mu_{1,2}\widetilde{F_1} + \mu_{2,2}\widetilde{F_2} + \cdots \mu_{11,2}\widetilde{F_{11}} \\ \cdots\cdots \\ Y_{11} = \mu_{1,11}\widetilde{F_1} + \mu_{2,11}\widetilde{F_2} + \cdots \mu_{11,11}\widetilde{F_{11}} \end{cases} \quad (3)$$

Among them, Y_i is the $i-th$ principal component, $i = 1, 2, \cdots, 11$.

Step4: Determine p principal components and perform statistical analysis.

Step5: According to the contribution rate of each principal component, the comprehensive index weight is calculated and the comprehensive evaluation function is constructed [7].

$$\omega_j = \frac{c_j}{\sum_{j=1}^{n} r_j} \quad (4)$$

$$D = \sum_{j=1}^{p} (c_j Y_j) \quad (5)$$

3.2 Correlation analysis of indicators

According to the above steps, this paper uses R to first obtain the correlation coefficient of each index (as shown in Figure 2). When the correlation between the indicators is strong, if only these indicators are used to evaluate the system, it will not only make the calculation too large, but also cause the overlap of information, which will affect the objectivity of the evaluation [8]. When the indicators are not correlated, according to the Kaiser-Harris standard, in order to retain the largest amount of information in the data, we hope to set the number of components to be the same as the number of our indicators. It can be found from the figure that most of the indicators have weak correlation.
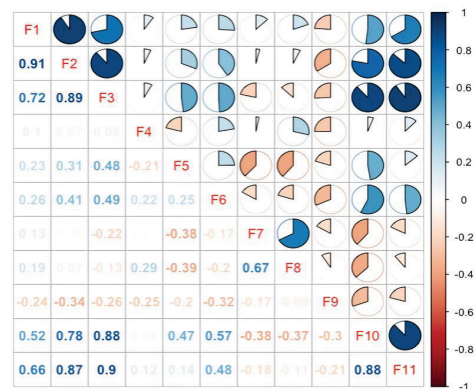
Figure 2: Thermal map of correlation coefficient

3.3 Selection of principal components

This paper uses SPSS software to retain the principal components based on the principle that the cumulative contribution rate is greater than 80%. The analysis obtained four principal components, these four principal components retained 84.083% of the information in the original data, and met the principle of principal component analysis. It can be seen from Table 1 that the contribution rate of the first three principal components is relatively large, indicating that these three principal components are important indicators in the system.

3.4 The composition of the principal components

The orthogonal solution calculated by the above analysis using SPSS software shows that in the food system evaluation indicators, the principal component 1 is the

combination of Production, Energy Use, N_2O emissions, Value of Agricultural Production, CH_4 emissions and Net Capital Stocks (Agriculture, Forestry and Fishing). The principal component 2 is the combination of Percentage of children under 5 years of age who are stunted (percent) and Prevalence of undernourishment

(percent) (3-year average). The principal component 3 is mainly cereal supply quantity (g/ capita/day). The principal component 4 is the combination of Land use indicators and Export Quantity.

Table 1: Eigenvalues and cumulative contribution rates

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.869	44.268	44.268	4.869	44.268	44.268
2	2.207	20.059	64.327	2.207	20.059	64.327
3	1.204	10.949	75.276	1.204	10.949	75.276
4	0.996	8.806	84.083	1.096	8.806	84.083

The four principal components reflect different aspects of the food system, which can be obtained by analyzing the properties of the indicators contained in each component. We visualize it with a spatial distribution map (Figure 3):

Principal component 1 $\rightarrow$ sustainability
Principal component 2 $\rightarrow$ fair
Principal component 3 $\rightarrow$ efficiency
Principal component 4 $\rightarrow$ profitability
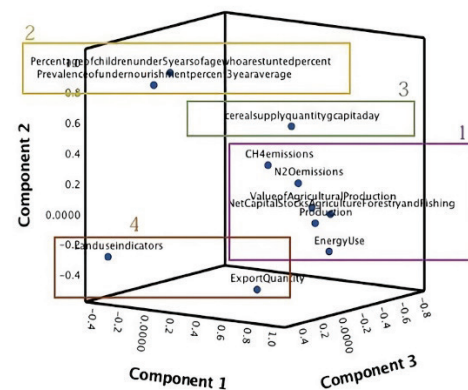
Figure 3: Component plot

3.5 Building a comprehensive evaluation model

Table 2 Principal Component Expression

	Component			
	1	2	3	4
Production	0.434	0.008	0.104	0.059
Energy Use	0.423	-0.139	-0.050	0.071
N2O emissions	0.416	0.196	0.211	-0.003
Value of Agricultural Production	0.410	0.069	0.070	0.317
CH4 emissions	0.340	0.273	0.291	0.000
Net Capital Stocks (Agriculture, Forestry and Fishing)	0.276	-0.048	-0.440	-0.004
Percentage of children under 5 years of age who are stunted (percent)	-0.089	0.588	0.077	-0.019
Prevalence of undernourishment (percent) (3-year average)	-0.110	0.541	0.171	-0.268
cereal supply quantity (g/capita/day)	0.052	0.278	-0.661	0.317
Land use indicators	-0.172	-0.197	0.427	0.637
Export Quantity	0.217	-0.326	0.074	-0.559

In Table 2, each column constitutes a principal component expression. Obtaining specific coefficients is helpful for us to quantitatively analyze the impact of each indicator on the four aspects of the food system.

Comprehensive evaluation function:

$$S = \frac{4.869}{4.869 + 2.207 + 1.204 + 0.996} Y_1$$
$$+ \frac{2.207}{4.869 + 2.207 + 1.204 + 0.996} Y_2$$
$$+ \frac{1.204}{4.869 + 2.207 + 1.204 + 0.996} Y_3$$
$$+ \frac{0.996}{4.869 + 2.207 + 1.204 + 0.996} Y_4$$
$$S = 0.525Y_1 + 0.238Y_2 + 0.130Y_3 + 0.107Y_4$$

4. THE BENEFITS AND COSTS OF CHANGING THE FOCUS OF THE FOOD SYSTEM

From the previous analysis, we can get that the current food system model will give priority to efficiency and profitability. Through our understanding of the global food security situation, we found that the situation is not optimistic. More importantly, with the impact of this epidemic, the problems in the food system are more clearly exposed to us. In announcing the findings of the report, Inger Andersen, Executive Director of the Environment Agency, said: "Although the new crown pneumonia epidemic has exposed the fragility of the food supply system, the crisis has also led us to think about how to produce and consume food. If you want to change the

priority of the system at this time, the main component analysis results should focus on sustainable development and fairness [9]. "Everything has two sides." Changing the priority of the food system has benefits but also some disadvantages.

4.1 Benefit analysis

(1) Take fairness as the criterion

Combined with the above analysis of the PCA model, it is possible to resist food monopoly to a certain extent, reduce the number of hungry people, and reduce the proportion of people who are malnourished or under-food. Specifically, it is possible to control the main grain exporting countries to meet the food needs of their people before exporting grain, so as to control the ratio of hungry people in the country to 0.

(2) Take sustainability as the criterion

It can reduce greenhouse gas emissions, reduce soil erosion, and increase the total value of grain output and the recycling rate of energy. Specifically, it is possible to reduce the use of chemical fertilizers by protecting the soil, and try to develop plant-based, organic and regional eating habits [10].

4.2 Cost analysis

(1)Restrict the amount of grain exports to a certain extent, thereby affecting the income of some countries that rely on grain exports to develop their economies

(2)Reduce the spatial transmission of food, which may lead to people's dietary structure being too simple and leading to malnutrition.

(3)Break the balance of the previous food system, which may require an unstable transitional period.

5. PREDICTION OF THE TIME TO TARGET REALIZATION BASED ON TIME SERIES BASED ON TIME SERIES

When predicting the time when the benefits of improving the food system will be realized, we first collect relevant current data, and then use time series models to analyze the relevant data. If we reduce the percentage of stunted children under 5 by improving the priority of the food system as an example, we can predict the time to reach this goal.

(1) Collecting the percentage of children under 5 years of age with stunted growth from 2010 to 2019 from the official FAO website. Three main research objects were taken: the world, the United States and Africa. The United States as a developed country and Africa as a developing country make the analysis of this question more comprehensive and reduce bias.

(2) Using SPSS software for time series analysis. We first performed residual testing on the fitted model.
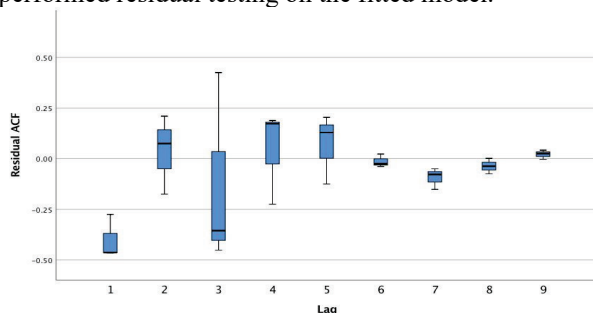
Figure 4: Residual sequence autocorrelation

Analysis of Figure 4: From an overall point of view, the coefficient of the residual autocorrelation graph fluctuates around 0, and the later range is small. This shows that the model residuals can be random.

(3) Predict the next ten years based on the fitted model.
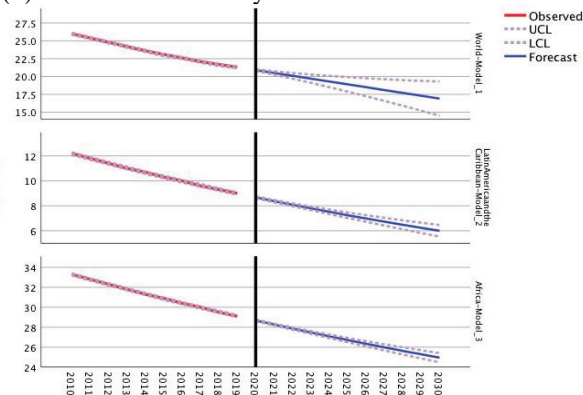
Figure 5: Prediction of the percentage of stunted children under 5

Analysis of Figure 5: The prediction results show that by 2030, the percentage of children under 5 years of age who are stunted in the United States can be reduced to about 6%, which is in line with our goal. But for Africa, although it can keep declining year by year, because its original ratio is too large, its ratio in 2030 is still not optimistic in comparison.

When we make sustainable development the first goal of the food system, what concrete impact will it have on the reduction in the percentage of children under 5 years of age who are stunted in Africa?

As the saying goes, "It is better to teach people how to fish than to teach people how to fish." For the sustainable development of the African food system, increasing its own food production is the most effective and efficient way. In 2017, compared with 1961, the percentage of wheat yield in Africa in the world yield increased, while the percentage of rice and corn yield in the world yield decreased significantly, and the yield of grain in most African countries and regions was still significantly lower than that of the world [11]. But looking at the overall situation, the potential for food development in Africa is considerable. Taking 2017 as the reference period, the development potential of African food is 268, 578, 100 to 27, 794, 400 tons, and the development potential is 181.64% to 186.52%. Among them, the development potential of corn is 217, 680, 700 to 223, 483, 300 tons, and the development potential is 258.67% to 265.54%. Countries such as Nigeria, Tanzania, Angola, Mozambique, Kenya, Malawi, and Democratic Congo are among the highest in the development potential of corn [12].

Given that Africa's potential under sustainable development can reach nearly 200%, we assume that the rate of decline in the rate of stunting for children under 5 years old is twice the current forecast. Therefore, it is expected that by 2035, the proportion of children under 5 years of age in Africa will be reduced to less than 15%, and the global proportion will be reduced to less than 10%.

6. CONCLUSIONS

Based on the above analysis, sustainability ranks the first influencing factor with a contribution rate higher than 44%. Therefore, in the food system, we should regard it as the focus and primary consideration, followed by fairness, efficiency and profitability. When the global food system is improved, it is estimated that by 2035, the proportion of children under 5 years of age who are stunted in the world will drop to less than 10%. More importantly, this paper also obtained the comprehensive evaluation equation of the global food system, which is convenient for decision makers of relevant organizations to use when evaluating the food system.

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Research on Real Estate Industry Association and Spread Effect Based on Input-Output Model

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Abstract: This article uses the input-output table data released by Anhui Province from 2002 to 2017 to analyze the dynamic relationship between the real estate industry and industrial boom in Anhui Province, and it reflects the industrial pattern and its interrelation. The research results show that the real estate sector is a sector with the nature of the raw material industry, which will have a greater impact on the economic development of Anhui Province in terms of production and consumption; the real estate industry has significant distinctions in the correlation effect of diverse sectors; the induction coefficients of the real estate industry is lower than 1, which is not very stimulating to other sectors; the main contribution of the real estate industry to economic development is achieved through industrial linkages with financial, retail, and leasing sectors.
Keywords: Real estate industry; Industry linkage; Input-output; Ripple effect.

1. INTRODUCTION

The real estate industry is a key industry of domestic economic development all the time. It has a very close relationship with other departments. " Urban Land Price Monitoring Report in Anhui Province in 2019" shows that house prices in Anhui Province have relatively small fluctuations, house prices are lower than the national average, and the real estate market continues to be stable. The comprehensive land price level value of Anhui Province in 2019 is 4983/m2. The median house price ratio of commercial offices and residential buildings in Anhui Province has dropped by 5 to 11 percentage points compared with last year, and house prices have clearly cooled down.

Anhui Province's input-output table for the period 2002-2017 shows the total output in the real estate sector is increasing. Estate has sizable industrial agglomeration and long upper and lower industrial lines, so it can better promote the progress of relevant industries. The pullulation of real estate industry occupies a large share in economic promotion, and its instability will have a measurable impact on other sectors of the national economy.

At present, some scholars have conducted research on the impact of the development of the real estate industry and have formed rich research results. Mingliang Deng and Chuanqing Wu (2020) utilize the DEA method to compute the input-output level of the real estate industry, and

concluded that the marketing results of the real estate industry are remarkable, the pre-construction preparation time is longer, and the differences between cities are obvious. Weirong Xi (2020) used the coupling degree model to measure the pullulation of the real estate industry and the tourism industry in Jiangxi Province from 2008 to 2018, and concluded that there is a conspicuous positive connection between the two sectors; tourism has a significant impact on real estate development through the number of tourists. Rui Yuan (2020) used the input-output data to determine the connection and fluctuation of the real estate industry in developed cities, and got that its prospect is not markedly affected by economic elements. Peilin Li and Danqing Zhao (2019) used the super-efficiency DEA model to measure the input-output data of each city in Henan Province for 8 years, and concluded that the overall efficiency of the real estate development mainly relies on technological progress and scale efficiency. Ronggui Yang and Yu Huang (2019) used the super-efficiency DEA two-stage model to measure public investment data in Fujian Province, and got that the real estate tax has a marked function of improving the efficiency of local public service supply. Wei Xu (2019) used data envelopment analysis to analyze the real estate data of 15 central cities in my country, and concluded that the lack of agglomeration effect and the inefficient management level restrict the prosperity of the real estate industry. Yingchao Bai (2018) used the input-output method to measure the relevance of the real estate industry in Guangdong Province and concluded that the development of the real estate industry is less dependent on consumption promotion.

To sum up, the existing literature mostly discusses the development of the real estate industry in various regions of China and the development problems, but there is less research in this area in Anhui Province.

Regarding the fluctuation mechanism of the sector, Anhui Government has used a variety of actions to stabilize the housing consumption policy and promote the smooth operation of the economy, including encouraging farmers to purchase houses in cities, investigating actual market demand, etc., while also strengthening behavioral supervision of the real estate market. However, problems such as surplus supply have also appeared in the real estate industry's rapid pullulation. In order to explore the connection, rationally allocate the input and output resources, reduce unnecessary supply, and find

opportunities for the upgrading of the real estate industry, this article uses an argument research. According to the input-output tables of Anhui Province in 2002 to 2017, this article quantitatively empirically analyzes the connection results and scope of the industry, and explores the degree and dynamics of the connection with other sectors of the national economy.

2. RESEARCH METHOD

2.1 INDUSTRY IMPACT ANALYSIS

The inductance coefficient s_i represents the demand induction of sector i as a response to the economic and industrial relevance when each sector adds a unit of final product. Its formula is:

$$s_i = \frac{\sum_{j=1}^{n} C_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} C_{ij}} \quad (i,j = 1,2,3,\cdots,n) \quad (1)$$

Among them, s_i is the inductance coefficient of i industry. i,j are the rows and columns in the input-output table, respectively. n is the number of industrial sectors in the input-output table. C_{ij} is the element in the coefficient table C of the Leon Sif inverse matrix. If s_i >1, it means that the output change of sector i has an impact on economic fluctuations beyond the general level of society.

2.2 INDUSTRY ASSOCIATION ANALYSIS

Industrial relevance can be divided into two aspects: backward relevance and forward relevance according to influence and effect.

Backward correlation refers to the influence of a certain industrial sector in the national economy and the industrial sector that supplies products or services to it as an intermediate consumption. It is usually analyzed by direct consumption coefficient and complete consumption coefficient. The direct consumption coefficient α_{ij} can be calculated from the input-output table and it represents the value of the product of the department i consumed by the product of the department j of the production unit. It reflects the intermediate consuming connection of multiple sectors of the national economy. The larger the value, the more obvious the closeness of economic production between sectors. Its formula is:

$$\alpha_{ij} = \frac{x_{ij}}{x_j}(i,j = 1,2,3,\cdots,n) \quad (2)$$

Among them, α_{ij} represents the direct consumption coefficient. x_j represents the total input of j product department. x_{ij} represents the products or services of department i consumed by department j in the production and operation process.

The complete consumption coefficient refers to the ratio of the value of a certain department's product directly to indirectly consumed by the value of other department's products. Its formula is:

$$B = (I - A)^{-1} - I \quad (3)$$

Among them, the complete consumption coefficient matrix B can be calculated by the direct consumption matrix A. I is the identity matrix.

The forward correlation effect means that a certain industrial sector promotes the development of other industrial sectors by supplying products or services to other industrial sectors. It is usually analyzed and measured by direct distribution coefficient and complete distribution coefficient. The larger the value of the distribution coefficient, it indicates that the supply driving effect is more obvious. The direct distribution coefficient refers to the ratio of the value directly used when a product or service provided by an industry sector is allocated to other industries as an intermediate product to the total value of the product [1]. Its formula is:

$$r_{ij} = \frac{x_{ij}}{x_j}(i,j = 1,2,3,\cdots,n) \quad (4)$$

r_{ij} is the direct distribution coefficient of i product to j sector. x_{ij} is the quantity allocated by product i to department j as an intermediate product. x_i represents the total output of i products.

The complete distribution coefficient represents the sum of the product or service provided by one industry and the use value directly allocated to the industry as an intermediate product in the total value of the product of another industry [2]. Its formula is:

$$D = (I - R)^{-1} - I \quad (5)$$

Among them, D represents the complete distribution coefficient matrix. R is the direct consumption coefficient matrix. I is the identity matrix.

3. DATA SOURCES

The data used in this article are derived from the 2002-2017 input-output table published by the Anhui Provincial. The data is preprocessed first. Since the total output and total input of oil and natural gas extraction products are both 0, this article incorporates it into the energy sector. Only when it is ensured that the total output and total input are not 0, the matching inductance coefficient, influence coefficient and other data can be obtained.

4. ANALYSIS OF INDUSTRY ASSOCIATION OF ANHUI REAL ESTATE INDUSTRY

4.1 BACKWARD INDUSTRY ASSOCIATION ANALYSIS

The top 7 industrial sectors that provided direct intermediate consumption products to the real estate sector in 2017 are shown in the following table. And the sum of the direct consumption coefficients of the 7 sectors is 0.1628 [3]. See the table 1 below.

Table 1. The direct consumption coefficient of the real estate industry in Anhui Province from 2002 to 2017 (top 7 sectors)

Industry	2002	Industry	2007
Water production and supply	0.4586	Metal products	0.0280
Financial	0.1153	Agriculture, forestry, animal husbandry and fishery products and services	0.0207
Metal products	0.0333	Transportation equipment	0.0200
Non-metallic mineral products	0.0288	Rental and business services	0.0175
Rental and business services	0.0288	Accommodation and meals	0.0134
Information transmission, software and	0.0256	Information transmission, software and information	0.0068

Industry		Industry	
information service technology		service technology	
Transportation equipment	0.0131	Financial	0.0066
Total	0.7036	Total	0.1131
Industry	2012	Industry	2017
Research and experimental development	0.1288	Financial	0.0854
Information transmission, software and information service technology	0.1090	Rental and business services	0.0415
Papermaking printing and cultural, educational and sporting goods	0.0657	real estate	0.0166
Rental and business services	0.0625	Building	0.0072
Financial	0.0453	Electricity and heat production and supply	0.0045
Accommodation and meals	0.0249	Wholesale and Retail	0.0044
Gas production and supply	0.0205	Gas production and supply	0.0031
Total	0.4568	Total	0.1628

This shows that the backward correlation is weak, and the backward related industries are relatively scattered in the real estate sector. Among them, it has the largest consumption of intermediate products in the financial industry and leasing and business services. In 2015, the direct consumption coefficient of the financial industry was 0.0854, and that of the leasing and business services industry was 0.0415. This shows that the financial, leasing and business services industries provide the real estate sector with mortgage, loan, financing, leasing and other products necessary for production, especially financial support. This is significant to the development of the real estate industry. By providing leasing services in the market of second-hand housing, it provides an effective way for the real estate industry to convert the bloated excess real estate supply into capital and then flow into the market. Energy industries such as electric power, wholesale and retail and other real economy industries are the guarantee for the stability of the real estate industry [4]. Without the products provided by these industries, the real estate industry's own products will lose their corresponding competitiveness. At the same time, the complete consumption coefficient of the real estate industry (see Table 2) has not changed in the top three sectors, and the degree of correlation is still high. However, the complete consumption coefficient ranking for the wholesale and retail sectors rose to fourth. The improvement in the ranking of the complete consumption coefficient for the papermaking and printing and cultural, educational and sporting goods industries is due to the signing of contracts by the real estate industry.

Table 2. The complete consumption coefficient of the real estate industry in Anhui Province from 2002 to 2017 (top 7 sectors)

Industry	2002	Industry	2007
Water production and supply	0.4658	Metal smelting and rolled products	0.0408
Metal smelting and rolled products	0.1852	Metal products	0.0360
Financial	0.1689	Accommodation and meals	0.0340
Non-metallic mineral products	0.1294	Agriculture, forestry, animal husbandry and fishery products and services	0.0334
Building	0.1092	Chemical product	0.0282
Accommodation and meals	0.1020	Transportation equipment	0.0256
Metal products	0.0943	Rental and business services	0.0219
Total	1.2549	Total	0.2201
Industry	2012	Industry	2017
Research and experimental development	0.1735	Financial	0.1116
Papermaking printing and cultural, educational and sporting goods	0.1412	Rental and business services	0.0808
Information transmission, software and information service technology	0.1272	Real estate	0.0313
Real estate	0.0892	Wholesale and Retail	0.0188
Rental and business services	0.0825	Metal smelting and rolled products	0.0188
Transportation, warehousing and postal storage	0.0714	Chemical product	0.0182
Chemical product	0.0697	Papermaking printing and cultural, educational and sporting goods	0.0178
Total	0.7546	Total	0.2872

From the perspective of the dynamic changes of backward industry linkages, the sum of the direct consumption coefficients of the real estate industry and the top 7 sectors that provide direct intermediate consumption products decreased from 0.7036 in 2002 to 0.1628 in 2017, which shows that the degree of backward correlation between these sectors has been weakening and decentralized. In summary, the long-term backward correlation between these sectors is relatively significant. Its direct and complete consumption coefficient is often at the forefront, and the production activities of the real estate industry are more dependent on these types of industries, that is, the degree of mutual influence is greater. The direct consumption coefficient of the financial industry dropped from 0.1153 in 2002 to 0.0066 in 2007.As Anhui Province has entered the mid-stage of industrialization, infrastructure construction has been relatively complete, urbanization has been accelerated, housing supply is relatively tight, and the housing loan industry has a local surplus. This has led to the inability of funds to flow into

real estate companies in a timely and effective manner, resulting in insufficient funds for real estate construction, etc. In 2008, the economic crisis even broke out, causing real estate and other related industries to enter a downturn. In order to avoid being affected by economic fluctuations in financial and other sectors, real estate has gradually dispersed its industrial structure and reduced the use of products in financial and other sectors. As time goes by, the direct consumption coefficient of the financial industry will gradually rise to 0.0854 in 2017.The sum of the direct consumption coefficients of the top seven sectors of the real estate industry increased from 0.1131 in 2017 to 0.4568 in 2012 and dropped to 0.1628 in 2017, showing an inverted V-shaped structure. The sum of the complete consumption coefficients of the top 7 sectors also increased from 0.2201 in 2007 to 0.2872 in 2017.After the economic crisis, the real estate industry has gradually revived after some fluctuations. With the continuous improvement of the level of industrial urbanization, housing supply has gradually become tight, and industries such as real estate leasing have been adequately developed. Therefore, by 2017, the real estate industry maintains a relatively strong backward correlation with finance and leasing and business services due to the highest direct consumption coefficient and complete consumption coefficient.

4.2 FORWARD INDUSTRY ASSOCIATION ANALYSIS

As shown in Table 3, the top 6 sectors in the real estate industry that provided the most intermediate products for other sectors in 2017 are shown in the table. The sum of the direct distribution coefficients of the first six industrial sectors is 0.5799, which indicates that more than 50% of the intermediate products in the real estate industry are invested in these six sectors, and the forward industrial relevance of the real estate industry is highly concentrated in these six sectors. The direct distribution coefficients of the wholesale and retail industry and the financial industry are 0.2969 and 0.1385 respectively, occupying the top two direct distribution coefficients of the real estate industry. This indicates that nearly 30% of the intermediate products produced are supplied to the wholesale and retail sectors. Approximately 14% products are supplied to the financial industry, indicating that their forward correlation is relatively significant and strong. It shows that their production demand has a more marked direct effect to real estate sector, and the direct supply has a more obvious driving force. As a country with a large population, the lives of people in the wholesale and retail industries are closely related, and the market demand rate is relatively high. The warehouses and stores necessary for the wholesale and retail industries are precisely the most dependent on the supply of real estate products. As a bridge among them, the financial industry also occupies a larger part of the distribution coefficient. This also highlights the role of these industry in stimulating the stable development of the real estate industry.

Table 3. The direct distribution coefficient of the real estate industry in Anhui Province from 2002 to 2017 (the top 6 sectors)

Industry	2002	Industry	2007
Accommodation and meals	0.0234	Accommodation and meals	0.0203
Financial	0.0222	Resident services, repairs and other services	0.0141
Information transmission, software and information service technology	0.0146	Financial	0.0114
Resident services, repairs and other services	0.0038	Rental and business services	0.0107
Non-metallic mineral products	0.0017	Building	0.0088
Chemical product	0.0009	Education	0.0072
Total	0.0667	Total	0.0726

Industry	2012	Industry	2017
Accommodation and meals	0.1265	Wholesale and Retail	0.2969
Research and experimental development	0.1227	Financial	0.1385
Transportation, warehousing and postal storage	0.1161	Education	0.0385
Wholesale and Retail	0.0581	Rental and business services	0.0380
Public administration, social security and social organization	0.0576	Accommodation and meals	0.0372
Coal mining products	0.0511	Information transmission, software and information service technology	0.0307
Total	0.5321	Total	0.5799

In Table 4, the wholesale and retail industry, and the financial industry still occupy the top two places. The construction industry, electrical machinery and its equipment industry, chemical product industry, leasing and business service industry rank in the top 6 on the full distribution coefficient table. The healthy growth of these industries with driving abilities plays a key role in the stable operation for it. At the same time, the direct distribution coefficient of the leasing and business services industry in 2017 was less than the full distribution coefficient, indicating that the leasing and business services industry mainly relied on direct consumption for the products produced by the real estate sector [5].

Table 4. The complete distribution coefficient of the real estate industry in Anhui Province from 2002 to 2017 (the top 6 sectors)

Industry	2002	Industry	2007
Accommodation and meals	0.0390	Accommodation and meals	0.0254
Financial	0.0275	Building	0.0192
Information transmission, software and information	0.0176	Resident services, repairs and other services	0.0175

service technology			
Water production and supply	0.0150	Chemical product	0.0167
Agriculture, forestry, animal husbandry and fishery products and services	0.0113	Metal smelting and rolled products	0.0161
Food and tobacco	0.0099	Financial	0.0151
Total	0.1204	Total	0.1101
Industry	2012	Industry	2017
Wholesale and Retail	0.3328	Wholesale and Retail	0.3694
Metal smelting and rolled products	0.2316	Financial	0.1798
Accommodation and meals	0.2168	Building	0.1646
Chemical product	0.2122	Electrical machinery and equipment	0.1416
Electrical machinery and equipment	0.2018	Chemical product	0.1318
Transportation, warehousing and postal storage	0.1644	Rental and business services	0.1145
Total	1.3596	Total	1.1018

From the perspective of the evolutionary trend of forward industrial linkages, the sum of the direct distribution coefficients of the first six sectors of the reality business for intermediate products provided by other sectors increased from 0.0667 in 2002 to 0.5799 in 2017. It shows that the overall degree of relevance of the forward industry continues to increase, and this degree is continuously strengthened in estate. Among them, the direct distribution coefficient of the wholesale and retail sectors increased from 0.0581 in 2012 to 0.2969 in 2017, and the rising characteristics are more obvious. The direct distribution coefficient of the real estate industry to the financial industry also ranges from 0.0222 to 0.1385. The real estate industry's dependence on the financial industry has gradually increased, and the backward driving effect has been further developed. The direct distribution coefficient of information transmission, software and information technology services increased from 0.0146 to 0.0307, ranking sixth in the forward correlation effect. This shows that with the gradual development of science and technology, these industries have become increasingly closely related to the real estate industry, and estate start transformation.

In summary, the backward correlation between the estate and the finance, leasing and business service sectors has been significant for a long time. The forward correlation with wholesale and retail industry and financial industry is relatively strong. This shows that it should not only pay attention to market fluctuations and prevent against market risks in the development of the industry, but also use the industry's own advantages to promote the prosperity of the tangible sectors such as wholesale and retail [6]. The deep degree of backward correlation between leasing and business services indicates that the supply of estate is gradually tightening, and the market leasing and office buildings has been fully developed. The significant degree of forward and backward linkages in the financial industry also provides positive financial advantages for above sectors. The continuous strengthening of investment in wholesale and retail, the development of Internet technology, and the emergence of new retail concepts have accelerated the emergence of new prosperity opportunities in the estate market. The top 6 of the 2017 Direct Distribution Coefficient table are all service industries.

4.3 ANALYSIS OF INDUCTION COEFFICIENT
According to the input and output table of Anhui Province in 2017, the sensing coefficients of various departments were calculated.By calculation, the inductance coefficient of the real estate sector is 0.7866, indicating that for every additional unit of final product in the sector, the demand sensitivity of the real estate industry is 0.7866, ranking 27th, ranking in the middle of 42 sectors. In general, the higher the intermediate demand rate of the industry sector, the more significant the level of sensitivity[7]. The low sensitivity coefficient of the real estate industry indicates that the development of the national economy is less dependent on it and has a weakening trend. But this does not mean that the products they produce do not affect the national economy. The stable growth of the national economy is more closely related to the lasting prosperity of the final consumption link. In addition, the inductance coefficients of the secondary industrial sectors such as power and metals are still in the forefront of Anhui Province, indicating that the development of other sectors has greater demand for these industrial sectors, and industry plays a major role in restricting the economic development [8].

5.   CONCLUSIONES   AND   POLICY REKOMMANDATION
This paper adopts the input-output table data of Anhui Province from 2002 to 2017 to research the impact of the real estate industry, and draws conclusions and policy recommendations as follows:
First, from the perspective of data analysis, the real estate industry has a significant degree of forward correlation with the wholesale and retail industry, and the financial industry. The direct depletion coefficient and the complete depletion coefficient for the financial industry, leasing and business services are the highest. They maintain a relatively strong backward correlation. The real estate industry is more closely connected with service industries such as finance, leasing and retail, but its relationship with other industries is not balanced. This shows that its products are still in its infancy, and attention should be focused on improving higher-quality real estate products, through using new materials, new building structures, and greener processing. It also encourages the real estate industry to strengthen the use of new technologies and transform them into productivity through technology and new processes, so that it will move toward a more intelligent, environmentally friendly, and people-friendly direction, and meet people's growing spiritual pursuits.
Second, from the perspective of total volume, the annual

total output of the real estate industry has shown an exponential growth, and many small cities have seen false demand such as ghost towns. For this reason, the real estate industry should more scientifically adapt to the national housing policies in different periods, and timely get real-time contacts with upstream and downstream industries to reduce excess supply. And by appropriately extending the construction period of real estate construction projects, timely adjust the project schedule according to the market to avoid excessive production of products. At the same time, the decrease in demand is also related to the slowdown of the urbanization process. Anhui Province should increase government investment and urban employment rate, ensure the amount of urban infrastructure construction, and increase the attractiveness of the city.

Third, the sensitivity and influence coefficient of the estate sector in Anhui Province are not obvious, and they are all under the general degree, indicating that it has a small effect on the economic boom of other industrial sectors, and has a marked promotion on the economic growth. The role is gradually reduced, and the driving ability is not strong. To this end, Anhui Province should reduce policy preference and fiscal expenditures, and at the same time strengthen supervision in estate market, and its products that are reasonable in accordance with market demand. At the same time, it is necessary to strengthen the boom of industry and technology industries, and propel the transformation and growth through the research and application of new materials and technologies, promote the industrial upgrading of the real estate industry, reduce the expansion speed, and stabilize housing prices.

Data Availability

The data used to support the findings of this study are included within the article.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Research on the Security of Enterprise Financial Shared Service Center Based on AHP

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Abstract: As a product of the combination of finance and information technology, the Financial Shared Service Center has received extensive attention for its security. Therefore, in order to grasp the potential security risks of the Financial Shared Service Center, so as to prepare the corresponding defense measures in advance, the article studies its security. The first is to use Multiple Linear Regression to analyze the development status of the Financial Shared Service Center. Secondly, it explains the hidden dangers that may exist in the service center. Then use the Analytic Hierarchy Process to analyze various risk indicators. Showing their degree of influence on the safety level of the service center in the form of weight. Finally, based on the model results, proposing risk prevention measures in a targeted manner.
Keywords: Financial Shared Service Center; Security; Analytic Hierarchy Process; Multiple Linear Regression

1. PREFACE

With the new round of information technology development, more and more companies choose to establish a Financial Shared Service Center to handle financial work. The Ministry of Finance has also clearly stated that "All kinds of enterprises should explore the use of information technology to promote the concentration of accounting work and gradually establish a Financial Shared Service Center."[1] However, the Financial Shared Service Center is a system closely linked to the core information of the enterprise, if it wants to achieve high speed and efficient development, the security must be guaranteed.

The Shared Service Center was created in the West in the 1980s and entered rapid development in the 21st century. The Financial Shared Service Center is its core content.[2] Huang Qinghua (2014)[2] discusses the factors restricting the development of the Financial Shared Service Center and formulates corresponding strategies. Li Saijuan (2014)[3] designs the security of the Financial Shared Service Center. Qi Yuan (2018)[4] conducts a deeper analysis of the risks of corporate group financial sharing in the era of big data and proposes the establishment of a risk assessment mechanism.

2. BRIEF ANALYSIS OF FINANCIAL SHARED SERVICE CENTER

2.1 CONNOTATION OF FINANCIAL SHARED SERVICE CENTER

The Financial Shared Service Center is a new financial management model. It allows enterprises to separate from the multitude and trivial financial business with the help of modern information technology. Centralizing different levels and types of financial data, resources to the center for analyzing and processing.[5]

2.2 THE INEVITABILITY OF FINANCIAL SHARED SERVICE CENTER IN ENTERPRISE APPLICATION

Firstly, meet the needs of the enterprises' daily operations and cover most of the enterprises' financial operations. Secondly, meet the needs of the enterprises' development. Through unified management, the Financial Shared Service Center standardizes a large number of repetitive and trivial tasks which improves work efficiency a lot. And allowing financial staff to invest in more productive work for the enterprises, realizing value creation for the enterprises.[6] Thirdly, meet the requirements of the enterprises' informatization. With the help of cloud computing, big data and Internet technology, the financial shared services have become more intelligent. It can manage massive amounts of data and perform data analysis, data mining. Providing the basis for the enterprise's management decision.

3. QUANTITATIVE ANALYSIS OF THE DEVELOPMENT OF FINANCIAL SHARED SERVICE CENTER BASED ON MULTIPLE LINEAR REGRESSION

3.1 FACTORS AFFECTING THE DEVELOPMENT OF FINANCIAL SHARED SERVICE CENTERS

First is the macroeconomic level. The macroeconomic level is an important indicator that can reflect a country's economic activities and operating status, which can be used to measure the development status and prospects of various industries. The higher the macroeconomic level, the faster the service center will develop. Second is the basic Internet resources. The financial Shared Service Center is a financial management model based on information technology. The richer the basic Internet resources, the more fully developed the service center will be.

3.2 VARIABLE SELECTION

Today, the Financial Shared Service Centers are gradually moving closer to the service centers based on cloud computing, big data and other technologies. The development of cloud computing technology can reflect the development of the Financial Shared Service Center to a certain extent. Therefore, this article adopts the scale of public cloud market (100 million) (Y) as the explained variable. Based on the theoretical analysis, the article chooses the following explanatory variables: GDP (100 million) (x_1), transforming the macroeconomic level; the number of IPv4 addresses (10, 000) (x_2), reflecting the

basic Internet resources.

3.3 DATA SOURCE

The article collects and organizes data from 2006 to 2019.The data comes from the official website of the National Bureau of Statistics of China, the statistical report on the development of the Internet in China and the China Academy of Information and Communications Technology Cloud Computing Development White Paper, etc.

3.4 MODEL FORM

Based on the analysis, the article uses Multiple Linear Regression to build a model:

$$Y_i = c + \beta_1 x_1 + \beta_2 x_2 \qquad (1)$$

3.5 PARAMETER ESTIMATION

According to the collected data, using Eviews software to establish the regression equation. Using the OLS method to obtain the estimation, the result is shown in Table 1.

Table 1. Parameter estimation results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-87.35068	53.72265	-1.625956	0.1322
x_1	0.001396	0.000146	9.578170	0.0000
x_2	-0.018856	0.003450	-5.465438	0.0002
R-squared	0.921844	Mean dependent var		135.6143
Adjusted R - squared	0.907634	S.D. dependent var		201.6004
S.E. of regression	61.27011	Akaike info criterion		11.25587
Sum squared resid	41294.30	Schwarz criterion		11.39281
Log likelihood	-75.79110	Hannan-Quinn criter.		11.24319
F-statistic	64.87183	Durbin-Watson stat		0.966419
Prob(F-statistic)	0.000001	-		-

The estimated results is as follow:

$$\hat{Y}_i = -87.3507 + 0.0014x_1 - 0.0189x_2 \qquad (2)$$
$$t = (-1.6260)(9.5782)(-5.4654)$$
$$R^2 = 0.9218 \quad \bar{R}^2 = 0.9076 \quad F = 64.8718$$

3.6 MODEL CHECKING AND REVISION

First is the economic significance test. According to the estimation result of the regression equation, it can be known that GDP (x_1) is positively correlated with the dependent variable and the number of IPv4 addresses (x_2) is negatively correlated with the dependent variable, which conforms to the actual economic significance. Among them, the "number of IPv4 addresses" item is economically meaningful. Because the number of IPv4 is becoming saturated, the development of IPv6 becomes a trend. The increase in the number of IPv4 will crowd out the development of IPv6. Therefore, the increase in the number of IPv4 represents a decrease in Internet resources. According to this, the basic Internet resources and the development of the Financial Shared Service Center are still positively correlated, which is consistent with theoretical analysis. In summary, the model can pass the economic significance test.

Second is the statistical test. It can be known from the solution result that the model R^2=0.9218, $\bar{R}^2$=0.9076, which has a high degree of goodness of fit. Secondly, at the 5% significance level, from the perspective of the common influence of all factors, it can pass the F test. From the perspective of the individual influence of each factor, the t test can be passed. In summary, the model can pass statistical tests.

Third is the econometrics test. Using Variance Inflation Factor (VIF) method to test the model for multicollinearity. The test result is shown in Table 2.

Table 2. Test results of Variance Inflation Factor method

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	2886.124	10.76330	NA
x_1	2.13E-08	30.29510	4.375125
x_2	1.19E-05	45.73230	4.375125

The variance inflation factor of each variable is less than 10. It can be considered that there is no multicollinearity in the model.

Using White test method to test the model for heteroscedasticity. The test result is shown in Table 3.

Table 3. Test results of White test method

Heteroskedasticity Test: White			
F-statistic	3.290017	Prob. F(5, 8)	0.0657
Obs*R-squared	9.419239	Prob. Chi-Square(5)	0.0935
Scaled explained SS	5.941335	Prob. Chi-Square(5)	0.3120

At the 95% confidence level, the probability corresponding to nR^2 is 0.0935>0.05, so the null hypothesis can be accepted and there is no heteroscedasticity in the model.

Using the Partial Correlation Coefficient method to test the model for autocorrelation. The test result is shown in Figure 1.

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.303	0.303	1.5812	0.209
		2	-0.054	-0.160	1.6354	0.441
		3	-0.213	-0.165	2.5622	0.464
		4	-0.300	-0.216	4.5721	0.334
		5	-0.287	-0.204	6.6288	0.250
		6	-0.182	-0.161	7.5568	0.272
		7	-0.232	-0.368	9.2791	0.233
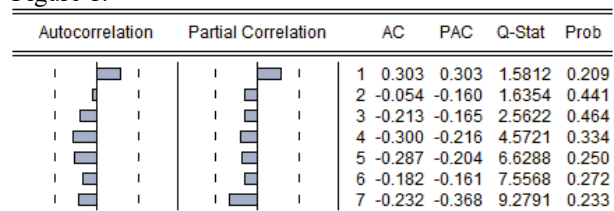
Figure 1. Test results of Partial Correlation Coefficient method

It can be seen from the figure that each partial correlation coefficient does not exceed the critical value shown by the dotted line, indicating that the model does not have autocorrelation.[7]

In summary, it can be considered that the model meets the requirements. Using Eviews to plot theactual development of the Financial Shared Service Center and the model fitting result, two lines have a high degree of overlap. The model fitting effect can be considered good. The fitting effect diagram is shown in Figure 2.
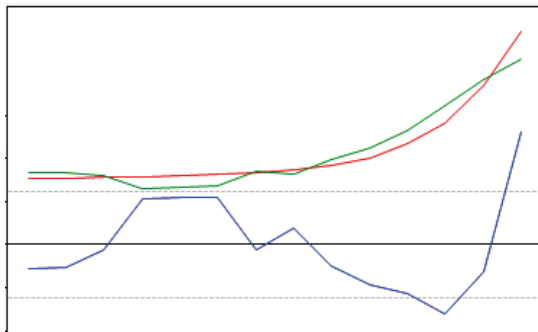
Figure 2. Model fitting effect diagram

As can be seen from the graph trend, the Financial Shared Service Center will continue to develop rapidly in the future. In this context, how to ensure its safety has also become a key issue.

4. THE HIDDEN DANGERS OF THE FINANCIAL SHARED SERVICE CENTER

4.1 THE HIDDEN DANGERS OF FINANCIAL INFORMATION SECURITY

The Financial Shared Service Center has made a qualitative change in the processing of financial data. That is, gradually shifting from manual operation to centralized computer processing.[2] However, this brings information security risks inevitably as well. First of all, as the Financial Shared Service Center needs to process financial information from multiple parties, under such a large data throughput, it is easy to cause server congestion and data delay. This will interrupt the business and increase the possibility of data loss. Secondly, in the process of computer transforming unstructured information into structured data for analysis. There will be a problem of unsatisfactory information conversion effect due to the technical reasons, which decrease the authenticity of information. But as the centralized processing point of financial information, the Financial Shared Service Center has high requirements for the accuracy of information. If the initial information is incorrect, the subsequent financial analysis work is difficult to carry out effectively. In addition, some cross-regional groups will receive financial data from various regions, levels and departments. When the enterprises do not develop a unified standard for the financial information system, there will be errors when integrating, which will affect the synergy of financial information. Finally, because there are a large number of user enterprises' financial accounting data stored in the suppliers' servers, if the suppliers' technology is not advanced enough, the data may be leaked during transmission or storage.[2] Affecting the confidentiality of information

4.2 THE HIDDEN DANGERS OF INTERNAL ENVIRONMENTAL SAFETY

First is the safety of management and control. If the enterprises set up a Financial Shared Service Center, it will be necessary to adjust the management methods. For example, which branch's original data is needed, what is the degree of disclosure, how to restructure the accounting systems of finance and funds to connect to the new system.[2] There may be security issues in the resolution and coordination process. Second is authentication security. Due to the flaws in the ID authentication technology itself, some employees will perform operations outside of the authentication authority. For example, stealing data of other personnel with the same level of authority, using a high-level authority account to modify and expand personal authority without authorization.[8] If things go on like this, the enterprises' control will be greatly reduced, which will have undesirable consequences. Third is safe to use. Generally speaking, after applying a new information system, there is an adaptation period for the personnel.[8] Besides, the Financial Shared Service Center can be said to put forward higher requirements for the operators. They need not only financial knowledge as the basis of work, but also some knowledge of computer application. Therefore, it is more prone to arise using risk due to the staff not familiar with the service center. For example, when the operation interface is changed, the staff still follow the old rules and make mistakes.[8]

4.3 THE HIDDEN DANGERS OF EXTERNAL ENVIRONMENT SAFETY

When the laws and regulations for the Financial Shared Service Centers are not perfect, the protection of service centers will be inadequate. It may increase the risk of intrusions of the Financial Shared Service Center. Coupled with the change of its accounting information storage method and its reliance on the Internet, the service center is more likely to become the target of network hackers and criminals. They will use direct attacks, spreading computer viruses and other malicious intrusions, stealing, leaking, tampering with financial resources, which will brings a great threat to the service center. At the same time, there is a certain chance that the Financial Shared Service Center will be deliberately sabotaged by competitors. This will bring new external environment risks.

5. ANALYSIS OF THE SECURITY OF THE FINANCIAL SHARED SERVICE CENTER BASED ON AHP

5.1 MODEL PREPARATION

In order to more intuitively show the impact of different hidden dangers on the security of the Financial Shared Service Center, the article will use mathematical method to analyze various risk indicators. In view of the fact that the factors mentioned above have multiple angles and need to convert qualitative factors into quantitative factors for processing as well. The article will adopt Analytic Hierarchy Process (AHP) for analysis.

AHP is a multi-criteria decision-making method.[9] By constructing a hierarchical structural model, it provides solutions to the decision-making and sequencing problems of systems that lack quantitative data. When building a model, it is usually divided into three levels, namely the target level, the criterion level and the scheme level.

5.2 CONSTRUCTING THE EVALUATION SYSTEM

According to the previous analysis, building the security evaluation system of the Financial Shared Service Center as Figure3.
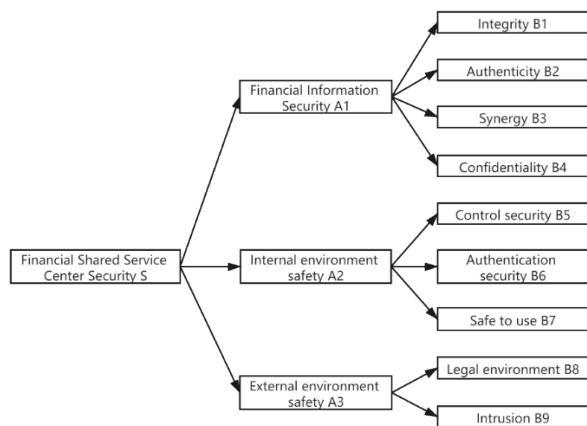
Figure 3. Security evaluation system of the Financial Shared Service Center

5.3 BUILD MODEL

According to the "1-9 scale method", constructing a judgment matrix to compare the importance of indicators. Refering to the two articles Ning Yangyang (2019)[10] and Chen Jiao (2018)[11] to give weights to each index of cloud accounting security system, combined with experts opinions. Determining the importance of the criterion levels: A_1, A_2, A_3 to the target level S, the comparison judgment matrix is as formula (3). Determining the importance of the scheme levels to the criterion levels, the comparison judgment matrixes are as formulas (4)~(6):

$$S = \begin{bmatrix} 1 & 2 & 5 \\ 1/2 & 1 & 3 \\ 1/5 & 1/3 & 1 \end{bmatrix} \quad (3)$$

$$A_1 = \begin{bmatrix} 1 & 1/5 & 3 & 1/4 \\ 5 & 1 & 7 & 2 \\ 1/3 & 1/7 & 1 & 1/5 \\ 4 & 1/2 & 5 & 1 \end{bmatrix} \quad (4) \quad A_2 = \begin{bmatrix} 1 & 3 & 1/2 \\ 1/3 & 1 & 1/4 \\ 2 & 4 & 1 \end{bmatrix}$$

(5)

$$A_3 = \begin{bmatrix} 1 & 2 \\ 1/2 & 1 \end{bmatrix} \quad (6)$$

With the help of Matlab software, the maximum eigenvalue of matrix S: λmax = 3.0037, the average random consistency index is RI. Checking the consistency of the matrix S:

$$CI = \frac{\lambda_{\max} - n}{n-1} = 0.0018 \quad (7)$$

$$CR = \frac{CI}{RI} = 0.0036 < 0.1 \quad (8)$$

This shows that the comparison judgment matrix S can pass the consistency test. The ranking weight of each factor is: (0.5816, 0.3090, 0.1094).

Then, checking the consistency of the matrixes A_1, A_2 and calculating the ranking weight of each factor. The results are as follows:

Maximum eigenvalue of matrix A_1: λmax = 4.1072, CI = 0.0357, CR = 0.0402 < 0.1, can pass the consistency test. The ranking weight of each factor is: (0.1128, 0.5129, 0.0562, 0.3181).

Maximum eigenvalue of matrix A_2: λmax = 3.0183, CI = 0.0091, CR = 0.0176 < 0.1, can pass the consistency test. The ranking weight of each factor is: (0.3196, 0.1220, 0.5584).

A_3 is the consistency matrix and does not need to be tested. The ranking weight of each factor is: (0.6667, 0.3333).

After calculation, hierarchical total ranking can pass consistency test:

$$\frac{0.5816 \times 0.0402 + 0.3090 \times 0.0176 + 0.1094 \times 0}{0.52} = 0.0554 < 0.1 \quad (9)$$

The results of the weight construction of the security evaluation system of the Financial Shared Service Center is shown in Table 4.

Table 4. The weight construction results of the security evaluation system of the Financial Shared Service Center

Target level	Criterion level	Corresponding weight	Scheme level	Corresponding weight	Total weight
Financial Shared Service Center Security Evaluation	Financial Information Security	0.5816	Integrity	0.1128	0.0656
			Authenticity	0.5129	0.2983
			Synergy	0.0562	0.0327
			Confidentiality	0.3181	0.1850
	Internal environment safety	0.3090	Control security	0.3196	0.0988
			Authentication security	0.1220	0.0377
			Safe to use	0.5584	0.1725
	External environment safety	0.1094	Legal environment	0.6667	0.0729
			Intrusion	0.3333	0.0365

5.4 RESULT ANALYSIS

From a holistic perspective, the various subdivided risk factors are ranked by influence. The authenticity and confidentiality of financial information as well as the safety of use are belonging to the first echelon, their total weight are all greater than 0.1. Among them, the proportion of authenticity of financial information is even close to 0.3, which is the most critical influencing factor. Those belonging to the second echelon include the integrity of financial information, the safety of management and control and the legal environment. Although the total weight is less than 0.1, they are all above 0.05. The remaining sub-indices have little impact on the overall.

6. COUNTERMEASURES AGAINST HIDDEN DANGERS IN THE FINANCIAL SHARED SERVICE CENTER

Based on the weight results obtained from the above analysis, the following countermeasures are derived.

6.1 ESTABLISH A FINANCIAL INFORMATION SECURITY PROTECTION MECHANISM

From the above analysis, it can be seen that the financial information security is the primary indicator that affects the security of the Financial Shared Service Center. It can be protected by establishing a protection mechanism. First of all, the authenticity of financial information needs to be ensured. Enterprises should choose suitable service center information system suppliers and urge them to optimize the information system code regularly. Ensuring the effect of information conversion to make the content presents

truer and more reliable. They can also build a traceability system based on big data, to grasp the source and channels of the service center information. Besides, the enterprises can monitor the entire circulation process of key information, which can further improve the authenticity of the data. Moreover, the enterprises need pay more attention to the confidentiality of financial information. They can encrypt important data directly or set an independent security key to make corporate information relatively isolated from the outside environment. In addition, automatic saving and backup functions can be used when possible, which can prevent the loss of information flow due to unexpected events, such as network failures and system crashes. Ensuring the integrity of information. At last, the planning of the Financial Shared Service Center must be holistic. The technical standards must be unified to standardize the form of financial information so as to maintain the synergy of information.[2]

6.2 ESTABLISH AN INTERNAL ENVIRONMENTAL REGULATION MECHANISM

According to the above analysis, the safety of use is in the first echelon that affects overall safety. Therefore, enterprises that establish Financial Shared Service Centers need to formulate detailed work procedures and operating specifications. Making clear regulations on key links and procedures. Training operators to improve operational proficiency and avoid risks caused by violations or misuse. In addition, the introduction of this system is a major change in the organizational relationship and management mode of the enterprises.[2] The senior management must deal with the challenges of system updates and personnel thinking changes that occur in the reform well. From another perspective, the establishment of the Financial Shared Service Center also means that a new way of information collection, transmission and processing method is formed inside the enterprises. The enterprises need to improve a series of management control systems, such as authorization system. Fully clarify the responsibilities of relevant personnel and develop a mechanism for handling violations. In more detailed aspects, such as authentication security, the enterprises should also be vigilant as much as possible. For example, they can require operators to set independent login passwords.

6.3 IMPROVE EXTERNAL INTRUSION RESISTANCE MECHANISM

The establishment of the Financial Shared Service Center has transferred a large amount of work from offline to online. And the prevention of network hazards is also a top priority. Enterprises should build a firewall that meets their own information security requirements. Detecting financial information circulating online in real time. Accurately identify and block dangerous information when found the abnormality. At the same time, tracking down the source of dangerous signals, so as to prevent them in advance. Besides, the key areas attacked by hackers and criminals should increase security level. Relevant technical personnel should also regularly kill viruses, fix the system bugs in time and optimize the

network environment to maintain the security of the Financial Shared Service Center.

6.4 FORMULATE BETTER LAWS AND REGULATIONS

Through formulating more complete laws and regulations, can provide a better external environment for the application and development of the Financial Shared Service Centers. In addition, by improving laws and regulations, the occurrence of external intrusions can also be prevented to a large extent. The external environment can be further protected.

7. EPILOGUE

The article mainly studies the security issues of the Financial Shared Service Center. First, analyzing the development status of the Financial Shared Service Center quantitatively by using the Multiple Linear Regression model. Proposing three types of hidden risks. Then using the AHP to quantify various risks and their subdivision indicators. Showing the degree of influence of various risks on the security of the service center in the form of weight. Based on this, the article proposes corresponding risk defense measures, including establishing a financial information security protection mechanism, an internal environmental regulation mechanism and the improvement of external intrusion resistance mechanisms, etc. Supported by the models, the results of this study point out the key prevention directions for the enterprises that intend to establish a risk defense system for the Financial Shared Service Centers and put forward corresponding recommendations as a basis for establishment. In the future, we will consider taking specific cases as the starting point of the analysis and further improve the research results in relevant fields.

Data Availability

The data used to support the findings of this study are included within the article.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Study on the Influence of Contemporary Pop Music Based on TOPSIS Method and ARIMA Model

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Abstract: Music is an important part of human culture and reflects the rhythm of changes in the times. In order to study the impact of the development and evolution of popular music, we collected relevant music data from 1930-2010 and established the "influencer-influencer-influencer" -Followers' music influence directional network. And built a music influence sub-network composed of five indicators such as the "number of influencers", Then we built a TOPSIS model to comprehensively evaluate and rank the influence of all musicians. It is found that musicians of the Pop/Rock genre such as The Beatles have the most influence. At the same time, a comprehensive index model of the Pop/Rock genre's influence was established, and the comprehensive index score of the genre from 1930 to 2010, that is, the influence value, was calculated. Finally, the ARIMA(2, 1, 1) model is constructed, and the law of Pop/Rock genre music style and influence over time is obtained.
Key words: Popular music; Music influence network; TOPSIS comprehensive evaluation; ARIMA model; Pop/Rock genre

1. INTRODUCTION

There are different forms of music culture in the world. Although they are different in style, tone or ethnicity, each kind of music makes it beautiful because of its differences. With the changes of the times, a large number of musicians have created many excellent music works based on their social background and their own life experiences. Of course, good works also need to refer to some previous experience. For example, the famous musician Chopin was greatly influenced by Bach, mainly piano music, and his music style is very romantic. His music also has a great influence on future generations. His original color harmony created the illusion of piano singing and is one of the most influential and popular musicians. Over time, pop music has gradually become the protagonist of the music stage. In the 1960s, the development of Country; Pop/Rock; Jazz and other popular music reached its peak. Excellent musicians can influence their followers through structure, lyrics, and style[1-4]. In what way do these musicians and their music works have an impact on society? How to measure this influence? Therefore, when we begin to review the history of music, the study of music influence is of great significance.

2. DATA COLLECTION AND PROCESSING

The data in this article comes from AllMusic.com and Spotify's API.
We collected data on 16 musical characteristic indicators of 98, 340 songs from 5854 musicians' influencers and followers in 20 music genres including Pop/Rock; Jazz from 1920 to 2010. They are: danceability; Energy; valence; tempo; loudness; mode; key; acousticness; instrumentalness; liveness; speechiness; explicit; duration_ms; year; popularity; count.
At the same time, make an assumption: We believe that the collected data is sufficient to explain the artistic characteristics and types of music and musicians. Then purify the above data, and all model establishment and data processing are completed by MATLAB 2018; SPSS 24 and R.4.0.2

3. NETWORK OF MUSICAL INFLUENCE MODEL

3.1 STRUCTURE OF DIRECTED NETWORK

Music is one of the representatives of the evolution of human civilization. To explore transmission mechanisms of musical influence, based on the selected data, it can be seen that when an artist creates music, he is influenced by the style of music created by his influencers, he influences the music created by his followers as well. So, we build a basic transmission network-"influencer's influencer - influencer - follower". Artists influence each other with different roles to promote the interaction of various musical styles. The structure is as following in the Figure 1.

3.2 SUBNETWORK OF DIRECTED INFLUENCER NETWORK
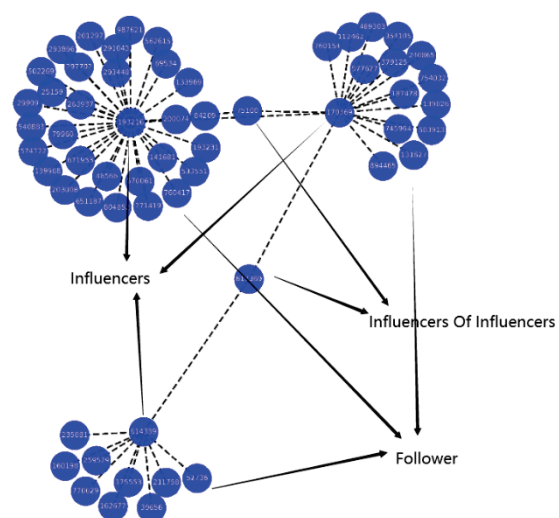
Figure 1. Directed network structure diagram

In order to further explore the impact of previous music on new music and artists, such as factors promoted the transmission of music types and styles, we create a

subnetwork based on the basic transmission network. By Literature 1, we learn that the musical influence of genres to a large extent depends on the size of genres. Due to large data, we choose the artists in 1970 as the representative to build subnetworks of every artist.

Which A_1 refers to the total number or influencer; A_2 refers to the number of people in the same genre that year (1970); A_3 refers to the total number of people of the same genre so far; A_4 refers to the rank of the genre influence, calculated as the proportion of the artists in the genre of all artists in 1970 from large to small;A_5 refers to the total number of follower, as shown in Figure 2.

Figure 2. Music Impact Subnetwork
Some of the data is shown as Table 1.

Table 5. Evaluation Indicator Data

Artist	Genre	A_1	A_2	A_3	A_4	A_5
The Beatles	Pop/Rock	31	5857	24141	1	615
Marvin Gaye	R&B	18	714	5530	2	169
Hank Williams	Country	3	504	3301	3	184
Miles Davis	Jazz	16	109	2716	4	160
Billie Holiday	Vocal	2	58	1414	5	106
…	…	…	…	…	…	…

3.3 TOPSIS THEORY OF MUSICAL INFLUENCE

After the creation of the subnetworks, we study the contribution to each artist's musical influence of the subnetworks' five evaluation indicators to calculate each artist's "music influence". We use Topsis theory, because it makes full use of the information from the original data, and accurately reflects the differences in the musical influence of the artists[5-7].

First, we will record the five indicator data a_1, a_2, a_3, a_4, a_5 for each artist in the data as the original matrix: $A = (a_{ij})_{m \times n}$, and make the original matrix positive. Then we converts data a4 to very large indicator data, and standardize the positive matrix.Assume the standardized matrix is $B = (b_{ij})_{m \times n}$.It can be expressed as

$$b_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}^2}}, i = 1, 2, \ldots, m; j = 1, 2, \ldots, n$$

Next, construct a weighted specification matrix $C = (c_{ij})_{m \times n}$ and entropy weight method to get the weight vector of the five indicators $W = [w_1, w_2, w_3, w_4, w_5]^T$.C can be modified as

$$c_{ij} = w_j \cdot b_{ij}, i = 1, 2, \ldots, m; j = 1, 2, \ldots, n$$

Then define positive ideal solution C* and negative ideal solution C⁰. Positive Ideal Solution: $c_j^* = \begin{Bmatrix} max_i c_{ij}, j \text{ is benefit attribute} \\ min_i c_{ij}, j \text{ is cost attribute} \end{Bmatrix}$, Negative Ideal Solution: $c_j^0 = \begin{Bmatrix} max_i c_{ij}, j \text{ is cost attribute} \\ min_i c_{ij}, j \text{ is benifit attribute} \end{Bmatrix}$

Calculate the distance between each scheme and the ideal solution.

$$s_i^* = \sqrt{\sum_{j=1}^{n} (c_{ij} - c_j^*)^2}, i = 1, 2, \ldots, m.$$

$$s_i^0 = \sqrt{\sum_{j=1}^{n} (c_{ij} - c_j^0)^2}, i = 1, 2, \ldots, m.$$

Finally calculate the comprehensive evaluation value.

$$f_i^* = \frac{s_i^0}{s_i^0 + s_i^*}, i = 1, 2, \ldots, m.$$

Through MATLAB, We get a comprehensive evaluation of the musical influence of each artist and sorted it. The top 10 artists are as Table 2.

Table 6. Date of the Top Ten

Rank	Artist	Genre	Rank	Artist	Genre
1	The Beatles	Pop/Rock	6	Jimi Hendrix	Pop/Rock
2	Bob Dylan	Pop/Rock	7	The Kinks	Pop/Rock
3	The Rolling Stones	Pop/Rock	8	The Beach Boys	Pop/Rock
4	David Bowie	Pop/Rock	9	Hank Williams	Country
5	Led Zeppelin	Pop/Rock	10	The Velvet Underground	Pop/Rock

As we can see, nine of all is from the Pop/Rock genre, the world's largest music genre. We conclude that Pop/Rock impacts on the music industry most, Hank Williams, the representative of the Country genre, has a profound impact on the music industry as well. This fully reflects the extent to which the genre directly determines the artist's influence.

4. THE INFLUENCE TREND OF GENRE OF POP/ROCK

4.1 COMPREHENSIVE INDEX MODEL OF ACADEMIC PUBLISHING HOUSE

POP/ROCK GENRE INFLUENCE

For the establishment of the influence composite index model, we use the artist music characteristic index that existed in pop/Rock faction at various points in time from 1930 to 2010 as the data, and use factor analysis method to reduce the dimensionality of 16 music feature indicators excluding count, and use the main component factor after the de-dimensionality as a comprehensive index to evaluate the influence, which can effectively reduce the complexity of the original data and maximize the retention

of the data content. Finally, the comprehensive indicator score is calculated, i.e. the influence of the faction. Here's an example of 1950 data:

From Table 3, the KOM and Bartlett tests, the KMO value is 0.703 and the significant is 0, indicating that the data is suitable for factor analysis.

Table 3. KMO and Bartlett inspection tables

KMO		0.703
Bartlett Spherical test	Approximate card side	9648.905
	Freedom	78
	Significant	0

Table 4. the information of comprehensive indicator

Comprehensive indicators	Contains metrics	Comprehensive indicators	Contribution factor
1	energy; loudness; acoustic;popularity	Track strength	22.17%
2	danceability;valence;instrumental	Positive degree	16.39%
3	liveness; speech	Type of audio track	13.34%
4	tempo ;duration; mode	Rhythm of the music	11.06%
5	key	Audio track parameters	9.22%

Finally, based on each artist's five composite indicator values, the combined indicator score of pop/Rock faction is calculated based on the contribution factor as the weight, which represents the impact of the force.

$$S = \frac{22.17}{78.182}f_1 + \frac{16.39}{78.182}f_2 + \frac{13.34}{78.182}f_3 + \frac{11.06}{78.182}f_4 + \frac{9.22}{78.182}f_5.$$

Where S is the composite indicator score and f-i. is the value of the first composite indicator.

And so on, we calculated the comprehensive indicator score (impact value) of the Pop/Rock faction in 9 time nodes from 1930 to 2010. The results are in Table 5.

Table 5. Pop/Rock's influence in each era

Age	Influence	Age	Influence	Age	Influence
1930	18480.7	1960	23820.26	1990	24753.25
1940	16094.81	1970	24513.85	2000	23761.17
1950	18801.88	1980	24577.15	2010	22538.46

4.2 GENRE MUSIC FEATURE CHANGE TRENDS ANALYSIS

Through the above model, we find that with the change of time, the change of the values of the indicators in the comprehensive index system established above can effectively reflect the trend of the change of the musical characteristics of the genre. According to the above factor analysis model, the change of the comprehensive index score (influence) of the genre can directly reflect the degree of change of the value of each comprehensive index. So we built an ARIMA time series model to study trends in the influence of pop/Rock genres over time to analyze trends in the musical characteristics of pop/Rock genres over time[8-10].

4.3 BUILD INFLUENTIAL ARIMA MODEL

First, We build an ARIMA model according the Pop/Rock genre's impact data

$$\begin{cases} \phi(B)\nabla^d X_t = \Theta(B)\varepsilon_t \\ E(\varepsilon_t) = 0, Var(\varepsilon_t) = \sigma^2, E(\varepsilon_t\varepsilon_x) = 0, s = 12 \\ E(X, \varepsilon_t) = 0, \forall s < t \\ \nabla^d = (1 - B)^d \end{cases}$$

Among them, B refers to delay operator, ΔdXt refers to time series after a finite order difference, ε_t refers to white noise sequence, Θ(B) refers to smooth and reversible ARMA (p, q) model movement smoothing coefficient politics, Φ(B) refers to smooth and reversible

ARMA (p, q) model self-regression coefficient polypodies, X_t is t-moment Pop/Rock genre influence value.

4.4 THE SOLUTION OF THE ARIMA MODEL OF INFLUENCE

Then we can obtain the solution of the ARIMA model of influence. Since the original data is a non-stable sequence, we differentially calculated it, after the 1st order difference, the sequence is stable, and according to the properties of the correlation graph and the partial correlation graph, it can be considered that the self-correlation coefficient 1 order cut-off, partial correlation coefficient 2-order cut-off. The results are in Table 6.

Table 6. Forecast Values

Year	Forecast	Year	Forecast
2020	22374.3	2070	22915.09
2030	22992.37	2080	23010.77
2040	23466.44	2090	23159.95
2050	23392.95	2100	23194.88
2060	23069.52	2110	23128.58

Therefore, the primary models are: ARIMA (2, 1, 1), ARIMA(1, 1, 1), ARIMA(2, 0, 1). In accordance with the AIC minimum criteria, we selected the ARIMA (2, 1, 1) model and performed a residual sequence white noise test, resulting in a p-value of 0.984, which is significantly established. Figure 3 shows the autocorrelation and partial autocorrelation graphs (acf and pacf) of the comprehensive influence data of the Pop/Rock genre from 1930 to 2010 calculated above after first-order difference. Then we predict the future impact of the Pop/Rock genre, The result is shown in Figure 4.
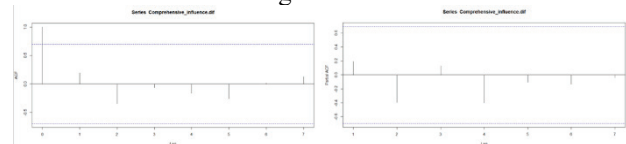
Figure 3. The graphs of acf and pacf
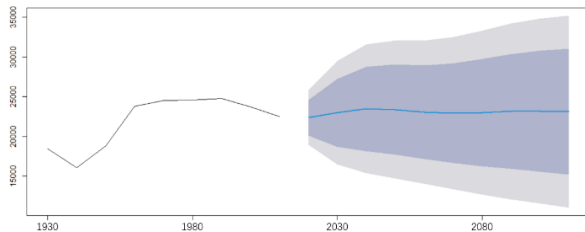
Figure 4. Pop/Rock genre influence time series chart

5. CONCLUSIONS

The ARIMA model, which analyzes the above factors and influences, concludes that between 1940 and 1970, with the emergence of artists such as The Beatles, the influence of genres grew rapidly, and that the trend in pop/Rock musical characteristics was characterized by a significant increase in the overall indicator of the intensity and passive of the music track, representing the positiveness of the works created by Pop/Rock artists during that period, and the energy intensity of the music. The overall loudness of the audio track gradually increases and reaches its highest level as its impact increases, and the Pop/Rock genre reached its peak between 1970 and 2010 with a smaller trend of decline. During this period, the positive level of the work, the energy intensity of the music, the overall loudness of the audio track is reduced by a small margin, possibly due to the fact that there are fewer influential artists during this period and are influenced by other genres.

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The Influence of Wu Jingxu's Works on The Oil Painting Art of Central Plains

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Abstract: The development of human historical civilization is the result of human pursuit of spiritual civilization, and it is the continuous study of human beings to adapt to the environment at that time with new historical civilization. The reason why oil painting art can be inherited has its unique artistic value. With the rapid development of material civilization, people are constantly strengthening superstructure to meet the spiritual desire, and artistic aesthetics has become the pursuit of people. The development of oil painting is constantly advancing in affirmation and negation. In the tide of the times, oil painting shows the spiritual civilization state of an era with its unique artistic form. Through the study of Wu jingxu's oil painting art works, this paper looks at the oil painting language characteristics of this period, provides more valuable materials for the future study of new oil painting art crowd, better understanding of the image of Wu jingxu's oil painting language on the oil painting art of Central Plains, and provides the basis for the future study of Wu jingxu's oil painting creation.
Key words: Wu Jingxu; Oil Painting Art; Oil Painting Creation; Painting Style

1. THE LINGUISTIC FEATURES OF WU JINGXU

The economic foundation determines superstructure, social development determines social consciousness, and the essence of art comes from life, all artists can't be separated. The trajectory of artists' life has a great influence on the artist's creation. Wu jingxu is an artist who grows up in such a rich geographical and cultural environment in Central Plains. He has a high insight into art and has a passion for artistic creation beyond imagination.

Oil painting pays attention to science and nature. The style of oil painting art is not only one side, but also what way to watch and what style to present. In fact, the expression of the work is related to the artist's personal knowledge, experience, temperament and experience. If we look from the global art perspective, the artistic style is bright and if the stars River, it is difficult to summarize it. Art also has its charm because of its diversity of viewing and presentation.

China has a profound cultural heritage, a long history, a vast territory of China, the Central Plains culture has a profound foundation, cultural richness, resulting in a number of literati fury, the Central Plains modern oil painting to the performance of culture is particularly Prominent, including representative artist Mr. Wu Jingxu. The regional culture of Central Plains, the middle of the five mountains, grottoes culture and art make his works have their own striking characteristics and personality. But at the same time, he inherited the cultural mantle inherited by this thick soil. He expressed his feelings for the hot soil through his own symbolic language. Rousseau, the thinker, said, "The differences in spirit and intention in different regions". Influenced by the history and culture of the Central Plains, Wu Jingxu is more sensitive to artistic thinking. He expresses his views with the attitude of inclusiveness, humility and keen as an observer of the times, and promotes the development of oil painting art in Central Plains. His art originates from the repeated changes and uncertainties of space. In the practice of painting, from the enthusiasm for the western contemporary art to the deep attention to the eastern traditional art, it is the instant confirmation of the painting process related to the art practice, and the occasional traces are stored in the art.

Artists also take Oriental philosophy as the starting point, pay attention to the "artistic conception" of image, take historical images or myths and legends as the opportunity to draw pictures, constantly think about the relationship between art and history and philosophy, explore the eternal art with the thinking of the heart, and convey the unique Oriental temperament in their independent image way. Taking the viewing mode as an example, taking the Oriental aesthetic perspective and the view mode of "moving from step to step" as the foundation, "the view moves at will" presents the most moving view of the object image, and breaks the fence of the established space with the Oriental people's viewing wisdom. Throughout the traditional Chinese painting theory, the evaluation standards of painting are all over the world by summarizing the standards of "Chang Shen", "Yi Qi", "character", "mood", "Qi Yun". Whether it is "the divine and the elegant and wonderful", the art view focuses on the internal view, and it is the "vivid portrait" after the "moving the imagination" of the object, which provides more possibilities for painting Nature, care about the real vision above image character. Artists choose Oriental view, most of the works are landscapes, the style of art presentation is clear and the recognition is high. Taking Grottoes Temple series as an example, the creation attaches importance to the scene feeling and historical presentation. The picture leaves out various external inducements, integrates the artistic experience and subjective feeling into the work, with the same feelings and different presentation.

Wu Jingxu's oil painting creation has local characteristics and strong nationality. In his art form, he drew lessons from the traditional Chinese landscape art and calligraphy

ink spirit, and had the western oil painting art expression in the painting form, but it already had a Chinese flavor in the overall charm. His choice of oil painting theme is to express the life and emotion of the Central Plains landscape culture and grottoes art; in color, he absorbed the characteristics of traditional Grottoes in China, but the color painting was covered with black; in the creation of the picture, Wu Jingxu successfully integrated the traditional Chinese calligraphy and calligraphy art into the oil painting, and integrated the elements of Chinese culture symbols with Western oil paintings. Therefore, we can see that a distinctive Chinese art style can be seen through Wu Jingxu's paintings.

Wu Jingxu's picture pays attention to the form of line expression, and uses some simple and interesting lines to describe the form, and the object image form is clearly visible. Wu Jinglong pays more attention to the block sense and emotional display in the form of the picture. The artistic language of the lines depicted is rich, which gives the viewer a strong visual impact. In Wu jingxu's works, calligraphy, painting and ink taste often appear, especially his painting layout, which adds new blood to Chinese oil painting.

2. ARTISTIC VALUE AND LITERARY CONNOTATION OF WU JINGXU'S OIL PAINTING

Sun Weimin said: "I think art should give people a sense of tranquility and happiness. It should be good-looking and eye-catching, and give people a kind of beautiful and happy mood. In the process of painting, you can also enjoy beauty. You should observe, feel and excite life, and make yourself excited and others moved."

Oil painting has been in China for nearly a hundred years. In the past, oil painting has many artistic styles. Oil painting artists in Central Plains have rich oil painting art styles. Wu Jingxu has outstanding artistic achievements in this respect. His artistic style is not only one side, but also how to watch and what style to present, which is closely related to the artist's personal temperament, knowledge and experience. If we look from the global art perspective, the artistic style is bright and if the stars River, it is difficult to summarize it. Art also has its charm because of its diversity of viewing and presentation.

Indeed, the viewing and presentation of art is often random and accidental. Artists try to show their own unique thinking mode, feel the intellectual expression of objective objects and art, break through the original thinking mode, emphasize the view and presentation of related art outside the original style, and realize the Enlightenment of images on life, existence and fate. In contrast, the skill level of painting can be obtained through long-term professional training, which can be called "gradual improvement". If he wants to have a higher quality and reach the level of "Epiphany", artists should not only be aware of the law of art development, but also consider how to separate from the previous art styles and be unique. Originality and uniqueness can survive in the history of art to combine the long history of art with its own uniqueness, and create new products. In the media era, a visual innovation such as new media, new technology and new ideas is constantly filling with art styles, which

makes it difficult to put contemporary art works into a certain time node in the history of art to explain clearly. However, in the face of art works, how to evaluate what is a good art style still needs a ruler of measurement. Art needs inspiration, needs to think, and it needs to create a difference. New media and new technology are not the necessary carriers to advance art.

From the painting creation of the landscape and Buddhism in the Central Plains of Wu Jingxu, we can't find his portrayal and praise of the Central Plains culture. It is no longer a graphic for the contemporary concept, but reveals the contemporary literati by the color language in the painting. Influenced by Huang binhong, the master of Chinese landscape painting, Wu Jingxu's landscape works can also appreciate the strong Chinese traditional literati atmosphere, which is the morale of literati in landscape painting of Song Dynasty and Yuan Dynasty. However, he is contemporary, abandoning the annotation of woodcutter and fishing reading, more intuitive spiritual world, releasing simple elegance and tranquility. He endowed Oriental philosophy with strong vitality of art Wu Jingxu, who thinks and asks like philosophers, watches, interprets and presents, transcends the limitations of cognition and creates a complete and eternal unique image system with his own knowledge system and feeling. Wu Jingxu's artists are under the context of the history of art development, and undertake civilization and face the present.

Wu Jingxu combines impressionist painting with the Oriental philosophy of skills, and through his own integration, he extracts and smelts his own artistic language form, and successfully establishes the new ideas and aesthetic value of modern oil painting art creation. Wu Jingxu's works of art have a unique literati temperament, and have a special contribution to the spirit of oil painting in the contemporary Chinese era. It has a positive and profound inspiration to Chinese oil painting art.

3. CONCLUSION

As a famous oil painting artist in Henan Province, Wu Jingxu is worth our in-depth research and exploration. At the same time, he is not only a painter, but also an art educator, and also a leader in Henan art work in a period. Many identity characteristics make Wu Jingxu have more demonstration in the pursuit of Art. His picture has a thick and thick visual effect. While strengthening the traditional art style, he decomposes and transforms into contemporary art symbols, expresses it in epic context, and expounds the spiritual shock brought by human civilization. In Wu jingxu's art world, this is not the meaning, and the focus of the painter is to constantly explore the sincere presentation. This simple and sincere emotional display has always provided a good reference and learning opportunity for young oil painters.

"Read thousands of books, travel thousands of miles." Wu Jingxu walked in the South and South China in his own way. In the difference of geography, history and environment, Wu Jingxu constantly explored and experimented to express his oil painting language. Wu Jingxu used his real emotion to describe the mountains and rivers of art. His unique artistic language became his

unique mark.

In recent years, the Central Plains has been developing rapidly in economy and urbanization. We should base on our lives, realize the artistic value with real artistic emotion, break the inherent thinking mode, unlock the closed and self-sufficient state, walk out of the Central Plains and move to the world. Study Wu Jingxu's rigorous artistic attitude and his enterprising spirit of "drawing in breathing and breathing in painting". Finally, I wish Mr. Wu Jingxu a greater contribution to the brilliant future of Chinese oil painting, and the tree of art will grow green. Henan oil painting art tomorrow better!

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The Objectives of Law Education in Junior High School

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Abstract: *Morality and the rule of law* instead of *Moral Character* has become a new textbook for junior high school students' ideological and political lesson education. Scholars and education practitioners need to understand what are the backgrounds and reasons of central committee of party and the relevant national institutions to take the rule of law education into ideological and political lesson in junior middle school, clearly defining what the rule of law education goal is in junior high school. For the determination of junior high school rule of law education goals, however, should be from the perspective of public policy, rather than the perspective of curriculum and teaching theory, which can be found in the junior high rule of law school education as a part of moral education, the goals need to understand from the perspective of compulsory, i.e. not only making the junior middle school students have the quality of rule of law, and respect for others as people. Because rights and freedoms prescribed by law need to be incorporated into mutually respectful relationships.
Keywords: Junior high school students; rule of law; moral education; duty; instructional thinking

1.INTRODUCTION TO LEGAL KNOWLEDGE IN THE NEW EDITION OF MORALITY AND THE RULE OF LAW

Since July 2016, Morality and the Rule of Law, approved by the Ministry of Education and published by People's Education Press, has replaced Ideology and Moral Character as the new version of ideological and political education textbooks for junior high school students, and has been gradually promoted and used nationwide.[The textbook "Morality and the Rule of Law" published by People's Education Press, approved by the Ministry of Education, was published in July 2016 for Grade 7, November 2016 for Grade 7, July 2017 for Grade 8, December 2017 for Grade 8, and yet unpublished for Grade 9.]As an important part of the national education system, the rule of law education is an important decision made by the Fourth Plenary Session of the 18th Central Committee of the Communist Party of China. It can be said that in the current China with the rule of law, theorists and education practitioners need to understand the background and reasons why the Party Central Committee and its relevant state institutions include the education of rule of law knowledge into the ideological and political courses of junior high schools, and clearly define what the goal of junior high school rule of law education is.Only in this way can teachers make corresponding arrangements in the specific implementation of the curriculum and the

teaching process, so as to ensure the effective realization of the goal of junior high school legal education.

Moreover, the accurate understanding and definition of the goal of junior legal education is also determined by the nature of the law itself. As is known to all, law, as a kind of artificial reason, as a profession and professional knowledge, is mainly an elite education in western countries. Law is mainly the discourse and things between adults. Junior high school students between the ages of 13 and 16 are limited in the "pure" legal knowledge they can accept and understand as people with limited capacity stipulated by the Civil Law of China. Therefore, in the sense of pedagogy, especially from the perspective of the relationship between curriculum and teaching, teachers can only carry out targeted teaching activities by making clear the question "why to teach". If the goal of junior high school rule of law education is not clarified first, and the curriculum purpose that teaching serves is ignored, it is easy to cause the inefficiency and ineffectiveness of teaching in the course implementation, and even the alienation phenomenon that only pays attention to the teaching form.In fact, in a limited period of time to ask teachers to carry out pure legal knowledge of the "indoctrination", unavoidable some superficial, and may even lead junior high school students to legal knowledge itself a little knowledge and go astray. Therefore, under the new situation of the construction of the rule of law, it is necessary to conduct in-depth discussion on the goal of the school rule of law education first, so as to have a consensus basis for further exploration in teaching.

To define the goal of junior high school rule of law education, it is necessary to have a preliminary understanding of the background and reasons why the rule of law education is included in the new curriculum of junior high school, as well as the content changes of legal knowledge in the new curriculum. By analyzing the background and reason of the rule of law education and the change of the contrast between old and new teaching material content, can be found to include the rule of law knowledge in junior high school education is not the current contingencies occur, a new version of "morality and the rule of law" and the old version "ideology and moral character" although there are great changes in terms of course arrangement and content, but not totally different.

(1) The background and reasons for bringing the rule of law into the new textbook
Legal literacy is one of the core qualities of citizens in modern society.Legal literacy enables citizens to grow up healthily, actively participate in social life and enjoy a happy life.Youth, as the future of the motherland, is also

the hope of national rejuvenation.It has a special background and reason in the current society to bring the rule of law course into the ideological and political course of junior high school students and make them develop some specific legal literacy.

First of all, the rule of law is included in the new curriculum of moral education in junior high schools. It is a basic project to cultivate teenagers' legal literacy to comprehensively run the country according to law and accelerate the construction of a socialist country ruled by law.Since the 18th National Congress of the Communist Party of China (CPC), the CPC Central Committee with Comrade Xi Jinping as General Secretary has made important plans for comprehensively advancing law-based governance.The Third Plenary Session of the 18th CPC Central Committee called for "a sound social legal education mechanism";The Fourth Plenary Session of the 18th Central Committee of the CPC required that "rule of law education be included in the national education system, starting from teenagers, and legal knowledge courses be set up in primary and secondary schools".The Fifth Plenary Session of the 18th CPC Central Committee called for "carrying forward the socialist spirit of the rule of law, enhancing the awareness of the whole society, especially public officials, of respecting, abiding by, and applying the law, and forming a good atmosphere and habit of the rule of law in the whole society."

Under this background, on April 17, 2016, the central propaganda department, the Ministry of Justice jointly announced the "about the citizens to carry out the rule of law publicity and education in the seventh five-year plan (2016-2020)" (hereinafter referred to as the " the franco-prussian planning"), the rule of law publicity and education object is defined as "all citizens capable of receiving education, the focus is on the leading cadre and teenagers."On June 28, 2016, the Ministry of Education, the department of justice and national PuFaBan issued notice about the youth of the rule of law education outline, including compulsory education, high school education and higher education stage, the guiding ideology of the rule of law education, job requirements, target, content, way of implementation and safeguard measures are made a detailed regulations and specific requirements. Obviously, bringing the knowledge of rule of law into the ideological and political classes of junior high school students is a manifestation of the implementation of the Party's education policies and the normative documents of the relevant state organs, as well as a natural requirement for the construction of a country ruled by law.

Secondly, bringing the rule of law knowledge into the new curriculum of ideological and political education in junior high schools is also an important way to deeply carry out the education of socialist core values among teenagers, which is in line with the phased characteristics of moral education for teenagers. It should not be forgotten that the rule of law is itself an integral part of core socialist values. Although moral education is a process in which the head, heart and hands should all be involved, the emphasis of all three varies at different ages. With the development of reason and the maturity of reasoning ability in adolescence,

understanding, practical wisdom and good judgment should be consciously cultivated.In this sense, in adolescence, law containing practical reason and judgment should be fully involved in the cultivation of moral education, and become the focal point and important content of moral education."Teenagers need to understand moral principles.They need to learn to give rational reasons for their own decisions and judge the reasonableness of others.Hearts play a huge part in all this: moral maturity means that we are not only asking what the right thing to do is, but are also driven by the desire to do it.Rational reflection is combined with good habits, thereby putting the moral life more centrally.

Finally, bringing the rule of law knowledge into the new curriculum of ideological and political education in junior high schools is an objective requirement to ensure the healthy growth and all-round development of young people and to cultivate qualified socialist citizens.The present society is one that affirms individualism and pluralism, but the result is an increasing number of violence, teenage suicide, teenage pregnancy and many other social ills that are attacking our young generations.Why do teenagers have these problems?Scholars have observed four reasons. First, a desire to be accepted, "fit in" and "cool."Second, boredom;Third, lack of a presumption of interest and responsibility to move in other directions;Fourth, escape the pain and sense of meaninglessness in life.So, what should education provide students to resist these four self-destructive factors?

Clearly, what students really need, and what schools can offer, cannot be individual qualities in the purely private sphere, but the rules of communal life in the public sphere. The diseases and problems of the adolescent group are a social problem that needs to be considered by the public. Public Education . Within the group of teenagers, they establish rules early in their own way. This means that the education of teenagers should not stop at teaching them personal knowledge, feelings and values, but should let them understand the sense of responsibility, understand that the acquisition of any personal things must be placed in a higher social community, into the value and significance of the pursuit and thinking. In this regard, to ensure the healthy development of young people and cultivate qualified citizens for socialist construction, it is necessary to incorporate the knowledge of the rule of law, especially the knowledge of the rule of law containing the core socialist values, into the new curriculum of ideological and political courses in junior high schools. Then, what kind of legal knowledge is set in the new curriculum, and how is the legal knowledge incorporated into the new curriculum? This is the question of all the analysis that follows.

(2) the comparison of the legal contents in the new and old textbooks

It should be pointed out that, although the new edition of junior high school ideological and political lesson of the textbook name is changed to "morality and the rule of law", rather than "ideological and moral character", this does not mean that the old edition of "ideological and moral

character" there is no legal knowledge.However, we can still find the changes in the content of legal knowledge in the two editions of the textbooks through comparison.

First of all, in the old edition of "moral character", the legal part of the content is the seventh grade second volume of the fourth unit "do know the law, law-abiding usage of the people" began to introduce, its content respectively for the seventh lesson "feel the dignity of the law", the eighth lesson "the law to protect my growth". There is no rule of law content setting in the first volume of Grade 8, which involves how junior middle school students deal with the interpersonal relationship with parents, teachers and friends, and lies in the art of interpersonal communication. The curriculum arrangement of Volume II of Grade 8 is all legal knowledge, and the content focuses on rights, that is, Unit 1 "Rights and obligations are with us", Unit 2 "Our personal rights", Unit 3 "Our cultural and economic rights", and Unit 4 "We advocate fairness and justice". In the course content setting of the whole volume of Grade 9, there are both moral and legal knowledge. The legal knowledge is mainly based on the sixth lesson "Participating in Political Life" in Unit 3, which mainly involves the knowledge of Constitution. In addition, it is worth noting that on the title page of each volume of the old edition of Ideology and Moral Character, the socialist concept of honor and disgrace is printed with "Eight Glories and Eight Disgraces".

Secondly, in the new edition of "Morality and the Rule of Law", the content of the first volume of the seventh grade without legal knowledge is still the ideological and moral character in the traditional sense.The legal part is also introduced in the fourth unit of the second volume of the seventh grade, "Into the world of the rule of law". The content is followed by the ninth lesson, "The law is around us" and the tenth lesson, "The law accompanies us to grow up".And the old version "ideology and moral character" pay attention to interpersonal communication art is different, the new "morality and the rule of law" eighth grade four units of the days of the course content arrangement of the scholars pay more attention to junior high school rules consciousness, the arrangement of the courses not only in morality and law, namely the first unit "into the social life", the second unit "abide by the rules of society", the third unit "social responsibility" explorations and ends with the fourth unit "national interests".Grade eight part ii of the content of the "morality and the rule of law" is the legal aspects, namely the first unit "uphold the constitution is supreme", the second unit "to understand the rights and obligations, " unit 3 "the people are masters of the country", ends with a fourth unit "advocates the spirit of the rule of law" as a unit, namely the lesson 7 "respect for freedom and equality, " lesson 8 "to maintain fairness and justice".

Through the old and the new teaching material content changes can be found in law, is different from the old version in some knowledge of the law of the ideological and moral recognition of rights, the new "morality and the rule of law" in addition to the required junior high school students understand as the various rights of citizens, the new teaching material attach more importance to the understanding of the rule of law spirit of junior secondary school students, pay more attention to the rule of law spirit behind the spread of socialist core values, to realize the rule of law knowledge and educating function of education.

2.THE DEFINITION OF THE GOAL OF JUNIOR LEGAL EDUCATION

In curriculum and teaching theory, educational goal is to choose teaching materials, outline teaching contents, form teaching procedures and prepare the standards for tests and examinations. All aspects of teaching are the means to achieve the basic educational goal.Then, from what Angle should we define the goal of junior high school legal education, especially how to specify the goal of junior high school legal education?This is the question that this section aims to analyze.

The rule of law education as a component of moral education.At present, Chinese scholars mainly analyze the definition of the goal of junior legal education from the perspective of curriculum goal system.Based on this perspective, rule of law education should be regarded as the educational content parallel with moral education. After all, the new course is "morality and rule of law", rather than just "ideology and moral character".As is known to all, from the perspective of paying attention to the overall and comprehensive development of students, the current curriculum reform of basic education in China establishes the three-dimensional goals of the curriculum, namely the goals of knowledge and skills, process and method, emotional attitude and values.Corresponding to the three-dimensional goal of the curriculum, scholars believe that junior high school legal education should also successively achieve three different levels of goal requirements, namely, understanding legal knowledge, forming legal thinking, and establishing legal belief.However, the problem of stating the goal of junior high school rule of law education in the form of curriculum standards and activities carried out by teachers is that there is no way to judge whether these activities should be carried out.This conventional expression seems to be a circular reasoning, which cannot provide satisfactory guidance for the further selection of teaching materials and the design of teaching procedures for junior high school legal knowledge education courses.

In this paper, it is necessary to clarify the different meanings of various goals in pedagogy to accurately define the goals of junior legal education.In particular, curriculum objectives cannot be equated with teaching objectives."in our country, the curriculum goal is equal to the Angle of the important reason lies in the analysis of the teaching goal. "from the perspective of teachers and students, or from the perspective of the implementation of curriculum, the curriculum goal, that is, the teaching goal, the both are consistent."this is because in the education system, the goal or purpose itself is a multi-level complex organic whole and system, including the education goal, training objective, course target, teaching target, etc. in general, in the education of the concept of the top, the education purpose is general, general and abstract, is a

common the ultimacy of education value, its core is training to become what kind of social role and with what kind of quality.Training objectives are the embodiment of educational objectives at different levels and in different types of educational fields, and refer to the specific training requirements for all levels and all types of schools.Curriculum objectives are subordinate to educational objectives and training objectives, which are the embodiment of educational objectives and training objectives in educational activities of different disciplines, and are basically completed by subject experts.Teaching objective is the direction of teachers' teaching activities and the concrete implementation of the curriculum, which belongs to the concept of the third level.Teaching objectives have a direct impact on teachers' choice of teaching content and methods, and play a guiding and encouraging role by passing the most direct test standards for teaching results.

In this sense, the understanding of junior high school legal education objectives cannot be analyzed from the perspective of curriculum. Equating curriculum objectives with teaching objectives will not only affect the implementation of the new curriculum reform, but also lead to the alienation of emphasis on teaching forms in the course implementation, thus resulting in the low efficiency of classroom teaching.This paper argues that the definition of the goal of junior high school legal education should be analyzed from the perspective of the makers of junior high school legal education and adopt a perspective of public policy. After all, bringing legal education into the ideological and political courses of junior high school students is itself a public decision of the subject of power. An important rule of pedagogy is that educators must learn before they teach. In this regard, to define the goal of junior high school legal education, teachers must learn and look for it from the relevant national education policies and normative documents. Both the curriculum objectives formulated by the subject experts and the teaching objectives actually formulated by the teachers are the implementation of the educational policies and normative documents of the relevant national institutions. They are not only the next concept of the educational purpose in logic, but also subordinate to the educational purpose in legal effect. Because the education policies and normative documents related to the rule of law education are issued by the national education authorities alone or in conjunction with other national institutions, they are departmental regulations in the legal source and a form of expression of the law.In this regard, it is illegal to violate the normative documents of school rule of law education.There is no doubt that the teachers who conduct legal education in schools must first be the law abiders, and the teachers must accurately define the goals of legal education from the relevant educational policies and normative documents, and then achieve them effectively through some teaching process.

It can be said that the discussion on the nature of legal education in schools has been carried out since the 1980s.The focus is on the rule of law education in schools is intellectual education curriculum or moral education

curriculum?Is it to teach students basic legal knowledge, or guide students to enhance legal awareness and legal concepts?Is it necessary to set up a legal knowledge course apart from the moral education course?[li-jie Chen, chun-hua dong editor. this discussion until November 1985, the central propaganda department, the department of justice for all citizens basic popularization of legal knowledge of the five year planning "(that is, " the franco-prussian planning contents ") after the release, to gradually achieve consensus.According to the requirements of the "One Five Plan for Law Popularization", the courses of legal education are set up according to the development stage and characteristics of teenagers in combination with the ideological and moral lessons.In 1995, the State Education Commission, the Ministry of Justice and other departments jointly issued the "Opinions on Strengthening Legal Education in Schools" more clearly pointed out that school legal education is an important part of school moral education. The current direct basis for the ideological and political curriculum reform in junior high schools is the "Seventh Five-Year Plan for Law Popularization" jointly published by the Publicity Department of the CPC Central Committee and the Ministry of Justice on April 17, 2016, and the "Youth Legal Education Outline" issued by the Ministry of Education, the Ministry of Justice and the National Legal Popularization Office on June 28, 2016.Among them, the "Seventh Five-Year Plan for Law Popularization" points out that the main task of current law popularization education is to "promote the combination of legal education and moral education. We will adhere to the basic principle of combining the rule of law with the rule of virtue, embody moral concepts with the rule of law, and nourish the spirit of the rule of law with morality, so as to ensure that law and morality complement each other and the rule of law and the rule of virtue complement each other.""The Outline of Legal Education for Teenagers" further points out that the education of legal knowledge in schools must "take socialist core values as the main line.Law education should be combined with moral education and focus on promoting core socialist values in the spirit of the rule of law and legal norms."

All in all, from the current national policy level, the school has on the education although the concrete expression of law "legal system" to the change of the "rule of law", but the school legal knowledge education goal definition is clear: on the one hand, the school legal knowledge education and "ideology and moral character", "moral education", such as the rule of law knowledge education as part of the moral education; On the other hand, the purpose of popularizing basic legal knowledge and common sense is to carry forward the socialist core values in the form of law, so that students not only understand that the socialist core values nourish the rule of law, but also that the rule of law reflects the socialist core values in its own way.Since modern national policies and normative documents have defined school rule of law education as a kind of moral education, schools and teachers must abide by these policies and normative documents before they are

modified or abolished, and actively realize them through specific teaching practices.

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Analysis and Countermeasures of the Status Quo of Using Multimedia in Translation Teaching for English Majors in Local Undergraduate Colleges

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Abstract: Through visits and on-site lectures, we investigated the current situation of multimedia teaching in English major translation teaching in some local colleges and universities, and found that there are certain defects in teaching courseware, teacher teaching, student learning, teaching evaluation, etc., combined with our own teaching experience and feedback from students, it is suggested that teaching courseware should be made scientifically, new teaching models should be adopted, and new teaching evaluation standards should be implemented.
Keywords: local undergraduate colleges; English majors; multimedia teaching; translation teaching

1. THE CURRENT SITUATION OF USING MULTIMEDIA FOR TRANSLATION TEACHING IN ENGLISH MAJORS OF LOCAL UNDERGRADUATE COLLEGES

The syllabus for undergraduate English majors clearly states that the training goals of English majors are: "Cultivate a solid foundation in English language and extensive cultural knowledge and be able to use English proficiently in foreign affairs, education, economics and trade, culture, science and technology, military, etc. The department is engaged in translation, teaching, management, research and other work of compound English talents". (2000) Putting translation teaching in the first place of training goals shows the importance of translation teaching and the urgency of my country's demand for translation talents. Traditional translation teaching is usually teacher-centered, and the classroom is mostly based on teacher lectures, ignoring students' thinking process, restricting students' initiative and creativity in learning translation, and the talents cultivated are seriously out of touch with social needs. Therefore, the traditional education model has been difficult to adapt to the educational needs of today's society. As human beings enter the digital age of the 21st century, the rapid development of hardware construction in local undergraduate colleges and the continuous improvement of society's requirements for the quality of English teaching, multimedia-assisted teaching has become a new teaching method to enter the English classroom, and the use of multimedia teaching has become a major issue. Kinds of trends and requirements. The use of English multimedia teaching capacity is large, intuitive, fast and efficient, can overcome traditional teaching drawbacks, mobilize students' enthusiasm for learning, make English classrooms more lively and lively, the classroom atmosphere is more active, and the classroom teaching effect has been significantly improved. However, in the 4 local undergraduate colleges and universities that the author visited using multimedia for translation teaching, I found some problems in the course of multimedia teaching in the classroom teaching process. Next, the author discusses the problems and solutions in the process of using multimedia for translation teaching.

(1) The production of teaching courseware is not standardized

The investigation found that after teachers made multimedia courseware, the teaching requirements were higher than before, and the workload increased a lot. Some English teachers in local universities lacked certain computer application skills. Therefore, in the production of multimedia courseware, some English translation teachers were working on teaching materials and on the basis of the lack of a deep understanding of the syllabus, some relevant courseware was downloaded from the Internet and put together, and then used in the classroom with little modification. As a result, the content of the courseware is overlapped and the knowledge points are not consistent and pertinent.

2) Outdated teaching model

Mainly reflected in the following three aspects:

Teaching method: After teachers use multimedia in class, they still adopt a single classroom teaching mode that mainly teaches. English translation teachers have almost become projectors. They only play the pre-prepared courseware in the classroom. There is not much interaction and communication between teachers and students, and students just passively accept the teacher's explanation. Teachers do not have time to listen to students' feedback, which hinders the bilateral relationship between teaching and learning. In multimedia classrooms, we often find such a phenomenon. Teachers write every sentence or so-called key points they want to say in the courseware and cast them on the screen, and then show them screen by screen. The content of the exercises is typed in the courseware. Such teaching certainly lacks innovation and attractiveness to students.

Learning method: After chatting with students, it is found that most of the students still take the traditional method of taking notes in class. Students are not able to master the independent learning ability under the network

information environment, and it is difficult to adapt to the needs of learning in the new era. Some students originally had a poor foundation in network technology, but now they have to learn some computer application knowledge by themselves in class, which increases their learning burden. For a long time, students have developed the habit of relying on teachers in the learning process. They are not very comfortable with this self-study mode. They are not very accurate in grasping the focus and progress of learning during the learning process, resulting in low learning efficiency. In the process of using multimedia and network teaching, many teachers are mainly thinking about the courseware, and there is a lack of communication between teachers and students. Of course, they lack the very important emotional factors in the process of language learning. After interviewing the students, I found that a common problem they reflected was that the students felt that the classroom learning atmosphere was not very active when they were in class, and they needed a kind of interaction and communication with the teacher in a relaxed and happy atmosphere.

Translation teaching test and evaluation:

Translation test is an effective means to examine students' translation knowledge, translation level, and even comprehensive language ability and cultural literacy. Fang Mengzhi pointed out in the "Translation Teaching" entry in the "Dictionary of Translation Studies": "Traditional translation teaching is teacher-centered, and error correction is one of the main teaching methods. The provision of reference translations is the ultimate means of translation courses. In line with the essential characteristics of translation in real situations, it has stifled students' initiative and creativity in learning translation to a certain extent. Modern translation teaching methods believe that translation teaching should be student-centered, give full play to their initiative and improve their skills. In practice, students can choose translation materials or write original texts by themselves to increase their interest in translation, give play to their strengths, and even form a style; encourage creativity and organize discussions; compare reference translations and allow students to conduct independent analysis." In the four local undergraduate colleges and universities I visited, the summative evaluation methods adopted by English translation teachers are similar: the usual grades account for about 30% (including translation assignments and classroom performance, etc.), and the final exams account for about 70%. Generally, there are 3-5 question types, including word, single sentence translation, phrase, idiom translation, short text translation, answering questions, choosing to fill in the blanks or correct mistakes, and translate and comment. This kind of evaluation method is based on summative evaluation which has been influenced by test-oriented education for a long time, that is, examination results are used as the only criterion for evaluating students' learning ability and teaching quality. This summative evaluation method only pays attention to the learning results, and ignores the evaluation of the students' learning process.

Translation teachers are mostly able to use modern teaching methods to teach, but the teaching model is still outdated, and still adopts the traditional "crawling" and "full room" model, which is contrary to modern teaching concepts. Not only is it not conducive to improving the quality of education and teaching, but it also imprisons teaching and even stifles the imagination and creativity of students. It is difficult for students educated by this kind of teaching mode and method to adapt to the needs of social development and must make changes.

2. STRATEGIES FOR ENGLISH MAJORS IN LOCAL UNDERGRADUATE COLLEGES TO USE MULTIMEDIA IN TRANSLATION TEACHING

The production of teaching courseware should meet the needs of three-dimensional teaching materials

English translation teachers should participate in the theoretical research and practice of multimedia foreign language teaching when making courseware, so that the teaching content and teaching methods of translation can keep up with the pace of development of the times. On the basis of thorough understanding of the syllabus and teaching materials used, books and multimedia should be used as platforms to make full use of a large number of books related to translation teaching and the ever-changing network resources, integrate courseware according to their own teaching characteristics, and produce and develop translation courses suitable for English majors. Teaching courseware. Teachers can download some courseware related to teaching content on the Internet, but the premise is that the downloaded courseware must be reprocessed and added to the teacher's own unique teaching content and teaching methods. Teachers must ensure that they handle the important and difficult points in the chapters according to their own teaching ideas and methods, and have their own teaching ideas in the process of integrating teaching courseware. English translation teachers should create an autonomous learning environment for students with rich content and diverse forms of teaching software; when designing courseware, they must eliminate excessive information input, delete the text used for explanation on the slides and keep only the main points. When it comes to translation courseware, examples of courseware production should be clear and express the sense of the times. Qualified departments should also establish three-dimensional textbooks, including (electronic) textbooks, electronic teaching plans; courseware (teaching aided version and learning aided version); teaching videos, famous translation works and translation of famous quotes or experiences, and translation lecture videos; students Translation works, teacher-student interaction resources (such as online translation). Provide students with diversified foreign language translation learning and communication opportunities through emails, English learning websites, English chat rooms, and English QQ groups.

The four processes of the teaching model:

(1) Situational presentation

Teachers use multimedia to uniformly present the current learning theme framework, learning tasks, and background knowledge to students, so as to prepare

students for learning. Teachers should show the students one week in advance, that is, at the end of this class, the important and difficult points in the next class, the theoretical knowledge needed for translation, and the goals to be achieved in class teaching. College English translation courses are two hours a week, so a week of preview time is reserved for students. They can familiarize themselves with teaching materials, check books, and search for information on the Internet before class to make full preparations for the next class.

(2) Group collaborative learning

Teaching should be student-centered, taking full account of the quality of the source of students, professional direction and market requirements, mobilizing students' learning enthusiasm to the greatest extent, and teaching translation with students as the main body. It is necessary to focus on training students in basic translation theory and translation skills, and the training of students should keep up with the times, pay attention to the updating of knowledge, and more importantly, the training of students should be developed in the direction of professionalism. In the practice of translation teaching, the breadth and depth of the students' knowledge and ability structure are combined, to a certain extent, to achieve the complex, blend and infiltration between related majors and foreign language majors, and to combine teaching translation and translation teaching, which not only trains students Language skills, and train translators who meet market requirements. This requires that in translation classes, we must break the previous teaching model of full teachers and adopt group collaborative learning. The specific method is to divide five or six students in a class into groups, and each group is assigned a specific translation task. After their discussion, each group leader made a concluding statement. In the end, share the results and learn from each other. The main teaching method adopted under the old model is that teachers explain and teach English-Chinese translation skills, and then allow students to passively adjust and modify their own translations based on the reference translations. However, under the new model, teachers should guide and assist students in autonomous learning and allow them to actively participate in teaching. When encountering difficulties in the translation process, the first thing students think of should be to use their initiative and creativity to solve them, and then discuss with teachers and classmates to solve the problem with their active participation throughout the process. At this time, the teacher has changed from the original authoritative center to the position of guide and consulted throughout the teaching process. The use of this teaching method mobilizes students' autonomy and initiative in learning, and can better help students to internalize the translation knowledge and skills they have learned into translation capabilities, so as to better complete various translation tasks.

(3) Teacher teaching

The role of the teacher needs to change, from the transmitter and indoctrinator of knowledge in the old model to the guide and facilitator in the new model.

Teachers should focus on guiding, stimulating, and helping students, with explanations as supplementary. English translation teachers should guide students to pay attention to the various problems they encounter or may encounter in translation, and inspire their interest in recording the real situation of translation truthfully, help them analyze the reasons for the problems, and discuss with them Ways and skills to solve problems. This kind of student-centered teaching operation program under the guidance of teachers can more stimulate students' enthusiasm for learning. The existing translation teaching materials of local undergraduate colleges are relatively single, relatively outdated, and the translation is relatively single. Therefore, teachers should make full use of network resources, combine professionalism, practicality and timeliness when choosing translation training materials, choose some materials that can stimulate students' interest in learning, and extensively collect the latest domestic and foreign newspapers, magazines and other materials. As translation material. At the same time, encourage students to pay attention to social focus issues and the rapid development of science and technology, link theory with practice, so that students feel that learning is useful, thereby enhancing the effect of teaching. Teachers should not only impart knowledge to students, but also guide their learning methods. Harmonious and tacit relationship between teachers and students can help improve students' learning efficiency.

Therefore, in the translation classroom, it is necessary to realize the combination of textbook content and Internet current affairs, the combination of teacher's explanation and student discussion, the combination of text learning and video appreciation, and the combination of after-class learning and multimedia testing. Realize students' independent learning. Student autonomous learning means that students have the ability to determine learning goals, set learning content and progress, select appropriate learning methods and skills, monitor the learning process, and evaluate learning effects. It is mainly reflected in the ability to understand teaching goals and teaching methods, and establish learning goals. Choose appropriate learning strategies, monitor learning strategies, and evaluate learning effects.

(4) Teaching effect evaluation

Teaching effect evaluation refers to the summary of learning content by multiple subjects including students and teachers, and the reform of learning effects, learning strategies, teaching content and curriculum system. As an important part of translation teaching for English majors, the establishment of a comprehensive, objective, scientific and accurate evaluation system is essential to achieve the goals of translation courses. Through this evaluation system, teachers can obtain teaching feedback information, improve teaching management, and ensure teaching quality; students can adjust learning strategies, improve learning methods, and improve learning efficiency.

Under the new situation, scientific teaching effect evaluation can be divided into formative evaluation and summative evaluation. Translation teaching should organically combine these two evaluation methods. The

American psychologist Bloom once pointed out: "Formative evaluation is a systematic evaluation in order to obtain feedback about teaching, improve teaching, and make students reach the level of mastery in the teaching process, that is, to promote the mastery of what has not been mastered. Content evaluation." (Bloom, 2003, 94) Formative evaluation can take a variety of evaluation forms, including teacher evaluation of students, student self-evaluation, and mutual evaluation between students. Many methods can be adopted to observe, evaluate and supervise the learning process of students, for example: through records of classroom activities and extracurricular activities, online self-study records, learning file records, etc., so as to more effectively promote student learning. By evaluating students' classroom performance, learning attitude and effort, formative evaluation can better discover students' potential and improve students' learning. The implementation of formative evaluation in multimedia teaching characterized by students' autonomous learning can enhance students' self-confidence and tap the inner motivation of learning, which is conducive to the sustainable development of students. The summative evaluation is the "conclusive evaluation of the result of some external cause, or used to judge whether each special learner has acquired certain abilities and whether he can continue a certain course" (Bloom, 2003, 94) . Generally, it is a final course exam and a level exam after a certain kind of learning experience or course is over. This kind of test is mainly to evaluate the students' comprehensive application ability of English. Combining formative evaluation and summative evaluation in translation teaching allows students to truly learn independently, which can effectively reduce the tendency of test-oriented teaching and test-oriented learning.

3.CONCLUSION

With the development of local economy and the increasing investment in teaching by local colleges and universities, local colleges and universities have more and more complete teaching equipment. As teachers of foreign language translation courses, they should make full use of multimedia and network technology and adopt new teaching models to improve the original The single classroom teaching mode based on teacher lectures makes English teaching independent of time and place restrictions, and moves towards personalized learning and autonomous learning.

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Countermeasures to Cultivate College Students' Healthy Network Psychology

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Abstract: Human beings have entered the high-speed development of the information age, the popularity of the network for human brought great convenience at the same time, but also produced many problems, such as network psychological problems. Through the analysis of the manifestation and the causes of the network psychological problems of college students, it is particularly important to find out the ways to solve the problems and cultivate the healthy network psychological problems of college students.
Key words: College students; Network psychological problems; Performance; countermeasures

1. PARENTS SHOULD DO A GOOD JOB IN COLLEGE STUDENTS' FAMILY EDUCATION

Parents are the first teachers of children, and play a very important role in the process of eliminating college students' network psychological problems. This role can not be replaced by anyone else. Therefore, parents should take active actions in the process of eliminating college students' network psychological problems, specifically to do the following aspects:family education should pay attention to the spiritual care of children.95% of college students is a long-distance education, because of distance from home factors, combined with the college students have been into the adult ranks, so some parents failing to child care and education for college students is, often when children are addicted to the Internet initially found no, when the child was frantically obsessed network just detection, then to persuade start children began to become over-irritated once sharply after several times to persuade failed, and even beat and scold, so can only act as a reaction. Family education in the network era should pay more attention to the development of children's mental health. Parents should actively communicate and exchange with their children, improve the degree of spiritual care for children, actively understand the inner world of children, and give children spiritual care. Parents should often talk to their children about what they are interested in, participate in their interest and healthy activities, often take their children out to play on vacation, in order to eliminate the diaphragm between the children, meet the children's spiritual need for love, reduce the desire of children online.

In addition to the correct understanding of the Internet, parents should also use the Internet correctly, so as to set an example for their children. Parents' good network moral quality is the most direct and effective educational resource for children to conduct network moral education. Parents' teaching by words and deeds is the most basic method for children to conduct family education.

Therefore, parents should correctly use the network to establish a healthy network psychology. Parents should not visit pornographic websites, do not log on illegal websites, do not spread bad information, spread rumors, do not attack or belittle others on the Internet, do not indulge in the Internet, and do not have the same personality online and offline. Through these to set an example to educate children, with their own correct network moral concept to stimulate the correct network morality of children, so as to cultivate children's healthy network psychology.

2. SCHOOLS TO STRENGTHEN THE TRAINING OF COLLEGE STUDENTS' NETWORK MENTAL HEALTH

① Colleges and universities should create a good cultural atmosphere for college students

Campus culture is very important to enrich the spiritual and cultural life of college students and improve their comprehensive quality. Therefore, it is very necessary to strengthen the construction of campus culture. To build a campus culture that integrates culture, entertainment and sports, and form a good cultural atmosphere, in order to enhance the cultural taste of college students and enhance their ability to resist the negative influence of the network. At the same time, to strengthen the comprehensive management of the clubs, with community as the carrier to carry out the rich campus culture activities, to cultivate college students' participation consciousness, to make them into all sorts of community activities, such not only can arouse their interest, and can make them feel in team activities in the real world interpersonal pleasure, which will automatically reduce the access through the network to meet the behavior.

② To comprehensively strengthen the construction of software and hardware facilities of network mental health education for college students

The hardware of network mental health education mainly refers to the computer and campus network, etc., and there are many Internet bars around the university, which also provides the conditions for college students to go online often. Therefore, I think universities should first make corresponding adjustments in the school room facilities, first of all, increase investment in improving the number of computers, network speed and other aspects. Secondly, to build an efficient campus network, so that students in the campus in addition to the classroom outside other places can surf the Internet, so that not only can meet the psychological needs of college students to study online, entertainment, but also through the management of the campus network to filter out those bad information. In

addition, it is necessary to establish the psychological education teaching website, develop the psychological health education software for college students, and strengthen the management of network information, so as to create a good hardware environment for the network mental health.

3. ALL WALKS OF LIFE TO CREATE A GOOD NETWORK ENVIRONMENT FOR COLLEGE STUDENTS

A good network environment fosters a sound personality. Therefore, in order to ensure the healthy development of college students' network psychology, it is necessary to create a good network environment with the common concern and active cooperation of various social forces. Social aspects should:

① Strengthen and improve network management and optimize the network environment

First of all, the government should improve the laws and regulations on the Internet, and increase the publicity efforts, so that the Internet users not only know the existence of the laws and regulations, but more importantly, let them understand the serious consequences of violating these laws and regulations. Secondly, the management department should also set up an education network for Internet cafe owners, the implementation of Internet cafe network registration system, so that the management department can regularly educate Internet cafe owners through the network, to increase the supervision of its efforts, to create conditions for purifying the network. Finally, network management department to spread advanced culture and outstanding traditional culture on the Internet, to alleviate the conflict of various information, impact on college students' values of original cognitive deviation caused by a series of influence, only in the advanced culture and the excellent cultural highland occupation of network culture, to make college students to receive a healthy Internet culture, and to create a college students' psychological health network.

②Internet cafe owners actively cooperate to create a good external environment

Some colleges and universities around the Internet bar, providing convenience for college students to get online, to the college students addicted to the Internet has played a fueling role, therefore, to solve the network psychological problems of college students also need the active cooperation of the Internet bar operators. I think the owners of Internet cafes should do the following aspects:

First of all, the Internet bar operator should regularly on the Internet bar computer antivirus, in order to avoid the computer virus by the intrusion of bad information, the psychological impact on college students caused by bad psychological. Second, Internet cafe owners can consider abolishing the 24-hour business system and only open after 7 a.m. to 11 p.m. On the one hand, this can avoid college students to give up the time to rest at night to get online all night, on the other hand, it can also play a maintenance role on the computer in the Internet bar and extend the service life of the computer. Finally, I think the Internet bar should not sell snacks, after all, the Internet bar is a place for entertainment, playing and eating

together is not healthy, but also for the growth of the university time online to provide conditions.

4.COLLEGE STUDENTS ACTIVELY CARRY OUT SELF-EDUCATION

"To solve the network psychological problems of college students, it is not enough to do only from the above three aspects. After all, the internal cause is the root of the change and development of things, while the external cause is only the condition. Therefore, to solve the network psychological problems of college students can not be separated from their own self-education and active cooperation.

①Establish correct values and clear ideal goals

Setting up correct values is helpful for college students to select and receive the complicated information on the Internet, learn to use scientific means to screen the information, improve their ability to resist the pollution of bad information, and make themselves truly drivers of the Internet. Setting up correct values is helpful for college students to clarify their goals. With a clear goal, they will strive to achieve their goals, so as to learn to correctly use the Internet to achieve their ideal goals and consciously avoid the network psychological problems caused by addiction to the Internet.

② College students should understand the network dialectically and develop good Internet habits

College students should understand the network dialectically and realize that the network is a double-edged sword. On the one hand, it should be seen that it has brought great progress to human civilization, so as to learn to use the positive factors in the network, the network as a convenient and effective way to acquire knowledge. On the other hand, we should also see the negative effects of the Internet on people, and see that some people have a series of psychological problems due to the improper use of the Internet, so as to warn ourselves. Facing the network, college students should have a strong sense of self-control, learn to refuse all kinds of bad temptations from the network, actively understand the scientific methods of the correct use of the network, take the initiative to accept the school's study on the network knowledge education, and make great use of the positive factors in the network to resist the influence of its bad factors.

With the expansion and spread of network culture, it is of great practical and historical significance to study how to cultivate college students' healthy network psychology. "One chopstick is gently broken, and ten pairs of chopsticks are firmly held together." Just like the lyrics, the cultivation of college students' healthy cyber psychology requires our whole society to act and cooperate with each other. Only the family, school, society and college students can actively cooperate with each other to improve the network psychological problems of college students. Without any party, it is difficult to achieve the best effect.

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Research on Interactive Service Mode of Digital Archive Resources in Colleges and Universities

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Abstract: Based on the characteristics of interactive service of university digital archive resources and the existing problems in the current interactive service, this paper discusses the interactive service model of university digital archive resources based on the social network environment of users to provide a reference for the improvement of serviceability of university digital archive resources.
Keywords: University digital archive resources; Interactive; Personalized; Mobile service

1. THE CONNOTATION AND EXISTING PROBLEMS OF INTERACTIVITY

The integration of university digital archive resources and mobile social networks is getting closer and closer. The interactive micro-service platform has become the growth point of university digital archive resources [1] Using this mobile scene, the university digital archive resource service can provide users with more visual feelings and a two-way interactive experience, which changes the interactive channel of resource information and makes the interaction of its service more prominent.

Interactivity is a micro-service provided by the digital archive resource service using the mobile network, which is also an important characteristic that distinguishes it from the current digital archive resource service. Interactivity presents interaction and interaction. The introduction of this concept promotes the transformation of human-computer interaction service, which makes the context construction pay more attention to the service's satisfaction and usefulness. It pays more attention to the design of the functional value of both parties [2].

The interaction in social interaction is mostly linked by the emotions in the interpersonal relationships or the common interests, interests, and topics of the users. However, such business is weak compared with the interaction in interpersonal emotional relationships. Mobile users can build virtual communities and interest groups according to their hobbies and interests and share or discuss information related to this interest and recreation in the group. Other users can also get needed information through sharing and discussing topics and recommend or evaluate relevant information services based on their own experience.

Although some universities' digital archive management also uses mobile platforms and social media to push, the accuracy and pertinence of their interactive push services are insufficient, and the push is mostly interactive service modes such as topic clustering, collaborative filtering, and semantic tags. Among these interactive push modes, although social platform push can effectively attract users'

attention and participation, there are still some defects in using the social platform to realize interactive service of digital archive resources. It is not accurate enough to grasp the personality of users' needs, which leads to the lack of precision in the content and way of its push, and cannot better meet the needs of users.

Specifically, the current university digital archives resources interaction services only for single-user behavior and demand attention also attempted to meet the personalized requirements. Still, it did not numerical analysis was carried out on the user's needs, integrating simply, and failed to make full use of big data and cloud computing technology to the user interests and needs in-depth analysis and mining, the dynamic changes of user demand also cannot access and research promptly. The interaction of digital archive resources is not only the content interaction and the interaction between managers and users but also the interaction between users. Current university digital archives resources of interactive services mode, the user is relatively independent and distributed between individuals, exchange and communication between the user and cannot effectively, the correlation between the user and is not so strong, it not only weaken the function of interaction but also limits the knowledge communication between users, determines the user interaction between learning and sharing of resources, thus reducing the effect of university digital archives resources service, digital archives resource utilization and value play are severely affected. At the same time, the services pushed by the archives department are also lacking accuracy and cannot meet the personalized needs of users.

2. CONSTRUCTION OF INTERACTIVE SERVICE MODE OF UNIVERSITY DIGITAL ARCHIVE RESOURCES

Digital archives management departments in colleges and universities should build interactive service models according to mobile terminal scenarios, analyze user needs based on the network social environment and user data, and provide targeted and personalized archive resources services. Of course, the focus of this interactive service mode is to comprehensively analyze users and their network social environment and provide them with matching services.

The essence of mobile services is to provide services according to the user's network social environment. In the mobile network era, the same is true for the mobile service of university digital archive resources. It also needs to adjust and design its service mode and thinking according to the network social environment to provide users' best user experience. Based on the social climate of the mobile

service network, this paper designs the interactive service model of university digital archive resources to improve the serviceability of university digital archive resources.

In this interactive service mode, relying on modern information technology and network technology, the digital archive resource management department of colleges and universities provides personalized archive resource information service mode through users' analysis and their situations. This service model is an inevitable choice for mobile network development and an effective channel to realize the interactive service of digital archive resources.

The design's key point is to use the mobile terminal to provide services and have higher requirements on the provision of archive resource services and the convenience of access. The primary basis for providing services is to thoroughly mine and analyze the information data of the network social environment and users through big data technology and cloud computing technology to clarify the resource needs of users and provide personalized services to them.

Using the user's scene and user information to build a new interactive service mode, it mainly considers the user's behavior of using the original archive, the network environment, and the relevant archive resources and content that they have consulted to analyze and judge the utilization needs of their archive resources. This method is more operable and objective than the process based on the interest demand graph to evaluate the utilization demand. It can be said that this interactive service mode is mainly a dynamic service model based on the analysis of small data of users and real-time data of network scenes, and the focus of this service model is real-time and personalized.

The interactive service model comprises three modules: individual demand analysis, application demand algorithm adaptation and recommendation, and service provision. Among them, personality demand analysis includes real-time data of users, small data of users, and users' social environment. By analyzing single or multiple scenes in users' social environment and little user data, a remote data system of users is composed. The personalized demands of users' archive resources are analyzed. The demand algorithm is applied to carry out in-depth matching according to users' individual needs, and then the targeted mobile interactive services are recommended. The service provision mainly includes the mobile service content of archive resources, the mode of pushing resource content, the system platform of providing service and the resource management system of digital archives, etc.

3. IMPLEMENTATION OF INTERACTIVE SERVICE PATTERN

The realization of interactive service function requires digital archive departments in universities to change their service thinking, pay attention to the application of modern information technology such as big data and cloud computing, and establish corresponding and perfect management mechanisms. Therefore, the digital archives management departments of colleges and universities should strengthen the ability of data collection, pay attention to the efficiency and quality of data collection, pay more attention to the collection of users' small data and real-time data in the social environment of users, pay attention to users' past application history and user characteristics, to provide objective and accurate data for demand analysis.

In a word, mobile service has become an essential means of digital archive resource service in colleges and universities, promoting the digital archive resource service in colleges and universities to step into a new stage. The idea of integrating the network environment of users into the existing digital archive resource services can optimize the interactive service mode of digital archive resources in colleges and universities, strengthen the precision of resource push and turn, improve the interactive performance of archive resources, and provide good system support for the construction of digital archive resources in colleges and universities and the play of archive value.

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An Analysis of The Influence of Modern Financial System on College Finance

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Abstract: With the establishment of modern enterprise system in the new era, the corporate governance structure has promoted the adjustment of modern university system and the whole governance structure. Based on this, this paper will analyze the impact of modern financial system on the operation of financial work in colleges and universities according to the changes of modern financial system.
Keywords: Fiscal System; College Finance; Influence

I. THE IMPORTANCE OF COLLEGE FINANCE

College Finance, as an important foundation and main body of college governance, is an important economic source of college education management and sustainable development. How to understand the needs of the development and application of financial policy according to the modern financial system is an important part of the development of university governance in the new era.

1.1 The importance of finance at the national level: According to the requirements of the Third Plenary Session of the 18th Central Committee of the Communist Party of China, finance is the foundation and important pillar of state governance, being able to realize the optimal allocation of financial and tax system resources is an important institutional guarantee for maintaining the unity of the market and promoting the fair development of society. Therefore, we should give full play to the important role of finance in government Macroeconomic regulation and control and promote the major theoretical innovation of fiscal governance, be Able to achieve its foundational and supporting role at the level of national governance. On the one hand, fiscal governance plays an overall role in all governmental activities, and is the economic support for the operation and implementation of any other governmental activities. On the other hand, with the intervention of state political power, finance, as a lever tool in the economic level, can accomplish the distribution and practice of political rights and political activities in the political level. Obviously, the finance and the state power maintain the very close relations, is the national rule, the national management and the national governance all essential important financial support.

1.2 The role of college finance in the governance of colleges and universities: In the political activities of college decision-making, college budget as a reference, can effectively divide the scope and direction of college activities. Usually, the main source of funds for public colleges and universities is from the state financial allocation, so it is efficient, and all financial expenditure must be subject to the influence and limitation of the state financial system, that is to say, the budget of colleges and universities also belongs to the working budget of finance department. In particular, the funds of public colleges and universities are given by the unified financial allocation of the state after taxpayers pay taxes. Therefore, the rational planning of financial work in colleges and universities is an important requirement for the supervision of audit work in colleges and universities, the realization of efficient finance, the application of financial management in accordance with law and good governance.

2. THE INFLUENCE OF MODERN FINANCIAL SYSTEM ON FINANCIAL WORK IN COLLEGES AND UNIVERSITIES

2.1 Impact on financial budget of colleges and universities. According to the requirement of improving the financial budget management system, colleges and universities need to set up the mechanism of cross-year budget balance and adjust the budget management and control in order to realize the important requirement of the financial medium-term management plan. Under the joint research of the finance department and other departments, the high efficiency must prepare the medium-term budget, take the three-year rolling budget as the way continuously adapts the budget operation request which the finance department gives, and unceasingly enhances the financial expenditure performance application, strengthening the responsibility of financial expenditure of colleges and universities, constructing the management of budget mechanism and promoting the effect of budget performance management.

2.2 Impact on financial income of colleges and universities. According to the requirements of the modern financial system currently established in colleges and universities, colleges and universities must perfect the "new temporary measures for the management of tuition fees in colleges and universities" as far as possible, and formulate the range and standard of tuition fees in colleges and universities, we must fully guarantee that the legitimate rights and interests of schools and the educated are not infringed upon. We must abide by the relevant regulations of the state, collect necessary fees and make the collection of fees open and transparent. On the premise of strictly requiring the financial revenue and expenditure of colleges and universities, the increase of the educational expenditure and the financial revenue and expenditure will only be effectively cleaned up and standardized recorded, and the special financial items of colleges and universities will be cleaned up, consolidated and standardized, actively reduce the issue of special and local funds in competitive fields, and ensure that the special expenses in university finance, such as financial expenditure guidance, financial expenditure rescue and emergency response, are retained, it is an important

principle of one-to-one application of various special funds in colleges and universities. Therefore, on the basis of emphasizing the examination of the budget progress of colleges and universities, paying attention to the actual effect of the examination of the budget performance of colleges and universities, controlling the wrong application of the financial rights of colleges and universities, is to realize the control of the special funds of the project expenditure, important matters of improving the allocation standard and the validity of financial expenditure for college students.

2.3 The influence on the financial transparency of colleges and universities. In accordance with the basic requirements of the modern financial system, the modern financial system must be open, transparent and informationalized. Therefore, in the choice of the modern financial system in terms of openness and transparency, the degree of financial transparency in colleges and universities should be based on the premise of financial openness and the goal of transparent management of financial information. Due to the different degree and openness of information disclosure, the public's right to know about financial information will be affected by it and can not meet the set requirements. However, compared with the actual situation of financial information processing in colleges and universities in the new period, the colleges and universities failed to realize the precise recording and full disclosure of financial information, and the public's requirements for the transparency and openness of financial information in colleges and universities could not be met, it interferes with the important demand of financial information processing in colleges and universities.

2.4 Impact on college accounting. The Accounting Information System of colleges and universities is aimed at all kinds of accounting information provided by colleges and universities, according to various income information such as financial allocation, tuition fees, bank loans and social donations, etc., after recording in a timely manner the expenditure information therein relating to economic functions and the nature of the economy and related purposes, and managing the information on financial carry-over and balances, helps the government in its decision-making mechanism and the monitoring mechanism aspect to carry on the governance information consummates unceasingly the important composition. In view of the financial and accounting systems of administrative institutions proposed by institutions of higher learning, they are further revised and adjusted on the basis of accrual basis, it is stipulated that the financial information processing in institutions of higher learning is still based on accrual basis, while accounting can be done on a cash basis.

3. THE METHODS OF PERFECTING THE FINANCIAL SYSTEM OF COLLEGES AND UNIVERSITIES UNDER THE MODERN FINANCIAL SYSTEM

First, standardize the subject setting of efficient financial accounting. In the accounting system of colleges and universities, the detailed accounting of accounting expenditure must be divided according to the different attribute of the project, the source of fund and the application classification. Making full use of the accounting software to optimize the setting of the subjects, providing obvious feedback to the information of the basic accounting expenses and the item expenses, the financial expenses and the non-financial expenses, etc. to Register and process information in the financial system with reference to standard subjects. Secondly, strengthen the management of financial fund sources in colleges and universities. In accordance with the requirements for the establishment of the sources of funds in colleges and universities, and in accordance with the provisions of the new system, the sources of funds are analyzed on the basis of the application of modern information technology, and the treatment of budget categories is realized, so that the financial information of income and expenditure classification can be more clearly displayed. Because different sources of financial information have different requirements for setting up and controlling information in accounting information systems, in the process of realizing the management of project funding sources, first of all, it is necessary to determine the requirements for automatic matching and application of large-scale projects, so that corresponding financial projects and special corresponding information can be formed between financial management projects and state treasury projects, this will not only help colleges and universities in the financial information system so that all the budget and expenditure items and funds can be one-to-one correspondence, it is also helpful to help college financial management staff to have a clear understanding of the income and expenditure of different special funds. Finally, consummates the university financial system application. According to the needs of financial management in colleges and universities under the modern financial system in the new era, besides paying attention to the work of financial budget and information recording of income and expenditure, we also need to take into account the actual situation of colleges and universities, to set up the code system for different financial expenditure projects, and complete the construction of efficient project code system from the two directions of projects and departments, so that the work needs of budget management and decision-making information in colleges and universities can be taken into account by using Internet technology to help colleges and universities provide necessary work needs in budget and final accounts management and information decision-making, etc.so that the specific situation of the financial management and the project management system of colleges and universities can be standardized construction and scientific application to ensure the rationality and standardization of the application of the financial system of colleges and universities, it is helpful to establish the corresponding financial budget management system in universities.

4. CONCLUSION

To sum up, in the context of modern financial system adjustment and major social changes, the study will focus on the relationship between the Contemporary University

system and the adjustment of university governance structure, only by analyzing the influence on the financial affairs of colleges and universities under the modern financial system from the level of national governance, can the work of national governance be further expounded under the function of relevant financial information. At the same time, to complete the construction of efficient and modern financial system, and to promote a more fair, reasonable, open and transparent way of handling financial information, can give full play to the value of the reform of the government system in the financial management system of colleges and universities, we will promote the establishment of modern financial systems and the improvement and development of financial processing systems in institutions of higher learning.

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Educational Unfairness in China and Strategies for Promoting Educational Equity

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Abstract: Educational equity is a hot topic of academic discussion in this century and has become one of the keywords of Chinese education policy in recent years. Due to the known factors, social development factors, institutional and policy factors and the influence of traditional culture concept, etc, China education unfair characterized by regional, urban and rural education unfair, school education and school education unfair, run by the local education development, different groups of children education unfair phenomenon is outstanding, quality needs to further enhance education in national regions. To promote the policy of education equity, it is proposed that the national education system and policy should favor the disadvantaged groups. Reduce the economic and social differences between urban and rural areas, allocate educational resources in a balanced way, and promote educational equity; Strive to return to the essence of education and realize real educational fairness.
Keywords: Educational equity; Education policy; Vulnerable groups

1. THE UNFAIRNESS OF CHINESE EDUCATION

Educational fairness has always been a common ideal pursued by people, essentially pursuing the fairness of the educational process and the all-round development of people. In general, in the past ten years, education equity has become a basic value orientation of China's education reform, which has made great progress. Over the years, China's education equity has indeed made great historic achievements in stages.

China's regional, urban, and rural education is not equitable. First of all, the regional education gap is obvious. In terms of inter-regional education, the western region is lower than the central and eastern region in terms of educational equity index and educational informatization degree. There is a big gap between the western region and its provinces in terms of educational equity and the average level of the whole country, especially the eastern region. The regional output rate of low equity and low-quality schools in western China is significantly higher than that in central and eastern China, and the difference between regions is even higher than that between urban and rural areas [1]. Moreover, in some central and western regions, the campus broadband network access rate of a large number of rural and remote rural teaching sites is far from sufficient, and teachers' information technology literacy is low. Within the same region, there are also great differences in educational equity, such as the number of high-quality students and high-quality teachers. Secondly, there is a big gap between urban and rural education. The output rate of low-quality schools in rural areas is significantly higher than that in

urban areas, and the gap between urban and rural areas is higher than that between rural and rural areas as a whole. Specifically, the distribution of high-quality education resources in urban and rural areas is not balanced, including the unfair allocation of educational resources such as investment, school conditions, infrastructure, teachers, and so on. There is a big gap between teachers' ability and education quality.

Interscholastic and intramural education in China is unfair. First of all, there is a large gap in the development of interschool education. This is reflected in the gap between schools in funds allocation, infrastructure construction quality, school conditions, teachers, and other aspects, and the quality of education between schools in the same region is different. In the compulsory education stage, the inequality between schools is far more serious than that between regions. Second, there are substantial inequities in school education. Intra-school education inequity is reflected in the quality of teachers, education and teaching quality, classroom teaching process, and other substantive equity.

The development of private education is not particularly satisfactory. The policy of "two exemptions and one subsidy" is not well publicized in private schools, and the policy of "one subsidy" is absent in private schools. The government's supervision of private schools is not in place, and some private schools have the disorder of falsely reporting the number of beneficiaries.

The education of children in different groups is not fair. The inequality in the education of children of different groups is mainly reflected in the education of children of vulnerable groups, that is, left-behind children, children of migrant workers, children with economic difficulties, and girls. The status quo of educational equity for the children of these disadvantaged groups is not optimistic. There are inequalities in the starting point, process, and result of education, especially in the distribution of high-quality educational resources, which are not substantially equitable, and even deprived of the right to high-quality educational resources that could have been obtained through academic efforts [2].

The quality of education in China's ethnic minority areas needs to be further improved. At present, although education in ethnic minority areas of China has achieved great development, the overall development level of education in ethnic minority areas and its main indicators are close to or reach the national average level in 2020, and there is still a gap between the goal of gradually realizing the equalization of basic public education services. It is generally believed in the academic circle that the educational fairness in China's ethnic minority areas is not paid enough attention to the educational needs of

ethnic minority areas, the difference of ethnic minority education is not paid enough attention to, the quality assurance in the process of education is insufficient, and the investment mechanism of educational funds still needs to be adjusted according to the actual situation of ethnic minority areas.

2. STRATEGIES TO PROMOTE EQUITY IN EDUCATION

Most Chinese scholars believe that there are macroscopic and microcosmic ways to realize educational equity. On a macro level, scholars proposed multiple measures to accurately promote educational equity. On the micro-level, the way to realize educational equity is through the teaching process of teachers.

First of all, the national education system and policies should favor the disadvantaged groups. The state should establish a just education system and policies, give due preference to rural areas, poor and remote areas, and vulnerable groups, and promote comprehensive and equitable education. In the formulation of educational system and policies, a country can, firstly, take institutional ethics as the driving force, and pay attention to fairness and democracy, continuity and stability, inclusiveness, and coordination of the system and policies. Second, the education system and policies formulated by the state should be inclined to rural areas and vulnerable groups. On the design of the education system, policy, we should pay more attention to the students of different regions, different social classes, especially in the central and western regions, rural students, backwardness and poverty areas and disadvantaged children, urban floating population children, such as children, the urban poverty population to these areas and the compensation system of education and support policies of children.

Secondly, we should reduce the economic and social gap between urban and rural areas, allocate educational resources in a balanced way, and promote equality in education. At present, scholars propose to improve the distribution of social income to reduce the economic and social differences between urban and rural areas and to balance the allocation of educational resources to promote educational equity. The academic circles mainly discussed the strategy of promoting educational equity through a balanced allocation of educational resources. We should increase the investment in education through multiple channels. The balanced allocation of educational resources should be tilted to rural areas, backward and weak areas. Adopt the principle of substantive equity of positive differential treatment, give as much as possible to rural education and weak schools, and invest more in children and schools facing more challenges. It is to promote educational equity by accurately promoting educational informatization. Chinese academic circles generally agree that information technology or distance education should be adopted to establish a channel for high-quality education resources to return to rural areas, and measures such as Socrates intelligent learning system and free access of resources on the National Public Service Platform for Education Resources should be adopted to effectively promote educational equity.

Finally, we should try our best to return to the essence of education and realize real educational fairness. To achieve educational equity, scholars put it on the process of school education and teaching, on the individual teaching efforts of teachers, and the comprehensive development of students. The PISA results show that school systems have the potential to become more equitable in a relatively short period. Scholars adhere to the educational philosophy of respect, love, and responsibility, focusing on classroom teaching and teacher professional development. The attention to school education should eventually fall on the development of students. The academic community believes that to promote educational equity substantively, we must break through the thinking pattern of school education, establish an educational concept that obeys the nature of students, and strive to make education return to the essence of educating people and fully develop the biosynthesis potential of students. In terms of curriculum, we should build a curriculum model that serves the development of students' personality and evaluate the quality of curriculum development based on fairness.

Generally speaking, the current research on educational equity in China involves many aspects, such as connotation understanding, significance, the current situation of equity and unfair performance, influencing factors, and strategies, etc., and it can continuously promote Chinese localization research based on learning advanced experience of foreign countries and combining with China's national conditions. However, there are also deficiencies in the research, such as the homogenization of research content is more common, education equity in classroom teaching is less involved, and research methods are more based on public relevant data and fewer data using their research.

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Sentiment Analysis of Dianping Reviews Based on BERT Neural Network

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Abstract: As an important branch in the field of natural language processing, sentiment analysis has a wide range of applications in modern industry. With the increase of the length of the user comment text, the words after word segmentation appear to be polysemous, and the problem that the text is too long causes the dependence between words to decrease. In order to solve the above problems, this paper introduces the BERT neural network model. Through training a large number of Chinese corpus, the pre-training model is obtained. After fine-tuning, it is used to solve the problem of word ambiguity, combined with the Attention of the BERT model itself. The mechanism is used to eliminate the dependence of continuous training on time sequence and effectively solve the problem of dependence between texts. By comparing with the benchmark model, the BERT model introduced in this article has a certain improvement in accuracy.
Keywords: Natural language processing; Attention mechanism; Sentiment analysis

1. INTRODUCTION

In recent years, the development of e-commerce has been very rapid, especially since the outbreak of the new crown epidemic this year, consumers have become more dependent on online shopping. At the same time, the generation of more and more evaluation information has formed a huge amount of text data, and these data contain a large amount of consumer emotional information. Merchants can use this information to improve product quality and sales strategies. Consumers also Products can be selected based on this information. However, these huge amounts of information cannot be processed by humans alone. Therefore, the use of computers to assist people in collecting, processing and mining this information not only improves the efficiency of data processing, but also promotes the development of text sentiment analysis, making it A hot issue in the field of natural language processing.

With the introduction of various new machine learning models and the application of text sentiment analysis, this field has developed tremendously. The previous research methods in this field can generally be divided into two categories: traditional machine learning and deep learning. Traditional machine learning methods mainly rely on prior manual data collection, preprocessing, and manual labeling. The workload is large, which also makes the development of sentiment analysis slower. Compared with traditional machine learning methods, deep learning can Autonomous learning of text features and extraction of relevant semantic features accelerate the development of sentiment analysis.

From the very beginning of LSTM [1], by adding a Gate mechanism to the model, important information is retained to the next time sequence, and non-important information is discarded during the training process through the forgetting gate. This can temporarily solve the traditional RNN has the problem of forgetting due to the excessive length of the text, but due to the rapid advent of the information age, the length of the text data has also been further lengthened, and the lack of ability to process data based on the LSTM model has also been highlighted. With the publication of the Transformer[2] model paper proposed by Google based on the Attention mechanism in 2017, relevant researchers began to introduce the model into the field of sentiment analysis. Through this model, the semantic features in the text can be trained with the text. Advance without being forgotten, and further improve the accuracy of text discrimination. However, due to the ambiguity or ambiguity of the semantics of the text, the traditional word embedding technology is easy to cause misjudgments caused by ambiguity, and the introduction of pre-training can improve this problem well. On this basis, this paper introduces the BERT (Bidirectional Encoder Representations from Transformers) model[3], which obtains a pre-trained model through a large amount of data training in the early stage, and then fine-tunes the task data to solve the problem of traditional word embedding technology. And use the model to conduct experiments on the public comment dataset and the Weibo dataset. The test results show that the BERT model introduced in this paper has a certain improvement compared with the baseline model, and the accuracy has increased by 6.9% and 7.9%, reaching 87.3% and 89.5% respectively.

2. RELATED WORK

Based on traditional machine learning methods, whether the text contains emotional words in the emotional dictionary and the strength of the emotional words are used as the basis for judgment, so as to make a judgment on the emotional tendency of the text. For example, Shunxiang Zhang et al.[4] proposed a sentiment analysis model based on Sina Weibo corpus. On the basis of the basic sentiment dictionary, it introduced dictionaries such as degree adverbs, negative words, internet neologisms, relational conjunctions, and emoticons. The accuracy of sentiment analysis has been improved compared with that based on the basic sentiment dictionary, but the amount of manual work needed to be done based on this model is huge, and the continuous emergence of new words on the network leads to poor generalization ability of the model. P Dandannavar et al.[5] used traditional machine learning methods to model Twitter comment corpus and

constructed a sentiment analysis model based on naive Bayes and decision trees, and achieved good results. Although the above methods have achieved good performance on experimental data, their effects depend on complex design and extraction work, requiring a lot of manual work.

With the popularity of deep learning in the field of natural language processing, researchers began to introduce deep learning models into sentiment analysis. M Denil et al.[6] proposed a multi-level convolutional neural network model for feature extraction of text information; Kalchbrenner et al.[7] combined static convolutional networks and dynamic convolutional networks to construct a model called DCNN's convolutional neural network model is used for multi-category emotion prediction; Alec Yenter et al.[8] combined CNN and LSTM two neural network models to produce a model, performed sentiment analysis on the IMDb movie review data set, introduced regularization and achieved good results Effect; Yuxiao Chen et al.[9] proposed an LSTM model based on the Attention mechanism, which is mainly used to learn emoticons in the text, thereby retaining the expression of emotions of emoticons in the text, and introduces the Attention mechanism to make the model correct Semantic understanding and emotional discrimination are more powerful; Guixian Xu et al.[10] proposed an improved word vector representation method, combined with the traditional TD-IDF algorithm, to obtain the weighted word vector, and input it as the model input to BiLSTM In this way, the two-way semantic dependence is better captured and the accuracy is improved. S Sonkar et al.[11] proposed to introduce the Attention mechanism into the CBOW of word2vec [12] to improve the accuracy of downstream tasks, but the word vector trained based on this model did not resolve the ambiguity of words. MT Luong et al.[13] proposed two improved Attention mechanisms for machine translation, and achieved good performance.

In the current sentiment analysis research, because words have different semantics in different contexts, that is, a word has multiple meanings, such as "Don't bother him, he is settling accounts." The semantics in this context is Calculating the accounts is a neutral term, and in "This time you win, and next time I will settle accounts with you!" It is translated as "Contending with others after suffering a loss or failure", which is a derogatory term that expresses negative emotions. If At this time, the model translates it into a calculation account of neutral words, which will reduce the polarity of the text, resulting in classification errors. In response to the above problems, this article introduces the BERT model to learn and model a large amount of preliminary data, and learn as much as possible the semantics of words. Through fine-tuning of the experimental data, the model can make correct judgments of the semantics of the words according to the context. Improve the accuracy of sentiment analysis.

3. BERT MODEL
The architecture diagram of the BERT neural network model introduced in this article is shown in Figure 1. Because BERT abandons the cyclic structure of RNN,

CNN and other networks, but uses the Transformer structure based on the Attention mechanism, which effectively solves the thorny long-term dependency problem in NLP. Among them, E1, ..., En represent the input vector of the model, the two-way Transformer model in the middle is responsible for training and extracting the feature information in the input vector, and T1, ..., Tn are the output vectors obtained after the model feature extraction is trained.
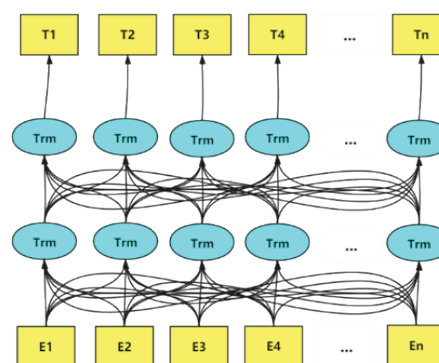
Figure 1. BERT model architecture diagram

3.1 EMBEDDING
The input coding vector of BERT is the unit sum of 3 embedding feature vectors. As shown in Figure 2, the three word embedding feature vectors are: Token Embedding, Segment Embedding, and Position Embedding.

Token Embedding is a word vector. The first word is the CLS mark, which indicates the beginning of a sentence, and the last word is the SEP mark, which is used to indicate the end of a sentence.

Segment Embedding is used to distinguish two sentences, such as whether B is the following of A.

Position Embedding refers to encoding the position information of a word into a feature vector, and it is also a crucial part of introducing the word position relationship into the model. However, as the training depth of the model increases, the influence of the location feature vector on the training effect is gradually reduced.
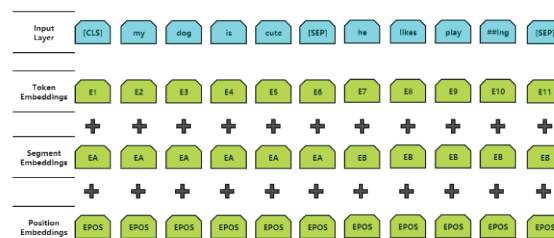
Figure 2. BERT pre-training model word vector composition

3.2 ENCODER IN TRANSFORMER
The bottom layer of the BERT model uses the Encoder part of the Transformer model as a feature extractor for pre-trained text feature extraction. But the Transformer model based on the Attention mechanism is a Seq2Seq model, and BERT pre-training aims to learn the input information and only needs to learn the text features. Therefore, BERT only extracts the Encoder structure in the Transformer model, that is, the encoder part. Its

structure is shown in Figure 3.
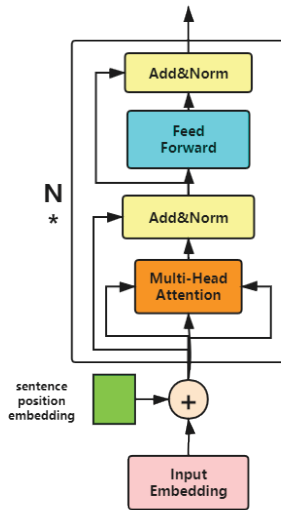
Figure 3. Encoder structure diagram

The Encoder in Transformer is composed of N=6 identical Layers, and each Layer is composed of two sub-layers, which are a multi-head self-attention mechanism and a fully connected feed-forward network. Each sub-layer has added residual connection[14] and normalization[15]. Therefore, the output of the sub-layer can be simply expressed by formula (1).

$$sub\_layer\_output = LayerNorm(x + (SubLayer(x))) \quad (1)$$

In order to better extract and learn the features in the text information, the Transformer model adopts a self-attention mechanism, and optimizes the Attention method of dot multiplication in its Attention score calculation, and proposes scaled dot-product attention for Attention For the calculation of the score, the calculation formula is shown in formula (2).

$$Attention(Q, K, V) = softmax\left(\frac{QK^T}{\sqrt{d_k}}\right)V \quad (2)$$

Among them, $\sqrt{d_k}$ is the scaling factor, and its main function is to prevent the dot multiplication from being too large. After the softmax, the gradient is too small, which is not conducive to back propagation.

Since a single self-Attention cannot learn all the information in the input vector, the Transformer model uses multiple self-Attentions to form multiple subspaces, allowing the model to pay attention to different aspects of information, and finally merge these multiple subspaces To form the output of Multi-Head Attention. The calculation formula is shown in formulas (3) and (4).

$$head_i = Attention(QW_i^Q, KW_i^K, VW_i^V) \quad (3)$$

$$MultiHead(Q, K, V) = Concat(head_1, head_2, \ldots, head_h)W^o \quad (4)$$

Among them, W_i^Q, W_i^K, W_i^V are training parameter matrices, which are obtained through learning.

3.3 OUTPUT LAYER

After training through the BERT model, the input word vector is linearly transformed, and the output is a vector representation that integrates the semantics of the entire text information. After passing through the fully connected layer, the output result is input to the softmax classification layer to obtain the emotional Classified information. The model is shown in Figure 4.
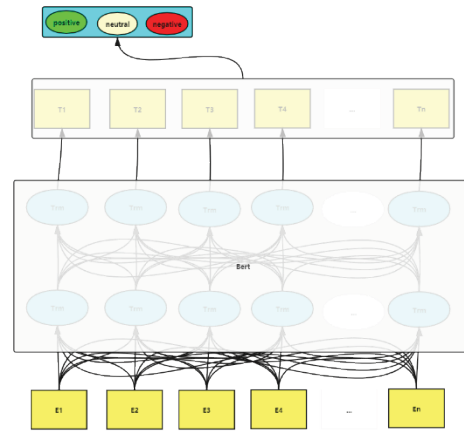
Figure 4. BERT sentiment classification model

4. EXPERIMENT AND ANALYSIS

4.1 DATA SET

The experimental data in this article uses two different types of information text. The first experimental data is the review information published by users on the restaurant environment, taste, service, etc. on the public comment platform. The size of the data set is 29, 000. Each review information includes ratings and comments., Timestamp, user ID, etc. In order to protect user privacy, this article performs desensitization operations on data preprocessing, removes irrelevant and private information, and retains ratings and comments. As a comparative experimental data set, data set 2 selects the discussion data of hot topics by users of the Weibo platform, the data and the size are 15, 120, and the desensitization and preprocessing operations are also performed on it. The emotional polarity of the two data sets after processing is divided into three categories: positive, neutral, and negative. The ratio of the training set to the test set of the data set is roughly 7:3. The polarity distribution of the data set is shown in Table 1.

Table 1. Data set polarity distribution

DataSet		positive	neutral	negative
Dianping	Train	6921	7013	6982
	Test	3079	2987	2018
WeiBo	Train	3487	3518	3399
	Test	1534	1645	1537

4.2 HYPERPARAMETER SETTINGS

In this article, the baseline models involved in the experiment are LSTM and BiLSTM. In order to eliminate the influence of baseline model parameters on accuracy, the same model parameters are used. Due to the limitation of the performance of the experimental equipment, the BERT model uses the BASE Chinese pre-training model officially released by Google based on Chinese Wikipedia training. Its hyperparameters are: BERTBASE L=12, H=768, A=12, and the total number of parameters is 110M; Other hyperparameters are shown in Table 2.

Table 2. Experimental hyperparameters

hyperparameters	Set size
Vector dimension	200

Batch size	64
Dropout	0.4
Batch size(BERT)	32
Learning rate (BERT)	2e-5

4.3 DISCUSSION AND ANALYSIS OF RESULTS

The experimental data results of the baseline model and the BERT model introduced in this article are shown in Table 3. It can be seen from the table that the model introduced in this article has different degrees of performance improvement in sentiment analysis compared to the baseline model.

Table 3. Experimental accuracy of different models

Model	Dianping	WeiBo
LSTM	0.712	0.721
BiLSTM	0.756	0.762
LSTM+Attention	0.780	0.797
BiLSTM+Attention	0.804	0.816
BERT	0.873	0.895

Experimental data shows that the accuracy of the BERT model introduced in this article can reach 87.3% and 89.5% on the comment dataset and the Weibo dataset, which is a significant improvement compared to the baseline model. The BERT model uses the Encoder in Transformer The structure, abandoning the cyclic structure, thereby shielding the reliance of the cyclic network on the timing, through the multi-layer self-Attention mechanism to learn the information contained in the text from as many aspects as possible. Thereby improving the learning efficiency and accuracy of the model.

5. CONCLUSIONS AND PROSPECTS

The work done in this paper is based on the BERT neural network model, combined with the Multi-Head Attention mechanism to fully learn the text corpus. Using the characteristics of this model can well eliminate the dependence of the text prediction on the training sequence, thus well overcoming the traditional loop. The dependence of neural networks or convolutional neural networks on context improves the efficiency of model learning and improves the accuracy of sentiment analysis to a certain extent.

Although the work done in this article has some improvement and progress compared with the baseline model, there are still some problems. First, when the data is pre-processed, because the emotional tendency of the text is calculated by the user's rating of various services provided by the merchant, future considerations The scoring algorithm is weighted to achieve a good and fair sentiment tendency; secondly, since the judgment of the sentiment tendency is calculated based on the user's various ratings, in the future, the emotional tendency score calculation algorithm will be used to divide multiple types of emotions and improve the model The generalization ability.

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Effect of Nano Zero Valent Iron on The Growth of Ryegrass in Tailings Pond

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Abstract: Vegetation is an important part of improving the environment around the tailings pond. In order to promote its growth, nano zero valent iron, as a nano material, plays an important role in the plant growth in the tailings pond environment. This experiment will choose ryegrass as the representative of its plants to explore the effect of nano zero valent iron on the growth of ryegrass under adverse conditions. By observing the effect of nano zero valent iron on the growth trend of ryegrass, it is determined that ryegrass and nano zero valent iron can jointly repair the environment of tailings pond. The effects of different concentrations of nano zero valent iron on the growth stage of ryegrass were studied in the harsh environment of mines, Through the analysis of the environmental characteristics of the tailings soil, the limiting factors of plant growth were found, and the growth status of ryegrass seedlings, the determination of heavy metal ions in the tailings and the determination of microorganisms in the tailings were observed. The results show that the concentration of nano zero valent iron of 100 mg/kg and 300 mg/kg can promote the growth of ryegrass, and the growth of 300 mg/kg is better than that of 100 mg/kg, while the concentration of nano zero valent iron of 500 mg/kg can inhibit the growth of ryegrass on vanadium titanium magnetite tailings. With the increase of the concentration of nano zero valent iron in soil, the growth of ryegrass changed from high to low. Considering the economic benefits, the concentration of nano zero valent iron is 300 mg/kg, which is the best way to restore the tailings and the surrounding ecological security environment.
Key words: Nano-Zero-Valent Iron; Ryegrass; Heavy Metal Pollution; Tailing Pond

1.INTRODUCTION

1.1 Research background and significance

Mining economy has made great contribution to China's economic construction. However, with the development of mineral resources, hundreds of millions of tons of tailings have been produced. These abandoned tailings occupy a large amount ofland, and the residual toxic substances destroy the growth conditions of plants. There is no grass on the tailings pond, and the dust is flying. The surrounding environment is seriously polluted and damaged. By studying the effect of nano zero valent iron on the growth of Ryegrass in different stages under drought conditions, the way to recover the vegetation in the tailings area as soon as possible was found to better control the pollution and damage of the ecological environment in the tailings area.

1.2 Research status at home and abroad

1.2.1 Application status of nano zero valent iron at home and abroad

In practical projects, nano zero valent iron has also been widely used in many countries, such as the United States of America's pairs environmental company in recent years has completed a number of contaminated sites such as tetrachloroethylene, ethylene oxide, dichloroethylene and nano zero valent iron groundwater pollution remediation projects. Since the 1980s, zero valent iron as an effective dechlorination reducing agent has gradually become a research hotspot.

Sun Yun-man [1]use nano zero valent iron to study the removal of organic pollutants in water. Jie Zhu [2] and others found that Fe0 can degrade water into phenol, which is conducive to further biodegradation, so as to effectively remove pollutants in water. I.K. Battisha, H.H[3]and others coated F-127 on the surface of NZVI particles. The results showed that the dispersion and oxidation resistance of the synthesized NZVI particles were significantly improved, and the chromium removal rate was increased by 37.56%. In addition, F-127 will gradually decompose into environmentally friendly small molecular substances in water, which will not cause secondary pollution to the environment. Through the above research of nano zero valent iron at home and abroad, the analysis shows that: nano zero valent iron is widely used in the removal of heavy metals in water, but the deficiency is the research on the pollution of heavy metals in water, so this research explores the effect of nano zero valent iron on the growth of plants under drought stress to see whether the treatment of heavy metal pollution can achieve joint remediation. This project inherits the advantages of Wang Xiangyu and others, but it is different from the carrier selected. In this project, carbon based materials are used as the surface modification of nano zero valent iron particles to improve their performance and avoid secondary pollution in the modification process.

1.2.2 Current situation of soil pollution control with ryegrass at home and abroad

In recent years, phytoremediation has become an important remediation technology of soil pollution, and it has been widely studied at home and abroad in the treatment of heavy metal contaminated soil. Ryegrass is a kind of annual monocotyledonous plant of Poaceae, which has the characteristics of fast growth, more tillers, developed fibrous roots and large biomass.

In the study of Michael W.H. [4], the effects of J6 bacteria ryegrass and EDTA ryegrass on remediation of Pb and Cd contaminated soil were compared, and the enhanced effect of J6 bacteria on Pb and Cd uptake by ryegrass was more obvious than EDTA. Xiao Chunqiao[5] and others studied the ecotoxicological effects of single and combined pollution of polycyclic aromatic hydrocarbons (PAHs) and sulfur dioxide (SO2) on soil plant system through indoor cultivation experiments with wheat and ryegrass as test plants. The effects of PAHs and SO2 on the germination and growth of wheat and ryegrass seedlings, as well as the soil enzyme activity, plant antioxidant enzyme system, soil microbial biomass and soil microbial community diversity in ryegrass soil system were studied. Xiao Chunqiao[5]and others studied the ecotoxicological effects of single and combined pollution of polycyclic aromatic hydrocarbons (PAHs) and sulfur dioxide (SO2) on soil plant system through indoor cultivation experiments with wheat and ryegrass as test plants. The effects of PAHs and SO2 on the germination and growth of wheat and ryegrass seedlings, as well as the soil enzyme activity, plant antioxidant enzyme system, soil microbial biomass and soil microbial community diversity in

Table 1. basic physical and chemical properties of tailings ryegrass soil system were studied.

In his research, he did not go further and more practically studied the effect of combining ryegrass and EDTA ryegrass on the remediation of Pb and Cd contaminated soil system. Zhang Jun's research is more practical, and has been studied on the current ecological problems of mines. However, the simulation environment is not specific. This project is specific to the mine environment of tailings pond.

At present, the ecological deterioration of mines is very serious today, the research on the practical application of soil remediation technology is very important. This paper draws on the experience of the predecessors, and takes carbon based materials as the carrier, and applies the nano-zero valent iron to ryegrass to control the mine environment of tailings pond, and to explore new and effective new technologies to effectively repair the mine ecology.

2.MATER AND METHOD

2.1Materials

The basic physical and chemical properties of the tested tailings are shown in Table 1, and the nutrient content classification standard is shown in Table 2.

soil	PH	Alkali hydrolyzed nitrogen	Available phosphorus	Available potassium	Cd	Cr	Cu	Pb	Company: mg/kg^{-1} Zn
tailings	9.02	11.6	0.701	57.1	2.55	592	293	18.9	759

Table 2. Classification standard of soil nutrient content

	very rich	rich	secondary	lack	very lack	Company:mg/kg^{-1} Extremely deficient
Alkali hydrolyzed nitrogen	*>150*	*120-150*	*90-120*	*60-90*	*30-60*	*<30*
Available phosphorus	*>20*	*20-40*	*10-20*	*5-10*	*3-5*	*<3*
Available potassium	*>200*	*150-200*	*100-150*	*50-100*	*30-50*	*<30*

It can be seen that the tailings are alkaline. Compared with the national soil nutrient content classification standard, the soil nutrient content is very low, and the tested soil is in the extremely deficient level.

2.2 Method

Figure 2 .Ryegrass planting

The tailings are vanadium titanium magnetite. Taking the blank control group, low, medium and high concentration gradient as a group, taking 200mg/kg as the gradient, three concentration units of 100mg/kg, 300mg/kg and

500mg/kg were set. In order to ensure the accuracy of the experiment, four groups of the same experiment were set at the same time. As shown in Figure 1.

Taking into account the growth cycle characteristics and speed of gramineous plants, we took three days as a cycle for sampling, planted three pots of plants in each small unit, and took the average value of each index to ensure the accuracy of the experiment. Each pot contains 0.5kg of air dried tailings passing 2mm sieve, and the surface is covered with 4cm mixture of nano zero valent iron and tailings (passing 2mm sieve). The plants are harvested after 60 days of cultivation. During the cultivation period, the soil water content is kept at 60% of the saturated water content, and the plant growth is observed by taking photos regularly. Tailings samples are collected after harvest.

2.3.1Experimental scheme and implementation process of ryegrass seedling germination and Seedling Growth

Plant height of ryegrass is the main component of biomass, so it is important to study the influencing factors of plant height of ryegrass. During 8 weeks of ryegrass cultivation, the growth of plants was observed. Five plants were randomly selected from the middle 0.5 m section of each row, and the seedling length was measured by tape measure. The root length of most plants in each pot was

measured, and the average value was taken. There is random environmental variation in the phenotypic mean difference of parents, so the environmental mean difference caused by random environmental variation should be removed when calculating the genetic mean difference.

The experimental data were collected by Excel software and plotted by origin9.0 software.
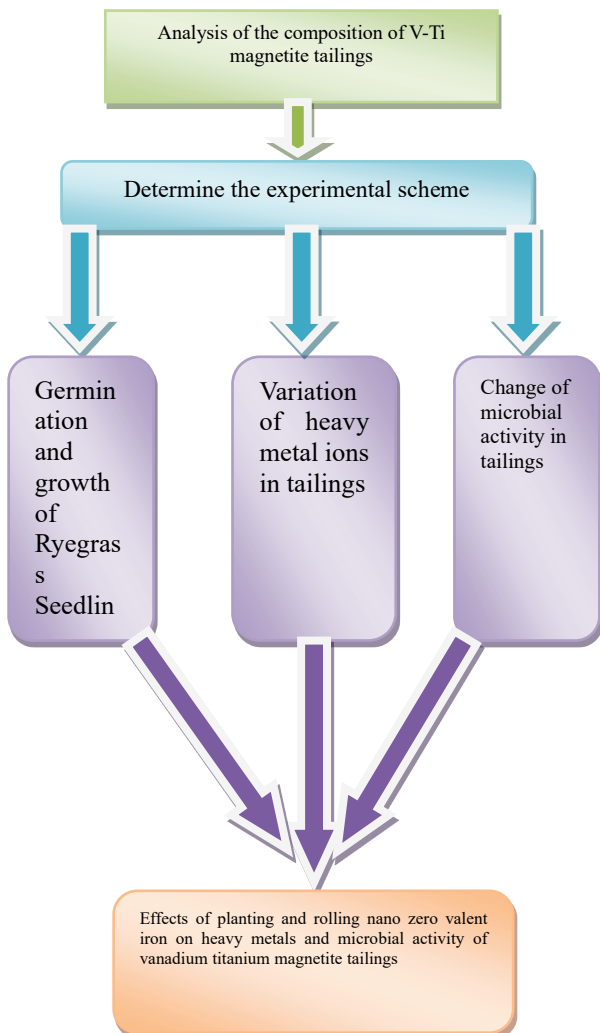
Figure 3． technology roadmap

2.3 Analysis method

2.3.2 Experimental scheme and implementation process for determination of heavy metal ions in tailings

1) Total extraction of heavy metals from Tailings

Weigh 2.000g dried tailings through 100 mesh sieve and put them into a polytetrafluoroethylene tube, add aqua regia and use a microwave digester for digestion. The digestion solution was diluted to 25ml with 2% nitric acid and determined by inductively coupled direct reading spectrometer.

2) NH_4NO_3 extraction method was used to determine the effective state of heavy metals in tailings

Weigh 2.000 g of air dried tailings in a 50 ml centrifuge tube, add 20 ml of NH_4NO_3 solution, vibrate for 2 h at 4000 r·min^{-1}, centrifuge for 20 min, filter into a 50 ml plastic bottle, and determine by inductively coupled direct reading spectrometer.

3) BCR extraction method was used to determine the speciation of heavy metals in tailings

a. Weigh 0.4g tailings in a 50ml centrifuge tube, add 16ml of 0.11mol/l acetic acid, vibrate at 4000R · min, centrifuge for 20min, filter the supernatant into a 50ml plastic bottle, add 8 ml secondary deionized water to the remaining residue, vibrate at 4000r· min^{-1}, centrifuge for 20min, filter in the above plastic bottle, and store at 4 ℃ for testing.

b. Add 16 ml of 0.1 mol/L hydroxylamine hydrochloride to the residue in the first step, shake the centrifuge tube to disperse the residue, and shake, centrifuge and filter according to the method in the first step.c. The influence of lunar oblateness on Chang'e-3 soft landing is not considered.2

c. Add 4 ml of 8.8 mol/L hydrogen peroxide to the residue in step 2, place it at room temperature for 1 h, then take a water bath at 85 ° C until it is nearly dry, cool it, repeat the above operation, then add 20 ml of 1 mol/L ammonium acetate, and shake, centrifuge and filter according to the method in step.

d.The residue extracted in the third step was washed into a 50ml polytetrafluoroethylene crucible with secondary deionized water, the water was driven away by an electric heating plate at low temperature, HF, HClO$_4$ and HCl were added for digestion until the solution was nearly clear, and the secondary deionized water was used to fix the volume in a 25ml colorimetric tube for determination.

2.3.3 The plate counting method was used for the determination of microorganisms in tailings

Weigh 5.0000g tailings, put them into a triangular flask with glass beads and 45ml sterile water, vibrate at 150 r ·min^{-1} for 10 min to obtain 10^{-1} tailings diluent, then take 0.5ml tailings suspension into test tube, and then add 4.5ml sterile water to make 10^{-2} tailings diluent, and make tailings diluent repeatedly. The bacteria took 0.1ml dilution of tailings with concentration of $10^{-3}, 10^{-4}, 10^{-5}$ and then put them into beef peptone medium, respectively took 0.1ml dilution of Actinomycetes with concentration of $10^{-2}, 10^{-3}, 10^{-4}$ and then put them into Gao's No.1 medium, respectively took 0.1ml dilution of tailings with concentration of fungi with concentration of $10^{-1}, 10^{-2}, 10^{-3}$ and then put them into Martin Bengal red medium, and each dilution was connected with three plates. Select the plate with the number of colonies in between 30 and 300 calculate according to the following formula:

The total number of bacteria is the same as the average number of colonies in several replicates of dilution degree.

total number of bacteria/g

＝Average colony number of several replicates at the same dilution × dilution multiple/tailing

3.RESULTS AND DISCUSSION

3.1 Growth data and results of Ryegrass

Observe the plant height, and the change of plant height with time is shown in Fig. 3 and Fig. 4.

As shown in Figure 3, three weeks is the fast growth period of ryegrass.

As shown in Figure 4, after 4 weeks, it was in a state of slow and steady growth. Ryegrass with 500 mg/kg nano zero valent iron grew faster in the early stage, but the

leaves began to turn yellow in the third week, and nearly stopped growing after the fourth week; Ryegrass with 100 mg/kg nano zero valent iron began to grow at the tip of the leaves in the fourth week; second, it turned yellow at the tip of the leaves from the fourth week, and the upper half of the leaves turned yellow in the sixth week; The Ryegrass with 300 mg/kg nano zero valent iron has been growing well, especially after the third week, and it is still growing rapidly until the sixth week. As for the plant height and its components, the difference between the results of this study and those of parental selection needs to be further studied.
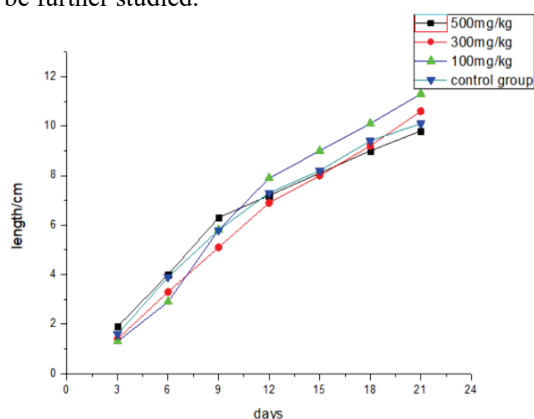
Figure 4.Variation of plant height with time in the first three weeks of Ryegrass
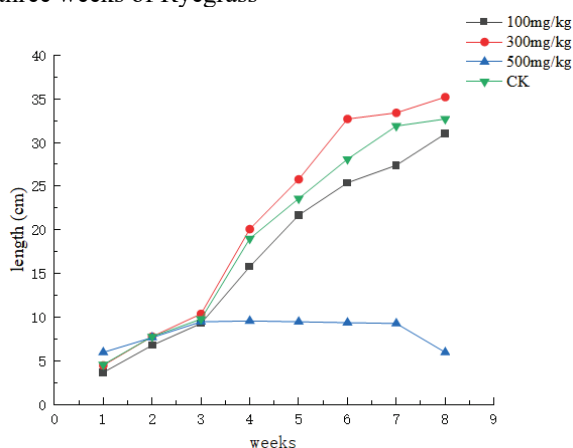
Figure 5.Variation of plant height of Ryegrass with time in 8 weeks

3.2 Data and results of heavy metal ions in tailings

Figure 6.Effect of adding nano zero valent iron to tailings on available Cd and Cu

3.3 Data and results of microbial activity changes in tailings

The plate counting method was used to measure the number of three groups of soil microorganisms (bacteria, fungi, actinomycetes). The changes of the number of bacteria, fungi, actinomycetes and the total number of microorganisms in the soil added with 100 mg/kg, 300 mg/kg and 500 mg/kg nano zero valent iron after 8 weeks and the control soil were compared. The influence of reclamation of different concentrations of nano zero valent iron on soil microorganisms was analyzed Law.

3.3.1 Horizontal distribution of microbial biomass in soil profile

Table 3. number of microorganisms added with different nano zero valent iron in soil (Company:×104 individual /g·Dry soil)

number	Sample plot	Bacteria	Bacteria	fungus	total
1	100mg/kg	383.26±1.72	97.96±0.60	5.70±0.01	411.85±2.31
2	300mg/kg	964.52±2.14	42.83±2.85	6.09±0.03	972.86±2.89
3	500mg/kg	222.53±3.19	12.91±3.85	5.27±0.04	251.23±3.64
4	CK	751.82±2.78	87.14±2.36	6.11±0.06	756.85±2.91

The results of soil bacteria, fungi and actinomycetes are shown in the table 3. The order of quantity of three kinds of soil microorganism is: bacteria > actinomycetes > fungi. Due to the vigorous metabolism and rapid propagation of bacteria, the number of bacteria is absolutely dominant in the total amount of microorganisms, and it is the most important participant in the life activities of

microorganisms in soil. Therefore, the change trend of the number of bacteria is basically the change trend of the total number of microorganisms.

Actinomycetes can adapt to alkaline and arid environment, decompose most compounds that fungi and bacteria cannot decompose, and participate in the transformation of refractory substances. Therefore, the number of

actinomycetes is more in the soil. Previous studies have shown that when the vegetation biomass is large and the nutrient level is high, the competition ability of slow growing actinomycetes is weak; when the vegetation biomass is small, the competition pressure is reduced, and actinomycetes are dominant. Therefore, the number of actinomycetes increased in the severely damaged soil environment. Fungi are generally resistant to acid and are the main bacteria for organic matter transformation in acid soil. In this study, the soil was weakly alkaline, resulting in the least number of fungi among the three species. When the concentration of 500 mg/kg was added into the soil, the microbial biomass decreased significantly. This study also found that the number of microorganisms in the soil added with nano zero valent iron was significantly larger than that in the control soil, which was due to the inhibition of microbial growth by heavy metals.

Heavy metals in soil can also affect the growth and metabolism of microorganisms. Related studies have shown that heavy metals can inhibit the growth of bacteria, fungi, actinomycetes and various physiological groups in soil. This study found that the number of bacteria in soil increased with the increase of heavy metal concentration; the number of fungi did not respond to the toxicity of heavy metals; heavy metals promoted the growth of actinomycetes in soil.

3.3.2 Vertical distribution of microbial biomass in soil profile
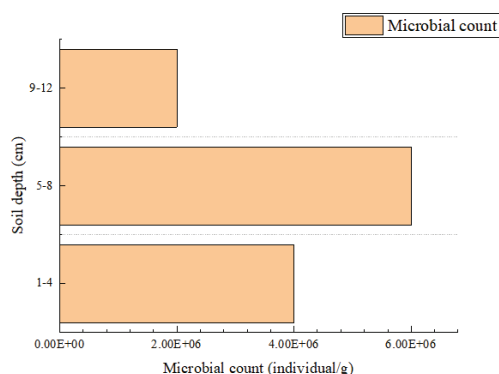
The vertical distribution of soil microorganisms in the soil profile was 5 ~ 8cm > 1 ~ 4cm > 9 ~ 12cm. It shows that the distribution of soil microorganism quantity is closely related to soil water content and nutrient content, which also explains that sufficient soil nutrient is the necessary condition to maintain the reproduction and healthy growth of most soil microorganisms.

4. CONCLUSIONS

Aiming at the current situation of barren tailings soil, low water content, poor water and fertilizer conservation, and difficult vegetation growth, this paper designs a 6-level combination experiment of 1 factor (nano zero valent iron concentration) in simulated tailings soil, and the nano zero valent iron concentration is three additive gradients of low concentration, high concentration and high concentration. Ryegrass is sown in the soil. The main conclusions are as follows: 1

1) Through the experiment, the growth potential of Ryegrass in the soil with three concentrations of nano zero valent iron and without nano zero valent iron was analyzed, and it was concluded that nano zero valent iron had an effect on the growth of Ryegrass in tailings pond. In addition, compared with the effect of different concentrations of nano zero valent iron (100 mg/kg, 300 mg/kg, 500 mg/kg) on the growth of Ryegrass in tailings area, the treatment of nano zero valent iron (300 mg/kg) is more suitable.

a. Through the determination of heavy metal ions in tailings, it was found that chromium inhibited the growth and development of plants, and the uptake of chromium by plants increased with the increase of the concentration of nano zero valent iron. High concentration would inhibit the uptake of chromium by ryegrass. Adding nano zero valent iron to soil, in a certain range of concentrations, such as 100 mg/kg and 300 mg/kg of nano zero valent iron, can promote the absorption of Cu by ryegrass roots, but higher than a certain concentration, such as 500 mg/kg of nano zero valent iron, can inhibit the absorption of Cu by ryegrass roots. It can be seen that higher concentration of nano zero valent iron and ryegrass have higher chromium repair ability. The standard electrode potential of iron is low. Theoretically, iron can reduce most heavy metal elements (except Ba, Zn and CD). However, in the actual treatment process, ordinary zero valent iron has a certain treatment effect on some heavy metal elements, because the reaction speed is very slow when the standard electrode potential of zero valent iron is close to heavy metal elements. The nano zero valent iron has a very high specific surface area, which greatly increases the number of surface active sites, greatly increases the reaction rate, and realizes the reduction of most heavy metals. Nano zero valent iron is reductive and adsorptive to heavy metals. It can reduce the harmful valence of heavy metals to environmentally friendly valence, reduce the content of heavy metals in soil, and reduce the damage of plants in the process of growth. The reduced heavy metals are one of the elements needed by plants, which can promote the growth of plants. In addition, due to the extremely high activity of nano zero valent iron, it can react with solvent water to produce a large amount of H2 and oh - on the surface of particles, which makes the acid-base properties of the surface change dramatically and forms complex ions with strong flocculation, such as Fe (OH) 2 +, Fe (OH) +, so that heavy metal elements can form coprecipitation on the surface of particles and be removed; the iron element after chemical reaction can be used as plant Grow fertilizer to promote plant growth.

b. The number of bacteria, fungi and actinomycetes in the tailings with the concentration of nano zero valent iron of 300 mg/kg increased significantly. The concentration of nano zero valent iron at 300 mg/kg was better than that at 100 mg/kg and 100 mg/kg.

That is to say, the concentration of nano zero valent iron of 100 mg/kg and 300 mg/kg can promote the growth of ryegrass, and 300 mg/kg is better than 100 mg/kg, while the concentration of nano zero valent iron of 500 mg/kg can inhibit the growth of ryegrass on vanadium titanium magnetite tailings. With the increase of the concentration of nano zero valent iron in soil, the growth of ryegrass changed from high to low. Considering the economic

benefits, the concentration of nano zero valent iron is 300 mg/kg, which is the best way to restore the tailings and the surrounding ecological security environment.

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A Novel Compensation Mechanism Detection Method Based on Brain Metabolic Connectivity in AD And MCI

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Abstract: Metabolic connectivity (MC) based on FDG-PET images provides insight into effectively detecting pathological changes in brains of Alzheimer's disease (AD) and Mild cognitive impairment (MCI) before the occurrence of brain atrophy. Nonetheless, few studies have explored the compensation mechanism in the resting state based on metabolic connectivity. Here, a novel method was proposed to estimate the metabolic connectivity of brain regions for PET data, then to detect the compensation mechanism by constructing the brain metabolic connectivity network based on graph theory. The results revealed that this method could effectively excavate the compensation network and metabolic attenuation network of AD and MCI patients. Additionally, several metabolic connectives extracted from metabolic attenuation networks were identified to be potential biomarkers for AD and MCI diagnosis. The areas under the curve (AUC) values of biomarkers are 0.895 and 0.825 for AD and MCI, respectively. In addition, it is the first time to discover that the contralateral compensation and the compensation for DMN simultaneously existed in the brain of AD and MCI. In general, this study excavates the biomarkers with potential value for the diagnosis of AD and MCI as well as providing a novel insight for the study of the compensation mechanism of neurodegenerative disorders.
Keywords: Alzheimer's disease; Mild cognitive impairment; PET; Metabolic connectivity; Compensation mechanism

1. INTRODUCTION

Alzheimer's disease is a frequently occurring neurodegenerative disease and the most common form of dementia [1]. In addition to memory impairment, AD patients also have dysfunction in language, personality, judgment, vision, association, sensation and motor function [2]. Mild cognitive impairment (MCI) has subjective memory impairment but does not meet the criteria for dementia, which is considered the precursor of AD, and about 10% to 15% of MCI will develop into dementia every year [3]. However, cognitive decline in patients with AD is a slow and gradual process, and the transition from normal cognitive status to clinically identifiable AD can take many years. Early identification of AD and MCI can guide physicians to take more effective treatment measures at an early stage. Positron emission tomography (PET) data provides the possibility for early diagnosis of AD and MCI. Moreover, fluoro-deoxyglucose (FDG)-PET data can be used for early diagnosis of AD and MCI with high accuracy and sensitivity when there are no abnormalities in the shape and volume of brain regions, owing to its perfect performance on identifying changes in the molecular metabolism of the brain [4, 5].

Previous studies have revealed that there are disrupted local network connectives and metabolic attenuation in the brains of patients with AD or MCI [6, 7]. For example, Santi S. D. et al. showed that the hippocampus of AD and MCI patients occurred significant hypometabolism and volume reduction in PET images [8]. What's more, significantly decreased glucose metabolism also appeared in other regions including bilateral precuneus, temporal lobe, superior frontal, cingulate, fusiform gyrus, angular, inferior parietal lobe, middle frontal gyrus, left anterior central and para-hippocampus, right superior frontal gyrus and thalamus in AD patients. In addition, MCI showed a slight decrease in glucose metabolism, but with similar regional distribution [9]. The evidence illustrated the importance and necessity of researches on defining a biomarker from so much differential metabolic connectives, which is an effective tool to assist diagnosis [10]. Unfortunately, it is limited and unreasonable to consider changes in only one brain region due to there is a flow of information between the brain regions [11]. Therefore, the doubt that needs to be addressed crucially is how to define the biomarker, which can represent the metabolic connectivity pattern of the whole brain with several metabolic connectives of brain regions and diagnose patients with high accuracy.

Furthermore, there was an alternative network in the brain of AD patients to compensate for the damaged functions [12]. When some brain regions were damaged, the activity of some brain regions would enhance to compensate for the functions of the damaged brain regions. An increasing body of literature on the compensation mechanism is mainly based on the task data to detect the compensation area. For instance, increased prefrontal activation reflects the compensation mechanism for AD in memory tasks [13]. Only few researches explored the compensation mechanism of the brain in resting state. Caroli A et al. proposed that the brains of AD patients had functional compensation in the hippocampus, bilateral amygdala, posterior cingulate cortex and other regions in resting state [14]. However, studies on the resting state compensation network only detected the enhanced activity in a brain region or the enhancement of several two-brain regions'

metabolic connectives, while the comprehensive functional compensation mechanism network detection of AD or MCI in resting state when DMNs are damaged has not yet been elucidated.

In this study, we proposed a novel method of compensation mechanism detection to make full use of FDG-PET data to calculate the metabolic connectives in brain regions. Then, the differential networks of metabolic connectives among AD, MCI, and NC were built to dig out the commonness and specificity in lesions. Furthermore, we explored the compensation mechanism in resting state of AD and MCI patients. Finally, our study verified the potential of multi-brain regions' metabolic connectivity as a biomarker for AD and MCI diagnosis, and it can be detected to supplement and enhance the specificity of clinical diagnosis.

2. MATERIALS AND METHODS

2.1 DATA ACQUISITION AND PREPROCESSING

18F-FDG PET image data were downloaded from Alzheimer's disease neuroimaging initiative (ADNI) database (http://adni.loni.usc.edu/), which is a longitudinal multicenter study on developing clinical, imaging, genetic, and biochemical biomarkers for the early detection and follow-up of AD [15, 16].

In this study, 42 AD subjects, 42 MCI subjects and 42 normal control subjects were selected to match the demographic information of the three types of subjects, eliminating the influence of covariates such as age, gender, and education. The demographic information is shown in table 1.

Table 1. Demographics information of AD MCI patients and NC.

Subject type	Number	Age	Female/Male
AD	42	78.7±6.2	20/22
MCI	42	78.8±4.9	21/21
NC	42	78.8±4.2	20/22

Note: No significant differences (p<0.05) were observed in age, sex between three groups.

Spatial normalization and smoothing were applied to all PET images by using CapTk software (E) [17]. All PET images were normalized onto the PET template derived from normal control, and then smoothed with a Gaussian filter (8 mm full width at half maximum). In order to locate the lesions of AD patients, metabolic connectives were calculated based on brain regions; the differential degree of metabolic connectives was used to measure the degree of brain lesions in patients with AD or MCI. Therefore, the images were subdivided into 116 brain regions using AAL atlas after preprocessing. The voxel values of each brain region were extracted to form 116 metabolic vectors, which were used to calculate the metabolic connectives of brain regions.

2.2 SLIDING AVERAGE (SA) PEARSON CORRELATION

For feature extraction, the intensity of the metabolic connectives between two brain regions were calculated by the improved Pearson correlation coefficient. Pearson correlation coefficient, also known as product moment correlation coefficient (PPMCC), is used to measure the

linear correlation between two variables, the equation can be written as equation (1).

$$r_{XY} = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}} \quad (1)$$

Where r represents the correlation coefficient, X and Y represent two vectors respectively, and N is the length of X or Y. Assume X and Y are the metabolic vectors of brain regions and r represent the metabolic connectivity of two brain regions.

Pearson correlation coefficient is often used to calculate the correlation between time series of brain regions of fMRI data, which is defined as the brain functional connectivity [18]. However, it is unreasonable to calculate the correlation coefficient of time series for PET images due to the low time resolution. Pearson correlation coefficient can calculate the correlation of two vectors with the same dimension, but the aim of this study is to calculate the similarity of brain regions in spatial metabolism, and the correlation coefficient of two vectors with different size need to be calculated. Therefore, a novel measure method of Pearson's correlation coefficient is proposed to calculate the correlation of brain region vectors with different dimensions.

The idea is derived from sliding time window method for calculating dynamic brain functional connectivity using fMRI data [19], and the equation can be written as equation (2)

$$avgr = \frac{\sum_{i=1}^{N-M+1}(\frac{\sum XY_i - \frac{\sum X \sum Y_i}{M}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{M})(\sum Y_i^2 - \frac{(\sum Y_i)^2}{M})}})}{N-M+1} \quad (2)$$

Where X is the shorter vector, and Y is the longer vector, N is the length of Y, M is the length of X, avgr represents the correlation coefficient of the two brain regions. $Y_i = Y(i, i + M - 1)$.

First, the top element of the two vectors was aligned and calculate the Pearson correlation coefficient of X and $Y(1, M)$. Then slide vector X down with the step size of one along Y and calculate the Pearson correlation coefficient of X and $Y(2, M + 1)$. This process needs to be repeated until the bottom of the two vectors were aligned and calculate the Pearson correlation coefficient of X and $Y(N - M + 1, N)$. Finally, all the Pearson correlation coefficients calculated during the process were averaged as metabolic connectivity between the two brain regions.

The correlation coefficient of the two brain regions was calculated using the above methods, which were defined as the metabolic connectivity of the brain regions. We calculated the metabolic connectives for each pair of brain regions forming the metabolic connectivity matrix, and the upper triangle was taken as the metabolic connectivity feature matrix.

2.3 FEATURE SELECTION

After obtaining the metabolic connectivity matrix by using SA Pearson correlation coefficient, the metabolic connectives with significant difference between AD or MCI patients and NC are obtained by T test. There are two groups of experiments including examining the differences between AD and NC and examining the

difference between MCI and NC with the same feature screening process. The differential test between AD and NC was taken as an example below.

T test was applied to screen the MC with significant P value less than 0.05 and to determine those specific positions in the feature matrix. The MC values were lined up at the same location for all AD subjects and NCs to form the metabolic connectives of the population at a certain location. Finally, T test was performed on the eigenvectors that represent the metabolic connectives at the same location of all AD or NC to obtain the remarkable metabolic connectives. Furthermore, SVM-RFE method was applied to verify the validity of features obtained by T test.

2.4 GRAPH CONSTRUCTION

Metabolic connectives obtained from T test were used to constitute the MC differential matrix of AD by subtracting the metabolic connectivity matrix of normal control from the matrix of AD. Before constructing the differential graph, the remarkable connectives in MC differential matrix are divided into enhanced and weakened groups verse to NC, which are used to construct the MC enhanced network and MC attenuation network to detected compensation mechanisms and pathological mechanisms, respectively.

During the construction of the differential graph of MC, the significantly differential brain regions in MC were numbered. A brain region was defined as a node in the network, then the MC with differences in brain regions was taken as the edge connecting the two brain regions, and then the MC intensity was taken as the weight of the undirected edge. The differences between AD and NC subjects or MCI and NC subjects were both constructed by the method above.

2.5 MINIMUM SPANNING TREE

The minimum spanning tree (MST) is the tree with the minimum sum of weights in a connected weighted undirected graph. In a given undirected graph G = (V, E), (U, V) represents the edge connecting vertex u to vertex v((u, v)∈E), w(u, v)represents the weight of this edge, if there exists a subset of E named T (T ⊆ E) and (V, T) is a tree, so that w(T) is minimized, then T is the MST of G.

Although MST does not retain all the connectives in the network, it still provides a mathematically defined, unbiased subnetwork whose characteristics can provide network topology information like traditional graph measurements [20]. MST can also greatly reduce the complexity of the network and facilitate the visualization of important topological. Therefore, MST has been widely used in the construction and analysis of brain functional network. For example, MST was conducted to quantify the structural brain network of schizophrenia patients and measure the integrity of the brain network of schizophrenia patients, which improved the accuracy of schizophrenia diagnosis [21].

In this study, after constructing the differential network between AD patients and NC, MCI and NC, the MC values in differential networks were converted into the distance values forming the distance matrices by using equation (3). Then, Prim algorithm was used to calculate

the MST of the two networks. The MST calculation in this study is implemented using igraph R package [22], as shown equation (3).

$$D_{ij} = 1 + \max(S_{ij}) - S_{ij} \tag{3}$$

Where D_{ij} represents the distance between node i and node j, and S_{ij} represents the difference value of metabolic connectives between node i and node j.

3. RESULTS

3.1 METABOLIC CONNECTIVITY MATRIX

The metabolic connectives between two brain regions of AD, NC and MCI were calculated by SA Pearson correlation. The data of 42 subjects in AD, NC and MCI were averaged to obtain the overall level of the MC matrix of brain regions, and then the three MC matrices were compared to visually show the differences among the three MC matrices as shown in figure 1.
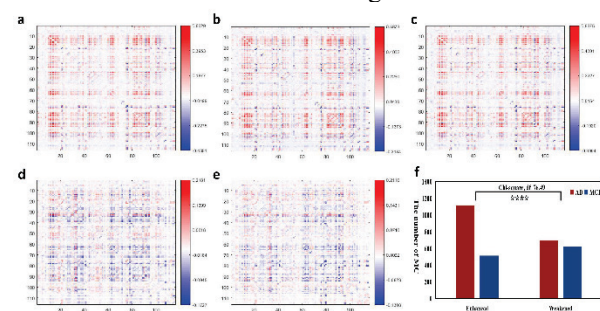
Figure 1. The MC matrices of AD, NC and MCI at the overall level and the MC difference matrices between three kinds of subjects. (a)-(c) denote the MC matrices of AD, MCI, and Normal Control separately. (d) is the differential matrix of AD and NC and (e) is the differential matrix of MCI and NC. (f) is the Chi-Square test for the distribution of enhanced and weakened metabolic connectives in AD and MCI. The P value is labeled with asterisks below signal plot (****P < 0.0001). Note: (d) and (e) are obtained by subtracting the MC matrix of NC from the matrix of patients, positive value in (d) and (e) means that the MC of patients are enhanced verse to NC, and negative means attenuation.

Both enhanced and weakened metabolic connectives are present in AD patients compared with NC. The number of weakened metabolic connectives accounted for 53.53% of the total number of metabolic connectives, while enhanced accounted for 45.58%. Compared with MCI and NC, the number of enhanced metabolic connectives accounted for 47.87% of the total number of metabolic connectives, while decreased accounted for 51.25%. It can be seen from (f) in figure 1 that there is a significant difference between the distributions of enhanced and weakened metabolic connectives of AD and MCI, therefore AD and MCI patients should be analyzed separately.

In general, the difference matrices of AD and NC and MCI and NC indicate that there are more weaken metabolic connectives in the brain of AD than MCI, which is consistent with the fact that MCI is the precursor of AD [3]. At the same time, 2, 586 metabolic connections showed weakened connectives in AD and MCI

simultaneously, and 2, 205 enhanced simultaneously. The number of metabolic connectives with the same trend accounted for 71.21% of the total number of connectives (6, 670), indicating that AD and MCI were similar in pathogenesis. In addition, more than 40% of the enhanced metabolic connectives were found in the differential matrix between the two groups, suggesting that some brain regions may compensate for the functional loss of diseased brain regions.

3.2 FEATURE SELECTION

The characteristic redundancy brings many difficulties to explore the pathological mechanism. In this study, t-test with significant P value less than 0.05 were used to detect the remarkable connectives in AD versus to NCs. There are 1812 remarkable metabolic connectives in AD versus to NCs including 1118 enhanced MC and 694 weaken MC. Also, there are 1136 remarkable metabolic connectives in MCI including 514 enhanced MC and 622 weaken MC. The effectiveness of those remarkable connectives in distinguishing of AD, MCI and NC was tested by SVM-RFE. It has been proved that the features obtained by the proposed method performed very well in AD or MCI classification after feature screening by T test. The results of the features (metabolic connectives) validation process of AD and MCI by SVM-RFE are shown in figure 2.
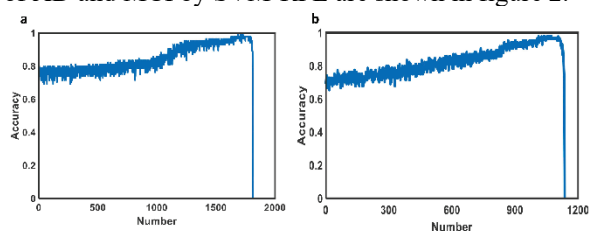
Figure 2. (a) Performance of 1812 metabolic connectives of AD selected by SVM-RFE. (b) Performance of 1136 metabolic connectives of MCI selected by SVM-RFE.

3.3 MINIMUM SPANNING TREE RESULT

The MST can identify greatly changed metabolic connectives in the network, so it can reduce the complexity of the graph and the difficulties of the analysis. Therefore, after obtaining the MC enhanced network and attenuation network of AD group and MCI group, the MSTs of differential networks were calculated respectively by using Prim algorithm, and Cytoscape [23] software was applied to draw diagram of MSTs, as shown in figure 3.
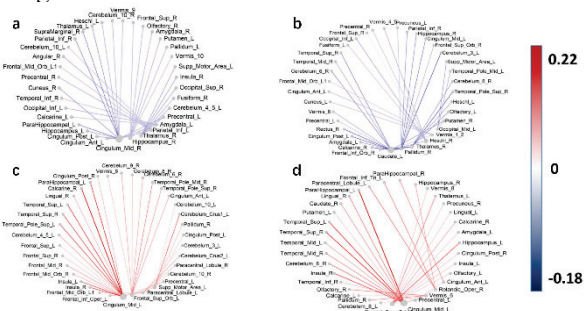
Figure 3. Weakened MST of AD (a) and MCI (b), and enhanced MST of AD (c) and MCI (d). The size of the node is proportional to the degree of the node; the color of the line represents the change of MC.

According to the decreased MSTs of AD and MCI, MC reduction occurred in cingulate gyrus, hippocampus, amygdala, thalamus, caudate, parietal lobe, temporal lobe, cerebellum in AD and MCI patients, consisting with previous researches [6-9]. However, a large number of MC reduction makes it difficult to analyze pathological mechanism. Therefore, the hub nodes are selected to mine pathological mechanism and simplify the analysis of differential networks. Hub nodes of AD and MCI are defined as follow.

In the MC reduction MST of AD, nodes with the degree greater than four are defined as hub nodes, including right medial and lateral cingulate gyrus (Cingulum_Mid_R), right hippocampus, right thalamus, left amygdala and left parietal lobe (Parietal_Inf_L). While set five as the threshold of hub nodes for MCI group, hub nodes contain left caudate, cerebellum (Vermis_1_2), right pallidum, right thalamus, right temporal lobe (Heschl_L).

In addition, figure 3(c) and 3(d) portrayed the enhanced network of the whole brain of AD and MCI patients, which reflected and visualized the compensation mechanism of patients. Therefore, the enhanced network is also called as compensation network. As shown in figure 3, the structure of compensation network can be seen vividly, the enhanced metabolic connectives and hub nodes in this network can be found easily and the enhanced metabolic connectives are labeled according to the degree of enhancement.

As defined above, the nodes with degree above eight are defined as hub nodes in compensation network of AD, including left medial and lateral cingulate gyrus (Cingulum_Mid_L), left Supplementary motor area (Supp_Motor_Area_L), left frontal lobe (Frontal_Sub_Orb_L) and left paracentral lobule (Paracental_Lobule_L). While set six as the threshold of hub nodes for MCI group, hub nodes contain left medial and lateral cingulate gyrus (Cingulum_Mid_L), left frontal lobe (Frontal_Sub_Orb_L), left precentral gyrus (Precental_L), Verims_6, left anterior cingulate cortex (Cingulum_Ant_L) and Rolandic operculum (Roland_Oper_R). It is worth noting that part of compensation mechanism of both AD and MCI expanded outward from the cingulate gyrus (Cingulum_Mid_L), while right cingulate gyrus (Cingulum_Mid_R) appeared severe reduction in metabolic connections at the same time. That might be a sign of contralateral compensation.

3.4 METABOLIC CONNECTIVITY PATTERN OF WHOLE BRAIN

There are many enhanced and weakened metabolic connectives in the brain. Excessive features increase the computational complexity and reduce the efficiency of diagnosis. Unfortunately, it is limited and unreasonable to consider changes in only one brain region due to there is a flow of information between the brain regions [11]. Therefore, it is concluded that detecting the metabolic connectivity pattern of patients that can represent the metabolism of whole brain is an urgent problem to be solved. In this study, a method for detecting the feature of whole-brain metabolic connectivity pattern was proposed which might be a potential biomarker for AD and MCI

diagnosis.
To construct the metabolic connectivity pattern of whole brain as a diagnostic biomarker for AD and MCI, metabolic connectives with clinical utility were extracted by receiver operating characteristic (ROC) method and regression analysis. The structure of metabolic connectivity pattern of AD and MCI and the results of ROC analysis are shown in figure 4.
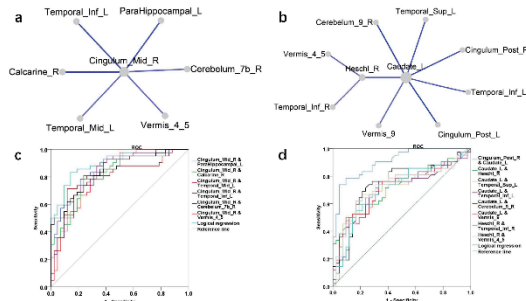
Figure 4. (a) is the metabolic connectivity pattern of AD and (b) is the metabolic connectivity pattern of MCI. (c) – (d) are the ROC analysis for metabolic connectivity pattern of AD and MCI. Logical regression denotes multi-index combined forecast probability calculated by binary logistic regression.

For AD group, connectives with AUC above 0.8 in ROC analysis were preserved and the metabolic connectivity pattern was formed by regression analysis. It can be seen from figure 4(a), the related brain regions in the pattern includes partial cingulate, cerebellum, temporal lobe and parahippocampus, the relationship between those brain regions and pathological mechanism of AD were reported in previous studies [8-10, 24-27]. More importantly, this pattern showed great potential as a biomarker with area under curve of 0.895 for AD detection. For MCI group, connectives with area under curve above 0.7 in ROC analysis were preserved and referred brain regions in the pattern includes cingulate, cerebellum, temporal lobe, and caudate, which are similar to AD. There are nine connectives combined in the pattern of MCI more than six in AD, owing to the less lesion degree of MCI than that of AD. Eventually, the AUC of the metabolic connectivity pattern reached 0.825 for MCI detection in ROC analysis, as shown in table 2. The results demonstrate that metabolic connectivity pattern of whole brain as potential biomarker exert enormous potential on the diagnosis of AD and MCI.

Table 2: ROC analysis of metabolic connectives. Metabolic connectivity pattern was obtained by multi-index combined forecast probability calculated by logistic regression.

Subject	Metabolic connectives	AUC	P Value	95%CI
AD	Cingulum_Mid_R & Vermis_4_5	0.817	≤0. 0001	0.726-0.909
	Cingulum_Mid_R & Cerebelum_7b_R	0.838	≤0. 0001	0.755-0.921
	Cingulum_Mid_R & Temporal_Inf_L	0.828	≤0. 0001	0.741-0.915
	Cingulum_Mid_R & Temporal_Mid_L	0.802	≤0. 0001	0.704-0.901
	Cingulum_Mid_R & ParaHippocampal_L	0.849	≤0. 0001	0.767-0.931
	Cingulum_Mid_R & Calcarine_R	0.818	≤0. 0001	0.729-0.907
	Metabolic connectivity pattern	0.895	≤0. 0001	0.828-0.962
MCI	Cingulum_Post_R & Caudate_L	0.701	0.002	0.587-0.815
	Caudate_L & Heschl_R	0.724	≤0.0001	0.615-0.834
	Caudate_L & Temporal_Sup_L	0.711	0.001	0.596-0.826
	Caudate_L & Temporal_Inf_L	0.7	0.002	0.584-0.816
	Caudate_L & Cerebelum_9_R	0.741	≤0.0001	0.63-0.852
	Caudate_L & Vermis_9	0.713	0.001	0.6-0.825
	Heschl_R & Temporal_Inf_R	0.711	0.001	0.598-0.825
	Heschl_R & Vermis_4_5	0.72	0.001	0.606-0.834
	Cingulum_Post_L & Caudate_L	0.743	≤0. 0001	0.633-0.853
	Metabolic connectivity pattern	0.825	0.046	0.735-0.915

4. CONCLUSIONS AND DISCUSSIONS

Based on metabolic connectivity of PET images, this study demonstrated that depressed metabolic connectives are directly related to the pathology of AD and MCI. Moreover, the metabolic connectivity patterns that can reflect the metabolism situation of the whole brain were defined for AD and MCI, which might be a potential biomarker for AD and MCI diagnosis. In particular, this study explored the compensation network in the resting-state of patients, which not only detected brain areas but also revealed the topological structure of the compensation mechanism.
(1) Metabolic connectivity attenuation network is directly related to the pathological mechanism of AD
The attenuation networks reflected the different pathological mechanisms of AD and MCI. In this study, reduced metabolic connectives of AD patients were found to be related to the brain regions known to be involved in cognitive activity, such as cingulate gyrus, hippocampus, thalamus, amygdala and parietal lobe. The number of reduced metabolic connectives in the right medial and lateral cingulate accounts for 58.26% meaning that it is a central structure of metabolic reduction and plays a significant role in cognitive impairment of AD [28, 29]. Decreased metabolic connectives of hippocampus may account for the temporal and spatial memory impairment of AD [24-26]. The attenuation of the metabolic connectives of thalamus is directly related to the progression of AD because the thalamus is involved in the processing of filtering, processing and transmitting information and receives the output of the structure associated with emotion and memory [30-32]. The attenuation of metabolic connectives of left amygdala may associate with the cognitive impairment and morphology of other brain regions due to the interaction between the amygdala and subcortical and cortical regions, which

contribute to emotion, cognitive process [33]. In the meantime, metabolic reduction is a typical trait of AD, as previous studies have shown that the disruption of functional circuits involving the left parietal lobe increased risk for AD [34].

Different from AD, metabolic connectives attenuation of MCI occurs primarily in the caudate, cerebellum, temporal lobe, thalamus, and pallidum. Among those connectives, 44.34% weaken metabolic connectives related to left caudate which plays a vital functional role in forming new associations to acquire explicit memories, and in motor learning [35, 36], those are the severely impaired cognitive functions in patients with AD. Decreased connectives of temporal lobe were found in the brain of MCI patients, the lesion of temporal lobe might be related to the episodic memory impairment of patients [37] and the neurofibrillary tangles that is one of the causes of AD initially appear in the temporal lobe [38]. These evidences suggest that decreased temporal lobe metabolic connectivity is closely concerned with AD and MCI pathology. In addition, it was found that the metabolic connectives of the right pallidum were decreased and studies have shown that the relationship between the pallidum and spatial navigation activities disappeared in patients with MCI [39]. However, there is no studies have shown a direct link between the metabolic connectivity attenuation of pallidum and pathological mechanism of MCI, the disappeared relationship between the pallidum and spatial navigation activities might be caused by other damaged brain regions. What's more, the attenuation of connectives also appeared in the cerebellum of MCI and AD, but as previous studies reported, cerebellar atrophy and metabolic attenuation may be secondary to AD and MCI pathology in the brain, rather than in the cerebellum itself. The cerebellum is relatively immune from neurodegeneration in the preclinical stage of the disease and is gradually affected by the full development of clinical manifestations [40-43].

(2) The metabolic connectivity pattern of AD and MCI might be a potential biomarker for the diagnosis of AD and MCI

In order to visualize the metabolic connectivity differences between patients and normal controls, the attenuation networks and minimum spanning trees of networks were computed to measure the disease state of patients. Previous studies inquired disease information by combining CSF data and MR (Magnetic Resonance) images, with CSF (Cerebrospinal Fluid) reflecting a disease state, while whole-brain atrophy rate measured from MRI reflected the rate of disease progression [44-46]. While in this study, the metabolic connectivity attenuation network of patients not only can reflect the disease state from the metabolism perspective, but also contain the disease progression information.

More than that, the metabolic connectivity pattern was defined by receiver operating characteristic analysis and regression analysis, which can reflect the abnormal metabolic information of patients with a small number of connectives and assist in early diagnosis. As a result, the metabolic pattern showed strong diagnostic capability in ROC analysis with area under the curve of 0.895 and 0.825 for AD and MCI respectively, meaning that the metabolic pattern might be a potential biomarker for AD and MCI diagnosis. In particular, metabolic biomarker extracted from PET images can detect abnormal metabolism in early stage than atrophy rate obtained from MR images.

(3)The contralateral compensation and the compensation for DMN exist simultaneously and the location of compensation network is marked out

In our work, the compensation network is visualized instead of being shown in the text description, as shown in figure 3. In the analysis of the compensation network, the whole brain was divided into five subnetworks, there are default mode network, affective network, visual cortical area, cerebellum and undefined region. Surprisingly, all the hub nodes defined in the compensation network of AD are in the undefined region. In this study, we define this region as compensation region of AD. On the one hand, the result is consistent with the characteristics of resting state, in which the affective network and visual cortical area are not distinct activated, on the other hand, the result demonstrates that most of the brain regions that play a compensating role are mostly located in compensation regions. Similar results can be seen in MCI groups, as four of six hub nodes are in compensation regions. This phenomenon may be the compensation for damaged DMN of AD and MCI patients that should have been activated in resting state.

Besides, we speculate that the contralateral compensation and the compensation for DMN exist at the same time. Contralateral compensation refers to one side injury and reinforcement occur on the other side to supplement the injury function [9]. For instance, the medial and lateral cingulate gyrus is a typical representative of contralateral compensation because the metabolic connectives of right medial and lateral cingulate gyrus are decreased greatly while enhanced of left medial and lateral cingulate gyrus. What's more, as mentioned above, the brain regions located in the compensation region with enhanced metabolic connectives may play a key role in compensating the damage of DMN in the resting state. The results demonstrate that the compensation mechanism of the brain is worthy of further exploration, and our study provides a new idea for the detection of compensation mechanism.

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Collaborative Filtering Based on Time Factor and Attention Mechanism

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Abstract: The collaborative filtering algorithm is a method of personalized recommendation by mining explosively growing data. The traditional collaborative filtering algorithm only scores the historical items, which makes the recommendation effect not ideal. Because the contribution of different projects to user selection is ignored, attention mechanism is introduced in this paper. At the same time, the influence of the time from the failure rate to the time on the user preferences in the previous model, the longer the time, the greater the change of user preferences, and the lower the reference of historical items, the time factor is introduced to study the influence of time on the user choice. User preferences are stable, and the threshold value of time influence factor is set. The experiment uses the real data sets Movielens 100k and Pinterest, and the evaluation index uses HR and NDCG. Through the comparative experiment, the effectiveness of the model in personalized recommendation is improved.
Keywords: Personalized Recommendation; Collaborative Filtering; Attention Mechanism; Time Factor

1. INTRODUCTION

With the popularization of Internet technology, the amount of information is growing explosively. According to the user's historical behavior data, the recommender system can mine the user's preferences, which can help the user to recommend the items that the user may be interested in from the mass data, and help reduce the time for the user to search for information in the mass data. Recommender system has a certain commercial value, such as in the field of e-commerce to help users choose the right goods, so as to increase the sales of goods and drive economic growth.

The goal of personalized recommendation is to analyze and mine the data from the historical user projects to understand the user preferences. Recommend relevant items to users. This method is called collaborative filtering technology [1]. Collaborative filtering technology is mainly divided into two kinds: user based system filtering technology and project-based recommendation technology. User based recommendation is to mine the relationship between users and deal with the data similarity between users. The more similar the users are, the more similar their items are. However, this method often has shortcomings. The cost of user similarity matrix increases with the increase of the number of users, which is suitable for less users. It is suitable for the fields where the user's personalized interest is not obvious. In the recommendation of popular items or life needs, the user based recommendation method needs to be more convincing. The principle of project-based recommendation is basically the same as that of user recommendation, which is to mine user preferences according to user's own historical behavior data. Using the user's historical behavior to recommend items to users has good interpretability.

However, the existing recommender system methods have some problems. The demand of users is fuzzy and uncertain. Users' preferences may be different from the present for a long time. Personalized recommendation is based on users' historical behavior data mining. Time factor should be introduced to show the influence of time on users' current preferences. Because of the stability of user preferences, we need to set a time threshold for discussion.

User history items have different contributions to the current selection. If they are regarded as the same model, the accuracy of the model is not high. Attention mechanism is widely used in deep learning, such as image processing, natural language processing and so on. Mnih [2] et al. Proposed using attention mechanism in image classification task. He [3] and others used attention mechanism to solve the problem of the influence of different importance of items in user history documents on user preferences. The application of attention mechanism in recommendation system can improve the accuracy of the model. Therefore, attention mechanism is introduced. We have studied this kind of problem. Aiming at the problems of time factor and attention mechanism, a collaborative filtering model including time factor and attention mechanism is proposed.

2. TAACF MODEL

Based on the historical project matrix $y = (y_1, y_2, y_3.., y_j.., y_n)$, y_j represents the historical project j. The target project matrix is represented as $x = (x_1, x_2, x_3.., x_i.., x_n)$, x_i for target item i.

In time factors, the user's preferences for a long time ago are likely to change. For example, users four years ago love to watch literary and artistic films, the last six months of learning pressure, like to watch light-hearted comedy. Because four years ago the number of historical behavior, in the process of model learning, more in favor of recommended literary and artistic films, but this is not consistent with the user's current behavior, four years ago preferences should have a small impact on the current preference choices, now the characteristic vector of comedy should be more weighted, we consider the impact of time on user preferences. At the same time, user preferences have stability, a certain time will not change. Introduce a time factor model, as shown in formula (1).

$$f_{T_j} = e^{-aT_j} \quad \begin{cases} T_j < T_0, a = 0 \\ T_j \geq T_0, a = a_j \end{cases} \tag{1}$$

T_j is the time difference between the current time and the historical behavior time, a_j is the super parameter, and T_0 represents the time threshold. f_{T_j} is the time influence factor, between (0, 1), the closer to 0 indicates that the characteristics of the time have a smaller impact on the present, the closer 1 indicates a recent behavior preference, the closer to the next recommended choice.

Super parameters are parameters that set values before starting the context learning process, initialize super parameters, and get a set of optimal super parameters through training, which can improve model performance. Because user preferences are stable, they don't change in the short term. But the longer historical behavior is now, the more likely it is that users will change their preferences. Therefore, the time threshold is set. Because user preferences are stable, they don't change in the short term. But the longer historical behavior is now, the more likely it is that users will change their preferences.

Attention mechanisms are widely used in the field of deep learning. Such as image recognition, natural language processing and so on. In the recommendation system, different projects contribute differently to the user's choice, so the attention mechanism introduced can change the weight of historical projects and improve model performance and accuracy.

In the implementation, the historical item $Y_j = T_j \cdot y_j$, under the influence of the time factor model is obtained. The historical project matrix is $Y = (Y_1, Y_2, Y_3, .., Y_j, .., Y_n)$. $\begin{bmatrix} x_i \\ Y_j \end{bmatrix}$ represents a historical project and a target project stitching interaction that increases robustness and robustness, and if the project never appears together in the training data, its attention weight cannot be estimated and is a small number. This approach mitigates this problem and reflects the fusion strategy.

Use the MLP model to learn attention mechanism weights, as shown in formula (2).

$$\xi_{ij} = H_3^T ReLU(H_2^T ReLU(H_1 \begin{bmatrix} x_i \\ Y_j \end{bmatrix} + b_1) + b_2) + b_3 \tag{2}$$

Among them, H_1, H_2, H_3 is the input layer to the hidden layer, hidden layer between, hidden layer to the output layer weight parameters, b_1, b_2, b_3 is the input layer to the hidden layer, hidden layer, hidden layer to the output layer bias, ReLU is the activation function. As shown in formula (3).

$$Att_{ij}^* = \frac{exp(\xi_{ij})}{[\sum_{j \in R(u)} exp(\xi_{ij}))]^\gamma} \tag{3}$$

Att_{ij}^* Represents the interaction between the target project and the historical project. Where γ is the smoothing exponent, the range of values is 0, 1, and when γ is 1, it reverts to the softmax function. The softmax function makes the range value of each element (0, 1) and the range value of all elements equal to 1. Attention mechanisms exist to prevent the characteristic vectors from being treated equally. This calculates the different weights assigned by different items.

According to FISM algorithm improvement, FISM is a machine learning method, based on the idea of matrix decomposition, the object similarity matrix is decomposed into two low-dimensional matrix multiplication. The matrix is obtained through learning, and the similarity formula between items is represented $y_{ij} = p_i \cdot q_j$. Among them, p_i is the target project, q_j is the historical project. Combined with the attention mechanism, this paper predicts the user u's rating of the target project, the core of which is to calculate the historical score similarity and the product of the target project. As shown in formula (4).

$$\widehat{y}_{ui} = x_i^T \left(\frac{1}{|R_{(u)}|^\alpha} \sum_{j \in R_{(u)}} Att_{ij}^* Y_j \right) \tag{4}$$

In the item-based collaborative filtering model, historical items can make different contributions to user selection by assigning personalized weights to each project. Y_j represents a historical project with a rights feature vector, and Att_{ij}^* represents the weight after the historical project interacts with the target item.

Define and train target functions to learn the recommended model, and define the target functions as shown in formula (5).

$$Z = -\frac{1}{N} \left(\sum_{(u,i) \in R^+} ln\sigma(\widehat{y}_{ui}) + \sum_{(u,i) \in R^-} ln(1 - \sigma(\widehat{y}_{ui})) \right) + \lambda||\theta||^2 \tag{5}$$

Objective function, in the form of a pair loss function. There are usually two ways to define a target function, square loss and count loss.

Among them, the square loss and implicit feedback data are not very applicable, the target value, that is, the actual label. is a valued 1 or 0 that indicates whether user u interacts with item i. 1 for correlation and 0 for irrelevant. The predicted score (model output) indicates how likely it is that user u and item i are related, so you need to limit the predicted score to between 0 and 1.

In processing implicit feedback of two-value data 1 or 0, the learning model is a two-classification task, so it uses the count loss as the target function, minimizing the objective function to learn the model parameters.

In the formula, N represents the size of the training set, σ represents the sigmoid function, $\widehat{y}_{ui}$ represents the product of historical scoring similarity to the target item and R^+ represents the sample Positive instance set, indicates that the user has historical behavior for this item, R^- represents the sample negative instance set, indicates that the user has no behavior on the project, the ln function is a loss item, the s is a positive parameter, using the L2 paradigm as a penalty, The L2 paradigm prevents overfits by attenuating the weight, which in turn reduces the influence of the feature on the population. The advantage of L2 is that it is stable, fast and prevents overfit.

Use the random gradient drop method to optimize the target function, use adaptive learning rate for the parameters, and randomly select the training case each time, so that each model parameter is updated in the direction of negative gradient.

3. EXPERIMENT AND RESULT ANALYSIS
3.1 EXPERIMENTAL ENVIRONMENT AND DATASET

The operating system used in this experiment is Ubuntu, and the programming language is Python 3.6. The data sets used are Movielens [4] 100k and Pinterest. Movielens data set is a data set for movie recommendation, including user data, movie data and rating data. Pinterests is a data set for image recommendation, which contains 9916 users' ratings of 55187 images. The leave one out method is used for evaluation, and the test set is the one whose time is close to the current data.

The performance is evaluated by hit rate and normalized loss cumulative gain, in which the hit rate is used to evaluate the prediction accuracy of the model. In the recommended list, whether the user will have interactive behavior. The higher the value is, the more accurate the recommended list is. Normalized cumulative gain emphasizes the order of recommended products in the list, and whether recommended products are in a more prominent position. The higher the value is, the higher the recommendation quality is. If the test items appear in the top 10 list, HR and ndgc can effectively reflect the performance of the model.

3.2 COMPARISON ALGORITHM

(1) Pop algorithm: recommend the most popular items of the day to users

(2) itemKNN algorithm: calculate the similarity between historical items and target items for recommendation.

(3) MLP [5] algorithm: MLP algorithm needs to learn inner product function, large model capacity and a large number of training data, from which we can learn nonlinear interaction.

(4) FISM [6] algorithm: collaborative filtering algorithm based on project and top-N recommendation method based on structural equation modeling. There are historical interaction projects and target projects.

3.3 RESULT ANALYSIS

In this experiment, Gaussian distribution is used to initialize the parameters randomly, the mean value is 0, and the standard deviation is 0.01. The embedded dimensions were [8, 16, 32, 64] respectively to evaluate the model, and the value of attention factor was the same as that of sneak size. The regularization coefficient is adjusted between [1E−5, 1E−4, 1E−3, 0], the learning rate is set to 0.01, and the number of iterations is 80.

The paper uses the MovieLens and Pinterest datasets to evaluate model performance, and when the embedding size is equal to 16, the HR and NDCG results are shown in the table 1.

Table 1

Method	Movielens		Pinterest	
	HR	NDCG	HR	NDCG
Pop	0.4536	0.2543	0.2739	0.1409
itemKNN	0.6227	0.3586	0.7857	0.4831
MLP	0.6841	0.4104	0.8649	0.5385
FISM	0.6735	0.3965	0.8703	0.5586
TAACF	0.7022	0.4234	0.8932	0.5624

The table lists the recommended accuracy of different methods with embedded size of 16, gives the recommended HR and NDCG values of 5 methods in the data set, and finds that in moveLens 100k data set, the

user-based MLP method works better than the project-based FISM method, and the different methods of estimating project similarity between FISM and itemKNN result in poor performance of the itemKNN method.

The HR and NDCG line charts of the MLP, FISM, TAACF algorithms in the comparison experiment are shown in Figures 1, 2, 3 and 4.
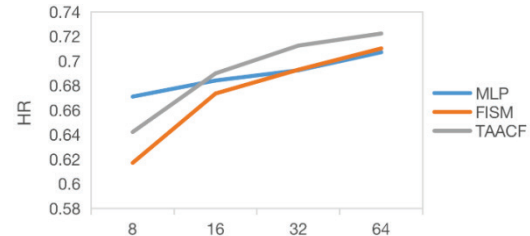
Figure 1.   Movielens Hit Rate
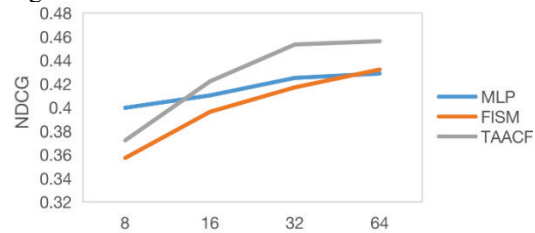
Figure 2.   Movielens Normalized Discounted Cumulative Gain
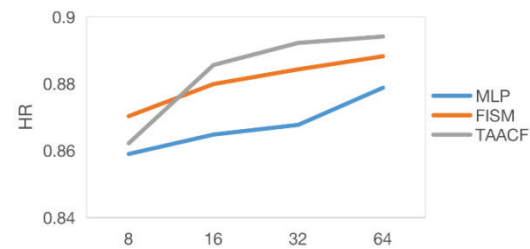
Figure 3.   Pinterest Hit Rate
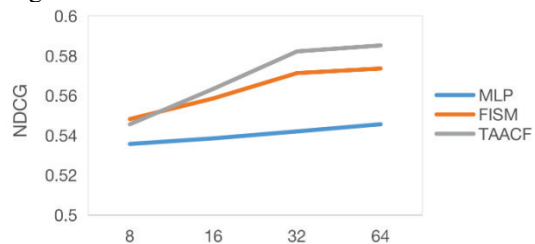
Figure 4. Pinterest Normalized Discounted Cumulative Gain

The results were based on a comparative experiment with different algorithms using the Movielens and Pinterest datasets based on an embedded size of 16. Use HR and NDCG as the basis for experimental performance. The experimental results show that TAACF has achieved performance improvement on the data set. The results showed that the recall rate of HR increased by 0.58 percentage points over MLP in TAACF and 1.64 percentage points over FISM on the Movielens data set. The NDCG is up 1.19 percentage points from MLP and 2.83 percentage points higher than FISM. The TAACF model has a 2.08 percentage point increase over MLP and a 0.67 percentage point increase over FISM on the Pinterest dataset. The NDCG is up 2.49 percentage points over MLP and 0.48 percentage points higher than FISM.

Experimental results show that the introduction of attention mechanism can help the model to further extract more complex feature information in the data, and thus improve the expression and accuracy of the model.

4. CONCLUSIONS

This paper is an improvement of FISM algorithm, adding attention mechanism and time influence factor to improve the performance of the model. Experiments show that user preferences will change over time and tend to be more recent. And the contribution of each project to user selection is different. The effectiveness of the model taacf is verified on two real datasets, and it is reflected in HR and NDCG. TAACF is superior to other collaborative filtering algorithms. The following work is carried out from the following directions, trying to introduce more attributes into the model, exploring higher-order attention mechanism, and improving the effect of the model.

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Research on CTR Prediction Model based on Field weighted Factorization Machine

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Abstract: Aiming at the hit rate estimation problem with high model complexity, sparse data, poor domain information interaction, etc., a Field weighted factorization machine (FwFM) and deep neural network (DNN) click Rate prediction model, and use the MoiveLens data and Criteo data set of the Kaggle data mining platform to complete the experiment. Among them, the FwFM module is divided into two parts. The linear part is used to extract low-order features and the individual weights of domain information. The interactive part considers domain information and the interactive relationship between feature information. The DNN module passes through the hierarchical transmission of multiple hidden layers and the learning process of the adaptive moment estimation optimizer to deeply dig high-level abstract features. Comparing the factorization machine (FM) model and the DeepFM model, which is a parallel fusion of deep neural networks and factorization machines, is superior to mainstream models in terms of prediction accuracy.
Keywords: CTR; Mean Square Error; Loss Function.

1. INTRODUCTION

Click-through rate estimation is mainly used in advertising or recommendation scenarios to accurately push physical products or Internet products such as games and short videos to users. In the application of advertising scenarios, it is mainly used in Real Time Bidding (RTB)[1]. Taking the domestic Sina Weibo and Douyin advertising models as examples, advertisers submit product information and determine target user characteristics (such as age Scope, region, gender), delivery time and budget, advertising platforms such as Weibo and Douyin based on the unit click cost (Cost Per Click, CPC) and click-through rate (Click-Through Rate, CTR) to conduct the bidding ranking of the advertising space So as to maximize the platform revenue[2]. In the recommendation scenario, CTR estimation can be used to sort news in personalized news applications and sort merchants in takeaway applications, to achieve information screening and accurate recommendation for users. Therefore, click-through rate (CTR) estimation has become the key to the focus of industry and academia [3]. In recent years, click-through rate estimation models have developed relatively well. Traditional machine learning models (such as logistic regression LR, gradient boosting decision tree GBDT, etc.) have passed a lot of training, although they can be used in click-through rate estimation tasks [4]. Achieving good results, but high-dimensional feature processing not only requires a lot of manpower to complete the feature extraction and construction work, but

also has higher requirements for the industry experience and analysis experience of data analysts. At the same time, deep learning can form a more abstract high-level representation attribute category or feature by combining low-level features to discover distributed feature representations of data, thus attracting widespread attention from many scholars [5].

Zhang et al. learned data feature representation and proposed a factorization-machine supported neural network model (Factorization-machine supported Neural Network, FNN) to make predictions. The model first uses a factorization machine for training and then uses a neural network to process high-level Features interact, but the capabilities of the model are limited by the factorization machine [6]. Qu et al. proposed a neural network model for predicting user responses, which is called PNN (Product-based Neural Network). The PNN model introduces a Product layer between the embedding layer and the fully connected layer, which is used to learn different representations of different field data and capture cross-domain interactive information [7].

The above models can capture high-order feature interactions well, but ignore the impact of low-order feature interactions on the prediction model. In response to such shortcomings, scholars such as Guo proposed the Deep Factorization Machine (DeepFM) [14], which combines the simplicity and efficiency of the first-order and second-order features of the factorization machine (FM) and the advantages of deep learning in the interaction of high-order features, and uses The Embedding layer allows the FM and DNN parts to share the original data set samples. The model also takes into account the common interaction between low-level and high-level features. However, the factorization machine (FM) part fails to take into account that the interaction strengths between features in different fields are often different, which leads to a certain deviation in the accuracy of the model's estimation [13].

In view of the shortcomings of the above models, this paper proposes a fusion field weight factorization machine (FwFM) and a deep neural network (Deep Neural Network, DNN) click-through rate prediction model, which can make full use of The factorization machine processes low-level domains and feature interactions, and also takes into account the intensity of domain interactions, making the model learn more about data [8]. On this basis, deep neural networks are used to model high-level feature interactions, thereby improving model accuracy.

2. CLICK-THROUGH RATE ESTIMATION MODEL
2.1 DEEPFWFM

In the overall DeepFwFM model, an embedding layer is

first introduced, and different features in different fields are transformed from a non-numerical type to a fixed-length dense numerical type vector through a layer of perceptron neural network. The sample data processed by the embedding layer is shared and processed jointly by the domain interaction intensity factorization machine (FwFM) and the deep neural network (DNN). FwFM is divided into two parts, the linear part processes the characteristics and the individual weightsof the domain information, interactive Part of the consideration is the interaction between domain information and feature information. Some nodes of the deep neural network all introduce the sigmoid function to compress the output range of the function value to the interval [0, 1] to introduce nonlinearity. Through the hierarchical transmission of multiple hidden layers and the learning process of the adaptive moment estimation optimizer, the abstract features are deeply explored. The output layer of the model fuses the final output of the domain interaction intensity factorization machine module (FwFM) with the result of the deep neural network (DNN) through the sigmoid function to calculate the final prediction result, so as to realize the CTR prediction function. The overall structure is shown in Figure 1.
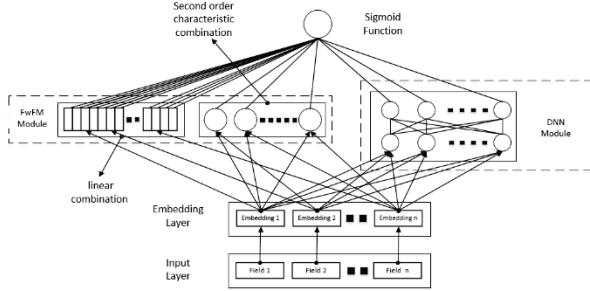
Fig.1 Structure of DeepFwFM model

2.2 FIELD-WEIGHTED FACTORIZATION MACHINES FOR CLICK-THROUGH RATE

The Field-weighted Factorization Machines (FwFM) based on domain interaction intensity can effectively solve the problem of feature combination such as high data latitude and sparse features. This paper uses this module to express the combined features by using the inner product of hidden vectors and the strength of domain information as weights. While effectively processing a large amount of sparse feature data, it also takes into account the interaction of domain information, thereby reducing the number of model parameters and making it more effective in certain situations. This reduces the complexity of the click-through rate estimation model. The first two parts of this module are traditional linear combination models, and the FwFM model is defined as formula (1):

$$\phi_{FwFMS}((w,v),x) = w_0 + \sum_{i=1}^{m} x_i w_i + \sum_{i=1}^{m} \sum_{j=i+1}^{m} x_i x_j \langle v_i, v_j \rangle r_{F(i),F(j)} \quad (1)$$

In the formula, $w_0 \in R^n$ is the offset term of the linear combination part, x_i and x_j are the i-th and j-th feature components of the training data, respectively, $w_0 \in R^n$ the coefficient of the primary term,

m is the total feature dimension, and represents two k dimensions the inner product of the hidden vector is
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shown in formula (2):

$$\langle v_i, v_j \rangle = \sum_{f=1}^{k} v_{i,f} v_{j,f} \quad (2)$$

Where v_i represents the i-th dimension vector of the coefficient matrix V, and, $v_i = (v_{i,1}, v_{i,2}, \dots v_{i,k})$, $k \in N$ is a hyperparameter. Using the K-dimensional coefficient matrix V to model the interaction between features and features can effectively reduce the data sparsity caused by a large number of non-numerical features, among them, $F_{(i)}, F_{(j)}$ respectively represent the field of feature i and feature j, and $r_{F(i),F(j)}$ is the weight, which is used to model the interaction strength between the Field $F_{(i)}$ and the $F_{(j)}$. The FwFM model structure is as Figure 2.
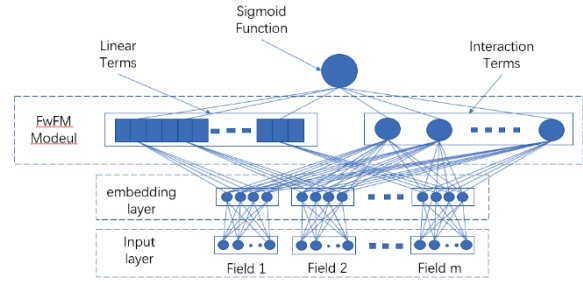
Fig.2 Structure of CTR FwFM Modeul

The FwFM factorization machine model improves the accuracy of the click-through rate prediction model by modeling domains, features, and the common interaction relationships between them. At the same time, it also considers the intensity relationship between domain interactions to reduce the relevant parameters of the model. There is a certain improvement in the complexity of the algorithm, and finally the ability to extract hidden vectors by the factorization machine reduces the sparseness of non-numerical data, thereby improving the learning efficiency of the model.

2.3 EEP NEURAL NETWORK

The depth part of the model in this paper is realized by DNN, which is composed of multiple perceptrons, which is a feed-forward neural network. Unlike input such as image or voice, image and voice input are generally continuous and dense, but the input used for CTR is generally extremely sparse. Therefore, the network structure needs to be redesigned. In the specific implementation, before the first hidden layer, an embedding layer is introduced to compress the input vector to a low-dimensional dense vector. The structure of DNN is shown in Figure 3
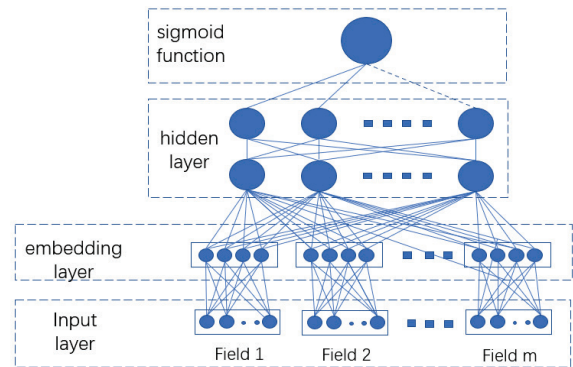
Fig.3 Structure of DNN

2.4 MBEDDED LAYER

The embedding layer is located between the input layer and the hidden layer, and is used to convert non-numerical sparse features into low-dimensional dense vector form. Since it is difficult for DNN to process non-numerical sparse features, the non-numerical features in the CTR estimation task are converted by embedding. The structure of the embedding layer is shown in Figure 4.
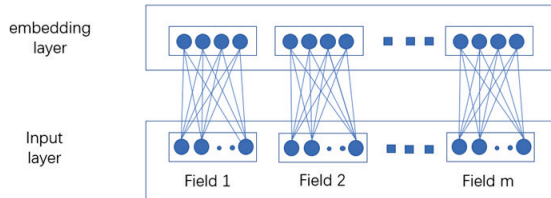
Fig.4 Structure of Embedding Layer

The embedding layer has the following two characteristics: 1. It can process input data of different dimensions, and use a processing method similar to a single-layer perceptron to convert the data into fixed-length low-dimensional dense data. 2. The depth part of the model in this paper shares the weight with the factorization machine part, so the hidden vector weight obtained by the factorization machine part is the weight of the embedded layer network.

3. EXPERIMENT

3.1 DATA SET DESCRIPTION

In order to verify the accuracy and effectiveness of this experimental method, experiments were carried out on two real public data sets MoiveLens and Criteo. The MoiveLens data set includes 283, 228 users, and 27, 753, 445 samples of 53, 889 movies.

The Criteo data set includes 39 features, including 13 numerical fields, 26 non-numerical fields, and about 246, 423 samples. Each data set is divided into three subsets, including a training set (80%), a validation set (10%) for adjusting hyperparameters, and a test set (10%), as shown in table 1.

Table 1: Statistics of training, validation and test sets of MoiveLens and Criteo data sets respectively

Data set		Samples	Fields	Features Interaction
MoiveLens	Train	151,088	14	11,592
	Validation	18,886	14	11,016
	Test	18,875	14	11,025
Criteo	Train	198,229	26	39,954
	Validation	24,778	26	39,628
	Test	24,741	26	39,637

The data used in this experiment are real movie rating data and actual advertising click log data to ensure the accuracy and rigor of the experimental process and experimental results.

Among them, take the MoivenLens data set as an example, as shown in table 2.

Table 2: The first three details of the MovieLens dataset

Field	User_Information				Moive_Information				Context_Information	Label
	user_id	gender	age	occupation	movie_id	title	genres	rating	timestamp	click
Feature	3931	M	25	writer	2723	Mystery Men (1999)	Action|Adventure|Comedy	4	965499600	1
	736	F	18	student	20	Money Train (1995)	Action	2	975477904	1
	720	M	24	technician	253	Pillow Book, The (1995)	Drama|Romance	null	null	0

Take user_id:3931 as an example to briefly explain the model calculation process, as shown in figure 5.
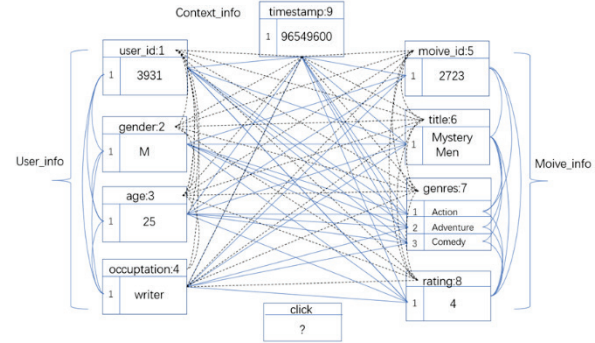
Fig.5 Description of model calculation process

Each solid line is assigned a weight value. For example, feature No. 1 of gender domain No. 2: Feature No. 1 of male and title domain No. 6: The weight value of the interaction between Mystery Men is $< v_{2,1}, v_{6,1} >$ which is used in the factorization machine Is obtained by the hidden vector dot product. Each dotted line in the figure represents the interaction strength between various fields. For example, the interaction strength between gender 2 and title field 6 is represented by $r_{2,6}$, and the estimated CTR value can be expressed as:

$$< v_{1,1}, v_{5,1} > \cdot 1 \cdot 1 \cdot r_{1,5} + < v_{1,1}, v_{6,1} > \cdot 1 \cdot 1 \cdot r_{1,6} + \\ < v_{1,1}, v_{7,1} > \cdot 1 \cdot 1 \cdot r_{1,7} + < v_{1,1}, v_{8,1} \\ > \cdot 1 \cdot 1 \cdot r_{1,8} + < v_{1,1}, v_{9,1} \\ > \cdot 1 \cdot 1 \cdot r_{1,9} + \ldots \ldots + < v_{8,1}, v_{9,1} \\ > \cdot 1 \cdot 1 \cdot r_{8,9}$$

Finally, according to the calculated CTR value and the actual click value (0/1), the model MSE, Loss and AUC are calculated.

3.2 EXPERIMENTAL RESULTS AND COMPARISON

In this section, a comparative experiment between the model in this paper and the factorization machine (FM) and DeepFM model is carried out. Among them, the GBDT+LR model structure and training process refer to [13], and the FDNN model structure and training process refer to [14], as shown in table 3.

Table 3: MSE, AUC and Loss of FM, DeepFM and DeepFwFM

MODEL	AUC	MSE	Loss
FM	84.05%	0.1138	0.1319
DeepFM	86.65%	0.1101	0.1258
DeepFwFM	88.44%	0.1049	0.1213

The final comparative experimental results are shown in Table 4. The click-through rate prediction models of the Fusion Field Interactive Strength Factorization Machine (FwFM) and Deep Neural Network (DNN) proposed in this paper are better than those of AUC, MSE and Loss. The factorization machine (FM) model 4.39%, 7.82% and 8.03% is better than the DeepFM model by 2.06%, 4.72% and 3.57%. It proves that DeepFwFM can improve the model's ability to mine hidden feature interactions to a certain extent, thereby improving the model the effect, which also shows that the fusion model designed in this article has a certain effect on the processing of click-through rate estimation problems.

4 CONCLUSIONS

This paper combines the domain interaction intensity factorization machine model (FwFM) and deep neural

network (DNN), and gives the model structure and model training methods, aiming to use factorization machine and neural network to respectively mine low-level and high-level feature interactions, so as to obtain the characteristics of users or Internet products, thereby improving the accuracy of click-through rate estimation. Use experiments based on real data sets to complete the adjustment and optimization of the model's own parameters and compare and analyze the prediction results of other models. The experimental results and data analysis prove that the model constructed by fusing FwFM and DNN is better than the existing CTR prediction model A certain degree of improvement, the prediction results are better than the factorization machine (FM) model 4.39%, 7.82% and 8.03% in indicators such as MSE, AUC and loss, and better than the DeepFM model by 2.06%, 4.72% and 3.57%.

The fusion model proposed in this paper has made some improvements to the click-through rate prediction model based on the deep width model, and also has a certain degree of optimization, but there are also many works that can be studied in depth:

(1) In the training of DNN, how to systematically and scientifically set the learning rate has been the research focus of researchers and one of the key parameters of the fusion algorithm proposed in this article;

(2) The model in this paper has achieved good results on a certain number of data sets, but the performance of industrial-level data sets is not good, and the improvement of indicators such as accuracy is slow. The next step is to consider applying to larger-scale data sets for model parameters and Dynamic adjustment of network structure;

(3) Introduce more application scenarios to examine whether the fusion model proposed in this paper can still achieve good prediction results in different application scenarios, to prove the general applicability of the model and the generality of the conclusions of this paper.

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Based on Cloud Computing System of Large-scale Human Life Signs Measuring Method

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Abstract: The human body vital signs in the flood, earthquake such complex environment, the life of the trapped workers large-scale signal instability, pulse, characteristics, such as a sharp slowdown in heart will, based on the life of radio frequency control by signs of large-scale crowd monitoring system of measurement precision is poorer. Is proposed based on a cloud computing technology of large-scale sensor, distant distance vital signs of the measurement system design method, the system adopts the LPC2148 embedded processors. Through the rf gathering vital signs echo information, using powerful cloud computing model, form a large range of signal processing environment. Through the experiment test, this system can be a complex area in the remote environment, of more than 20 trapped staff's life signs in accurate collection, collection of no more than 1% accuracy.
Keyword: Cloud computing; Vital signs; Interference environment.

1. INTRODUCTION

With the frequent occurrence of various natural disasters, search and rescue work for trapped persons has become more and more common. he current detection of life mainly relies on the life detection system, which is to find the position of the "living person" by inducing the electric field (produced by the heart) generated by the ultra-low frequency waves emitted by the human body.[1-3] Pass through reinforced concrete walls and steel plates. When the instrument encounters the above-mentioned obstacles, the detection distance will be reduced, but as long as the operator approaches the detection location, it can still accurately find the human target to be searched. Real-time motion detection, through concrete, brick, snow, ice and mud; Detect movement and the distance of persons in distress; It can work in various climates; it is intuitive and easy to learn, without a lot of specialized training; it has low power supply energy requirements; almost no system maintenance is required; The firmware program can be upgraded through a wireless or wired network; there is no need to drill, arrange cables and mute the environment, making search and rescue work simple and easy. However, the current life detection equipment has a problem, that is, it is difficult to complete long-distance positioning. In addition, due to the limitation of processing capacity, it is difficult to determine the specific number of trapped persons. This also limits its application. [4-5] In order to solve such problems, it is necessary to upgrade the traditional system to ensure the accuracy of the system. This paper proposes a new system design method to try to solve such problems.

2. THE OVERALL DESIGN FRAMEWORK OF THE SYSTEM

The traditional search model is mainly because the signal correlation calculation ability is not strong, and it cannot meet the requirements of long-distance and strong interference for human vital signs detection. In order to overcome the shortcomings of the traditional system, due to the weak computing power and the weak associated information ability. In this paper, by adding cloud computing technology, relying on powerful data computing capabilities, to ensure the accuracy of large-scale, long-distance trapped personnel positioning method. The system mainly consists of the following parts:The radio frequency detector uses the radio frequency emitter (Figure 1) to penetrate into the area where trapped persons may exist. By transmitting radio frequency waves, the interaction between the radio frequency waves and the signals in the vital signs of the human body produces echo effects. The basis of the positioning of the trapped personnel, so as to achieve the purpose of searching. The enlarged structure of the RF emitter is as follows:
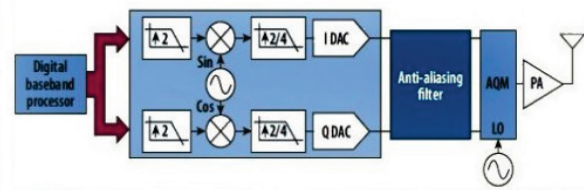
Figure 1 rf emitter structure

This system uses the embedded processor LPC2148 to realize related functions, Unlike general processors, LPC2148 has multiple 32-bit timers, 2 10-bit ADCs, 2 10-bit DACs, 2 PWM channels, 45 high-speed GPIO ports, and up to 9 edge or level triggers. External interrupt pin, with large-scale computing capability and information processing capability. Based on the high performance of the embedded processor LPC2148, the whole system takes LPC2148 as the core, and the peripheral circuits include: power supply, information input, signal display, signal detection module, radio frequency echo reflection module. The hardware design of this system fully considers the working environment of the system. Under some responsible environments such as heavy rain and rubble buried, the embedded 32-bit ARM7 TDMI-S CPU microcontroller has a good anti-interference ability. The radio frequency emitter is equipped with a radio frequency wave generator device with a diameter of 0.3mm, The signal value of the vital signs of the human body can be directly converted into the corresponding electromotive force. After the signal is amplified by the amplifying circuit, it is input to the 10-bit A/D conversion module of the processor. After the signal intensity of the detected

vital signs is digitized, the processor undergoes and design The threshold value of the signal is set for comparison, and the high and low level of the GPIO port of the RF output is controlled to control whether there are survivors, forming a PWM pulse width modulation, In order to achieve the purpose of vital signs detection.

In traditional personnel search and rescue methods, the biggest drawback is the inability to complete long-distance, large-scale measurement of personnel vital signs. Cloud computing provides the possibility to solve this problem, Cloud computing disperses the vital signs information of a large number of remotely returned human echoes into distributed systems in different regions to perform parallel computing at the same time. Relying on the powerful cloud computing capabilities in the personnel positioning subsystems in different regions, it extracts and calculates the relevant characteristics of the personnel positioning information belonging to its own area, and uses the personnel positioning networks in different regions to calculate the relevant personnel positioning parameters. This cloud platform for parallel computing in different regions includes three parts: a basic data cloud for vital signs of personnel positioning

information, a platform cloud for remote operation, and an application cloud for realizing personnel vital signs detection.

3.SYSTEM HARDWARE DESIGN

The vital signs measurement circuit is divided into two parts, one is the preamplifier circuit of the vital signs sensor, which is responsible for reasonable amplification of weak vital signals, and the other part is digital/analog conversion and display, control, and software nonlinear correction. As the Figure 2 shows, the PWM channel output pin of the processor LPC2148 is connected to the control bit of the radio frequency generation module, and the frequency and period of the radio frequency generation signal can be controlled by controlling the signal of this bit. The processor encodes and outputs PWM based on the difference between the collected measured vital signs and the set vital signs. The radio frequency is an on (ON) or off (OFF) repetitive pulse sequence, which is loaded on the radio frequency emitter. When it is on, the radio frequency is added to the load, and the signal strength of the vital signs of the radio frequency emitter terminal rises. When it is off, the radio frequency is stopped, and the radio frequency emitter terminal vital signs detection ends.

Figure 2 PWM control block diagram

4.SYSTEM SOFTWARE DESIGN

4.1 VITAL SIGNS SIGNAL ACQUISITION PHASE

The radio frequency echo detection method adopts PWM pulse width modulation, and the detection circuit adjusts the duty cycle of the PWM square wave to achieve the purpose of detecting vital signs. Therefore, the output of the formula is the pulse width of the vital signs detection pulse. The output PWM structure is shown in Figure 3:
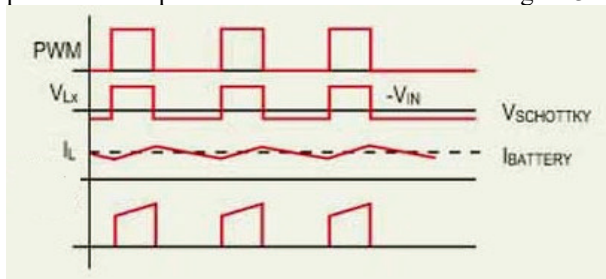
Figure 3 pulse control dutyfactor schematic diagram

Since the RF transmission is determined by the duty cycle of the PWM square wave, the vital signs detection system is a time-discrete control system. Therefore, the vital signs can be discretized by differential equations in the design of cloud computing detection algorithms, so that they can be directly applied It is in the vital signs detection of cloud computing. At this time, the integral term and the differential term can be expressed by summation and increment, As shown in the following formula(1), formula(2):

$$\int e(t)dt = \sum_{j=0}^{n} e(j)\Delta t = T\sum_{j=0}^{n} e(j) \tag{1}$$

$$\frac{de(t)}{dt} \approx \frac{e(n)-e(n-1)}{\Delta t} = \frac{e(n)-e(n-1)}{T} \tag{2}$$

Then the expression for detecting discrete vital signs can be obtained, As shown in the following formula(3):

$$Y(n) = K_p\left\{e(n) + \frac{T}{Ti}\sum_{j=0}^{n} e(j) + \frac{Td}{T}\big[e(n)-e(n-1)\big]\right\} \tag{3}$$

In the above formula, T is the vital sign sampling period; e(t) is the deviation value of the nth vital sign sampling; e(n-1) is the deviation value of the n-1th vital sign sampling; n is the sampling sequence, n =0, 1, 2.... The fuzzy detection function e(n) is the input and Y(n) is the output. In the formula, en and en-1 are the deviation values of the nth and n-1 times respectively, and Kp, Ti, and Td are the proportional coefficients, Integral coefficient and differential coefficient, use fuzzy control rules to modify PID parameters.

In the signal acquisition stage, the currently collected vital signs set value is still far from the actual vital signs. In order to speed up the acquisition speed, the duty cycle of the acquisition time is the largest, and the speed adjustment does not work, only the output power Increase the speed to adjust the speed of vital signs collection.

4.2 DENOISING AND DETERMINATION PHASE OF VITAL SIGNS

At this stage, the duty cycle is calculated based on the

collected radio frequency echo duty cycle information and the deviation between the standard information of vital signs and the measured information. The system brings the difference between the on-site vital signs and the target vital signs set by the user into the incremental acquisition algorithm formula every fixed time T, and the output of the formula determines whether there are relevant personnel, and the subsequent positioning circuit is determined according to this duty cycle characteristic The frequency at which the echo occurs. The larger the deviation between the on-site vital signs and the target vital signs, the larger the duty cycle. The longer the detection time of the detection circuit is, it means that there is no relevant vital signs information. Conversely, if the deviation between the two is small, the duty cycle will decrease, and the detection time of the detection circuit will decrease until the target value is equal to the actual measured value, indicating that there is a relevant rescuer.

5.CONCLUSIONS

This paper proposes a design method for a large-scale, long-distance vital signs measurement system based on sensor cloud computing technology, the system uses an embedded processor LPC2148. Collect vital sign echo information through radio frequency and use powerful cloud computing model to form a large-scale signal processing environment. Through experimental tests, the system can accurately collect the vital signs of more than 20 trapped persons in a remote environment in a complex area. The accuracy error of the collection is small, which meets the requirements of the system.

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The Design of Teaching Contents of "Sensor and Measurement Technology"

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Abstract: According to the characteristics of the "Sensor and Measurement Technology" course in higher vocational colleges, this article integrates the teaching contents in selection, organization and expression, and incorporates new technologies and new knowledge in a timely manner to improve students' knowledge and ability.
Key words: Curriculum Design; Content Selection; Organizational Form; Expression Form.

1.CONTENTS SELECTION

Due to the continuous expansion of the sensor application, new measurement technology endless, so the teaching of "sensor and measurement technology" courses in higher vocational colleges must face challenges and propose scientific teaching content design.[1]

The teaching location is located in the sensor technology application training room and the enterprise site. The complete teaching process is the work process. The learning of theoretical knowledge is integrated in the use and operation of measuring instruments and equipment. The theoretical explanation and actual operation are organically integrated at any time. Theoretical knowledge Use enough as a degree. At the same time, students can feel the real production environment and corporate culture atmosphere during the production of simulated products, so that students' learning and working processes can be integrated. [2]

The course teaching content is based on the course objectives, in accordance with the requirements of the industry's electrical automation related professional positions and professional ability training, and the professional standards are transformed into the course teaching content for selection. According to the latest application fields of sensors, real measuring instrument project teaching combined with virtual real work is adopted Practical teaching of the scene, training production management personnel of typical sensor measurement technology.[3-4]By absorbing new knowledge, new technology, new technology, new materials, new equipment, new standards of sensors and measurement technology, teaching content is reconstructed, and students' sustainable development ability is developed.

1.1 The typical work process is a learning situation

Through the integration of professional standards, we have conducted discussions with engineers, technicians, and craftsmen of many electronic product manufacturers, extracted typical tasks from the electronic product production process of the enterprise, determined the learning content, and set the learning context. Take measuring instruments and equipment as the learning carrier and typical production process as the learning process, integrate theoretical knowledge into specific training and practical projects, realize the consistency of the teaching process and the work process, and highlight the training of students' professional ability and quality.

1.2 Introduce the latest sensor technology and the latest application fields to optimize teaching content

In-depth integration with high-tech enterprises in the region, real-time tracking of new fields and new technologies in the use of sensor technology, and timely introduction into the course, keeping the content of this course synchronized with the development of sensor technology.

1.3 Specific teaching of specific measurement signal types

Each learning situation is designed for a specific measuring instrument, and the off-campus training base is responsible for providing relevant sensor product materials and technical data to make teaching more targeted and applicable.

2. TEACHING CONTENTS ORGANIZATION

The basic idea of the organization and arrangement of the teaching content of this course is to follow the basic laws of students' professional ability training, integrate and order the teaching content based on the real work tasks and work process, and scientifically design the corresponding knowledge and skills for the job. The learning module has designed a real learning situation. At the same time, learning from the German vocational education model, at the beginning of the course, students are assigned a comprehensive project work, which requires students to use extracurricular time to complete. In the final assessment, the project work accounted for 40% of the total score. The teaching process of this course effectively implements the integration of teaching, learning, and doing in the sensor technology application training room and the training base, completing the teaching process, and integrating theoretical learning and practical training. [5-7]

The practical teaching of this course adopts the integrated and progressive task-driven method of teaching. According to the different requirements of skill training, it is divided into in-class training, course training, comprehensive training, vocational ability training (combination of work and learning) and evidence-collecting training. On this basis, in order to further improve the professional ability of students, the corresponding practical teaching links are set up, such as: comprehensive training, work-study combined internship, graduation internship, graduation design, etc.

The characteristics of the organization and arrangement of the teaching content of this course are:

(1)The learning situation is selected, and the typical measurement system is used as the carrier to scientifically design learning tasks.

(2)The design of learning scenarios and projects follows the principles of knowledge from simple to complex, and technology is from single to comprehensive, integrating and ordering teaching content, in line with the cognitive and learning laws of higher vocational students.

(3)Standardized management of teaching organization, each learning situation is in accordance with the standardized teaching sequence: clarify the task requirements of the measuring instrument, analyze the task and make a learning plan: explain the principle of the sensor, learn relevant knowledge to determine the solution to the task: select sensors, electronic components, imitate the occupational environment and implement the task: component assembly, circuit connection, check the quality of the task: check whether the measurement result of the measuring instrument is accurate and whether the circuit connection is correct, evaluate the entire working process: evaluate the measurement result of the measuring instrument and the production process, Whether the product meets the needs of customers, what improvement measures need to be taken, and the introduction of innovative solutions. The teaching mode focuses on cultivating students' ability to correctly select sensors for different measurement signals, as well as the ability to independently assemble measuring instruments, check and troubleshoot measurement circuit faults.

(4) According to the requirements of the work process, the study task book (including information, decision-making, planning, implementation, inspection, evaluation and innovation), study guide, study worksheet, teaching plan design, comprehensive project evaluation form, and total score evaluation form are designed to ensure different Teachers are organizing teaching to achieve the knowledge and skills goals stipulated in the curriculum.

3. REFORM OF TEACHING METHODS

3.1 Constructing all-round and three-dimensional information curriculum teaching resources

In the course of teaching, this course makes full use of network multimedia technology to collect existing designs related to various sensor applications, and make them into teaching cases for students to refer to when studying. And flexibly use various modern teaching techniques, such as multimedia courseware, sensor training animation, and training videos for circuit making teaching. Part of the typical product production process videos can also be used as video materials for students to observe and learn, and extend the time and space of on-site teaching. At the same time, virtual software is fully used for simulation in the design of detection circuits to improve design efficiency and reduce training costs.

3.2 TO Develop supporting instructional design tasks, evaluation forms, and simulation animations

Through the exchanges and explorations with technical personnel in the industry and enterprises, the research group has carried out reforms and innovations in curriculum structure, teaching mode, curriculum development, etc., formed its own characteristics, and compiled a school-based textbook "Sensors and Measurements" based on the systematic work process Technology", and a set of related experimental instruction books, and formed the supporting teaching design, task book, study work list, study guide, inspection and evaluation form and other materials. Developed a simulation system

3.3 CreatING corporate working environment and implement situational teaching in a real environment

The classroom is built in the training room, using the multimedia teaching equipment and experimental training equipment in the training room, so that students can not only learn interactively through multimedia courseware, but also intuitively understand the working process of sensor measurement equipment through physical objects and simulate The working environment of the production site, hands-on operation.

Through the reform of the teaching mode of this course, the continuous exploration of scientific and reasonable teaching methods has provided motivation for the learning of this major, and provided a reliable basis for the reform of the curriculum system, teaching content and teaching methods, thereby improving the quality of talent training and achieving The goal of talent training has been achieved and the teaching effect has been achieved.

4. THE FORM OF EXPRESSION

The course of "Sensor and Measurement Technology" has undergone teaching practice, and the teaching content has been continuously enriched and improved. We draw on the concept of foreign vocational education, focus on the cultivation of students' professional ability in the design of teaching content, and focus on students' independent learning ability and technological innovation ability, and lay a solid foundation for the development of students' professional ability. The specific form of teaching content changes accordingly. The specific manifestations of the course teaching content are: the combination of reality and virtuality, the rich paper textbooks, electronic materials, and network resources.

4.1 Deep integration of school and enterprise, development of curriculum standards

The core curriculum syllabus of "Electrical Automation Technology Major" was jointly formulated with professional technical personnel of industry enterprises and professional construction committees, highlighting (1) the implementation of the school-enterprise cooperation work-study alternate course teaching model; (2) the implementation of "teaching, learning, doing "Integrated teaching mode; (3) Combination of course learning and vocational qualification certification; (4) The content of the course is consistent with the job requirements. Contact industry companies and first-line experts in time to update the course teaching content according to the latest developments in sensor technology.

4.2 KeepING up with technological development and select excellent teaching materials

The textbook uses the "Sensor and Detection Technology" compiled by He Xinzhou and published by Wuhan University Press. This textbook is specifically designed for the planning of electrical automation in higher

vocational colleges and belongs to the 11th five-year plan for higher vocational colleges. At the same time, based on the advanced and abundant on-campus training circuit, the research team and the off-campus training base jointly compiled the training textbook of "Sensors and Measurement Technology" based on the work process system. In addition, a number of other reference textbooks have been selected, as shown in the figure below, to enrich the teaching content.

4.3 IntroducING enterprise management and implement standardized management of courses

Completed the design of learning resources such as the curriculum standards, learning situation task book, learning guide, learning worksheet, project evaluation form, general evaluation form, exercise set of the "Sensor and Measurement Technology" course, and completing the teaching plan design, teacher manual, teaching Standardization of teaching resources such as PPT, electronic teaching plans, and on-site production videos. In the process of teaching standardization, attention is paid to process control and result quality testing.

This course is designed according to the design ideas based on the work process, and the school-enterprise cooperation develops the course, which reflects the combination of work and learning; in a real working environment, it realizes the integration of teaching, learning and doing, improving students' vocational skills and professional qualities, and training to meet the needs of society and high-quality talents that the company needs.

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Research on the Application of Optical Storage Intelligent Conversion System in the Echelon Utilization of Power Battery

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Abstract: Photovoltaic and energy storage through the optical storage intelligent transformation cube mainly work with the charger to jointly output energy to charge the electric vehicle, or the charger in turn can charge the energy storage battery by transforming the cube; suitable for all charging control boxes Or the usage scenarios of charging box change, including bus, express, airport, etc. The optical storage system has no special requirements for charging users, and is consistent with the charging operation of conventional chargers. All strategies are controlled by the local microgrid controller and the energy cloud.
Keywords: Power battery; Echelon utilization; Optical storage intelligent conversion system.

1.INTRODUCTION

With the vigorous development of the new energy automobile industry, the number of replacement and retirement of power batteries is increasing. As of 2020, the total installed capacity of power batteries in my country is 63.6GWh, a cumulative increase of 2.3% year-on-year. Among them, the cumulative installed volume of ternary batteries was 38.9GWh, accounting for 61.1% of the total installed vehicles, a cumulative decrease of 4.1% year-on-year; the cumulative installed volume of lithium iron phosphate batteries was 24.4GWh, accounting for 38.3% of the total installed vehicles, a cumulative increase of 20.6% year-on-year, showing an overall appearance Blowout situation.

With the introduction of power batteries into the market, a large number of retired batteries will be dealt with by the end of their service life. Large-scale decommissioned batteries have not only become a major social problem, it will not only affect the sustainable development of the new energy industry, but also bring a series of environmental issues. At present, there are mainly two feasible treatment methods: one is cascade utilization, which means that the decommissioned power battery will be used as a carrier of electric energy in other fields such as energy storage, so as to give full play to the residual value; the other is dismantling and recycling, which means that the battery will be decommissioned. Carry out electric discharge and dismantling, and refine raw materials to realize recycling [1]. Under normal circumstances, power batteries retired from electric vehicles usually have a remaining capacity of 60-80% of the initial capacity and have a certain service life. If these batteries are directly disassembled, it is obviously a waste of resources. However, how to evaluate, use and maintain these batteries is a very complex and integrated system engineering with very broad application value. Therefore, when the mission of power batteries in new energy vehicles is completed, how to smoothly transition to the next level of utilization has become a common concern for practitioners in the new energy industry and even national policymakers.

2. THE APPLICATION OF OPTICAL STORAGE INTELLIGENT CONVERSION SYSTEM

Recently, the state has actively encouraged the cascade utilization of power batteries and issued a policy document on the "Energy-saving and New Energy Automobile Industry Development Plan (2012-2020)", which proposes to establish a cascade utilization management system for power batteries. As the power battery of new energy vehicles, the power battery including lithium-ion battery is a high-performance green battery. It also has the advantages of high energy density, no memory effect, long life, good safety performance, and low environmental pollution. The improvement of production technology and battery performance will occupy the main market of power batteries and energy storage batteries. Similar to the situation faced by the echelon utilization of power batteries, the current barriers and opportunities for the development of the energy storage industry, the huge demand of the current energy storage market and the shortcomings of various existing energy storage measures, are affected by the explosive electric vehicles. Driven by growth, the echelon utilization of power batteries in the field of energy storage has become a new focus.

On the other hand, my country's clean energy such as wind energy and solar energy has developed rapidly in recent years, with rapid growth in installed capacity and an increase in its proportion of total installed capacity. Due to the intermittent nature of wind and solar energy, in the absence of energy storage devices, wind energy cannot be continuously and stably output for a long time. In order to maintain the stability and power quality of the power grid, the phenomenon of abandoning wind and light has gradually appeared. According to statistics, in 2020, several provinces with relatively abundant wind energy have discovered different levels of wind abandonment phenomenon and it is increasing day by day. Under the condition that photovoltaic power generation is running well, some areas in the northwest have also experienced more serious abandonment of solar energy, and the rate of abandonment Increase gradually. Energy storage technology, as the last one kilometer in the field of new

energy, can store wasted energy and release it when needed. It can stabilize and stabilize the output power of intermittent renewable energy generation such as wind and solar energy, and increase the acceptance of intermittent renewable energy in the grid. Renewable energy capacity meets the stable and continuous requirements of new energy power generation, and effectively reduces wind and solar abandonment. In addition, power generation companies and grid companies are designed according to the maximum power and with a certain safety margin when designing, but the actual load power often changes during peak and valley periods. Therefore, the power generation equipment and the power grid have been in a long-term relationship. Low utilization rate, economic and environmental effects are very low. Energy storage equipment can store the excess electricity generated when the load is low, and store it on the power generation side and the transmission and distribution side. When the peak value is met, the excess power stored at the bottom of the load valley can be sent to the grid to meet the demand of the peak load. In addition, the existence of the peak-to-valley price difference enables the energy storage system to store electricity during the valley hours, and the stored electricity during peak hours can be used again, which can not only meet the growing demand for electric vehicle charging, but also reduce electricity costs and greatly reduce the power grid. Pressure has played a very important role in improving the safety of my country's power system. [2]

When the power battery cannot fully meet the needs of the vehicle, it can be applied to other scenarios, continue to play its function, and maximize the use of resources. Among them, the additional distribution of light energy storage in charging stations is an effective scenario for the cascade utilization of power batteries.

According to preliminary research, the power batteries on the market lack consistency. Since the demonstration research project of automatic battery cascade utilization, the problem of battery consistency has been an important challenge in the operation of cascade utilization projects. Due to different production processes and manufacturers, different power batteries exhibit inconsistencies in capacity, internal resistance, voltage, etc., which are closely related to the battery's own charging and discharging reaction mechanism. There is a lack of an intelligent charging device that can simultaneously achieve Expansion of the micro-grid function with charging as the main body, realizes the dual-network integration system of charging and micro-grid, and realizes intelligent energy management, strategic control according to the realization demand, optimal control of energy flow, and realizes the profitability and functionality of the entire system to the greatest extent Reduce user costs [3]. The system topology diagram of this design is shown in Figure 1. It realizes the expansion of micro-grid function with charging as the main body, realizes the dual-network integration system of charging and micro-grid, and realizes intelligent energy management, and implements strategic control according to the realization demand, and the energy flow is optimal

Control to realize the profitability and functionality of the entire system.
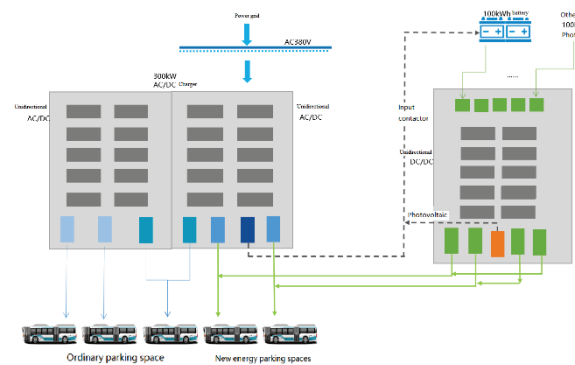
Figure 1. Optical storage intelligent conversion box system topology diagram

The advanced nature of the project and main innovations:

(1) The integrated design of the optical storage intelligent power conversion assembly, which is connected in parallel with the charger to realize the expansion of the dual-network integration function, and completes the charge and discharge control of the cascade power battery safely and efficiently.

(2) Realize the optical storage intelligent control strategy, coordinated control strategy with charging, the carrier of optical storage conversion and energy management component integration, and can achieve IP54 protection level.

(3) The system adopts multiple input and output. The output PDU can be connected to ten-channel modules, and PDUs can be output in parallel according to actual needs. The parallel connection link is completed in the conversion box. When there is photovoltaic connection, there is one output PDU connected in parallel with the charger for charging energy storage.

(4) Through external CAN and charger centralized control coordination communication, and cloud platform energy cloud communication to realize data upload and control strategy issuance.

The system design of the core cascade battery conversion and utilization of this system is carried out according to the following methods and routes:

(1) Theoretical analysis: study the method of realizing the dual-network integration system of charging and micro-grid, and realize intelligent energy management, according to the realization demand for strategic control, optimal control of energy flow, preliminary budgeting of the project cost, and completing the research within the project budget. The feasibility of the content.

(2) Construction of the system: Combining the production process data of specific enterprises to realize the expansion of micro-grid functions with charging as the main body, and build an intelligent control system based on communication function technology.

(3) Experimental verification: According to requirements, complete parameter condition verification in the laboratory to judge the accuracy of system operation.

(4) System debugging: On the premise that the laboratory verification results meet the requirements, on-site debugging is carried out, and the experiment process

completes the equipment installation and adaptation process.

3.CONCLUSIONS

According to the results of the field experiment, carry out system optimization, perfect the system, realize the profitability and functionality of the whole system, and complete the research report.

In summary, the optical storage intelligent conversion system in the echelon utilization of power batteries has very broad application value and industrialization value.

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Application Analysis of New Energy Power Generation Technology

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Abstract: We currently use non-renewable resources such as coal as the energy source for power generation, which is unsustainable. The application of new energy power generation has become the inevitable direction of my country to solve energy shortages. New energy power generation technology meets people's growing demand for electricity while protecting the environment. Reduce carbon emissions, and can promote the sustainable development of the power industry. At present, new energy power generation technologies mainly include solar power generation, wind power generation and other power generation methods.
Keywords: New energy; Power generation; Application analysis.

1. INTRODUCTION

As the global demand for electric energy continues to increase, how to expand energy supply methods has become an important issue to ensure energy security, especially how to effectively use renewable energy. In recent years, new energy power generation technology will gradually become a key technology in the power industry. Compared with traditional power generation technology, new energy power generation is cleaner. Only with advanced new energy power generation technology can it meet the increasing demands of people. While demanding electricity use, it protects the environment, reduces carbon emissions, and promotes the sustainable development of the power industry. New energy power generation technologies mainly include solar power, wind power, hydropower and other power generation methods. [1]

2. OVERVIEW OF NEW ENERGY

With the advent of the era of artificial intelligence, large-scale industrial upgrades such as the electrification of automobiles have made the entire human society have an increasing demand for electricity. At present, thermal power generation still accounts for a relatively large proportion of my country's power system, and it has serious environmental pollution, and non-renewable resources such as coal will gradually be exhausted over time. This makes the widespread application of new energy power generation a current An important direction of power generation engineering in my country's power system. Although the current new energy power generation technology is not mature enough, the production of many new materials and new technologies has enabled the rapid development and application of new energy power generation. According to the development of my country's modern power industry, my country's new energy power generation industry is the same as other emerging industries. Many technologies are still relatively backward and there are many shortcomings. However, the country is increasing its investment in new energy power generation technology to provide new energy power generation technology for my country. The continuous development of the new energy generation provides long-term support. [2]At the same time, the many advantages of new energy power generation will also promote it to become the main form of energy supply in the future.

2. 1 DEVELOPMENT AND CLASSIFICATION OF NEW ENERGY

New energy is a new form of energy supply. Compared with traditional energy, it is usually renewable. It is mainly used to transform the existing energy technology by using new technologies and new materials to cope with the ever-shortening energy structure. new technology. Through continuous exploration, we will develop and utilize natural resources in nature in a modern way, so as to replace the most important traditional fossil energy sources with endless sources of renewable energy. There are many new forms of energy that can be utilized, among which solar energy and wind energy account for a large proportion.

2. 2 APPLICATION OF NEW ENERGY POWER GENERATION TECHNOLOGY

In recent years, with the successive promulgation of a series of national subsidy policies and the continuous improvement of public environmental awareness, my country's new energy power generation industry has been rapidly and relatively steadily improved. my country's installed renewable energy power generation capacity reached nearly 800 million kilowatts in 2019, accounting for about 40% of all power installed capacity, of which wind power and photovoltaic power generation are the fastest growing forms of power generation. At present, my country's new energy power generation industry is gradually replacing the traditional energy power generation industry, and it has also produced quite good benefits. Although there are still many technical problems that need to be overcome in new energy power generation technology, the technology is constantly advancing, and as the technology continues to mature, the benefits generated are increasing. At this stage, in the construction of new energy power generation, wind power, photovoltaic power generation and hydropower account for a large proportion, and related facilities and technologies are also becoming mature. [3]

3. WIND POWER GENERATION

Wind energy resources are extremely abundant in many regions of the world, and they are more prominent than water resources, which are 10 times the water resources

reserves. Moreover, the history of wind energy resource utilization is long, so the technology is relatively mature. In the western region of my country, the reserves of wind energy resources are huge and the development is relatively simple. The use of wind energy to generate electricity has gradually become one of the pillars of my country's emerging energy industry.

3. 1 PRINCIPLES AND CLASSIFICATION OF WIND POWER

The principle of wind power generation is to convert wind power into mechanical force that drives the wind, and use generators to convert energy to form current, thereby converting wind energy into electricity. Wind power generation devices usually consist of wind wheels (including blades, hubs, etc.), transmission systems (main shafts, main bearings, gearboxes and connecting shafts, mechanical brakes), yaw systems, electrical systems (generators, control systems, capacitor compensation cabinets and Transformer) and the engine room. The wind wheel is composed of three blades (however the shape of the blade affects the degree of wind energy absorption), it is an important component that converts the kinetic energy of the wind into mechanical energy. The blades of wind wheels are generally made of composite materials, which are light in weight, high in strength, and not easy to break. Then through the part of the power grid in the corresponding area, the generated electric energy can be stored and transmitted to produce economic benefits. In wind power generation, there are also speed-limiting safety mechanisms, tail fins, batteries and other structures that work together to convert natural wind energy into usable electrical energy. According to the installed capacity index, wind turbines are divided into small machines, medium machines, large machines and super large machines. Generally speaking, the greater the capacity of the fan, the greater the length of the blade. According to the generator speed index, it is refined into a constant speed machine, a variable speed machine, and a multi-state fixed speed machine. Fan control technology. The types of grid-connected generators used include doubly-fed generators, two-speed asynchronous generators and variable-speed wind generators. The new grid-connected technology introduces fuzzy control technology to efficiently adjust the speed and power. The use of neural network to control the blade pitch and predict the aerodynamic characteristics of the wind turbine has good results. When the wind farm is in grid-connected operation, reactive power is absorbed. In order to ensure the benefits of operation, the wind farm is equipped with SVC or other reactive power compensation devices, through real-time dynamic compensation, to reduce system oscillations caused by transmission power and optimize grid operation status.

3. 2 WIND POWER MARKET AND PROSPECTS

As countries in the world pay more and more attention to issues such as energy security, ecological environment, and climate change, accelerating the development of the wind power industry has become the universal consensus and concerted action of the international community to promote the development of energy transformation and respond to global climate change. In recent years, my country's wind power energy industry has shown explosive growth, and the growth of scale has reduced costs. This makes the benefits of wind power generation start to compete with traditional energy power generation. In 2019, China's newly added wind power grid-connected installed capacity was 25. 74GW, of which onshore newly-added grid-connected installed capacity was 23. 76GW. Among them, Neimenggu, Hebei, Liaoning and other provinces with abundant wind resources accounted for a large part and achieved rapid growth. . In addition, my country's newly-added offshore grid-connected installed capacity is 1. 98GW. As of the end of 2019, my country's installed wind power capacity reached 209. 94GW, which has remained the world's largest since 2008, accounting for 32. 24% of the world's cumulative wind power installed capacity. In addition, in some developed countries such as Europe and the United States, wind power has also developed rapidly. Many countries regard the development of wind power as an important part of the clean energy revolution. [4]

The rapid development of wind power generation is mainly due to its advantages that other power generation methods cannot match. First of all, compared with traditional energy sources such as thermal power, wind power has almost no impact on the environment. It is clean and does not produce any environmentally harmful waste, and has good benefits. Furthermore, the scale of wind power generation facilities can be adjusted according to the actual situation. Once completed, hydropower units that are not easy to change are more flexible and have a wider range of adaptation. Of course, wind power also has many shortcomings. At present, due to technical reasons, the manufacturing cost of wind power generators is relatively high, and noise is generated during operation. In addition, the construction of wind power plants is still Need to occupy a lot of land; and the most important thing is the instability and unreliability of wind resources, which is also an important reason for restricting the benefits of wind power.

4. SOLAR POWER

Solar energy is the most primitive energy source and the largest known energy source. Most of the energy required by living things on the earth comes from solar energy.

4. 1 PRINCIPLES OF SOLAR POWER GENERATION

With the development of economy and society, people have gradually matured the development and utilization of solar energy. Solar thermal power generation and solar photovoltaic power generation are the basic forms of application. Photovoltaic power generation also includes photovoltaic power generation, photochemical power generation and photobiological power generation. Photovoltaic power generation is the most common form of solar power generation in our lives. It can use specific devices to directly convert solar energy into electrical energy. The device that plays a key role is the solar cell. The quality of the solar cell determines the efficiency and effectiveness of the entire system.

4. 2 APPLICATION AND PROSPECT OF SOLAR POWER GENERATION

Nowadays, the use of solar energy mainly includes solar water heaters, small household solar power generation devices, large solar power stations, aerospace and so on. At present, the actual application cost of solar energy is relatively high, and the efficiency is generally low. The energy radiated by the sun is very huge. Although the amount of radiation reaching the earth's atmosphere is only about one part of 2 billion, this small part of energy is enough to supply most of the life energy sources on the earth. From this perspective, Solar energy will be the most reliable energy source for mankind in the future.

With the increasing demand for electricity, the continuous development of solar power technology is imperative. To realize the large-scale application of solar power, two problems must be solved, namely: the conversion efficiency of solar photovoltaic must be based on the existing basis Get a great improvement; establish a comprehensive and systematic solar power generation. Transportation grid. Only when we have achieved breakthroughs in these two areas, we can truly and effectively use solar energy.

5. CONCLUSIONS

In recent years, as the country vigorously advocates low-carbon and environmentally friendly economic policies and initiatives, the model of my country's energy industry has undergone earth-shaking changes. The emerging power industries such as wind energy, nuclear energy, solar energy, etc. have emerged, changing traditional energy sources. Especially the pattern of the power industry. Various new energy power generation industries in my country are developing rapidly, driving the entire power industry. Even the energy industry is gradually developing in the direction of environmental protection and ecology. But in this process, many problems were still exposed. Although there are still many problems in my country's new energy power generation, the potential of the new energy industry has begun to be reflected in various data when energy is gradually scarce. To fully tap this potential, we still have a long way to go. The next step is to improve the grid design and strengthen smart grid planning based on the development of new energy in accordance with local conditions, and prepare for the large number of new energy power generation farms.

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Research on Methods of Shaft Angle Data Detection

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Abstract: The paper researched methods of shaft angle data detection. Under the same experimental conditions, the performance of the DSP plate is compared to the special module and single chip.
Keywords: Synchronous motor; Shaft angle detection; Control system of CNC machine tool.

1. THE APPLICATIONS OF SYNCHRONOUS MOTOR

In modern control systems such as machine tools, robots and military engineering equipment are inseparable of the process of transmission, measurement and transformation of digital angle signals. Following things are required: transmitting or reproducing an angle over long distances with high precision; so-called angular synchronization tracking, synchronous rotation between two or more axes that are not mechanically fixed; accurately measuring a certain linearity Displacement or angular displacement; complete control of the position, velocity and acceleration of a three-dimensional space of a system, etc., are inseparable The process of transmission, measurement and transformation of digital angle signals. [1]

There are many kinds of traditional angle measurement methods. According to the sensor, it can be divided into potentiometer, brush contact encoder, photoelectric encoder, Ac micro-motor and so on. The use of inductive Ac micro-motors - synchronous machines and all-electronic solid-state synchronous machines - digital conversion technology has become more and more popular, this angle measurement method is not only highly reliable, It solves the measurement and display of angular position, and also can realize precise control of related motion systems. It has simple structure, strong anti-interference performance, high precision, long life and good real-time performance, convenient. As shown in Figure1, it is a block diagram of CNC machine tool CNC machine tool using a synchronous machine as a detecting component.
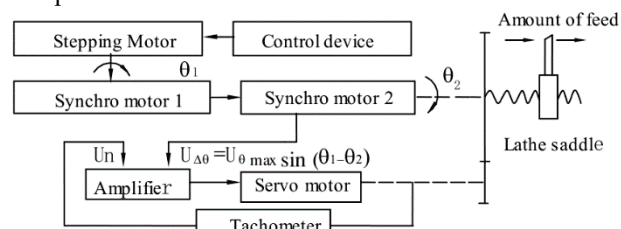
Figure 1. CNC machine tool servo system block diagram

The system uses a stepper motor to convert the command (digital quantity) issued by the numerical control device into a given rotation angle θ_1, the actual rotation angle of Synchronous motor angle receiver θ_2, and the output corresponds to the angular difference $\theta = \theta_1 - \theta_2$ error signal voltage U_θ. U_θ is amplified by the amplifier and used as the control voltage of the servo motor to rotate it. The servo motor is deflected by the gear to drive the rotor of the Synchronous motor 2. The deflection makes the angular difference θ reduced, so that the rotating tool holder (or table) is approached to the ideal position until the difference is zero. If the angle of the Synchronous motor 1 is constantly changing (for example, the operator constantly manipulates the numerical control button or the handle), the servo motor will continue to rotate, so that θ_2 follows θ_1 to change and achieve the purpose of the corner follower. Thus the control of the lathe feed is realized according to the angular displacement of the stepping motor. The amount of feedback is the screw angle, not the actual position of the tool.

2. THE RESEARCH STATUS OF THE SYNCHRONOUS MOTOR SHAFT ANGLE DETECTION METHOD

Synchronous motor step is to use the whole characteristics of turning the corner into ac voltage or by the induction of the micro motor ac voltage into a corner, and in the servo system is used as a measurement of Angle displacement sensor. Synchronous motor can also be used to achieve the Angle signal remote transmission, transformation, and receive instruction. Two or more electrical circuit through the link, make the mechanical on two or more of the disconnected automatically to keep the same root the rotation Angle changes, or synchronous rotation. The performance of the motor is called step since the whole characteristic. In the servo system, creating a signal used by a party of synchronous motor called transmitter, receiving signal used by a synchronous motor is called a receiver. Control from the Angle of the whole machine is mainly used for detecting element. In the system from the Angle of the whole machine is usually a combination of two or more than two use, in order to directly compare two groups of signal and processing. Synchronous motor converts azimuth information to three-phase ac modulation signal. After shaft Angle detection device, the three-phase ac modulation signal is converted to digital quantity, calculated and azimuth, finally can be displayed or forwarding. The synchronous motor shaft angle measuring circuit is shown in Figure2. [2]
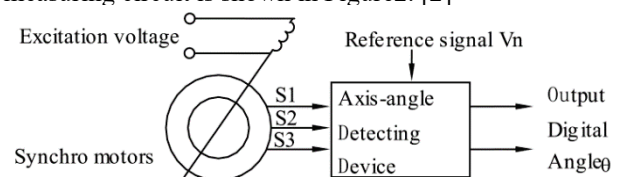
Figure 2. Shaft angle detecting circuit

At present, there are three main methods for detecting the angle of the Synchronous motor.

2. 1 GRAY CODE DETECTION METHOD

Gray code binary code is also called cycle or reflected binary, is a kind of no-right code, adopts absolute coding method, is a kind of reflection features and circulation characteristics of single step complement, its circulation characteristics and single step eliminate the possibility of a significant error in a random access, its reflection and the filling feature makes complementation is very convenient. Gray code is of reliability, it is a kind of coding way of minimizing errors. It is greatly reduced by a state to the next logical confusion.

The principle of gray code detection method, which is based on a synchronous motor positive or negative of three phase voltage output and the size of the relationship between each other to partition, determine the shaft angle in which region to get the value of the angle, it is a fuzzy value, and is not a precise angle, so the precision is bad. But it also has its own advantages, tracking speed, low cost, can be applied in the accuracy which is not high situation.

The result is a fuzzy value, the accuracy is relatively poor. The advantages are its fast tracking speed, low cost, and can be applied in places where accuracy requirements are not high.

2. 2 SPECIAL MODULE DETECTION METHOD

Modular structure design of Synchronous motor /rotating transformer is digital converter, such as SDC module or ZSZ module. Digital converter SDC converts three-wire AC voltage outputting by Synchronous motor into binary digital quantity. Because it uses a second order servo loop, so it was a continuous digital output tracking input shaft Angle change. The module is mainly composed of the SCOTT transformer, high speed digital Sine cosine multiplier, error amplifier, phase-sensitive detector, proportion integrator, voltage controlled oscillator and reversible counter control circuit consists of a second order closed loop system, eventually making counter number stable tracking real shaft angle, so as to complete simulation of the angle to digital angle conversion. This method has the advantage of accuracy is higher, but expensive. [3]

2. 3 A/D CONVERSION DETECTION METHOD BASED ON DSP AND TAKAGI-SUGENO FUZZY INFERENCE

The detection method of A/D conversion performs the shaft angle detection of the Synchronous motor. Most researchers use MCU as a control and calculation tool. The operation speed of the single chip microcomputer is low, the sampling speed is low, and the detection precision is poor.

In order to improve the detection speed of the Synchronous motor and optimize calculation methods of testing various shaft angle, select DSP as MCU, and develop a low-cost Synchronous motor shaft angle detecting device. The DSP -based Synchronous motor shaft angle detecting method has been studied experimentally. The hardware and software of the shaft angle detection system based on TAKAGI-SUGENO

fuzzy inference algorithm are studied experimentally.

Fuzzy reasoning is a kind of language variable controller, the fuzzy rules only qualitatively expressed in the form of language variables, avoiding the state equation and the transfer function, sought to people about the success and failure of a control problem of processing experience, summed up the knowledge, and then to extract rules from them directly with language variables are given, then the application of approximate reasoning method of observation and control.

In Takagi-Sugeno fuzzy reasoning, fuzzy rules and membership functions are continuous, if you can accord to the input and output data to solve the suitable control rules and membership functions, you can use them for nature to solve the problem of calculation of jumping between partitions.

Using fuzzy method in solving shaft angle, the shaft Angle value is obtained by solving fuzzy. In the solution of fuzzy, the weighted average method is adopted to improve the fuzzy solution. Under the maximum use of the information of input variables, the influence of various rules can be reflected in the calculation results.

3. THE COMPARISON EXPERIMENT RESULTS AND ANALYSIS OF DSP DETECTION PLATE AND SPECIAL MODULE BASED ON TAKAGI-SUGENO FUZZY INFERENCE ALGORITHM

Based on the Takagi-Sugeno fuzzy inference algorithm, the shaft angle calculation formula obtained by the experimental data is applied to the DSP detection plate, and compared with the dedicated module.

3. 1 ABSOLUTE PRECISION COMPARISON EXPERIMENT

Test the absolute accuracy of the DSP test plate and the dedicated module under exactly the same conditions.

The stepping motor control plate is controlled to rotate 500 times in a range of 360 degrees at an interval of 0. 18 degrees. After each rotation, an interrupt signal is sent to the DSP detecting plate and the dedicated module, so that the two are detected at the same time and output data.

Experimental results show the variation of the detection error with the sampling point of the shaft angle.

3. 2 REPEAT PRECISION COMPARISON EXPERIMENT

Test the repeatability of the DSP test plate and the dedicated module under exactly the same conditions.

The stepping motor is controlled to rotate, the position of the shaft angle of the Synchronous motor is not moved, and the detection is continuously performed. The same position is detected 50 times, and the position is taken in 360 degrees 30 positions in the range, and the repeating precision of the DSP detecting plate and the dedicated module is compared.

It can be known from the experiment that the repeatability of the DSP test plate is within 0. 1 degree. At the same time, it is found through experiments that the repeatability of the dedicated module is within 0. 087 degrees, and basically the stable code output can be achieved. The nature of the second-order servo loop is consistent. From the comparison of repeatability, the DSP detection plate is similar to the dedicated module. [4]

From the experimental data, the following conclusions can be drawn:

The Takagi-Sugeno fuzzy method removes the large jump phenomenon in the shaft angle s angle detection.

It was found that this method of solving fuzzy rules and membership functions caused large errors in the detection of 0 degrees and 360 degrees.

The absolute accuracy error band of the DSP test plate is smaller than the dedicated module, and the distribution is more uniform than the dedicated detection module.

Since the synchronous machine is not completely accurate, the above error curve cannot truly reflect the absolute accuracy of the DSP acquisition plate and module, but under the same experimental conditions, the accuracy of the two is similar, which can indicate that the DSP detection plate has been Achieved the requirement to replace the dedicated module.

Based on the Takagi-Sugeno fuzzy inference algorithm, the shaft angle detection plate of the synchronous machine of DSP achieves the detection precision of the special module, which basically meets the requirements of CNC machine tool processing and positioning accuracy, and has good application value and economic benefit.

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Research on the Cultivation Model of Innovation and Entrepreneurship Ability of Higher Vocational Electronic Information Engineering

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Abstract: Young people are the future of the country, and college students are outstanding members of young people. Therefore, the cultivation of innovation and entrepreneurial ability and team spirit of college students as future talents is of great significance. As a higher vocational educator, he is responsible for cultivating qualified workers for the motherland. How to cultivate higher vocational students with innovative and entrepreneurial ability has become the primary research topic in our education and teaching. Starting from cultivating the innovative design ability of students majoring in electronic information engineering, this article explores a new model for cultivating students' innovative and entrepreneurial ability through the reform of course materials and practical teaching, as well as organizing students to participate in various skill competitions. Excellent results.
Keywords: Innovative thinking; Curriculum reform; Innovation and entrepreneurial ability.

1. PREFACE

Innovation and entrepreneurship ability is a combination of various psychological characteristics that can create new theories and new things with social value, and it refers to the ability to solve problems with originality. It mainly includes creative thinking and creative imagination, and creative thinking is the core of creative psychology. American psychologist Kolesneck believes: "Creative thinking refers to the process of inventing or discovering a new way to deal with something or express a certain thing. " It is based on the various information provided by the research object to make people's understanding break the routine, seek variation, and explore a variety of new ways of solving problems or new ways of thinking. The main performance is seeking opposite sex and diversity.

The emphasis on innovation and entrepreneurship is not only in modern society. It can be traced back to Confucius, a great educator two thousand years ago. He proposed to "teach students in accordance with their aptitude" and "not to be angry or blameless. Fu also. " thought. In 1919, the famous educator Tao Xingzhi introduced "creation" into the field of education for the first time. In his article "Top Educators", he proposed to cultivate talents with "creative spirit" and "exploring spirit", and cultivating students' innovation and entrepreneurial ability is of great significance to the prosperity of the country and the rise

and fall of the nation. What really set off the emphasis on the cultivation of students' innovative and entrepreneurial abilities in the education sector was the speech made by Comrade Jiang Zemin in Novosibirsk Science City on November 24, 1998: "Innovation is the soul of a nation's progress and a country's prosperity. The inexhaustible driving force for innovation. The key to innovation lies in talents, and the growth of talents depends on education. " Taking this speech as an opportunity, China has taken the cultivation of college students' innovative and entrepreneurial ability as an important goal of educational reform, which has triggered a new understanding of innovation and entrepreneurial ability in the education sector. Discussion on the connotation, the factors that influence the cultivation of innovation and entrepreneurship ability, and the methods and methods.

2. THE STATUS QUO OF COLLEGE STUDENTS' INNOVATION AND ENTREPRENEURSHIP CAPABILITIES

A survey report from the "Journal of Inner Mongolia Normal University" shows: "There is a great contrast between college students' awareness of advocating innovation and participating behavior: on the one hand, they pursue innovation in understanding and reflect a more proactive mental state; and On the other hand, in action, there is a negative state of weak execution, insufficient active role, and lack of courage and ability to commit to practice. " The specific manifestations are:

2. 1HAVE A SENSE OF INNOVATION, BUT NOT GOOD AT USING AND CREATING CONDITIONS

College students generally have innovative motivations, hope to produce new ideas and new theories in their studies, and actively seek new learning methods. However, due to the limitations of the school's creative learning conditions and the students' inability to create and use the existing conditions of the school, they lack knowledge and experience. The courage of abundant teachers or classmates to ask for advice often limits the further development of students' innovation and entrepreneurship capabilities.

2. 2THE THINKING IS QUITE AGILE, BUT IT LACKS INNOVATIVE WAYS OF THINKING

With the accumulation of knowledge and experience, college students have gradually enriched their imagination, their thinking ability, especially logical reasoning thinking ability has been developed to a large extent, and their thinking is quite agile; however, because their knowledge

is not wide enough, the absorption of knowledge is independent The phenomenon of "seeing the trees but not the forest" appears when they are not related to each other. There is a lack of flexibility, comprehensiveness and in-depth thinking about problems, and the methods and methods for dealing with problems are the same. There are not many new ideas and breakthroughs. The most obvious manifestation is the lack of new ideas in speeches, homework, test papers, and papers.

2. 3THERE IS INNOVATIVE INSPIRATION, BUT LACKS THE NECESSARY INNOVATIVE SKILLS

After continuous study and thinking, college students will be inspired by specific factors. However, inspiration is often short-lived and short-lived. If you have strong innovative skills at this time, inspiration will become a reality. Chinese students have been affected by test-oriented education for a long time, and their test-taking ability has a great advantage over foreign students, but they are far weaker than foreign students in terms of practical ability and the ability to use innovative techniques.

2. 4INTEREST AND ENTHUSIASM FOR INNOVATION, BUT LACK OF PERSEVERANCE

The survey shows that college students have made considerable progress in the depth, breadth, stability and effectiveness of their interests, but they need to be further improved, which requires strong perseverance. [1]College students are able to realize the importance of perseverance in innovative activities, but lack perseverance. In actual work, they are often anticlimactic, change their minds and even give up pursuit.

It can be seen that although major universities across the country attach great importance to the cultivation of students' innovation and entrepreneurship capabilities, the current situation is very worrying. Zhu Qingshi, president of the University of Science and Technology of China, once pointed out at an education forum: "The biggest problem in China is that the first and second generations of young people lack the ability to innovate and start businesses. This is also the bottleneck of our country's future development. " Achieved good results in international competitions, However, the overall lack of innovation and entrepreneurship capabilities of Chinese college students, lack of inquiry awareness, inability to ask questions, and weak research capabilities have probably been recognized. The reasons for the current lack of innovation and entrepreneurship capabilities of college students are profound and broad. There are factors such as the education system and the age characteristics of college students, as well as the stability and convergence formed by the cultural accumulation of thousands of years. The influence of the national characteristics of seeking differences and adventures. Despite the difficulties, the development of society and the country's strong demand for innovation and entrepreneurship have forced educators to face the difficulties and actively explore new ways and methods to solve them. [2]

3. CULTIVATE STUDENTS' INNOVATION AND ENTREPRENEURSHIP ABILITIES THROUGH CURRICULUM REFORM

3. 1REFORM THE ELECTRONIC COMPREHENSIVE TRAINING COURSES TO ENHANCE THE KEY ROLE OF THE COURSES IN THE DEVELOPMENT OF ELECTRONIC CAPABILITIES

The electronic comprehensive design training course is a course to train students' comprehensive design ability. Since 2015, the college has changed the original "electronic product production practice" into two courses, "electronic design training" and "innovative design coaching", and combined with extracurricular electronic production training as a supplement. The design and production content of the comprehensive electronic design training course is added on the original basis every year, which strengthens the novelty and practicality of the design content. So far, the laboratory has more than 50 design training circuit boards. Electronic assembly process training requires relatively low knowledge base for students. It is arranged in the second semester of the freshman year in the teaching plan. The focus is on training students' electronic circuit welding technology to lay the foundation for future electronic assembly. The teaching hours are a week, and the time is scattered, which lasts for half a semester. The electronic comprehensive design tutoring course is an introductory course for students to carry out electronic design. In addition to the public elective courses and elective courses, the learning and training of interest groups is also the most effective link, so that students who have a foundation and are interested in electronic design can get enough Play and improve ability. [3]The electronic production training is planned, generally divided into four stages:

The first stage: basic ability training for electronic production. It is arranged in the second semester after enrollment and will be conducted in the form of an interest group. The main contents are: welding technology training, understanding of basic components (learning to use multimeters), image recognition, and audio amplifier circuit production.

The second stage: Introductory training in electronic production. It is arranged in the third semester after enrollment and will be conducted in the form of public elective courses. Mainly learn drawing, production and measurement (learning the use of Protel (Altium Designer) software, learning the use of commonly used electronic instruments, using waveform diagrams to analyze the working status of circuits, and training analysis capabilities). The content includes: simple power circuits, motor drive circuits, Sound and light control light switch circuit, temperature control heater circuit, etc.

The third stage: basic training of electronic design. The circuit is mainly designed in combination with theoretical knowledge and arranged in the form of elective courses in the fourth semester after enrollment. The content includes:simple electronic organ circuit (including tone circuit, power amplifier circuit), isolation amplifier circuit, charger circuit, etc.

The fourth stage: Training to improve the comprehensive ability of electronic design. It is mainly for the comprehensive design of medium and large-scale circuits. It is arranged in the fifth semester after enrollment and is

carried out in the form of elective courses. The content includes: answerer circuit, switching power supply circuit, numerical control power supply circuit, wireless communication circuit, phase-locked loop oscillation circuit, speed detection circuit, and charger circuit.

3. 2REFORM THE PRINCIPLE AND APPLICATION COURSES OF SINGLE-CHIP MICROCOMPUTER TO HELP STUDENTS CULTIVATE THEIR INNOVATIVE ABILITY

As the main means of electronic automation control, the single-chip microcomputer plays an increasingly important role. The course of this major is a provincial-level excellent course. The teachers of the course group have carried out a series of teaching practices, compiled new teaching documents, revised electronic teaching plans and courseware every year, published new teaching materials and experimental guides, and continuously improved learning resources and implemented Electronic examinations, etc., have played an important supporting role for students' automated electronic design. In the 2016 version of the teaching plan, theoretical hours were changed to 48, experiments were changed to independent courses, with 48 hours, and the curriculum design was 2 weeks. The single-chip experimental circuit boards are all designed and manufactured by the teachers in the school. So far, there are more than 30 single-chip integrated application design circuit boards in the laboratory.

3. 3 COMPILE AND REVISE TEACHING MATERIALS AND TEACHING PLANS, AND ESTABLISH AND IMPROVE TEACHING AND LEARNING RESOURCES FOR TEACHERS AND STUDENTS

Compile and publish "Electronic Product Manufacturing Technology", "Single Chip Microcomputer Design Example Collection" and other practical guidance materials; carry out textual verification training for students and revise "Electrician and Electronics Skills Training", etc.; write new teaching documents, electronic teaching plans, courseware, etc., and establish and improve teachers Teaching learning resources with students. The first is to revise and publish the "Single-chip Microcomputer Experiment and Curriculum Design Guidance (Proteus Simulation Edition)", "Common Modules and Examples of Electronic Design", "Selection of Single-chip Design Examples (1)", "51 Series Single-chip Microcomputer Principles and Applications" and other practical guidance Strong textbooks; second, "Single-Chip Microcomputer Principles", "Electronic Product Manufacturing Technology" and other courses are launched in the MOOC of Chinese universities, and a homework practice question bank of about 150 questions is newly compiled; third is to modify the syllabus, electronic teaching plans and courseware; fourth is design Develop new experimental circuit boards and use them in the annual student electronic design competition training.

4. ESTABLISH A COMPETITION TEAM TO FORM A CONSTANTLY IMPROVING TALENT TRAINING AND ELIMINATION MECHANISM

4. 1TALENT SELECTION

Every year after freshmen enroll, the training department will use various channels to promote students with the active cooperation of the tutors of each teaching department and stimulate their enthusiasm for participation. Starting from the first semester of the university, the selection is carried out mainly through teacher recommendation and voluntary registration by students. Mainly review two aspects, one is the student's professional achievement, such as: analog electronic technology, digital electronic technology, etc.; the other is the quality of the student, including personal morality, hard work, etc., to ensure the overall quality of the student;

4. 2 A VIRTUOUS CIRCLE OF "PASSING BANDS"

In addition to instructors, "passing bands" in the upper and lower grades have also been formed. The fine tradition of cultivating students' self-learning ability and teamwork spirit while sharing part of the work for instructors;

4. 3 INTRODUCE THE GROUP COMPETITION MECHANISM

From the beginning, the training is carried out in groups. The relationship between groups is both competitive and cooperative, which not only promotes mutual improvement but also continuously achieves the survival of the fittest; in a competitive atmosphere, it can also encourage students to continue to innovate Seek change and form a good learning atmosphere;

4. 4 PARTICIPATE IN THE MANAGEMENT OF THE TRAINING ROOM AND CULTIVATE A SENSE OF BELONGING

The management of the training room is a lot and tedious, and the students participating in the training participate in the management, so that they can access the equipment every day and practice the theoretical learning content invisibly.; Secondly, students can cultivate a sense of belonging and responsibility. Students from different grades and different classes can manage the work in a group. They can build deep emotions and cultivate mutual understanding, thereby improving teamwork ability. In this environment, Students will not give up their pursuit easily.

5. CONCLUSIONS

It is against the background of such curriculum reform, combined with hardware guarantees, patient guidance from teachers, and a competitive environment. Electronic information engineering students have achieved outstanding results in various competitions, and there are multiple student teams coming soon. Entrepreneurship. In recent years, the electronic information engineering major has explored a set of innovative and entrepreneurial ability training models with advanced concepts, which have achieved good results through practice and are worthy of reference and promotion.

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Design of Quenching for Spring leaves for Trucks

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Abstract: Quench can improve the rigidity and abrasion resistance of metal. Making use of PLC to control quenching process, the quenching has simple technology, stable function and convenient operation. Quenching system constitutes heating system, quenching liquid cycle system, hydraulic pressure system and electric control system. The quenching machine control system introduced in this thesis have three control mode manual-control, auto-control and try-piece designed utilized PLC. This system can produce many kinds of auto-spring plate, meet the requirement of auto-spring plate nowadays.
Key words: PLC; LAD; Quenching machine; Electromagnetic valve.

1. STRUCTURE AND CONTROL REQUIREMENTS OF HYDRAULIC QUENCHING MACHINE

Quenching is a metal heat treatment process in which the metal workpiece is heated to a certain appropriate temperature and maintained for a period of time, and then immersed in the quenching medium for rapid cooling. Quenching can improve the hardness and wear resistance of metal workpiece, so the proper cooling method must be selected. [1]

PLC as the core technology of modern industrial control automation, it makes the realization of complex industrial control simple and flexible. The bending mechanism of the automobile spring steel plate pressure hardening machine is composed of upper and lower leaf spring beams. The red hot steel plate workpiece is placed between the two beams. When the upper leaf spring beam moves under the push of the piston push rod, the workpiece clamped between the upper and lower leaf spring beams will be bent into a set arc. Then swing in the quenching liquid, quenching evenly, so that the reed quickly and evenly cooling and forming. [2]The quenching machine is simple in technology, easy to control the cooling process, low in price, and can produce various cross-sections such as rectangle and trapezoid, etc. all kinds of length, especially suitable for small and medium-sized enterprises and private enterprises, so as to meet the needs of the steel plate spring for automobile.

The quenching system consists of heating system, cooling liquid and quenching liquid circulation system, hydraulic system, electric control system of quenching machine, etc. The heating system heats the steel plate of a certain specification according to the standard to provide the workpiece for the quenching machine; the coolant system uses softened water to cool the hydraulic oil, and the cooling water can never be stopped in the working process; the quenching liquid circulation system provides the quenching machine with uniform quenching liquid of a certain temperature; this paper focuses on the electrical control system of the quenching machine. [3]

1.1 COMPOSITION AND FUNCTION OF HYDRAULIC SYSTEM

The hydraulic system is mainly to provide power for the mechanical system, in addition, it also has a buffer function in the process of lowering the mechanism.

The quenching machine has three oil cylinders, No. 1 oil cylinder can make the workpiece clamping deformation (loose clamp falling), make the straight steel plate into a set arc;No. 2 oil cylinder can make the clamped workpiece swing back and forth, and the quenching is even;No. 3 oil cylinder can make the worktable fall (lift) and the workpiece enter (leave) the liquid.

There are four solenoid valves. From top to bottom, they are the main switch of oil circuit, which is responsible for the on-off of the whole oil circuit. They are the oil supply solenoid valve for No. 3 oil cylinder, the oil supply solenoid valve for No. 1 oil cylinder and the oil supply solenoid valve for No. 2 oil cylinder.

In addition, there are oil tank, oil pump, pressure gauge, etc.

1.2 COMPOSITION OF ELECTRICAL CONTROL SYSTEM

The electrical control system consists of two parts: control panel and control box.

The selection switch of the control panel is used to select whether the system is in the "manual", "automatic" or "test piece" state. When the selection switch is operated in any state, the system will immediately exit the current state and enter the selected state. In any state, the "run" and "stop" are used to control the start and stop of the motor, and the "indication" is used to display the state of the motor; Only in the "manual" state, press the "clamp", "unclamp", "front swing", "back swing", "lift" and "drop" buttons to carry out corresponding actions, release the button in the "hold" state; only in the "automatic" or "test piece" state, the "start" button works to start a quenching cycle. [4]

There is a time relay in the control box for quenching timing, a position switch for limiting the lifting height during automatic operation, and six solenoid valve coils for quenching action.

In addition, the control circuit also adopts the following measures and anti-interference measures:
(1) it is better to use special grounding electrode for PLC grounding. If it is not possible, it can also share the grounding system with other panels, but it must be directly connected to the common grounding electrode with its own grounding wire. It is absolutely not allowed to share the grounding system with equipment such as high-power

thyristor devices and large motors.

(2) The closer the grounding electrode of PLC is to PLC, the better, that is, the shorter the grounding wire is. If PLC is composed of multiple units, each unit shall be grounded at the same point to ensure equal potential between units. Of course, if some I/O units of a PLC are scattered in the far field (more than 100m), they can be grounded separately.

(3) When the input and output signal line of PLC adopts shielded cable, the shielding layer should be grounded at one point, and the cable close to PLC should be grounded, and the other end of the cable should not be grounded. If the signal fluctuates with the noise, a 0. 1 ~ 0. 47 μ f/25V capacitor can be connected to the grounding terminal.

(4) The cross-sectional area of grounding wire shall be greater than 2mm2. Generally, the longest grounding wire shall not exceed 20m, and the grounding resistance of PLC grounding system shall be less than 40 Ω.

1. 3 SYSTEM CONTROL REQUIREMENTS

The system has three working modes: manual, automatic and test piece.

Control requirements of manual operation mode:

(1) Select the working mode as manual.

(2) When the system is powered on, PLC is powered on, press the "run" button, the oil pump works, the indicator lights up, the system starts to initialize, the No. 1 oil cylinder retracts and unclippes; the No. 2 oil cylinder retracts and swings forward to load; the No. 3 oil cylinder extends and the worktable lifts; the system is in the waiting state.

(3) Press Sb3 to clamp the workpiece; press Sb4 to loosen the clamp.

(4) Press sb5 to swing forward; press sb6 to swing backward.

(5) Press sb7 to lower the table; press sb8 to raise the table. In this state, press any button action, release the button to hold. Pressing start does not work.

Automatic (test piece) control requirements

The system is powered up and the oil pump works.

(1) Select the working mode as automatic or test piece.

(2) Initialization, No. 1 oil cylinder extends and unclippes; No. 2 oil cylinder extends and can be loaded; No. 3 oil cylinder retracts and worktable lifts. The system is waiting.

(3) Put the workpiece on the workbench.

(4) Press the start button to power on.

(5)After clamping the workpiece for one second, the worktable will fall down; at the same time, the worktable will swing (the cycle is 1. 5s), and the external time relay will be started (the total swing time is controlled by the external timer).

(6) The delay of external timer ends and the swing ends.

(7) Swing forward for 1 second, No. 1 oil cylinder retracts and loosens the clamp, No. 2 oil cylinder extends, and the workpiece falls down; (there is no such step for the test piece)

(8) The system returns to the initial state. If it is in the automatic state, it can continue to work; if the test piece is taken out manually, it can be tested.

2. PLC SOFTWARE DESIGN OF QUENCHING MACHINE

The input of PLC has 11 points and the output has 7 points, a total of 18 points. The 20 point PLC can meet the requirements, and the remaining 2 points are standby.

2. 1 DESCRIPTION OF WORKING MODE

(1) manual (00001 on, 00002 on);

(2) automatic (00001 on, 00002 on);

(3) test piece (00001 off, 00002 off).

(4) no definition (00001 on, 00002 on, both cannot be connected at the same time).

The program consists of three parts: the first part is the state selection, which determines the state of the system; the second part is the main body of the program, which controls the flow of the program, which is the core of the program; the third part is the driving part, which is only related to the output. The drive of the solenoid valve is closely coordinated with the assembly of the solenoid valve, and any action is related to the main switch of the oil circuit. In order to protect the solenoid valve, the main switch is normally closed, the coil does not need to be powered, otherwise it is easy to burn.

2. 2 System debugging

When the PLC software design is completed, simulation debugging should be carried out in the laboratory to see whether it meets the process requirements. When the control scale is small, the simulation debugging can be based on the selected model, external appropriate number of input switches as analog input signal, through the output terminal led, can observe whether the PLC output meets the requirements. [5]

For a large PLC control system, program debugging generally needs to go through several steps, such as unit test, overall laboratory joint debugging and field on-line unified debugging. For PLC software, the first two steps of debugging is of great significance.

(1) Laboratory simulation debugging

Different from the general process debugging, the program debugging of PLC control system needs a lot of process I/O signals. But in the first two debugging stages of the program, a large number of field signals can not be connected to the PLC input module. Therefore, it is usually impossible to check the correctness of the program by relying on the actual signal on site. Only simulation debugging method can be used, which is the most common and effective debugging method in practice.

(2) On site online unified commissioning

Before going to the scene, we should make full preparations, otherwise we will be filled with emotion. Design the work plan in advance, arrange the clothing, food, housing and transportation properly, ensure the normal operation of notebook computer, prepare enough software CDs, prepare all common tools and appropriate electrical spare parts.

When the field construction and software design are completed, the on-line unified debugging can be carried out. In the unified debugging, the external output should be shielded first, then the monitoring function of the programmer should be used, the segmented and hierarchical debugging method should be adopted, the external input should be checked by operation, and then the output components should be operated one by one by

using the forced set/reset function of PLC.

Some field signals, such as the signals of travel switch and proximity switch, need to be manually given analog signals on site and checked on PLC side. Special instruments that provide signals to PLC, such as material level meter, digital switch, analog meter, etc., should also give analog signals from the signal end and check at PLC side. If the analog output signal is used to drive the electric drive device, the joint debugging shall be specially carried out to check the load capacity and control accuracy of PLC module.

The main circuit of single machine is supplied with power one by one, and the local manual test run is carried out. The main purpose is to cooperate with the mechanical debugging, and adjust the steering, travel switch, proximity switch, coding equipment, positioning, etc. The application program should be adjusted carefully to achieve various control indicators, such as positioning accuracy, action time, speed response, etc.

(3) Program storage and archiving

After the system debugging, in order to prevent the user program in RAM from being damaged and lost due to interference, lithium battery change and other reasons, the program can be saved by tape or disk, or solidified into EPROM or E2PROM through EPROM writer, or printed by printer. Take them as original basic data and file them together with other technical documents. It can shorten the time of maintenance and checking procedure in the future. This is a good habit of professional engineers. It will bring great convenience no matter how to maintain yourself or hand over users in the future. It is also a reflection of your professional standard.

3 SYSTEM IMPROVEMENT MEASURES

(1) Use subroutine, clear thinking

For the convenience of programming, subroutines can be used, the idea will be clearer, and the functions will not affect each other.

(2) The touch screen is powerful

Touch screen can integrate control and display, with stable performance and large amount of information, but it will increase investment and design cost.

(3) Use frequency converter to save energy and increase efficiency

No matter what state the system is in, the motor always works at full load. In fact, in the waiting state, there is no load, and the motor rotates at constant speed, which is a waste of energy. When the up converter is installed, the motor can work at low speed in the waiting state to save energy and increase efficiency; during the working period, the motor runs at power frequency.

4. SYSTEM MAINTENANCE

Most of the faults of the system come from the primary detection elements and the final actuator. For example, the primary detection element is stuck due to the dust in the environment, the actuator cannot operate due to the blockage of the oil circuit, and the contact of the intermediate relay is poor. Therefore, enough attention should be paid to their inspection.

When replacing the relevant parts of the PLC, such as the fuse of the power supply, lithium battery, etc., the power supply to the PLC must be stopped, and the parts that are allowed to be replaced with electricity must be operated safely to prevent unnecessary accidents. The operation steps shall comply with the requirements and operation sequence of the product operation manual.

After replacing the detection element or actuator, the corresponding parts should be checked and adjusted to make the replaced parts meet the requirements of operation and control. The replacement contents also need to be recorded and filed.

According to the replacement record, the purchase plan of spare parts should be put forward in time to ensure that the components can be replaced in time when they are damaged.

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Research on High Frequency Switching Rectifier of Communication Power Supply

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Abstract: As an indispensable part of the communication system, the communication power supply has the task of providing energy to the communication equipment. The high-frequency switching rectifier is an important component of the communication power supply. This article focuses on the composition, basic principles and characteristics of high-frequency switching rectifiers, as well as the important position and influence of high-voltage DC communication power supplies.
Keywords: High-voltage DC power supply system; DC power supply; High-frequency switch; Rectifier module.

1.INTRODUCTION

The communication power supply system is generally composed of an AC power supply system, a DC power supply system and a grounding system. The rectifier is a static commutation device that can convert AC power into DC power. It is widely used to charge batteries, parallel floating charging or as some communication equipment required DC power supply. Generally consists of transformers, rectifier components, filters, automatic voltage stabilizing and current stabilizing devices, signal control and other parts. The rectifier is a device that converts AC power into DC power, and its output terminal is connected to the outside through a DC power distribution panel to provide DC power to telecommunication equipment. The traditional thyristor phase-controlled rectifier can no longer meet the technical needs, because it has low working efficiency and high energy consumption. The transformer and filter components required in the working process are large in size and weight, which is not conducive to operation. These shortcomings are do not use to provide power, therefore, in the upsurge of technological development, high-frequency switching rectifiers have gradually replaced it.

2. OVERVIEW OF HIGH FREQUENCY SWITCH RECTIFIER MODULE

High frequency switching rectifier (SMR) is also called non-power frequency transformer rectifier. Its main components are the main circuit, control circuit and auxiliary power supply. In the whole circuit, the main circuit mainly completes the conversion from the input AC through the circuit, and finally The whole process of outputting the DC required by the device. The main circuit includes AC filtering and rectification. In the high-frequency switch rectifier module, the rectifier circuit is a particularly important part of the rectifier system. It includes four parts: ordinary rectifier circuit, synchronous rectifier circuit, current doubler rectifier circuit, and asynchronous rectifier circuit. [1] Choosing a technologically advanced rectifier circuit can improve the

utilization of power resources, thereby improving the working capacity of communication equipment.

2.1 INPUT VOLTAGE, UNDERVOLTAGE PROTECTION CIRCUIT

When the AC input voltage is higher than the upper limit of the allowable input voltage range, the overvoltage protection circuit cuts off the AC input of the main circuit; when the AC input voltage is lower than the lower limit of the allowable input voltage range, the undervoltage protection circuit enables the active power factor correction circuit And the DC converter are both turned off. When the grid voltage is normal, the rectifier should automatically resume work. The rectifier module is connected to a voltage-limiting surge protector at the AC power input for lightning protection.

2.2 INPUT FILTER

The input filter is used to filter electromagnetic interference from the power grid, resist surge impact, and suppress the back-irrigation conduction interference of the high-frequency switching rectifier to the AC voltage. An anti-interference filter with common mode inductance is usually used.

2.3 SOFT START

The soft-start circuit is also called the slow-start current, which is used to reduce the impact (surge) current when starting up, so that the input impact current peak value of the high-frequency switching rectifier caused by the start-up is not greater than 150 % of the maximum regulated input current peak value under the rated input voltage condition. The soft start time is generally 3~10s. The soft-start circuit is usually a resistor with appropriate suppression resistance and large rated power in series in the rectifier input circuit. It is used to limit the current when starting, and after the start is completed, it is bypassed with a relay contact. The soft start resistor does not consume power when the rectifier is working normally.

2.4 BRIDGE RECTIFIER

Generally, a single-phase or three-phase bridge rectifier circuit without a power frequency transformer is used to convert the input AC voltage into a unidirectional pulsed DC voltage.

2.5 POWER FACTOR CORRECTION CIRCUIT

The power factor correction circuit is used to reduce the harmonic components in the input current of the high-frequency switching rectifier, so that the input current waveform of the rectifier is close to a sine wave and the same as the input voltage, and the power factor is close to 1. At the same time, the output waveform is relatively smooth DC voltage supply DC Converter. The rectifier module that inputs single-phase AC power usually uses an active power correction circuit. The main circuit is generally a non-isolated boost DC converter, which is

controlled by a special PWM integrated controller, which can make the power factor of the rectifier reach 0.99 or more, and play a pre-regulatory function. Its input voltage is the absolute value of the sine wave after single-phase AC voltage rectification, and it outputs a smooth DC voltage of about 400V. Most of the rectifier modules that input three-phase alternating current use passive power factor correction circuits to make the power factor of the rectifier reach 0.92 to 0.94.

2.6 DIRECT CURRENT (DC/DC) CONVERTER

The DC/DC converter inputs the DC voltage output by the power factor correction circuit, and outputs the stable and smooth DC voltage required by the load of the high-frequency switching rectifier. Generally adopt PWM control. In order to isolate the output side of the high frequency switching rectifier from the power grid, an isolated DC converter must be used, preferably a soft switching circuit. Direct current (DC/DC) converters must have output current limiting performance. [2]

2.7 OUTPUT FILTER

The output filter is used to filter noise voltages such as spikes and clutter on the output side of the high-frequency switching rectifier, so that the output voltage of the rectifier can meet the requirements of various noise indicators without electromagnetic disturbance to the load.

2.8 PWM CONTROL, PROTECTION AND CURRENT SHARING CIRCUIT

The PWM integrated controller and drive circuit output drive pulses to control the DC converter. The output voltage value of the high-frequency switching rectifier is mainly controlled by the monitor in the switching power supply system in addition to its own control. According to the DC output voltage, current and internal temperature of the rectifier module detected in the machine, when the situation is abnormal, the protection circuit controls the PWM integrated controller to implement output voltage and over-temperature shutdown protection, under-voltage alarm, and output current limiting and short-circuit protection. Commonly used current sharing methods include average current method and maximum current method (ie, democratic current sharing method). Using this method, each rectifier module in the switching power supply system relies on its own performance to complete the current sharing task, and only a current sharing bus is connected between the rectifier modules, and no other external control is required to reduce the failure of current sharing.

2.9 AUXILIARY POWER SUPPLY

The auxiliary power supply provides DC power supply voltage such as the control circuit in the high-frequency switching rectifier, usually a single-ended flyback converter.

2.10 DISPLAY AND ALARM CIRCUIT

The rectifier module usually displays its output voltage and current on a digital tube or LCD screen. When various protection circuits act, the rectifier module uses light-emitting diodes to display various alarm signals, and at the same time transmits the alarm signals to the monitor in the switching power supply system. In addition, the air-cooled rectifier module is usually equipped with a temperature

control and speed regulation circuit in the machine to make the fan work at an appropriate speed, which can extend the life of the fan. The fan should be removed from the module safely and conveniently for easy maintenance.

3. MAIN TECHNOLOGY OF HIGH FREQUENCY SWITCHING RECTIFIER

3.1 POWER CONVERSION CIRCUIT

In the high-frequency switching rectifier, the high-power high-voltage direct current (a few hundred volts) is converted into a low-voltage direct current (tens of volts), which is completed by a power conversion circuit. This process is obviously the most fundamental task of the rectifier. Whether it is done well or not, there are two main points, one is whether the efficiency is high in the power conversion process, and the other is whether the volume of the high-power circuit is small. To improve efficiency, we can easily think of using transformers. The power conversion circuit is one: high-voltage DC→high-voltage AC→step-down transformer→low-voltage AC→low-voltage DC. To make the power conversion circuit small, except for the performance of the components that make up the circuit well, in addition to low power consumption, reducing the size of the transformer is the most important. The volume of the transformer is inversely proportional to the operating frequency, and increasing the operating frequency of the transformer can effectively reduce the volume of the transformer. Therefore, the power conversion circuit can be described as the process of high-voltage direct current→high-voltage high-frequency alternating current→high-frequency step-down transformer→low-voltage high-frequency alternating current→low-voltage direct current.

3.2 PWM POWER CONVERSION CIRCUIT

The PWM type power conversion circuit is a commonly used circuit form in the early development of the switching rectifier, and later resonant power conversion circuits are developed on the basis of it. The PWM power conversion circuit has the form of push-pull, full-bridge, half-bridge, single-ended flyback and single-ended forward.

3.3 RESONANT POWER CONVERSION CIRCUIT

The resonant power conversion circuit uses the resonance phenomenon to achieve the purpose of reducing switching losses by appropriately changing the relationship between the voltage and current waveforms of the switching tube. Resonant power conversion circuits are divided into three types: series, parallel and quasi-resonance. In the conversion circuit of high-frequency switching power supply, the switching mode in which the power switch is turned on when there is voltage and turned off when there is current is called hard switching. The type of switch that the power switch is turned on at zero voltage and turned off in parallel at zero current is called soft switching. The PWM type switching method is hard switching. It has the advantages of simple control, and the steady-state DC gain has nothing to do with the load. The disadvantage is that the switching loss increases with the increase of the switching frequency, which limits the further increase of the switching frequency. The resonant switching mode is soft switching, which can make the switching power

supply work at a higher frequency with little switching loss. Quasi-resonant converter is a new type of resonant converter, which is formed by appropriately adding resonant inductors and resonant capacitors on the basis of PWM switching converters. The resonant inductor, the resonant capacitor and the switch in the original PWM converter form the so-called "resonant switch". In the operation of this kind of converter, a resonant working mode appears, so that the voltage and current waveforms of the switch can be improved, and the switching loss can be reduced. In operation, the time of working in the resonant state only occupies a part of a switching cycle, and the rest of the time is running in the non-resonant state, so it is called a "quasi-resonant" converter, also called a "quasi-resonant switch." The quasi-resonant converter is a DC-DC converter that combines the PWM type and the traditional resonant type. It not only has the advantages of simple PWM circuit control, but also has the advantages of resonant circuit switching voltage and current waveforms that are not mandatory and low switching loss, so it is widely used in DC-DC converters. Quasi-resonant converters are divided into two types: one is zero-current switching, and the other is zero-voltage switching. [3]

3.3.1 ZERO CURRENT SWITCHING RESONANCE TECHNOLOGY (ZCS-QRC)

The principle of the zero-current quasi-resonant switching power supply is shown in Figure 1. In the zero-current quasi-resonant switch, the resonant capacitor C and the rectifier diode VD are connected in parallel; the active switch S and the resonant inductor L are connected in series, and the active switch S is at zero current. The rectifier diode VD turns on and off at zero voltage. If the active switch S works in one direction, the resonant switch works in half-wave mode. If the active switch anti-parallel diodes, the resonant switch works in full-wave mode. The main advantage of ZCS-QRC is to ensure that the current in the switch tube has dropped to zero before the disconnect signal arrives during operation, which ensures that the switch tube is disconnected under the condition of zero current, thereby greatly reducing the switching device off. It can also greatly reduce the voltage spike that may appear when the inductive load is disconnected.
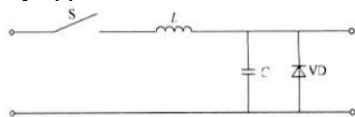
Figure 1 Zero-current quasi-resonant switch

The main disadvantage of ZCS-QRC is the turn-on loss of the capacitor. The energy stored in the capacitor at the output end of the switch during the off-state is consumed inside the device when it is turned on.

3.3.2 ZERO VOLTAGE SWITCHING QUASI-RESONANT TECHNOLOGY (ZVS-QRC)

The principle of zero-voltage quasi-resonant switching power supply is shown in Figure 2.
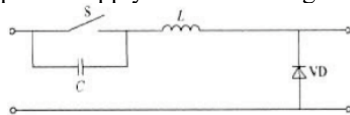
Figure 2 Zero-voltage quasi-resonant switch

The resonant capacitor C and the active switch S are connected in parallel, the rectifier diode VD and the resonant inductor L are connected in series, the active switch S is closed and disconnected at zero voltage, and the rectifier diode VD is turned on and off at zero current. Like the zero-current resonant switch, the structure of the active switch S determines the working mode of the zero-voltage resonant switch. If S has an anti-parallel diode, the resonant switch works in half-wave mode. If the active switch S is a unidirectional switch with a diode connected in series, the resonant switch works in full-wave mode. The main advantage of ZVS-QRC is that the voltage of the switching device is shaped into a quasi-sine wave, which can ensure that the voltage at both ends of the tube has dropped to zero before the turn-on signal arrives during operation, which ensures that the switching tube It is turned on under the zero voltage condition, thereby greatly reducing the turn-on loss of the switching device. The main disadvantages of ZVS-QRC: First, the voltage stress in the unilateral circuit with wide load changes is too large; the second is the parasitic oscillation in the resonant circuit formed by the junction capacitance of the rectifier diode, which generates strong electromagnetic interference.

3.3.3 ZERO-VOLTAGE MULTI-RESONANT SWITCHING TECHNOLOGY (ZVS-MRC)

The principle of zero-voltage multi-resonant switching power supply is shown in Figure 3. The resonant capacitor Cs is connected in parallel with the switch S and the diode VD. The result is a zero-voltage switch of two devices. Using a multi-resonant switch to replace the PWM switch generates a zero-voltage switching multi-resonant converter from the PWM topology. All the main parasitic elements of the multi-resonant circuit including the output capacitance of the switch tube, diode junction capacitance and transformer leakage inductance are incorporated into the resonant circuit, so that the multi-resonant switching rectifier has the most suitable zero voltage for all semiconductor devices when working at high frequencies Switch conditions.
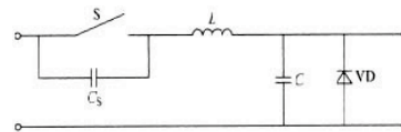
Figure 3 Schematic diagram of zero-voltage multi-resonant switching power supply

The main advantage of ZVS-MRC is that all the main parasitic reactances in the main circuit are incorporated into the resonant circuit. ZVS-MRC works under the best zero voltage switching of all semiconductor devices, which greatly reduces switching losses and interference. The main disadvantage of ZVS-MRC is that the current and voltage stresses are larger than those of PWM switching rectifiers, but smaller than those of quasi-resonant switching rectifiers.

4. FEATURES OF HIGH FREQUENCY SWITCHING RECTIFIER

First of all, the high-frequency switching rectifier is small in size and light in weight. It is much smaller than the traditional phase-controlled rectifier, so it can be more

convenient in operation, and the high-frequency switching rectifier is very good for equipment that needs distributed power supply. It can provide Provides the working power required by various parts of the communication equipment; secondly, the converters and controllers used in the high-frequency switching rectifier make a great breakthrough in energy saving compared with the traditional rectifier, and the working efficiency can even reach more than 90%. It can improve the efficiency of the entire communication equipment; the power factor of this rectifier is high, so that it will not cause pollution to the public grid during the operation of the equipment; in addition, it has the characteristics of low noise, simple debugging, and convenient maintenance.

5.CONCLUSIONS

In the era of rapid development of communication technology and various high-tech fields, rectifiers have been used in many devices, and the requirements for the power supply system are reliability, stability, small size and high efficiency. In this article, the high-frequency switching rectifier uses its many advantages to convert the DC power into the required AC power, and then provides DC power to the telecommunication equipment. It replaces the traditional phase-controlled rectifier and makes the high-frequency switching rectifier in the current communication system In the form of a module, with its unique internal circuit, it outputs DC power through rectification and filtering, inversion, and output rectification and filtering.

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Brain Connectivity Assessed by Cross-Sample Entropy of Resting State fMRI

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Abstract: Through the research of brain functional connectivity and effective connectivity, based on functional magnetic resonance imaging, we can understand the detailed activity of the brain. At present, the analysis of brain connectivity is mainly to use the correlation coefficient between time series of brain regions or ROI. Cross-sample entropy, as an evaluation index of time series complexity, can give us a method to evaluate the degree of complexity of brain internal connections. In this study, we analyzed resting state fMRI data selected from UCLA fMRI data set, including 24 schizophrenics and 36 control groups. Firstly, 90 brain regions of AAL template were used as ROI to extract their time series. The cross-sample entropy matrix representing the connection strength of different brain regions was calculated through time series, then, the brain region connection related to schizophrenia was found through machine learning. This study provides a new method for brain connectivity analysis based on fMRI.
Keywords: fMRI; Brain connectivity; Cross-Sample entropy

1. INTRODUCTION

Functional magnetic resonance imaging (fMRI) is an imaging technique used to identify the functional activations across different regions in the brain.fMRI mainly refers to Blood oxygen level dependent functional magnetic resonance imaging (BOLD - fMRI), but also includes diffusion-weighted imaging(DWI), diffusion tensor imaging(DTI), etc. BOLD-fMRI is a kind of brain imaging technique measuring the indirect neural activity of the brain tracing the oxygenation level of the blood flow. Because of its non-invasive characteristics, it is widely used in various brain research like diagnosing critical psychological disorders.According to the experimental design, fMRI has resting-state fMRI and task-based fMRI. The task-based fMRI refers to the subjects being asked to complete specific cognitive tasks according to the experimental design when collecting data. Unlike task-based fMRI, resting-state fMRI does not require subjects to complete any cognitive tasks.

In fMRI, whether the resting-state fMRI or task-based fMRI, mainly for the study of brain time series. Common features such as local consistency, correlation coefficient, frequency spectrum, etc. These indicators analyze some characteristics of the time series. The research on the relationship between the brain and the complexity of brain time series is relatively less. One is to analyze the complexity of brain time series, the other is to analyze the predictability between time series. As an index of complexity, entropy is used more and more in fMRI data analysis, and has made some progress. Sokunbi et al. Used entropy to analyze the differences among people of different ages and found that the complexity of the brain will decrease with age[1-2]. Wang et al. Studied the relationship between occupational plasticity and brain entropy[3], and found that seamen can cause changes in the complexity of some brain regions, and so on. Entropy gives us a new perspective to study fMRI data.

Cross sample entropy, Cross approximation entropy, and so on, as features to measure the complexity between two time series, have a wide range of applications in the fields of brain electrical signals, financial data[4-5] and so on[6-7]. However, currently it is rarely used on fMRI data. Regardless of sample entropy, approximate entropy and other methods of calculating entropy, it is basically the entropy of the complexity of the time series itself[8]. The brain as a whole, internal functional integration and other mechanisms indicate that the activities of various parts of the brain are related to a certain extent[9]. In addition to analyzing the time series of the brain, the relationship between time series is also our research content.

In order to analyze the correlation between brain regions, we quantify brain connections through cross-sample entropy of resting state fMRI. Entropy represents the relationship between the complexity of two time series, so cross-sample entropy can more comprehensively represent the relationship between brain regions.

In this paper, we mainly analyze the difference in mutual information entropy between the brain regions of schizophrenia and the control group. After preprocessing, the time series were extracted according to the AAL template. Calculate the mutual information entropy between time series. Then use feature filtering to sort the importance of each feature. The results showed that compared with the control group, the mutual information entropy of schizophrenia was significantly different in some brain regions. At the same time, we analyzed these relevant brain regions.

2. MATERIALS AND METHOD

2.1 PARTICIPANTS AND FMRI DATA ACQUISITION

The data uses UCLA's public data set. During the resting state scan, the subjects were asked to stay relaxed, without responding to anything during the scan, and to stay awake and not sleep during the scan. The neuroimaging data was obtained on a 3T Siemens Trio scanner. The functional magnetic resonance imaging data uses T2-weighted echo planar imaging (EPI) sequence with parameters: slice thickness=4mm, 34 slices, TR=2s, TE=30ms, flip angle=90°, matrix size=64×64, viewing Field=192mm. T1-weighted high-resolution anatomical image scanning

uses the following parameters: slice thickness=1mm, 176 slices, TR=1.9s, TE=2.26ms, matrix size=256×256, field of view=250mm. After realign, co-register, denoise, and slice timing, the AAL template is used as the ROI to extract the time series of brain regions, and the number of time series extracted from a single data is 116. The length of each time series is 142 time points.

Before the feature extraction and classification of the data, In order to keep the irrelevant variables of the data consistent, we selected data from 32-48 years old, and obtained 36 control group data (average age 40.25 years, standard deviation 3.73) and 24 schizophrenia data (average age 40.63, standard deviation 4.21).

2.2 CROSS-SAMPLE ENTROPY

Mutual sample entropy is an extension of sample entropy, used to calculate the complexity between two time series. Sample entropy is to calculate the complexity of the sequence through the probability of generating a new pattern in the time sequence. The calculation does not depend on the data length and has good consistency. The sample entropy calculates the complexity of the time series by the probability of generating a new pattern in the time series, and the mutual sample entropy is between two time series. One of the time series is used as a reference for the other time series to calculate the probability of the new pattern generation, As the complexity of another time series to the time series.

For time series S=(x1, x2... xn), T=(y1, y2... yn), the formula for calculating the cross sample entropy of time series S to time series T is defined as equation (1).

$$Cross\_SampleEn(S,r,m) = -ln\frac{U^{m+1}(r)}{U^m(r)} \quad (1)$$

$$U^m(r) = \sum_{i=1}^{N1-m}\frac{C_i^m(r)}{N1-m+1} \quad (2)$$

$$C_i^r(r) = \frac{B_i}{N2-m+1} \quad (3)$$

$$B_i = \sum_j dist(X_i, Y_j) < r \quad (4)$$

$$dist(X_i, X_j) = MAX(|X_i - X_j|) \quad (5)$$

In equation (2), N1 is the length of the time series S. In equation (3), N2 is the length of the time series T. x and y are the values in the time series, m is the pattern length, and r is the tolerance. In the formula, X is a subsequence of S, Y is a subsequence of T, and the distance between Xi and Xj is the maximum value of the difference between the corresponding elements of the sequence. Bi is the number of which the distance between the i-th subsequence of the time series S and the subsequence of the time series T is less than r, defined as equation (4) and equation (5). It can be seen that the cross-sample entropy is calculated by changing the calculation of Xi and Xj of Bi in the sample entropy formula to the calculation of Xi and another time series Yj. Different from the calculation of the correlation coefficient, the calculation of the mutual sample entropy is realized through the comparison of the sub-sequences of each mode length, so it does not depend on the data length like the sample entropy. In the calculation of cross-sample entropy, the change of any one time series will cause the change of the cross-sample entropy value. When the two time series tend to be consistent, the entropy will decrease, otherwise the entropy will increase. This agreement is different from the

correlation coefficient. The agreement of different parts of the two sequences will also lead to the decrease of the mutual sample entropy.

2.3 FEATURE SELECTION

Sometimes dataset are small, but mostly, they are tremendously large in size. It becomes very challenging to process the dataset which are very large. Generally, in a high dimensional dataset, there remain some entirely irrelevant, insignificant and unimportant features. It has been seen that the contribution of these types of features is often less towards predictive modeling as compared to the critical features. They may have zero contribution as well. These features cause a number of problems which in turn prevents the process of efficient predictive modeling. Feature Selection is the process of selecting out the most significant features from a given dataset. In many of the cases, Feature Selection can enhance the performance of a machine learning model as well.

Filter methods, Wrapper methods, and Embedded methods is different types of general feature selection methods. Embedded methods are iterative in a sense that takes care of each iteration of the model training process and carefully extract those features which contribute the most to the training for a particular iteration.

To find the key brain connections that can distinguish normal people from schizophrenia, we used feature selection. When selecting features, in order to better find the key brain connections and reduce the erroneous brain connections caused by overfitting, we have performed feature selection many times, each time using a part of the data randomly selected as the training set. And count the number of appearances of each feature, and take the number of appearances exceeding the threshold as the research object.

3. RESULTS
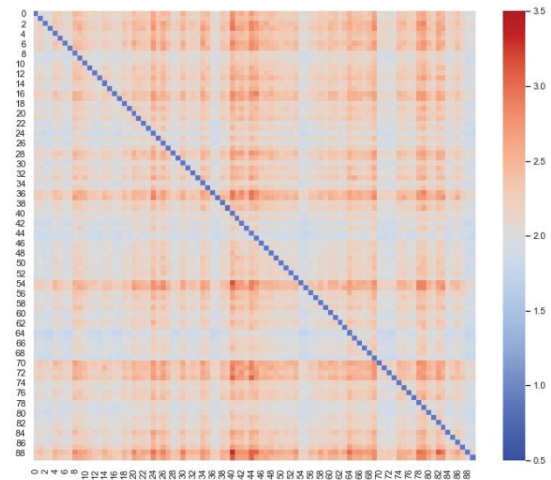
Figure 1. The healthy cross-sample entropy heat map

Figure 1 and Figure 2 shows the average heat map of the cross-sample entropy matrix. It can be seen in the picture that the value of the diagonal of the matrix is generally small, which shows that a brain area has the lowest complexity for itself. In the cross-sample entropy matrix, because the difference in brain area standard deviation leads to different cross-sample entropy tolerance r, the matrix is not symmetric. That is to say, for brain regions A and B, the entropy of the cross-sample of brain region

A to brain region B is different from the entropy of the cross-sample of brain region B to brain region A. In addition, if the mutual sample entropy of all brain regions to one brain region is larger, the mutual sample entropy of this brain region to other brain regions is smaller. This shows that complex brain areas contain more information for simple brain areas, while simple brain areas have lower information for complex brain areas.
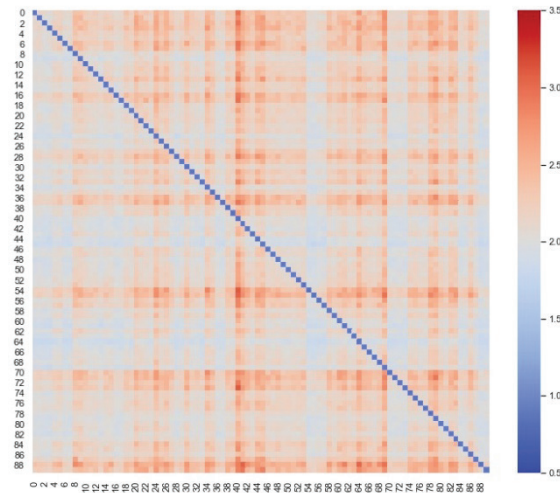
Figure 2. The schizophrenia cross-sample entropy heat map
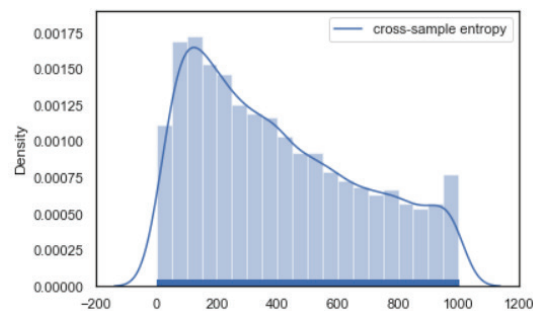
Figure 3. The feature selection histogram

We counted times of feature was selected in feature selection, and the Figure 3 shows feature selection histogram. Table 1 showed us, most features was selected, but numbers of features reduce by times up. We get 25 features, by set threshold to 1000. it means this feature was selected in every feature selection. To test our features is useful features, we apply this features to training SVM. through many times cross validations, we get the mean accuracy was 96%.

Table 1. The important feature weight

No.	weight	Brain region
135	53.52369853	1, 45
422	31.36941635	4, 62
940	51.02086721	10, 40
1281	-37.30912493	14, 21
1317	-24.23311982	14, 57
1326	-23.51913448	14, 66
1398	-32.80969799	15, 48
1736	-37.13944858	19, 26
2398	30.48904504	26, 58
2442	30.9402258	27, 12
3381	-39.36757369	37, 51
3820	45.07368529	42, 40
4036	25.56591864	44, 76
4347	-35.30719998	48, 27
4452	-40.53436712	49, 42
5135	31.65678793	57, 5
5179	37.76946051	57, 49
5194	44.61859493	57, 64
5393	-38.10337813	59, 83
5713	-28.91796322	63, 43
6037	28.26235101	67, 7
6189	35.87937663	68, 69
6614	-78.85831145	73, 44
7101	31.70472338	78, 81
7205	28.14461652	80, 5

4. CONCLUSIONS

It can be seen that when analyzing the complexity of fMRI time series, not only the complexity changes of the time series itself, but also the complexity changes between time series between different brain regions need to be considered. The brain area has a broader meaning for the complexity of the whole brain. On the one hand, changes in the complexity of the brain itself will lead to changes in the complexity of the whole brain. On the other hand, when the brain area itself changes little, the whole brain The weakening of the function of the single brain area and the whole brain caused by the overall changes of other brain areas will also increase the complexity of predicting the whole brain. Although the difference between schizophrenia and the control group can be represented and classified by cross-sample entropy, the specific changes need to be further studied.

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A Study on Content Validity of Reading Comprehension in CET-4

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Abstract: Based on the theory of Bachman and Palmer's task characteristics framework, this paper analyzes the content validity of the reading comprehension subtest in CET-4 (2018.12- 2020.09), according to *College English Teaching Guide (2017 Version)* and *Syllabus for CET-4 (2016 Revised Edition)*. The results show that the reading comprehension subtests generally conform to the requirements and possess satisfactory content validity. But there is still advice for further improvement.
Keywords: CET-4; content validity; material selection; reading speed

1. INTRODUCTION

College English Test Band 4(CET-4) is currently one of the largest scale English tests in China, with the largest number of candidates and the most profound influences. It has had a great impact on my country's College English teaching and the selection of talents in the society. With the introduction of the new College English Teaching Guide (2017 version), the Ministry of Education has carried out corresponding reforms to the CET-4. In the reformed CET-4, the score of reading comprehension part has been reduced (from 40% to 35%), and the question types have also changed.

Weir (1993) believes that reading is a selective process that occurs between the reader and the text he or she reads.[1] In this process, the reader's background knowledge interacts with the language knowledge and the information in the text to achieve reading comprehension. Reading as an important language skill has always been a priority in English teaching. Therefore, it is meaningful to analyze the content validity of the reading comprehension part of CET-4.

2. THEORIES

Bachman and Palmer (1996) point out that reliability and validity are two important indicators of language testing.[2] Reliability is the embodiment of the quality of the test score itself, and validity is the embodiment of the correct interpretation and use of the test.[3] Because the reliability of language testing is relatively stable, it can be easily obtained through statistical analysis; while the validity is much more complicated.

Henning (1987) believes that validity refers to the reasonable degree of a test or a component of a test to its content.[4] Hughes (1989) defines validity as follows: Validity refers to the extent of the testing content to which the tester desires to test.[5] That is, if a set of test sample can test the content and ability that needs to be measured or tested, its validity is high, and vice versa.

Content validity refers to the validity embodied by conceptual and non-statistical data. It is a judgment on whether the sample in the measurement target field is appropriate based on the systematic analysis of the test content. Heaton (2000) believes that the content validity of a language test refers to "whether the test has tested what required in the test syllabus, or the extent to which the test questions can represent the content it wants to measure or test".[6] According to Bachman (1990), content validity includes content relevance and content coverage.[3]

The more the test content is relevant to the teaching requirements and the test syllabus, the higher its validity is. Content coverage refers to the extent to which the test task characterizes the behavior. Therefore, the usual basis for verifying the content validity of the test is the teaching guide and the test syllabus.

3. RESEARCH DESIGN

3.1. Research Tool:

This study mainly uses the method of text analysis, and takes the *College English Teaching Guide* (hereinafter referred to as the Teaching Guide), [7] officially promulgated by the Ministry of Education in 2017, and the *Syllabus for College English Test Band 4 (2016 Revised Edition)* (hereinafter referred to as the Test Syllabus)[8] as the reference standard.

3.2. Research Objects:

The research objects selected for this study are five testing papers of CET-4 reading comprehension subtest, from December 2018 to September 2020. In each testing paper, there are two deep reading passages in the reading comprehension subtest. Totally, this study explores ten deep reading passages with fifty question items.

3.3. Data Collection:

This study collects a total of 10 deep reading passages of CET-4, from December 2018 to September 2020, for quantitative and qualitative analysis. The analysis is based on the test task characteristics framework proposed by Bachman and Palmer, and combined with the content and requirements involved in reading comprehension in the Teaching Guide and the Test Syllabus. This study will focus on the characteristics of input (including text length, reading speed, readability, topic area and genre) and expected answers (reading skills coverage) to evaluate the content validity of deep reading comprehension in CET-4 from December 2018 to September 2020.

4. ANALYSIS

According to the test task characteristic framework of Bachman and Palmer, the following will evaluate the content validity of deep reading comprehension in CET-4 from December 2018 to September 2020, in the two dimensions of text input and expected answer.

4.1. Text input

4.1.1. Length

Regarding the length of passages, the Test Syllabus

requires candidates to read two deep reading passages. Both are multiple-choice question type passages and each is with a length of three hundred to three hundred and fifty words. From the data in Table 1, it can be clearly seen that lengths of most of the multiple-choice-question passages are between 300 and 350, within the range of words specified in the Test Syllabus. Among all 10 passages, only Passage 2 in July 2020 has a length of 562 words, which seriously deviates from the prescribed length; and Passage 1 in September 2020 has a length of 352 words, slightly exceeding the prescribed length. It can be concluded that the length of deep reading passages is appropriate and has a good control of words, which is in line with the requirements of the Test Syllabus.

Table 1 Length of reading passages in CET-4

	2018.12	2019.06	2019.12	2020.07	2020.09
P 1	338	345	336	346	352
P 2	345	345	347	562	337

P 1=Passage 1   P 2=Passage 2

4.1.2. Reading Speed

In terms of reading speed, the basic requirements for deep reading comprehension in the Teaching Guide are "able to read English passages on general topics, with a reading speed of 70 words per minute." The time allocated to deep reading comprehension is 17 minutes according to the Test Syllabus. Yang Huizhong and Weir state that the time allocated for reading the article and answering the questions is 1: 0.75. Therefore, CET-4 candidates have 9.7 minutes of the 17-minute to read the two passages and, and the total reading volume should be 680 words.

	2018.12	2019.06	2019.12	2020.07	2020.09
WOP	683	690	683	908	689
Time	9.7	9.7	9.7	9.7	9.7
Speed (wpm)	70.4	71.1	70.4	93.6	71.0

Table 2 Speed of reading passages in CET-4

WOP=Words of passages

Observing from Table 2 above, the reading speeds of deep reading in CET-4 from December 2018 to September 2020 are 70.4 words per minute (wpm), 71.1 wpm, 70.4 wpm, 93.6 wpm and 71.0 wpm. Except for the reading speed of 93.6 wpm in July 2020, which seriously exceeds the reading speed stipulated in the Teaching Guide, other reading speeds are between 70.4 and 71.1 words per minute. It can be concluded that the reading speed of the deep reading comprehension part is high in correspondence with the Test Syllabus and the Teaching Guide. It also presents the high consistency in these five deep reading comprehension sections of CET-4 testing papers.

4.1.3. Readability

In terms of readability, the author uses Microsoft Office Word to detect the ten deep reading passages in CET-4, and then extracts the required data from the basic information on readability. The data in Table 3 shows that the readability of deep reading comprehension section in CET-4 from December 2018 to September 2020 remains relatively stable. The readability of all the ten passages ranges from 35.7 to 65.2. The average readability of each test is between 40.8 and 58.9.

Table 3 Readability of deep reading passages in CET-4

	Passage 1	Passage 2	Mean
2018.12	53.2	64.6	58.9
2019.06	35.7	45.9	40.8
2019.12	49.6	52.5	51.05
2020.07	65.2	40.9	53.05
2020.09	51.5	64.4	57.95

Table 4 The Flesh Readability Yardstick

Score	Description of style	Typical magazine	Potential readers	
			School grade	% of US adults
0-30	Very difficult	Scientific	College	4. 5%
30-50	Difficult	Academic	High School	24%
50-60	Fairly difficult	Quality	Some high school	40%
60-70	Standard	Digest	7th or 8th grade	75%
70-80	Fairly easy	Slick- fiction	6th grade	80%
80-90	Easy	Puff- fiction	5th grade	86%
90-100	Very easy	Comics	4th grade	90%

According to Table 4 of Flesh readability yardstick, it can be seen that the scores of these deep reading passages place between 35.7 and 65.2, that is, they are fairly difficult and difficult, with only one passage of them is standard. CET-4 is a norm-referenced standardized test, thus, it is acceptable that the readability of the deep reading comprehension is with the level of difficult and fairly difficult. Reading test with this kind of difficulty has a good discrimination. It can accurately and objectively reflect the actual English proficiency of the test takers.

4.1.4. Topic Area

Regarding the topic area of test materials, the Test Syllabus stipulates that a wide range of topics is the basic principle of the reading comprehension part. It should include areas such as humanities, social sciences, natural sciences and other fields, but the background knowledge involved should be known by students or provided in the passage. Judging from the total ten deep reading passages in CET-4 from December 2018 to September 2020, the passages include various kinds of topics and genres, involving all aspects of the society. In terms of topics, there are hot topics on the rapid development of science and technology in recent years. For example, artificial intelligence and social ethics in December 2018, artificial intelligence teaching assistant answering questions raised by students in December 2019, and the death of traditional wallets in July 2020. Workplace issues, health problems and other humanity topics are included in the deep reading passages from December 2018 to September 2020, such as women and leadership, and global trend of increasing height in June 2019, relationship between body mass index and income, and so forth. Natural science topics include deep water extraction, knowledge intake and dreams, etc.; there are also topics about the characteristics of crowdfunding, work-life balance, and so on. In short, authentic language, broad and unbiased topic areas meet the requirements of the Test Syllabus, and test takers can easily understand them.

4.1.5. Genre

The Test Syllabus has statement of the genre selecting principle of reading comprehension: genre should be

diverse, including narration, exposition, argumentation, etc.. The Teaching Guide also clarified that students are required to read and understand commonly used materials in applied styles in work and life. From Table 6, the ten deep reading comprehension passages are all expositions and argumentations. There are no novels, dramas, or poems that are difficult for students to understand, which meets the requirements of the Test Syllabus. But it is not difficult to find the following problems in the selected deep reading comprehension passages of CET-4.

Table 5: Topics of the deep reading passages

Time	Task	Topics	Topic area
2018.12	P 1	Deep water extraction	Nature science
	P 2	AI and social ethics	Humanities
2019.06	P 1	Woman and leadership	Humanities
	P 2	Global trend of increasing height	Social science
2019.12	P 1	Artificially intelligent teaching assistant	Nature science
	P 2	Traits of science crowdfunding	Social science
2020.07	P 1	The death of the wallet	Social science
	P 2	Knowledge intake and dreams	Nature science
2020.09	P 1	Relationship between body mass index and income	Humanities
	P 2	The work-life balance	Social science

P 1=Passage 1   P 2=Passage 2

First of all, the two genres, exposition and argumentation, summarized the ten passages, which did not reflect the diverse genres required in the Test Syllabus. Practical genres such as advertisements, charts, manuals, etc., which are easily seen in daily life, cannot be found in these passages. Actually, obtaining information in reading advertisements, charts, manuals, etc. is a real need in daily study, work and life. Abandoning these types of genre does not conform to the spirit of the Test Syllabus, and it will also have a certain impact on the content validity of the test.

Second, the proportion of the three genres in these tests is unbalanced: the number of narration is zero and the number of exposition and argumentation are five deep reading passages respectively, each accounting for 50%. The lack of narration makes the genre that is not diversified, and it also shows that the design of the deep reading comprehension subtest is not meticulous enough. Third, the genres of the reading materials in the same test are too concentrated. In these five deep reading comprehension subtests of CET-4, there are twice where a certain genre dominates in the deep reading comprehension, such as in December 2018 and September 2020. This may cause disadvantages to the candidates who participate in that test, and also affect its content validity. As one of the largest standardized foreign language tests in the country, the quality of the CET-4 test paper must be guaranteed, and any factors that are not conducive to the test itself and the candidates should be avoided as much as possible.

Table 6:Genre of the deep reading passages

2018.12	Passage 1	Exposition
	Passage 2	Exposition
2019.06	Passage 1	Argumentation
	Passage 2	Exposition
2019.12	Passage 1	Exposition
	Passage 2	Argumentation
2020.07	Passage 1	Argumentation
	Passage 2	Exposition
2020.09	Passage 1	Argumentation
	Passage 2	Argumentation

4.2. Expected Response
4.2.1. Response types
According to Bachman and Palmer, there are three main types of responses, namely selected response, limited production response and extended production response. In the CET-4 deep reading comprehension subtest, only selected response in the form of multiple-choice questions are used. Multiple-choice questions include a stem (or question) and several alternative options to be chosen. Because the answers to multiple-choice questions are extremely objective and they can be marked by computers, thus ensuring the accuracy and reliability of the scores. However, when testing reading ability, multiple-choice questions also have shortcomings: one is that they are not in line with the reality of real life, and the other is that the correct answer is already in the options. Candidates can answer the questions by guessing. Generally, there are four options. Therefore, it is more than 25% that candidates can get correct answers simply by guessing. In view of the fact that the questions in CET-4 deep reading comprehension are basically multiple-choice questions, in order to ensure the validity of deep reading comprehension, it is recommended that the test makers combine other answer types when making such test questions.

4.2.2. Reading skills
Readers have not only the ability to acquire knowledge, but also the ability to process information. The Test Syllabus stipulates that the reading comprehension part assesses students' ability to obtain written information through reading, including understanding the main idea, important facts and details, implicit meaning, the author's point of view, attitude, etc. The deep reading comprehension part assesses skills as follows:

A. Understand explicit information
01 Understand the main idea
02 Understand the details
03 Understand the author's clearly expressed views, attitudes, etc.
B. Understand implicit information
04 Summarize the main idea
05 infer the implied meaning
06 Judge the author's opinions, attitudes, etc.
C. Use language features to understand text
07 Guess the meaning of words and phrases based on context
08 Understand the relationship between sentences (such as cause and effect, comparison, condition, etc.)
09 Use vocabulary and grammatical cohesion to understand the relationship between parts of the text

D. Use reading strategies

10 Use appropriate reading strategies to help comprehension

According to the above stipulations, the author has carefully read the ten passages in CET-4 from December 2018 to September 2020, and made statistics on the fifty questions (see Table 7).

Table 7 Reading skills coverage of the deep reading comprehension in CET-4

Skill cove-rage	01	02	03	04	05	06	07	08	09	10
2018.12		2	1		2	2	1	2		
2019.06	2	4		1	1	1		1		
2019.12	2	2	1	1	3			1		
2020.07	2	3		1	1	1	1	1		
2020.09	2	3				1	1	3		
Total	8	14	2	3	7	5	3	8	0	0

From the data in Table 7, it can be seen that from December 2018 to September 2020, the CET-4 deep reading comprehension basically covers eight of the ten skills specified in the Test Syllabus, but there is no assessment of "use vocabulary and grammatical cohesion to understand the relationship between parts of the text" and "use appropriate reading strategies to help comprehension". The eight skills assessed are mainly focused on the understanding details. Among them, there are 8 questions assessing 01 understanding of the main idea, 14 questions assessing 02 understanding of the details and 8 questions assessing 08 understanding of the relationship between sentences, accounting for 16%, 28% and 16% respectively. Questions on these three skills totals to thirty, accounting for 60% of the entire questions. This is basically consistent with the basic requirement of "Be able to read and understand domestic English newspapers and periodicals, grasp the central meaning, and understand the main facts and related details" stipulated in the Teaching Guide for reading comprehension. However, judging from one single test, the coverage is small and the skill distribution of some tests is too dense, such as the deep reading comprehension in CET-4 September 2000.

5. DISCUSSION

Based on the analysis of the deep reading comprehension part of CET-4 from December 2018 to September 2020, it is found that the text length of the CET-4 deep reading passages is moderate, and the total amount of reading words for the entire deep reading is controlled within the scope specified in the Test Syllabus, meeting the requirement of 70 words per minute. The readability of these ten deep reading passages is appropriate and has a certain degree of stability. The topic area is diverse, including various topics in various fields, but on the whole, the recurrence rate of some topics is high. The genre only reflects the exposition and argumentation and lack of other styles, which are also described in the Test Syllabus. In general, the genre lacks diversification, and a single test appears in which only one style unifies the entire deep reading comprehension. The answer type is single, and the multiple-choice question type cannot truly reflect the candidate's language proficiency. The assessment of reading skills focuses on the understanding of details and simple inferences. There are few assessments on the main ideas of the text, the author's views and attitudes, especially assessment at the text level.

Overall, the CET-4 deep reading comprehension subtests from December 2018 to September 2020 basically meet the requirements of the Teaching Guide and the Test Syllabus and have fairly high content validity. They to a certain extent test the test takers' English reading ability, and have an effective guidance for College English teaching. However, as a national standardized foreign language test, there should be more stringent requirements on the quality of its test papers, and the production of test papers and the design of question types should be more scientific and reasonable. It should ensure that the testing content meets the requirements stipulated in the Teaching Guide and the Test Syllabus, and then the test results better reflect the purpose of the test.

6. CONCLUSION

The above analysis shows that the CET-4 deep reading comprehension subtest from December 2018 to September 2020 has fairly high content validity, but it does not mean that there is no room for the improvement in the CET-4 deep reading comprehension subtest. For example text length, genre and reading skill coverage can be better improved. In short, it is hoped that this study can be help of the improvement of the quality of CET-4 deep reading comprehension subtest, and provide valuable information for college students to improve their English reading ability, as well as further improve the quality of College English teaching.

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Analysis of Computer Network Cloud Computing Technology in the New Era

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Abstract: With the continuous development of science and technology, information technology has been widely used in various fields. In the process of information technology being widely used, network cloud computing technology plays a very important role. Network cloud computing technology can quickly store information, which is of great significance for realizing efficient network information processing. Based on this, this article mainly analyzes and explores the computer network cloud computing technology under the background of the new era.
Key words: New era; Computer network; Cloud computing technology

1. INTRODUCTION

In the continuous progress of our society, the application of science and technology has played a vital role. Through continuous improvement of network information technology, people have ushered in the era of big data and cloud storage. In the new era, cloud computing technology can efficiently process network information, this can effectively ensure the stability of network data transmission. In order to make cloud computing technology serve people better, it is necessary to analyze the technology.

2. BACKGROUND OF COMPUTING TECHNOLOGY

Due to the development and progress of Internet technology, cloud computing technology has been continuously optimized and improved. With the rise of Web2. 0 technology, cloud computing technology is gradually being used in real people's production and life. In addition, major colleges and universities are building campus local area network, and the process of building commercial networks for companies is also advancing. These comprehensive factors make cloud computing technology develop towards commercialization. Through analysis, it can be known that cloud computing technology will have important application value not only in the current stage, but also in the future. However, there are still some shortcomings in the current stage of cloud computing technology. For example, if you want to apply cloud computing technology scientifically and effectively, you need a highly professional operation team. Moreover, building a cloud computing network platform requires high-quality hardware and software systems as basic support. In addition, it is necessary to pay special attention to the problems in the construction of computer models. To further mature the application of cloud computing technology, there is still a long way to go. This also requires relevant scientific researchers to continuously optimize and improve cloud computing technology to better serve people.

3. CLOUD COMPUTING TECHNOLOGY ANALYSIS

Judging from the overall situation of the application of network cloud computing technology at the current stage, its greatest value has not been fully utilized, and the room for improvement is very large. This is also the direction of cloud computing technology improvement in the future stage. Therefore, it is necessary to analyze and explore the problems that still exist in cloud computing technology at this stage, and propose targeted strategies for specific problems to provide better technical guarantees for the application of cloud computing technology.

3. 1 Cloud computing technology characteristics

In the new era, people pay more attention to cloud computing technology. This technology has many advantages in modern information technology. Cloud computing technology can give full play to the advantages of information technology, so as to meet people's new needs for information data applications in the context of big data.

(1) Cloud computing is large

Because cloud computing technology has many advantages, the scale of its application is increasing. At this stage, more than 1 million cloud computing servers have been installed in the Google Cloud Computer Room. In addition, there are hundreds of thousands of cloud computing servers in companies such as Amazon and IBM. It can be seen that the construction scale of cloud computing will continue to increase in the future. Cloud computing technology can provide users with more powerful computing services.

(2) Cloud computing virtualization

In the process of applying cloud computing technology, users can obtain and transmit information through different types of network services and terminal devices. Because the process of cloud computing is a process of "invisible and untouchable", users do not need to have too many requirements on the operating area of the technology when using it. Cloud computing services can be better accepted through the mobile devices in hand, which greatly meets the needs of users.

(3) High reliability

When designing cloud computing network technology, designers applied many guarantee services. For example, computing node isomorphism interchange and multi-copy fault tolerance of data can improve the reliability of information data calculation.

(4) Versatility

When users obtain cloud computing services, they can use multiple media. With the support of a powerful cloud computing server, users can use multiple applications at

the same time, which not only ensures the stability of the application, but also its security. (5)Lower cost
Because cloud computing has a very high fault tolerance rate, and the construction of cloud technology through more economical nodes, enterprises can obtain cloud services without paying high economic costs.

3. 2 Disadvantages of cloud computing technology
Although the current cloud computing technology has high application advantages, cloud computing technology is still in the stage of development and progress, and there are still many shortcomings in its technical application. First of all, in terms of information acquisition, users cannot directly acquire information in the supplier's database, therefore, users cannot perform specific access operations on information, which will cause users to experience inconvenience in using information; second, the network security of cloud computing is lacking. If relevant companies cannot ensure that they have high confidentiality performance, the security issues of cloud computing services cannot be effectively resolved. In severe cases, the user's information and data will be leaked, which will bring more adverse effects to the user. In addition, cloud computing technology also has the problem of incomplete information storage, which will cause more inconvenience to users.

4. CLOUD COMPUTING TECHNOLOGY IMPROVEMENT STRATEGY
In the field of information technology, the application of cloud computing network technology is an inevitable trend of the times. Therefore, it is necessary to further analyze and improve the shortcomings of cloud computing technology, so that cloud computing technology can achieve greater breakthroughs, so that the quality of cloud computing technology can be greatly improved. For this reason, this article puts forward several suggestions for improving cloud computing technology.

(1) Optimize access rights to ensure information security
In the current stage of cloud computing technology application systems, the corresponding providers usually provide cloud computing service platforms. In order to ensure the security of user information and data in the cloud computing network, this requires that relevant suppliers should be able to reasonably set access permissions in the platform according to the specific needs of the user, create a relatively safe environment for users to use data information. In addition, as the current information technology is becoming more and more perfect, relevant suppliers need to make reasonable use of information resource sharing, on the basis of further ensuring information security, it is necessary to improve the utilization rate of information and data, create better conditions for the utilization of user information and data, improve the application efficiency of cloud computing, and maximize the utilization value of cloud computing technology.

(2) Ensure data integrity and apply advanced storage technology
In cloud computing technology, people are very concerned about the application of storage technology, which is the most basic requirement to ensure the integrity

of data information. In current cloud computing, most of the storage methods used are distributed information storage, so the integrity of the information is not high. In order to further solve the problem of resource dispersion, the corresponding suppliers are required to further improve the integrity of data information in cloud computing technology, and maximize the use of cloud computing data information on the basis of fully ensuring data integrity. In addition, because cloud computing network technology is developed in the era of big data, the advantages of big data technology should be further brought into play in terms of data storage. At the same time, researchers are required to have a keen sense of smell, predict the development trend of cloud computing, and provide more technical guarantees for the future development of cloud computing. Research and develop more advanced technologies to be applied to cloud computing technology, so that the application defects of cloud computing technology can be better solved.

(3) Improve relevant laws and strengthen user awareness
At the current stage, the development of information technology is very rapid, and under the influence of this, the development of cloud computing technology is gradually accelerating. In order to improve the application quality of cloud computing technology, it is necessary to improve relevant laws and regulations. Constrain the network market environment through legal means, and with the help of the law, suppliers can more restrict their behavior, solve many illegal operations, and lay a good foundation for the application of cloud computing technology. In addition, if you want to further ensure that user information and data can obtain higher confidentiality, it is also necessary to upgrade the supplier's legal examination, so that the supplier can always restrict its behavior. In addition, the network environment should be continuously optimized and users should be guided to surf the Internet scientifically. Only by improving the overall quality of users can it provide a strong guarantee for building a good network environment and provide users with more good experiences.

3. CONCLUSION
All in all, in the current era when Internet information technology is developing very rapidly, the application of cloud computing technology can greatly improve the speed of network information transmission. As cloud computing technology includes many advantages of network information technology, cloud computing technology meets the requirements of the development of the times in the new era. In view of the shortcomings of cloud computing technology, we should actively seek solutions and continuously optimize them. So that the technical barriers of cloud computing technology can be broken, and finally better application of cloud computing technology to all walks of life. Fundamentally improve the speed of the development of the industry, for the overall social development to provide a strong guarantee.

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Research on Cultivation Mode of E-Merchants of Agricultural Products Based on Industrial College

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Abstract: With the continuous advancement of the "Rural Revitalization Strategy", it is a popular concept to improve the rural economic growth mode by using the Internet, and agricultural products e-commerce is the key to the development of rural e-commerce. It is a correct way to use industrial colleges to integrate the resources of universities, enterprises, and governments, and cultivate agricultural products e-commerce merchants to adapt to the development of The Times.
Keywords: Industrial College; Agricultural products e-commerce; E-commerce talent; Cultivation mode

1. PREFACE

With the rapid development of e-commerce in China, agricultural products e-commerce or rural e-commerce has become one of the areas with the most development potential in the e-commerce industry. Driven by the national strategy of "agriculture, rural areas and farmers", investors have shifted their attention to agricultural products e-commerce. In 2014, Alibaba Group proposed the plan of "Ten Thousand Counties, Ten Thousand Villages" to enter the field of agriculture-related e-commerce, and then major e-commerce giants entered this field in a race. With the continuous development of the industry, the corresponding demand for agricultural products e-commerce talent is also increasing. On June 10, 2020, the China agricultural university, wisdom electricity institute released "2020 China's rural electricity business present situation and the development report", (hereinafter referred to as the "report"), the report detailed analysis of the government, the enterprises in the development of China's rural electricity businessmen to the important role, and the future demand for agricultural products uplink power merchants to make forecast: "gap in 2025 to 3.5 million. At the same time, how to train agricultural products e-commerce talents to adapt to the development of talent market has also become a key topic of universities.

2.CHINA'S RURAL E-COMMERCE TALENT STATUS QUO

In June of 2020, China agricultural university wisdom electricity institute pointed out in the report, in addition to the entrepreneurial electric business, the rural county electric business mainly divided into operation and promotion, graphic design, customer service and logistics warehousing four categories, among them, the operation and design of technical requirements such as

high level of job personnel is relatively lack, and 87.6% of entrepreneurial teams there is more than a person and the situation of the job. The proportion and distribution of the four types of talents are shown in Figure 1.

Distribution of rural e-commerce talents in 2020
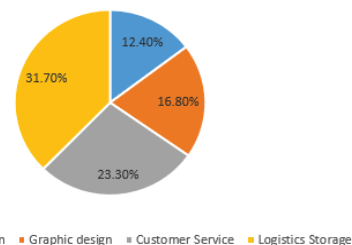
At the same time, the report said that the current e-commerce merchants of agricultural products are still dominated by the middle education level, with primary school education accounting for 1%, junior middle school education for 50%, high school education for 32.5% and university education for 16.5%. The majority of college graduates majored in e-commerce, the first choice is not to devote to the development of rural e-commerce. And in practice, produce electricity business operations need to be more highly educated people, especially in the era of current flow for the king's electricity, will not run again good products is difficult to sell the price, so the current out to develop suitable for the development of the agricultural electricity electricity businessman that also need to lead, guide their attention and encourage their into rural electricity field, but also need to set up the corresponding training institutions have a moderate degree of talent in rural area, electric business skills training to improve their ability to operate, in order to reduce dependence on external talent.

3.THE CHARACTERISTICS AND FUNCTIONS OF INDUSTRIAL COLLEGES

Industrial college is a talent training approach that enterprises and universities take in order to form complementary advantages under the rapid development of Internet economy. For colleges and universities, they can establish practice bases and provide internship opportunities for students with the help of enterprise resources through industrial colleges. Meanwhile, through the connection of industrial resources, colleges and universities can gradually improve the process of professional teaching and talent

supply. In addition, they can indirectly provide entrepreneurial bases for students to start their own businesses. For enterprises, industrial colleges can become their talent training centers, marketing centers and research and development centers, so as to optimize their internal talent structure and improve the quality of human resources.

At present, most industrial colleges in Chinese universities are run by enterprises providing equipment, technology and teachers, and by universities providing venues, teachers and teaching management, etc. Enterprises participate in the running process of industrial colleges as hosts, participate in the formulation and improvement of talent training programs, and share the benefits of running schools. This cooperation is not only in management system, teaching staff and practice base construction has obvious advantages, more important is through the close cooperation between and constantly optimize and integrate the teaching resources, improve education quality, promote the reform of the personnel training mode, which is conducive to the formation of the core competitiveness of colleges and universities, the optimization of enterprise human resources, realize the win-win between and common development.

4. CULTIVATION OF AGRICULTURAL PRODUCTS E-COMMERCE TALENTS BASED ON INDUSTRIAL COLLEGES

"In the face of 3.5 million electric businessmen to gap, only depend on the government, universities, or any electrical appliances business platform, can solve the problem in time", the team argues that the rural electric business culture is a system engineering, need government top-level design, colleges and universities to provide intellectual support, electricity in actual combat training, "to create a linkage model, to establish effective applicable talents cultivation system, cultivate and enterprise electronic commerce application actual " zero distance ", "zero adapting period" with jobs, both development and can quickly enter the specific e-commerce jobs' double zero talent ".

4.1. Strengthening policy guidance and actively promoting policy implementation

In September 2020, the Ministry of Education, Ministry of Industry and Information Technology jointly issued by the institute of modern industrial construction guidelines (trial) ", clear construction should adhere to education for the modern industry college, industry to, fusion, innovation and development, production and education focused on innovative talents training mode, improving the quality of specialty construction and development to build university-enterprise cooperation courses, practice bases and construct high level teachers, structures, production, service platform and improve the management system of the mechanism and so on seven big construction tasks. After four years time, the need of regional industry development as traction, oriented industry characteristic, with close ties to the university, with a focus on the application-oriented university, institute of construction of a batch of modern industry, build a batch of talents cultivation, scientific research, technological innovation, enterprise services, business students, and other functions in a body's demonstration talent training entities, provides applied construction of colleges and universities can be copied, can promote the new pattern. From the Ministry of Education, Ministry of Industry and Information Technology jointly issued by the construction of the institute of modern industry guide, you can see, in the government's emphasis on industry college, and points out that the industry institute of key construction object is applied in colleges and universities, so as applied in colleges and universities should actively promote and implement the policy, speed up the formation and high quality enterprise to build industry institute. In addition, the government also guides college students to pay attention to rural areas or agricultural products e-commerce through different ways, and gives different degrees of support and encouragement to college students who return to their hometown to conduct agricultural products e-commerce entrepreneurship.

4.2. Focus on key fields and form corresponding industrial colleges

Colleges and universities should focus on the key development fields determined by the state and local governments, promote the integrated development of new engineering, new agricultural science, new medical science and new liberal arts, deepen the connotation construction of majors, actively adjust the structure of majors, strive to create specialties with distinctive advantages and promote the development of majors in clusters. To connect closely with the industrial chain, realize the cross and composite of multiple majors, and support the rapid development of several related majors in the same industrial chain; According to the industry and the forefront trend of industrial development, it promotes the construction of a batch of new application-oriented undergraduate majors, and explores the construction path of innovation and development of undergraduate majors. Promote the establishment of the steering committee of specialty construction in cooperation with enterprises, introduce industry standards and enterprise resources to actively carry out the international substantially equivalent specialty certification, promote the coordinated linkage between specialty certification and entrepreneurship and employment qualification, and improve the standardization and internationalization of specialty construction.

4.3. Digging into the actual needs of enterprises or industries and actively docking talent training

For enterprises, it is necessary to actively study the actual employment needs of the enterprises or the industries they are in, and reflect the actual needs of the industries or enterprises to the cooperating universities and colleges, and jointly develop talent training

programs in line with the industry and local development, so as to form the mechanism of school-enterprise cooperation in personnel education.

4.4. Construct the collaborative mechanism of multi-party education in industrial colleges

E-commerce merchants of agricultural products are in large demand now and in the next few years. Besides, with the launch of the national "Rural Revitalization Strategy", national government departments will allocate more resources to rural areas and agricultural products, which will also cause investment funds to be injected into these fields. How to use the "Internet +" thinking change and improve the operation mode of rural and agricultural products, and then improve and revitalize the rural economy, this is the current government part is paying close attention to the problem. Colleges and universities, as institutions to train and transport talents, and enterprises, as the demanders of talents, need to cooperate with colleges, enterprises, industry associations and government departments to cultivate talents that are suitable for the development of The Times and meet the needs of enterprises in order to meet the needs of both supply and demand. Industry colleges can well integrate the teaching resources of universities, government departments, associations and enterprises, so as to ensure the orderly and efficient development of talents training integrating industry and education. The association is responsible for developing and organizing practice bases, opening practice training courses, selecting high-quality practice training teachers and other practical teaching resources; The enterprise is responsible for providing practical teaching resources such as internship posts, practical projects, practical instructors, cutting-edge productive knowledge and technology, and students' practical funds. Colleges and universities organize excellent student resources and provide teaching resources such as teaching places and facilities; The university association (enterprises) jointly built the laboratory, and jointly invested the teaching resources of the operation and management funds of the industrial college; Strive for supportive policies and special funding from government departments (industry authorities).

5. CONCLUSION

Agricultural products e-commerce is one of the main directions of the development of e-commerce at present and in the next few years, and it is also the focus of investors and the government. The cultivation of relevant talents in this field has become a key research topic of universities. The establishment of industrial college can well integrate the resources of the demand side, form a collaborative and long-term cooperative education mechanism, and explore the cultivation mode of agricultural products e-commerce talents in line with the development of The Times.

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Research on the Integrated Development Model of Guangdong-Hong Kong-Macao Greater Bay Area

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Abstract: The integrated development of the Guangdong-Hong Kong-Macao Greater Bay Area has become a major strategic decision of China, and the development of the Bay Area is of great significance. Due to historical reasons, the development of the Guangdong-Hong Kong-Macao Greater Bay Area faces many obstacles. By analyzing the basic situation of each region of the Greater Bay Area, this paper proposes three development models, namely, the integrated development model of infrastructure construction and resources, the policy guidance model and the extended industrial cooperation model, so as to promote the integrated deve-lopment of the Greater Bay Area.
Keywords: The integrated development; he Guangdong-Hong Kong-Macao Greater Bay Area; Development

1.INTRODUCTION
The development of regional economic integr- ation requires that the region should be regarded as a whole. The law of regional development should be grasped. The central government will further promote the coordinated development of the Guangdong-Hong Kong-Macao Greater Bay Area in accordance with the natural law. Regional economic integration will become the inevitable trend of world economic development, which is the embodiment of the economic law. The Guangdong-Hong Kong-Macao Greater Bay Area has gradually become an advanced form of regional economic integration in China. First write reported by the central government from 2017 to the February 2019 by the State Council to formally issued by the country of Hong Kong, Macao and the pearl river delta city of nine big, Hong Kong and Macao to the bay area development plan outline (hereinafter referred to as the outline), explicitly mentioned factors of the greater bay area circulation, establish integration of infrastructure, improve the level of logistics and supply chain management, Hong Kong and Macao to determine the large bay area in our country the important role of development planning in the future.
The Guangdong-Hong Kong-Macao Greater Bay Area refers to the 11 administrative areas adjacent to the Pearl River Eestuary, including Hong Kong, Macao and 9 cities in Guangdong. At present, it is the most mature bay area in China. The geographical advantages and leading advantages of the bay area have initially laid the foundation for a first-class bay area. The Greater Bay Area has two free ports in Hong Kong and Macao, two special economic zones in Shenzhen and Zhuhai, and three free trade zones in Nansha, Hengqin and Qianhai and Shekou.

It has three state-level innovative cities, 12 state-level key laboratories and more than 200 universities and colleges. Tencent, Huawei and DJI, represent- atives of high-tech innovation.
Unique cultural environment to form strong innovation atmosphere which lead to the economy develop rapidly in the bay area. The bay area as a the important carrier to promote the coordinated development of regional economy since the new period of reform and opening up. But the Bay Area is struggling to develop further, it need to consider different legal systems and different regimes, it need to break through the bottleneck of strengthen internal cooperation. According to the Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area, the integration of logistics construction in the Bay Area requires solving the problems such as unbalanced development of various regions, blocked circulation of factors, insufficient resource sharing and even vicious competition, so as to truly realize the integration of the Bay Area. On the premise of infrastructure interconnection, realize the free circulation of resource elements and the facilitation of management means; Through reasonable division of labor, improve the efficiency of resources, form effective competition among enterprises, realize the adjustment of industry, and then realize the comprehensive and sustainable development of regional economy.

2.DEVELOPMENT MODES
In view of this problem, the following three development modes are proposed:

2.1 Integrated mode of transportation planning
the first thing to be realized in integrated development is the circulation of elements within the region. Enterprises within the region cooperate and compete, cooperate under the sense of competition, and cooperate with the strong to achieve mutual benefit. A large bay area of guangdong developed city economy, commodities trading market active, represented by guangzhou, shenzhen, zhuhai nine cities on the mainland with the advantages of geographic location and economic policy and Hong Kong and Macao cooperation to build a number of exchange of goods distribution center, relatively perfect in the bay area regional infrastructure, the bay area transport hub function internal cohesion is not strong, cross-border customs clearance convenience is not strong. As a result, the flow of people, logistics and information is difficult to be shared. In particular, the flow of factors between Hong Kong, Macao and Guangdong is particularly hindered, which has become an important obstacle to the integrated

development of the Guangdong-Hong Kong-Macao Greater Bay Area. In view of this problem, the Framework Agreement on Deepening the Cooperation between Guangdong. Hong Kong and Macao in the Development of the Bay Area was signed in 2017 to further promote the construction of an integrated transport system in the Bay Area and make it a world-class port in the Greater Bay Area. The Greater Bay Area has strengthened the integration of logistics, the Guangdong-Hong Kong-Macao cross-border warehouses in Guangzhou and Nansha Free Trade Zone, the "Shenzhen-Hong Kong Land and Air Combined Transport" of Shenzhen Customs, and the mutual recognition of customs supervision between Guangdong and Hong Kong have improved transport efficiency and reduced logistics costs. The connectivity of infrastructure in different regions of the Bay Area has already started, and the integrated development model of transportation planning further requires the re-planning of the division of labor among ports and airports, which leads to misplaced development.

2.2 Extending the mode of industrial coopera- tion

Guangdong, with its advantageous position and dense labor force, has attracted the investment of enterprises from Hong Kong, Macao and other regions, promoted the local economic development and laid the foundation for in-depth cooperation between the Guangdong-Hong Kong-Macao Bay Area. With the economic development, the operation cost of enterprises increases, and the labor-intensive advantage no longer exists. In order to further promote the sustainable economic development of Guangd- ong, Hong Kong and Macao, enterprises can only transform and upgrade, make use of the science and technology in the coastal areas of Guangdong, Hong Kong and Macao, give play to the spirit of innovation, and combine with computer information technology to increase the profitability of production activities. The use of big data, cloud computing and other ways to collect and process information to improve the ability of analysis and decision-making is conducive to the integration of resource advantages within the region; Forming an integrated business processing system. We will combine scientific research with production to optimize and adjust the industrial structure and transform labor-intensive industries into high-tech intelligence. The remaining few enterprises with slow industrial upgrading and innovation transfer to the surrounding less developed areas to reduce the pressure of labor and land cost. To complete the upgrading and scale expansion of the Guangdong-Hong Kong-Macao Bay Area, it is required to improve labor productivity and replace labor with machines to save costs. The flow of guangdong talent to keep pace with the economic transformation of the talent demand, Hong Kong and Macao education level is very advanced, relatively stable demand for high-end talent, therefore, Hong Kong and Macao regions can use joint ventures, fixed-point support education development way, such as output from Hong Kong and Macao regions elsewhere in a large number of high-quality talent to the bay area, lay the talent base for the development of regional economic integration.

2.3 Policy guidance model

urbanization accelerates the refinement of labor division and specialization of industrial functions, and strengthens the interdependence among heterogeneous enterprises. In October 2020, the Fifth Plenary Session of the 19th CPC Central Committee pointed out that "we will continue to realize the major regional strategy, the coordinated regional development strategy, the major regional function regional strategy, and improve the system and mechanism of coordinated regional development". The integrated development requires giving play to the overall resource advantages within the region, but the cooperative development has different influences on the diverse subjects, different administrative regions and local regional cooperation, and the coordination of interest relations between local governments and cities has become the primary issue to be dealt with in the integrated development. The bay area division of labor is not clear, there are internal cooperation cooperation system is not perfect, development in the area of overlap, each characteristic is not obvious, vicious competition phenomenon, there is competition between regions and various enterprises, each bay area is under the guidance of government consensus planning layout, to achieve cross-regional resource mobilization, enterprise coordinated development. The government weighs the interests of all parties and formulates relevant policies to promote the flow and sharing of talent, capital and information. In view of the particularity of Hong Kong and Macao, it is necessary to consider the particularity of "economic and social cities" and "administrative cities" in formulating relevant policies. To clarify the different legal and policy solutions between Hong Kong, Macao and the nine cities in Guangdong, so as to realize the real coordinated regional development. A large bay area of guangdong with bay area the geographical position is superior to the central and western regions economic development has a very good congenital advantage is advantageous to the construction of the bay area, but the integration of development is also facing many challenges, we are going to Hong Kong and Macao to give full play to regional advantages, in the long term planning considering the actual situation of the bay area, from infrastructure, legal policy, etc, realize the free flow of factors of the bay area resource, to establish the model of the development of a large bay area of guangdong to achieve its sustainable development.

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Risk Assessment of P2P Crowd Funding Based on Signaling Game Model

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Abstract: The risk of P2P crowd funding platform has been widely concerned by all walks of life, and the risk assessment of P2P crowd funding financing is the key for small and medium-sized enterprises to choose the platform. By establishing a signaling game model, this paper analyzes the risk of P2P crowd funding in three Bayesian equilibria. The results show that the small and medium-sized enterprises with low credit will not modify the credit information and send out the signal of high loan interest rate in the state of separation equilibrium, which makes the financing risk faced by enterprises and investors minimum. Under the condition of mixed equilibrium, small and medium-sized enterprises with low credit may modify their credit information and send out the signal of low interest rate, which makes enterprises and investors face greater financing risks. Under the state of quasi separation equilibrium, small and medium-sized enterprises with low credit will modify their credit information and send out signals of low interest rate, which leads to the greatest financing risk faced by enterprises and investors.
Key words: P2P crowd funding, Mixed equilibrium, Separation equilibrium, Quasi separation equilibrium, Risk assessment.

1. INTRODUCTION
With the continuous development of internet financial technology, China's sufficient private capital flows into small and medium-sized enterprises through P2P financing mode, which provides greater financial support for enterprises and helps enterprises to operate and develop. In 2007, since the establishment of the first P2P network lending platform in China, P2P crowd funding financing mode has developed rapidly. According to the statistics of online loan house, from September 2016 to September 2017, small and medium-sized enterprises obtained financing amount of 345 million yuan through P2P crowd funding. According to the *white paper on China's P2P lending service industry*, the annual growth rate of China's P2P financing industry base has exceeded 300%. The proposal of P2P crowd funding financing mode broadens the financing channels of small and medium-sized enterprises, but there are many risks in the specific implementation process. According to relevant statistics, there were 5052 suspected cases of P2P crowd funding financing nationwide in 2017, involving an amount of 179.55 billion US dollars, which seriously affected the effective operation of P2P crowd funding financing mode.
The State Council issued *the implementation plan for special rectification of internet financial risks*, which requires comprehensive rectification of internet financial risks. This means that China's "sword" refers to the internet financial risk, and its key contents include P2P network lending and equity crowd funding business. As a dynamic game model with incomplete information, signal game can assist signal receiver to identify system risk and make scientific decision. The model is applied to the risk identification of P2P crowd funding, which can objectively describe the internal dynamic information and accurately locate the specific risk types. The keywords of "signaling game" and "P2P crowd funding" are used to search, the results of CNKI literature show that there are few researches on signaling game and P2P crowd funding financing in China, and a few of them focus on the development strategy of P2P crowd funding financing. For example, Lu Bing et al. [1] aimed at the information asymmetry problem of P2P crowd funding platform, established a signal game model, analyzed three different Bayesian equilibria in detail, and provided a reference for the sustainable development of P2P platform. Liu Yumei et al. [2] proposed a pricing mechanism of P2P crowd funding signaling game, which enables resource demanders to better identify the quality of information, so as to achieve reasonable payment. Qiu Rongguo et al.[3] put forward the P2P network credit financing mode based on the signal game theory, which is of great significance to improve the profitability and solvency of small and micro enterprises. After analyzing the relevant literature on signaling game and P2P crowd funding, it is found that most of the research contents are relatively single and lack of in-depth verification process. Based on the existing research, this paper uses the signal game model to study the risks faced by P2P crowd funding financing entities in different equilibrium states from a micro perspective, so as to ensure the effective operation of P2P financing and solve the financing difficulties of small and medium-sized enterprises.

2. OVERVIEW OF RELATED THEORIES
2.1 P2P crowd funding
Crowd funding specifically refers to the mode of "group purchase + pre purchase" to raise funds from netizens. With the rapid development of internet finance, crowd funding has gradually evolved into the use of internet platform to raise funds. P2P crowd funding is an individual to individual lending model, and its essence is still an information intermediary platform[4]. P2P crowd funding financing mode is mainly for small and medium-sized enterprises to use the internet financial platform to display relevant financial products on the query platform, reach cooperation intention with financial institutions, match the needs and data of both sides, and complete the

process of enterprise financing. When the loan interest rate is more open, the loan products of each financial institution are different. Even the same financial institution may provide different financial products in different regions[5]. The financial search platform combines the different needs of borrowers and uses big data technology to continuously improve the relevant content to meet the needs of different financial institutions and users[6]. Generally speaking, the process of P2P crowd funding financing mode mainly includes four steps (see Figure 1). According to figure 1, the first step of P2P crowd funding financing is that some small and medium-sized enterprises have financing needs and input demand information on the financial portal platform. Second, the platform matches the financial products according to the enterprise demand information. In the third step, according to the financial products, enterprises compare prices vertically and choose the best financial products. The fourth step is to match the corresponding financial products with financial institutions to meet the financing needs of small and medium-sized enterprises.
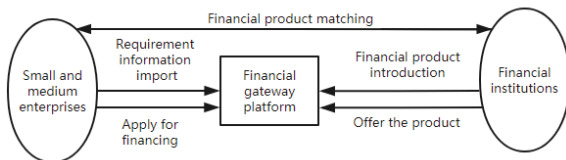
Figure 1. P2P Crowd Funding Financing Process

2.2 P2P crowd funding signal game process

Signal game is a dynamic game process composed of one sender and another receiver. In P2P crowd funding, the sender and receiver are represented by small and medium-sized enterprises and investors [7]. In the process of P2P crowd funding, both sides are rational people. Under certain conditions, the results of their choice behavior will affect the interests of both sides. In addition, small and medium-sized enterprises participating in P2P crowd funding financing can be divided into two types, including high credibility and low credibility. Small and medium-sized enterprises with high credibility can repay the loan principal and interest on time to maximize the interests of both parties; small and medium-sized enterprises with low credibility cannot repay the loan principal and interest on time, which will bring losses to investors to a certain extent[8]. Furthermore, this paper takes the loan interest rate of small and medium-sized enterprises as the signal in the signaling game model, and constructs the signaling flow chart of P2P crowd funding game of small and medium-sized enterprises (see Figure 2).
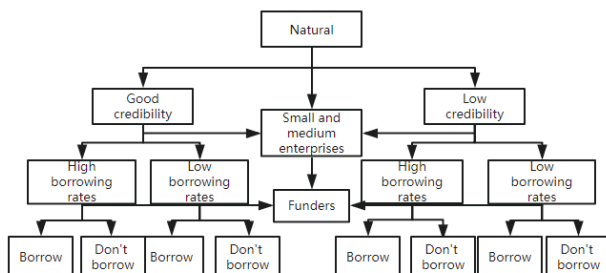
Figure 2. Flow Chart of P2P Crowd Funding Signal Game

It can be seen from Figure 2 that after the natural selection

of borrowers, different types of small and medium-sized enterprises send loan signals to investors through loan interest rates. Investors make the decision whether to invest or not according to the received signal. Generally speaking, when investors receive a lower interest rate, the corresponding borrowing small and medium-sized enterprises have a higher degree of credit. On the contrary, when investors accept higher borrowing rates, the reliability of small and medium-sized enterprises is generally at a low level[9]. However, when small and medium-sized enterprises use P2P crowd funding for financing, the enterprises with low credit will pay a certain cost to modify the credit information and send out the signal of low borrowing rate. In order to obtain more financing amount, some small and medium-sized enterprises with high credit will issue high interest rates to attract investors' attention[10]. The above two situations will affect the correct judgment of investors. Therefore, this paper further studies the income of small and medium-sized enterprises after financing, the income and loss of investors, and deeply evaluates the risk of each participant in P2P crowd funding.

3.RESEARCH DESIGN

3.1 Basic assumptions

In the signaling game model of P2P crowd funding, small and medium-sized enterprises and investors are in a rational state and know how to maximize their own interests under the given conditions. In view of this, in order to further study the risks faced by financing participants, this paper puts forward the following assumptions:

Hypothesis 1: whether P2P crowd funding can successfully complete the transaction depends on the participants in the game. The purpose of setting both sides of the game to participate in P2P crowd funding financing is to maximize personal interests[11]. The borrowers of small and medium-sized enterprises are A, the investors are B, the small and medium-sized enterprises with strong repayment ability are K1, and the small and medium-sized enterprises with weak repayment ability are K2.

Hypothesis 2: the cost of small and medium-sized enterprises participating in P2P crowd funding (C1), and the cost of investors participating in P2P crowd funding (C2). If small and medium-sized enterprises modify credit information in order to improve credit, the cost is C, and the risk guarantee fund (D) that small and medium-sized enterprises need to bear in order to obtain financing.

Hypothesis 3: under the condition of high loan interest rate, the loan amount that investors can provide is AH, and the collateral that small and medium-sized enterprises can provide to investors is E (E > DH). The investor's income is VH, and the small and medium-sized enterprises risk guarantee is DH. Under the condition of low loan interest rate, the amount of loan that investors can provide to small and medium-sized enterprises is AL, and the collateral that small and medium-sized enterprises can provide to investors is H (H > DL). The investor's income is VL and the small and medium-sized enterprises risk guarantee is DL.

Hypothesis 4: the main purpose of financing and

borrowing of small and medium-sized enterprises is to carry out normal business activities and obtain profits. In order to obtain financing loans, small and medium-sized enterprises can set a higher borrowing rate[12]. Small and medium-sized enterprises with high interest rate can be divided into two types that is high credibility and low credibility, and their income after financing can be expressed by GH and BH respectively. The enterprises with low loan interest rate can also be divided into two types, including high credibility or low credibility, and their income after financing is expressed by GL and BL respectively. GH and BH are related to AH, GL and BL are related to AL. Whether it is to set high or low interest rates, the income of small and medium-sized enterprises after successful financing is greater than the cost of participating in P2P crowd funding C1.

Hypothesis 5: the probability of high real credit of small and medium-sized enterprises is PG, and the probability of low real credit is Pb = 1-Pg. There are four different financing schemes for small and medium-sized enterprises, namely, the loan interest rate with high real credit, the loan interest rate with low real credit, the loan interest rate with high real credit, and the loan interest rate with low real credit. According to the above four different financing schemes, the probability of successful crowd funding of small and medium-sized enterprises is respectively PL/g, PL/B, Ph /b and Ph/g; investors also have four different investment strategies[13]. That is to say, low interest rate loans to small and medium-sized enterprises with high real credit, low interest rate loans to small and medium-sized enterprises with low real credit, high interest rate loans to small and medium-sized enterprises with low real credit, and high interest rate loans to small and medium-sized enterprises with high real credit. According to the above discussion, this paper names the contribution probability of investors as Pb/L, Pg/l, Pg/h and Pb/h respectively.

In order to facilitate the research, the variables involved in the above hypothesis are summarized and summarized, as shown in Table 1.

Table 1. Variable Definition

Variable	Variable interpretation
A	small and medium-sized enterprises
B	Funder
K1	SMEs have strong reimbursement to funders
K2	SMEs have weak reimbursement to funders
C1	P2P crowd sourced financing costs for small and medium sized enterprises
C2	Funder P2P crowd funding cost
C	Costs required for SMEs to modify credit
VH	Financing gains of SMEs under high borrowing rate condition
DH	SMEs whether reimburse the risk guarantees for loans on time under the condition of high borrowing rate
D	Financing risk guarantees for SMEs
E	Collateral provided by SMEs to funders
AL	Amount that the funder can lend to SMEs under the condition of low borrowing rate
VL	Low borrowing rate conditions yields attainable by the funder
GL	Low borrowing rate condition high post financing earnings of SMEs with high credit
AH	Line to which the funder can lend to its creditors under the condition of high borrowing rate

VH	Yields attainable by the funder under high borrowing rate conditions
GH	Post financing returns of SMEs with high credibility level under high borrowing rate condition
BH	Post financing returns of SMEs with low credibility level under high borrowing rate condition
BL	Post financing returns of SMEs with low credit level under low borrowing rate condition
H	Collateral provided to investors by SMEs under low borrowing rate condition
DL	SMEs whether reimburse the risk guarantees for loans on time under the condition of low borrowing rate
Pg	Probability of high true credit for SMEs
Pb	Probability of low true credit for SMEs
Pl/b	Earnings of funders after successful financing of SMEs with low true credit and high loan rate
Ph/b	Earnings of funders after successful financing of SMEs with high true credit and high loan rate
Pl/g	Earnings of funders after successful financing of SMEs with high true credit and low loan rate
Ph/g	Earnings of funders after successful financing of SMEs with low true credit and low loan rate
Pb/l	The funder had low borrowing rates and the funder gave SMEs with high authentic credit opportunities
Pg/l	The funder paid low borrowing rates, and the funder gave small and medium business opportunities with low authentic credit
Pg/h	The funder borrowed high interest rates, and the funder gave small and medium business opportunities with low authentic credit
Pb/h	The funder borrowed high interest rates, and the funder gave SMEs with high authentic credit opportunities

3.2 Model building

This paper constructs a signaling game model to study P2P crowd funding risk based on the hypotheses proposed above. Known from the research hypothesis, P2P crowd funding in small and medium-sized enterprises has two outcomes, financing success versus financing failure. Signaling games of the two financing outcomes the yields matrices of the two parties are shown in Tables 2 and 3.

Table 2. Yield Matrix for the Success of Crowd Funding Financing of P2P in SMEs

SMEs	Funder	
	High rates	low rates
High credibility	GH-C1, VH-C2	GL-C1, VL-C2
Low credibility	BH+AH-DH-C1, DH-AH-C2	BL+AL-DL-C1-C, DL-AL-C2

Table 3. The Failed Returns Matrix for Crowd Funding Financing of P2P in SMEs

SMEs	Funder	
	High rates	low rates
High credibility	-C1, 0	-C1, 0
Low credibility	-C1, 0	-C1-C, 0

For research convenience, this paper assumes that when small and medium-sized enterprises have a high credit level, funders, regardless of whether small and medium-sized enterprises set a high borrowing finance rate or a low borrowing rate, have expected gains greater than zero.Conversely, when small and medium-sized enterprises credit is low, the funder expected benefits are all less than zero. At the same time, due to the differences in rates, principal, risk guarantees, etc., funder expected losses are less at high rates than at low rates. So, when small and medium-sized enterprises are successful in crowd funding for the P2P platform, the funder's expected benefits are:

$$U = p_{g/h}(V_H - C_2) + p_{b/h}(D_H - A_H - C_2) +$$
$$p_{g/1}(pV_L - C_2) + p_{b/1}(D_L - A_{L-}C_2) \quad (1)$$

When small and medium-sized enterprises fail crowd funding on the P2P platform, the funder's expected yield is: $U = 0$ .Analysis of the funder's expected earnings revealed that when the funder's expected earnings were greater than 0, funds were borrowed in their hands. At this point, the probability that small and medium-sized enterprises are crowd sourced for funding success at the P2P platform is 100%. When the return on investment was 0, the funder elected not to fund. In this setting, the probability of small and medium-sized enterprises success in crowd funding via P2P is 0.

4. RISK ASSESSMENT

In the signal game model, funders of P2P crowd funding financing can hardly access the information such as the real finance, credit rank, and collateral in small and medium-sized enterprises, and the phenomenon of information asymmetry between the two sides of financing occurs. At this point, small and medium-sized enterprises choose different strategies for P2P crowd funding in order to access financing and maximize their own benefits. This paper examines the effect of different choices between P2P crowd funding financing small and medium-sized enterprises and funders on the effectiveness of P2P crowd funding financing based on a signaling game.

In the P2P crowd funding financing model, the credit degree of SMEs has a great correlation with the rate, the higher the credit degree of small and medium-sized enterprises, the lower the rate of accessible financing loans. The lower the confidence of small and medium-sized enterprises, the higher the interest rate of obtaining financing loans. Therefore, to obtain low interest rate financing support, high credit small and medium-sized enterprises will choose to set low financing rate. Small and medium-sized enterprises with low credit would choose to modify the credit information and improve the credit level to increase the chances of successful financing. Meanwhile, funders will be at great funding risk for small and medium-sized enterprises to modify credit information. And small and medium-sized enterprises face the risk of thawing down the capital because of modifying credit information.

For research convenience, this paper refers to the low interest rate chance of modified credit information in small and medium-sized enterprises with low credit level as r($0 \le r \le 1$), that is, Pb/h = 0, Pg/h = 1, Pb/L = R, Pg/L = 1-r. Based on these results, Bayes' rule was further utilized to calculate the funder's post funding earnings, PH/g, Pl/g, Ph/b, and Pl/b respectively in four funding decisions.

$$p_{h/b} = \frac{p_h p_{b/h}}{p_h} = \frac{p_b p_{b/h}}{p_g p_{g/h} + p_h p_{b/h}} \quad (2)$$

$$p_{h/g} = \frac{p_g}{p_b r + p_g} \quad (3)$$

$$p_{l/g} = \frac{p_{g/l} p_g}{p_{g/l} p_g + p_{b/l} p_b} \quad (4)$$

$$p_{l/b} = \frac{p_{b/l} p_b}{p_{b/l} p_b + p_{g/l} p_g} \quad (5)$$

From the above analysis, it is known that the equilibrium state in P2P crowd funding varies with r assignment, or with the value of the r interval.I.e., the probability that funders target small and medium-sized enterprises with low credit and set high borrowing rates, decreases as the probability r increases for small and medium-sized enterprises to modify credit information. The probability that low credit small and medium-sized enterprises signal a low interest rate, increases as the probability r of the small and medium-sized enterprises to modify credit information increases. When r = 0, P2P crowd funding, the two sides of the signaling game are in separating equilibrium. When r = 1, the two sides of the signaling game in P2P crowd funding are in mixed equilibrium. When 0 < r< 1, the two parties of the signaling game in P2P crowd funding are in quasi separate equilibrium. Based on the above analysis, three equilibrium states are analyzed:

4.1 Separating equilibrium states

Separation equilibrium state refers to different credit degree small and medium-sized enterprises, which issue corresponding rates according to their own actual situation, that is, small and medium-sized enterprises with high credit degree emit a low borrowing rate signal, and small and medium-sized enterprises with low credit degree emit a high borrowing rate signal, which aims to achieve the funder trust to obtain the fused funds.

Separating the risks faced by funders in the equilibrium state is primarily signaled by small and medium-sized enterprises borrowing interest rates. It is truthful that small and medium-sized enterprises emit borrowing interest rate signal, that is, its chance r of modifying credit information is 0, the chance that small and medium-sized enterprises with low credit degree emit high interest rate signal is 100%, and the chance that low credit degree emit low interest rate signal is 0.Arguably, in the separation equilibrium state, the funder faces the least risk and will earn a funder benefit. And, separating the equilibrium states can guarantee that P2P crowd funding finance has effectiveness and belongs to the optimal financing model. In the separation equilibrium state, the borrowing small and medium-sized enterprises were judged to have good credit when the funder received a low interest borrowing signal. And known by the P2P crowd funding success benefit matrix, the funder's profit is $V_L - C_2 > 0$, that the funder will definitely earn the benefit. In this scenario, the funder makes an investment decision. That is, small and medium-sized enterprises have a 100% probability of obtaining financing with P2P crowd funding. When funders received signals for high borrowing rates, there was low adjudicatible SME credit, known from funder earnings $D_{H-} A_H - C_2 < 0$, and principal losses may have occurred with funders' funding. At this point, the funder will not fund, that is, in the state of separation equilibrium, less credit small and medium-sized enterprises cannot access financing through P2P crowd funding. Meanwhile, small and medium-sized enterprises face the least financing risk in the state of separation equilibrium. The financing cost of small and medium-sized enterprises is C_1, small and medium-sized enterprises with higher credit

benefit is $B_L + A_L - D_L - C_1 - C$, and since, i.e $G_L - C_1 > 0 > -C_1$, small and medium-sized enterprises with higher credit gain through P2P financing will be larger than their financing cost. Hence, in this model, higher credit small and medium-sized enterprises have no incentive to deviate from this equilibrium. It is satisfied, however, that there is also no incentive for small and medium-sized enterprises with low levels of true credit to deviate from this equilibriu to be met $B_L + A_L - D_L - C < 0$.This is not to be biased by the need to guarantee that the amount of financing available to small and medium-sized enterprises in credit low, the risk guarantees, and the cost required to modify credit information are within a stable range.

In summary, in separating the equilibrium states, borrowing signals from small and medium-sized enterprises can genuinely reflect their credit degree and belong to the optimal financing equilibrium state, high credit small and medium-sized enterprises can acquire financing through P2P crowd funding, while low credit small and medium-sized enterprises cannot acquire financing through P2P crowd funding. Arguably, in separating the equilibrium states, funders and small and medium-sized enterprises in P2P crowd funding finance face the least risk.

4.2 The admixture equilibrium state
In the mixed equilibrium state, mall and medium-sized enterprises with different credit degrees signal the same borrowing rate. The concrete performance is that its borrowing signal is low interest rate regardless of the small and medium-sized enterprises credit level. Under this model, calculations were performed with equation (2), (3), and the funder's proceeds after funding were calculated according to the receiving borrowing rate signal $U = p_g(V_L - C_2) + p_b(D_L - A_L - C_2) + (D_H - A_H - C_2)$

The funder's receipt of borrowing signals were all at low rates, and in turn, the small and medium-sized enterprises true credit level could not be judged by the signals received. From this, the funder may make the following judgment. For small and medium-sized enterprises with higher credit levels, when SME credit is high, funders make a borrowing decision, followed by gains. Known by $V_L - C_2 > 0, D_L - A_L - C_2 < D_H - A_{H_1} - C_2 < 0$, to make the funder's anticipated benefits $U > 0$, the following conditions need to be met $|V_L - C_2| > |D_L - A_L - C_2|$.In this condition, the funder borrowing funds at low rates for gains from high credit small and medium-sized enterprises may compensate for the loss of funds made at low rates to true low credit small and medium-sized enterprises. That is $V_L > |D_L - A_L - C_2|$ established, the funder was able to earn earnings through P2P crowd funding. And in this case, small and medium-sized enterprises are also able to crowd funding for financing through P2P. For small and medium-sized enterprises with lower credit levels, small and medium-sized enterprises with low credit have a larger chance to access financing, which indicates that the credit of small and medium-sized enterprises using P2P crowd funding is generally low. There was a loss of principal as well as a

negative return when the funder made borrowing strategies. At this point, the funder will not fund the trial.I.e., financing through P2P crowd funding would end in failure without access to financing funds. In the hybrid equilibrium state, some small and medium-sized enterprises with low credit modify their credit information, emitting a low interest rate signal. At this point, P2P crowd funding effectiveness is underrepresented.

4.3 Quasi isolated equilibrium states
Quasi isolated equilibrium state mainly refers to small and medium-sized enterprises with different credit degrees, emitting different or same signals in a certain proportion. That is, small and medium-sized enterprises with a high credit level definitely signal a low borrowing rate. Small and medium-sized enterprises with low credit level, then signal low borrowing rate, i.e., r > 0, by modifying the credit information. This paper analyzes the quasi separation equilibrium state pattern, mainly in high credit small and medium-sized enterprises will definitely issue a low borrowing rate, and in low credit small and medium-sized enterprises, a low borrowing rate will issue. At this point, the credit information probability r fluctuates between 0-1 for low credit small and medium-sized enterprises to modify credit information.I.e., the chance of low interest signals from low credit small and medium-sized enterprises is greater than zero. The funder funded earnings were calculated according to formula (4), (5): $U = p_{g/1}(V_L - C_2) + p_{b/1}(D_L - A_L - C_2) + (D_H - A_H - C_2)$

When $p_{g/1}$ sufficiently large, $D_L - A_L - C_2 < D_H - A_H - C_2 < 0$.When large enough to state that low credit small and medium-sized enterprises modify the credit information, improve the credit degree, and then emit low interest rate signals with a large enough chance. At this point, the funder anticipated the benefit to be less than zero. The Funder, if he or she chose to fund, would face loss of funding, and thus the funder would make the decision not to borrow. That is, in the quasi isolate state, small and medium-sized enterprises face a difficulty of being unfunded due to the funder's choice not to fund, and then judge the failure of small and medium-sized enterprises to crowd funding through P2P.

Thereby, in a quasi isolate equilibrium state, funders cannot judge the true credit level of small and medium-sized enterprises by virtue of the received financing borrowing signal. In this state, both sides of the signaling game have huge risk hazards, i.e., small and medium-sized enterprises may be at risk of thawing and funders are at risk of losing funds.

5. CONCLUSION AND SUGGESTIONS
By utilizing the signal game model, this paper analyzes the risk situation of P2P crowd funding under three Bayesian equilibrium states. Studies have found that there are different subject risks among different equilibrium states. Firstly, separating the equilibrium state, funders can judge the true credit level of small and medium-sized enterprises according to the interest rate signal issued by small and medium-sized enterprises, make the decision of financing, and then obtain a certain benefit. This state of financing equilibrium, which is the most effective state of

crowd funding at P2P, faces the least risk on both sides of the game. Meanwhile, small and medium-sized enterprises in the separation equilibrium state obtain financing and can earn more gains. The funder received corresponding interest through loan funds. Arguably in the separation equilibrium state, high confidence small and medium-sized enterprises versus funders can earn revenue through P2P crowd funding. Secondly, in the mixed equilibrium state, small and medium-sized enterprises with low credit may modify the credit information and send a low borrowing rate signal, resulting in the funder being unable to rate SME credit by the borrowing finance signal received, and the funder may suffer from funding losses. Therefore, P2P crowd funding finance effectiveness is not fully exploited in this equilibrium, and funder funding runs some risk. Thirdly, in the quasi separate equilibrium state, the probability of the SMEs with low credit level to modify the credit information is greater than 0, that is, the small and medium-sized enterprises with low credit level will necessarily modify the credit information.In this equilibrium state, where the interest rate signal does not truly reflect the true credit in small and medium-sized enterprises, funder funding is most likely to incur losses.In this equilibrium, funders are generally not funded easily, and small and medium-sized enterprises have little access to financing. Based on the above conclusions, the following recommendations are made:

The first is to construct a borrowing platform warning system. P2P borrowing platform should establish an early warning system in these three aspects, before, during, and after borrowing from small and medium-sized enterprises. The platform should critically review the small and medium-sized enterprises information before borrowing, carry out the rating of high and low credit, bright red light to the problematic small and medium-sized enterprises, and reduce the risk of P2P crowd funding. In the borrowing process, the platform should refine the two party transaction contract, confirm the authenticity and lawfulness of the contract, once the problem is found, it can send an early warning, terminate the contract, and avoid the occurrence of risk. While after borrowing, the platform should continue to routinely survey small and medium-sized enterprises, and early warning is issued immediately to reduce unnecessary losses once small and medium-sized enterprises are found to have loss or behaviors that affect capacity reimbursement.

The second is to enhance disclosure of P2P crowd funding financing.To reduce the risks of P2P crowd funding, financing bodies including small and medium-sized enterprises and funders should increase disclosure efforts, such as to clearly inform small and medium-sized enterprises of the risks associated with deferred or default copayments, and the responsibilities that need to be borne to modify credit information. Meanwhile, to protect the legal interests of funders, small and medium-sized enterprises on P2P crowd funding platform should provide basic disclosures to SEC, intermediaries, potential funders. Through these measures, reduce the loss of both parties' risk in P2P crowd funding.

The third is to establish a third-party funding escrow system. The P2P crowd funding platform needs to collaborate with a third-party hosting organization to establish accounts, monitor the funding changes, evolution processes in all P2P platforms, and follow real-time the rights, ranks, and changes funded in the P2P platform to ensure the security of the funding for the P2P. Meanwhile, small and medium-sized enterprises with funders should register to open a third-party payment account number and connect to their bank accounts, to achieve the circulation of funds there is a third-party payment platform to participate throughout. Namely, the back-up account held by the funder's bank account to the third-party payment company at the bank, and finally transferred by the third-party payment company to the banking account of small and medium-sized enterprises, which achieves full monitoring of the flow of funds, ensures the effectiveness of P2P crowd funding finance, and guarantees the health development of the network financing.

Four is the creation of crowd funding communities. P2P crowd funding platform operation will require some extension methods at the initial stage, to solve the problems of low user base and difficult start. Meanwhile, P2P crowd funding platforms can rapidly accumulate large numbers of users through the positive agglomeration effect once they break through the critical scale. Thus, the P2P crowd funding platform can aggregate small and medium-sized enterprises with funding needs into the same community to communicate and share their respective crowd funding experiences and feelings by founding a crowd funding community, increasing the attribution and enthusiasm of small and medium-sized enterprises financed through the P2P crowd funding platform. At the same time, P2P crowd funding platforms can also improve products with information fed back in the community and play the role that P2P crowd funding deserves.

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The Development Path of Rural E-Commerce Based on Targeted Poverty Alleviation: A Case Study in Guangdong Province

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Abstract: As one of the "ten projects" of targeted poverty alleviation, e-commerce poverty alleviation has brought new forms to rural economic development. Due to the differences of regional conditions and industrial structures, the theory and practice of rural e-commerce poverty alleviation need to be further explored. Based on the mechanism analysis of targeted poverty alleviation background of rural e-commerce, this paper analyses the current situation of rural e-commerce under targeted poverty alleviation in Guangdong Province, and concludes the trend of the integration, in order to better promote targeted poverty alleviation development in rural areas.
Keywords: Targeted poverty alleviation; Rural e-commerce; Mechanism analysis; Guangdong Province

1.INTRODUCTION

The regional and urban-rural gap, the transfer of rural labor and the decrease of rural population have gradually become global concerns to against rural degradation. Rural e-commerce plays an important role in rural revitalization in both the developed and developing regions [1]. Since the strategic concept of the ten targeted poverty alleviation projects was put forward in 2015, e-commerce poverty alleviation has been formally incorporated into the poverty alleviation policy system, which has become an important measure widely studied and applied. Advancement of the favorable policies and perfect infrastructure and agricultural product system of rural e-commerce, the e-commerce market of agricultural products has been gradually activated as well.

The "2020 National County digital agriculture rural e-commerce development report" shows that in 832 poverty-stricken counties of China, the total online retail sales and the agricultural products online retail sales reached 107.61 and 19.08 billion yuan respectively, with an increase of 31.2% and 23.9% separately year-on-year. E-commerce has become an important converter to accelerate the reconstruction of agricultural industry and value chain. However, the rural e-commerce market shows a characteristics of long tail distribution. Namely, the "head" brand e-commerce market accounts for a large proportion, and the "tail" agricultural product brands "have more types and less flow". In this regard, how to solve the uneven distribution of resources with the help of rural e-commerce and better extend the coverage of targeted poverty alleviation projects is still worth further exploration. In view of this, this paper starts from the mechanism of rural e-commerce and precision poverty alleviation, then combines with the current development situation of rural e-commerce in Guangdong province, further discusses the effective integration and trend of rural e-commerce and precision poverty alleviation, to better promote the positive effect of rural e-commerce in the context of precision poverty alleviation.

2 MECHANISM OF RURAL E-COMMERCE TOGETHER WITH TARGETED POVERTY ALLEVIATION

Rural e-commerce mainly covers two aspects: one is to send industrial products to the countryside to expand rural consumption market; the other is to bring agricultural products into the city, especially those special agricultural products, to enlarge the channel of sale, and to minimize the cost and expenditure at the same time, aims to maximize farmers' interests [2]. Rural e-commerce poverty alleviation refers to the integration of e-commerce into the poverty alleviation system, which can promote rural economic development through e-commerce information technology, and improve the income of rural poor households directly or indirectly.

In terms of the relationship between rural e-commerce and targeted poverty alleviation, the achievement of targeted poverty alleviation needs to be market-oriented and sell the right agricultural products to the right places in the right way to realize the accurate sales of agricultural products. Rural e-commerce is a good way to break the information asymmetry, which can help poor rural households to obtain and use accurate market information in high efficiency, and form the industrial chain of "precision production, precise supply and precise sales". In terms of the effect between rural e-commerce and targeted poverty alleviation. Rural e-commerce can not only break through the market and time constraints, realize resource integration, help to overcome exogenous poverty, but also activate the entrepreneurial potential of poor areas to effectively alleviate endogenous poverty [3]. According to the Ali Research (2018) the number of Taobao villages in China has exceeded 3200, the annual sales exceeds 220 billion yuan,

creating employment opportunities more than 1.8 million, which plays an important role in the rural economic development in the way of entrepreneurship driven employment.

3 CURRENT SITUATION OF RURAL E-COMMERCE IN GUANGDONG PROVINCE

3.1 Policy support and promotion

With the widespread of poverty alleviation concepts, great attention and policy support have been put into rural e-commerce background of targeted poverty alleviation both at the national and provincial levels. There were 200 counties domestic selected as rural e-commerce demonstration counties financed by a special fund in 2015, and four counties in Guangdong Province were included. Then the "Guangdong Province e-commerce demonstration base" and "Guangdong Province e-commerce demonstration enterprise" selections were held, with the purpose of strengthening the driving and radiation role of e-commerce continuously. The "targeted poverty alleviation program for rural e-commerce in Guangdong Province (2018-2020)" was further issued, which comprehensively helped poverty alleviation and increase income with the requirements of pilot first, demonstration promotion, steady promotion and comprehensive coverage. There were 28 rural e-commerce grassroots demonstration stations have been set up in Guangdong province in 2018.

3.2 Cross-sectoral and multi-stakeholder involvement

Rural e-commerce poverty alleviation is the concrete embodiment of the concept of social poverty alleviation, which needs the joint propulsion of the government, enterprises, universities and farmers. At the level of government and enterprise, the Guangdong Commerce Department and Alibaba Group have signed a memorandum on rural e-commerce cooperation to jointly launch the poverty alleviation project of e-commerce. Besides, annual e-commerce demonstration enterprises are evaluated every year in Guangdong province, to promote the innovation of e-commerce application and mode. At the level of government, enterprise and local colleges, the Guangdong "Internet+" targeted poverty alleviation forum was jointly hosted in October 2016, which is a good way to promote all sectors of the community to work together to create an innovation poverty alleviation road of e-commerce with local features. With the advancement of overall planning under the government, the participation of farmers has been greatly improved, as well as other social organizations.

3.3 Substantial achievement

According to the Ali Research, the number of Taobao villages in Guangdong rose from 2 in 2013 to 798 in 2019, second only to Zhejiang Province. And seven cities in Guangdong ranked among the top 20 Taobao villages. In 2019, the e-commerce transaction volume of Dapu county was 2.153 billion yuan, with a year-on-year growth of 67.45%. The sales of rural agricultural products and tourism network was 844.7

million yuan, with a year-on-year increase of 87.42%. In 2018, the Qingyuan city launched the first official news system in rural areas and the "last mile" at the grassroots level. Rural e-commerce has gradually become new dynamic for economic growth and peasant income.

4 THE PATH OF TARGETED POVERTY ALLEVIATION OF RURAL E-COMMERCE

4.1 Optimizing the circulation mode of agricultural products

Take information network technology as carrier to innovate the sales mode of agricultural products. On the one hand, it actively promotes the establishment of online platforms, rebuilds the structure of packaging, logistics, publicity and other links, and gives priority to purchasing agricultural products of poor households; on the other hand, it actively combines with traditional retail channels, such as establishing poverty alleviation product experience stores and self-help points in the community, so as to get through the "last mile" of poverty alleviation. In product homogenization and price competition era, branding is significant in forming loyal customer group and accelerating circulation of agricultural products. For example, Guangdong province has built some typical e-commerce brands of agricultural products and constructed projects such as "one village, one product", "famous, special and excellent new agricultural products" and "ten famous brands of Guangdong" according to local conditions, which have great effort on rural economic development and poverty.

4.2 Cooperation with local universities

The implementation of the policy and the benefits of targeted poverty alleviation have indeed attracted many migrant workers returning to start e-commerce entrepreneurship. Due to the lack of necessary skills, some farmers nearly have no idea about e-commerce business especially at the initial stage. At this time, local colleges and universities can undertake the role of education to actively provide farmers with basic knowledge training and technical guidance. In addition, exploration and practiced on live e-commerce base of college students under university-poor villages and townships cooperation mode is also a good way. Taking the South China Agricultural University as an example, which has set up a special organization to serve rural revitalization providing technical services in the whole industrial chain or some key fields for 76 industrial parks, playing an important role in regional poverty alleviation in the whole province.

4.3 Application new mode of e-commerce to update the poverty alleviation concept

With the rural infrastructure completion gradually, some new e-commerce models, such as cross-border e-commerce and live e-commerce, have also joined to the countryside, injecting new opportunities for rural areas development. It covers agricultural and sideline products, furniture manufacturing, cosmetics and

other fields, releasing a strong "spillover effect" in poverty alleviation. According to the Ali research, five regions in Guangdong Province are selected as cross-border e-commerce villages in 2018-2019. In 2018, the imports and exports of cross-border e-commerce reached 67.45 billion yuan, a year-on-year increase of 126.54%, Affected by the outbreak, live e-commerce and rural poverty alleviation concept have been well integrated, creating such anecdotes as "county magistrate shows his magic power with goods" and "rural news officials go to the fields". These promote the adjustment of agricultural industry structure and better off farmers 'livelihoods, giving more employment to rural surplus labor force. Rural areas have rich characteristics of agricultural products and living environment, they should actively combine with e-commerce to give full representation to regional characteristics.

5.CONCLUSION

Industrial poverty alleviation is of great significance in the achievement of poverty alleviation. Rural e-commerce highlights the important economic and social value in industrial upgrading. Under the background of "Internet+" and the continuous improvement of rural infrastructure, rural electricity providers and special agricultural products will become necessary choices for more counties to practice poverty alleviation and economic development. Therefore, it is essential for rural e-commerce to actively update the circulation mode of agricultural products, cooperate with local universities, and actively apply some e-commerce models to better reflect the characteristics of rural areas and play positive role in regional targeted poverty alleviation.

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A Review of Deep Learning based Target Tracking Algorithm

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Abstract: The rapid development of deep learning in recent years has substantially changed the algorithm design ideas in such fields as Automatic Speech Recognition (ASR), image classification and text understanding. Target tracking, a basic and important issue of computer vision, has important theoretical research significance and application value, and has been widely used in intelligent video surveillance system, intelligent transportation etc. This paper first expounds the basic research framework of target tracking, reviews the history of the existing target tracking and points out that deep learning could help obtain a more robust observation model; furthermore, this paper introduces the deep learning method suitable for target tracking from the aspects of deep discrimination model, deep generative model, etc.; then, this paper classifies, elaborates and analyzes the current deep target tracking methods; finally, this paper analyzes the problems of deep learning method in the application of target tracking, such as training data shortage, real-time tracking and long-term tracking and expects the future development direction.
Keywords: Deep Learning; Target Tracking; Convolutional Neural Network (CNN); Correlative Filter; Siamese Network

1.INTRODUCTION

Target tracking, as an important branch of computer vision, models the appearance and motion information of target by means of the contextual information of video or image sequence so as to predict target moving state and calibrate its position. By integrating the theories and algorithms of many fields such as image processing, machine learning, optimization, etc., target tracking is the premise and basis for accomplishing image understanding tasks at a higher level such as target behavior recognition. (Li et al., 2018; Lu et al., 2018). With the rapid improvement of computer processing ability, a variety of target tracking based civil and military systems have emerged one after another, all of which are widely used in intelligent video surveillance (Huang et al., 2015; Collins et al., 2000; Haritaglu et al., 2000; Shu et al., 2005), intelligent human-computer interaction (HCI) (Bonin-Font et al., 2008; Li et al., 2003), intelligent transportation system (ITS) (Lu et al., 2010), visual navigation (Hu et al., 2007; Kristan et al., 2013), unmanned driving, unmanned autonomous flight, battlefield situation reconnaissance (Li et al., 2018c; Lu et al., 2018), etc.

Within the world range, Carnegie Mellon University, Massachusetts Institute of Technology and other prestigious colleges and universities and research institutions took the initiative in the research on target tracking related projects (Wang et al., 2015; Lowe et al., 2004) and improved the ability of active city surveillance and situational awareness of battlefield in virtue of multi-sensor technology. The S3 system (smart surveillance system) (Haritaoglu et al. 2000) developed by the IBM Research Institute can realize multi-target tracking and anomaly detection of target behavior. The University of Reading and the University of London in the UK, both of which are committed to civil video surveillance projects (Van et al., 2009; Guan Hao et al., 2016), have developed a public transport management system that can track and understand pedestrians in complex scenarios, monitor and guide traffic flow and achieve abnormal early warning. Related research groups have also been established by many domestic research institutes and universities, such as the State Key Laboratory of Pattern Recognition, Institute of Automation, Chinese Academy of Sciences, Institute of Communications and Signal Processing, Dalian University of Technology, Institute of Image Processing and Recognition, Xi'an JiaoTong University, Chinese University of Hong Kong, Tsinghua University and the Institute of Image Processing and Pattern Recognition of Shanghai JiaoTong University, etc., all of which have studied the application of target tracking in the field of computer vision. In addition to specific engineering applications, target tracking is also an important topic in top journals and conferences in various fields. A large number of latest and advanced achievements are published every year in such journals as IEEE TPAMI (IEEE Transactions on Pattern Analysis and Machine Intelligence), IJCV (International Journal of Computer Vision), PR (Pattern Recognition) and also some conferences including ICCV (IEEE International Conference on Computer Vision), CVPR (IEEE Conference on Computer Vision and Pattern Recognition), ECCV (European Conference on Computer Vision), etc. At the same time, various related conferences and journals held in domestic China also contain the topic of target tracking, such as related meetings including International Conference on Image and Graphics (ICIG), Conference on Pattern Recognition and Computer Vision (PRCV), Vision and Learning Seminar (VALSE), etc. as well as some journals such as *Scientific and Technical Information of China, Chinese Journal of Computers, ACTA AUTOMATICA SINICA, Journal of Image and Graphics* etc. These cutting-edge studies have greatly promoted the theoretical development and engineering

applications in the field of visual tracking, enabling the central application of related technologies into national defense, enterprises and personal life.

Target tracking can be divided into single target tracking and multi-target tracking according to the number of tracking targets. Deep learning has been extensively used in target tracking algorithms with the successful application of deep learning in computer vision tasks such as image classification and target detection, contributing to a lot of research achievements. Therefore, this paper sorts the deep learning based target tracking algorithm systematically in order to provide reference for the further development of target tracking.

2.CURRENT SITUATION OF TARGET TRACKING RESEARCH

There are a large number of target tracking algorithms available at present. According to its development process, Figure 1 shows the representative algorithms at different time nodes, which will be elaborated later. It can be seen that 2012 is a watershed, when the deep learning method represented by Alex Net network yielded great success in the field of image recognition, and then was quickly introduced into the field of target tracking.
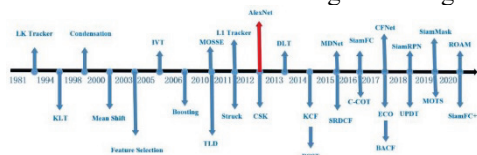

Fig. 1 Some representative object tracking algorithms

The basic framework of visual tracking system is generally composed of such modules as search strategy, feature extraction and observation model. The commonly used search strategies nowadays include mean shift (Comaniciu and Meer, 2002), particle filter (Isard and Blake, 1998), cyclic dense sampling (Robert, 2005), etc.; after the candidate samples are obtained through the search strategy, the features are extracted and mainly include artificial features and learning features; finally, the feature is used to judge whether the candidate sample is the observation model of tracking target, which is usually divided into generative model and discriminative model. As the observation model means a lot to tracking results, this paper mainly reviews the development of target tracking from the perspective of observation model (Wang et al., 2015).

2.1.GENERATIVE MODEL BASED METHOD

The generative model builds appearance model by extracting target features and searches the region that best matches the model in the image and takes it as the tracking result (Krizhevsky et al., 2012). The earliest target tracking work could be traced back to the LK optical flow proposed in 1981. (Horn and Schunck, 1981), which assumes that the gray level of the target remains unchanged within a short period of time but the velocity vector field in the region neighboring the target changes slowly. KLT (Kanade Lucas Tomasi tracking method) (Shi and To-masi, 1994) tracked the target by matching corners. Subsequently, the original appearance (Isard and Blake, 1998) or color (Comaniciu and Meer, 2002) was used as the main feature to describe target, which can also

be described by a more complex hybrid way (Jepson et al., 2003). This method consists of three parts, which describe the stability features, transient features and noise process of target. However, the above features could hardly describe the changes of target. For instance, when the angle of target changes sharply all of a sudden, the appearance model will fail and even lose the target, resulting in the failure of tracking task. In order to solve these problems, the multi-angle model is used to describe target. It tracks target by calculating the affine transformation difference between the current image containing target and the image reconstructed by the feature vector. On the basis of the above, Ross et al. (2008) updated the base of feature space online and directly took the previously detected objects as samples for online learning, making it unnecessary to collect a large number of labeled samples. The L1 tracker (Mei and Ling, 2011) regards tracking as a sparse approximation issue. By solving the L1 norm minimization, it can track target. At the same time, more robust local features such as Scale Invariant Feature Transform (SIFT) (Cruz-Mota et al., 2012), Speeded Up Robust Features (SURF) (Ross et al., 2008) and Maximally Stable Extremal Regions (MSER) (Matas et al., 2004) are also used to describe target to adapt to various local scales and rotation changes. The essence of generative model lies in finding the nearest candidate target as the current estimation in the high-dimensional space of target representation, whatever global feature or local feature. However, this method is also disadvantageous as it only focuses on the target information and ignores the background information.

2.2.DISCRIMINATIVE MODEL BASED METHOD

Different from generative model, discriminative model takes into account both target and background information and regards the tracking as an issue about classification or regression. Its purpose is to find a discrimination function to separate target from the background in order to realize target tracking.

(1) Classification of discriminative model. In the early stage, Collins et al. (2005) used linear discriminant analysis to adaptively select the color features that have the most distinguishing power to the current background and target in order to separate target. Subsequently, various classifiers were introduced into the field of target tracking. Avidan (2007) used machine learning methods such as support vector machine ((SVM) (Suykens and Vandewalle, 1999) and Ada Boost (Viola and Jones, 2001) to distinguish background from target. However, the selected feature is based on a single pixel, making it easy to lose target. Grabner et al. (2008) tracked target by using Haar feature (Mita et al., 2005) and online Boosting algorithm. TLD (tracking learning detection) (Kalal, 2012) used online Ferns (Bosch et al., 2007) to detect target and also used online Random forest algorithm (Svetnik et al., 2003) at the same time to track target. According to Struck algorithm proposed by Hare et al. (2016), structured Support Vector Machine (SVM) is used to output tracking results directly, which avoids intermediate classification and achieves excellent performance.

(2) Regression discriminative model. The typical method

based on Regression discriminative model is correlation filter. By realizing the conversion from time domain to frequency domain through Fast Fourier Transform (FFT) through circulant matrix, it greatly improves the algorithm speed. Correlation filter has attracted extensive attention because of its speed advantages and has gradually become the mainstream framework in the field of target tracking. On the basis of MOSSE algorithm (David et al., 2010), Henriques et al. proposed CSK (circulant structure of tracking by detection with kernels) (Henriques et al., 2012) algorithm, which is also known as kernel correlation filter algorithm, which uses cyclic shift for dense sampling and maps low-dimensional linear space into high-dimensional space by kernel function, with a view to enhancing the robustness of correlation filter. The subsequent work was aimed to improve the algorithm from the aspects such as feature selection, scale estimation, regularization, etc. In the aspect of feature selection, Histogram of Oriented Gradients (HOG), CN (color names) and other features can be used to better represent target. As for scale estimation, SAMF (scale adaptive multiple feature) (Li et al., 2015) simultaneously detected the changes of the target position and scale, and used image pyramid for scale selection, with the optimal scale corresponding to the maximum response value; DSST (accurate scale estimation for robustvisual tracking) (Danelljan et al., 2014) regarded target tracking as two independent issues of position change and scale change. First, the position translation coherent filter was trained to detect the target center translation and then the scale coherent filter was trained to detect the scale change of the target. As correlation filter uses cyclic shift sampling, all samples except the central one will have a boundary, which is called boundary effect. SRDCF (learning spatially regularized correlation filters for visual tracking) (Danelljan et al., 2015a) adopted a large detection area and added weight constraints to the filter coefficient. The closer it is to the edge, the bigger the weight. The closer it is to the center, the smaller the weight, so that the filter coefficient is mainly concentrated in the central area, which effectively alleviates the boundary effect. CSR-DCF (discriminative correlation filter with channel and spatial reliability) (Luke ic et al., 2017) used spatial segmentation and channel response values to evaluate the reliability of airspace and channels.BACF (background-aware correlation filters) (Galoogahi et al., 2017) obtained larger search domain samples by zero-filling operation and ensured real negative samples in course of cyclic sampling. STRCF (spatial-temporal regularized correlation filters) (Li et al., 2018b) considered both spatial and time regularizations, so that target could be tracked successfully if there is any occlusion and adapt to the substantial appearance changes at the same time.

2.3.DEEP LEARNING BASED METHOD

The deep learning based target tracking method makes tracking mainly by using the representation ability of powerful deep features. According to the way of using deep features, it can be divided into tracking based on pre-training deep features and tracking based on off-line training features.

(1) Pretraining deep feature based tracking. Some early work (Wang and Yeung, 2013) directly used the pretraining model on Image Net data to extract deep features. HCF (hierarchical convolutional features for visual tracking) (Ma et al., 2015) used the deep and shallow features of the VGG (visual geometry group) network and integrated them into the correlation filter, yielding an excellent tracking performance. However, the algorithm does not deal with the scale and assumes that the target scale remains unchanged in the whole tracking sequence. Therefore, it is not robust to track the targets whose scale is changed substantially. HDT (hedged deep tracking) (Qi et al., 2016) integrated and enhanced the correlation filters trained by each layer of features by using Hedge algorithm. C-COT (continuous convolution operators for visual tracking) (Danelljan et al., 2016) combined shallow apparent information with deep semantic information. According to the response of different spatial resolutions, the response graph of continuous spatial resolution was obtained by interpolation in frequency domain and the best position and scale were obtained by iteration. In order to solve the problem of slow C-COT, ECO (efficient convolution operators) (Danelljan, etc., 2017) made improvement through convolution factorization operation, sample grouping and update strategy and enabled the algorithm improve by an order of magnitude on the basis of ensuring algorithm accuracy. UPDT (unveiling the power of deep tracking) (Bhat et al., 2018) distinguished deep features from shallow ones, and used data enhancement and differential response functions to improve robustness and accuracy. At the same time, the proposed quality assessment method was used to adaptively integrate the response graph, finally acquiring the optimal target tracking results.

(2) Offline training feature based tracking. Off-line training feature based tracking is aimed to obtain a better tracking performance by making the most of the features that the end-to-end training is well matched with target tracking task. MDNet (Nam and Han, 2016) designed a lightweight network learning convolution feature for tracking algorithm in order to represent the target and used Soft Max (Kumarawadu et al., 2002) to classify samples. Its performance proved to be very excellent but the speed was only 1 frame/s. The subsequent Siam-FC (Bertinetto et al. 2016b) algorithm was provided with Siamese network to train a similarity measurement function offline in the video sequence ILSVRC2015. In the tracking process, the model was used to select the candidate that was most similar to the template and take it as the tracking result. Tao et al. (2016) proposed the SINT (Siamese Instance Search Network) algorithm, which uses Siamese network to learn the matching function of the target template and the candidate target directly. The target of the initial frame was used only as the template in course of online tracking for the purpose of tracking. After the siamese network obtains the target location, the region proposal network is used to directly estimate target scale (Li et al., 2018d), which is conductive to a better tracking performance and a higher efficiency at the same time.

How to integrate correlation filtering into deep learning framework and train the deep features that best fit correlation filtering through end-to-end training has become a hot issue in many fields. CFNet, proposed by Valmadre et al. (2017) first rewrites the correlation filter into a differentiable neural network layer, which is integrated with feature extraction networks to achieve end-to-end optimization and train convolutional features well matched with coherent filter. The VOT2017 contest champion algorithm CFCF (good features to corre-late for visual tracking) (Gundogdu and Alatan, 2018) is to learn the deep features suitable for correlation filter by adjusting network model delicately and then introduce the learned deep features into the tracking framework of C-COT. Some of the latest work is to introduce the latest progress of deep learning, such as meta learning (Park and Berg, 2018), Generative Adversarial Networks (GAN) (Song, etc., 2018) into the field of target tracking in order to achieve a better tracking performance.

3.DEEP LEARNING MODEL

3.1.CONVOLUTIONAL NEURAL NETWORK

Convolutional Neural Network (CNN), which refers to a typical deep learning model, was first proposed by Le Cun in 1989. In 2012, Krizhevskyd et al. applied deep CNN to the field of image classification for the first time and their Alex Net network model won the first place of Image Net image classification competition. As a result, deep CNN was successfully introduced into the field of computer vision. Since then, the champions of the Image Net competition are all based on the deep CNN method, the typical ones of which include AlexNet(Krizhevskyetal., 2012), VGGNet(Simonyan and Eisserman, 2015), GoogLeNet (Szegedy et al., 2015), ResNet (He et al., 2016), DenseNet (Huang et al., 2017b), etc. The basic structure of CNN includes input layer, convolutional layer, pooling layer, fully connected layer and output layer, as shown in Figure 2:
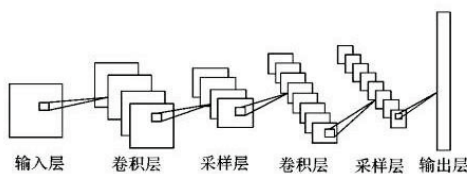
Fig. 2 CNN basic structure diagramt

Only one convolutional layer and pooling layer are drawn in Figure 2, but a real network often contains several convolutional layers and pooling layers, all of which are connected alternately. When dealing with pedestrian detection, CNN model can be divided into One-stage and Two-stage models according to detection steps. Two-stage model divides pedestrian detection into two stages. First of all, region proposals are generated and classified. The typical Two-stage models include RCNN, SPP-Net, Faster-RCNN etc. with the characteristics of high accuracy and low detection speed. One-stage model can generate pedestrian category probability and location coordinates directly and is typically represented by YOLO series model and CornerNet, CenterNet model. Its characteristics are fast operation speed and low accuracy in general.

3.2.RCNN NETWORK

Ross et al. proposed the RCNN (Regions with CNN features) model for target detection and introduced CNN into the target detection field in 2014. RCNN uses the CNN method to extract features within the target region proposal. The processing flow is shown in Figure 3:
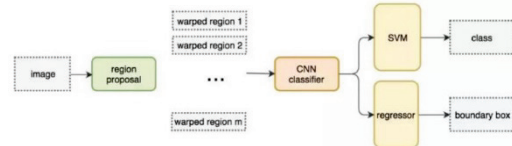
Fig. 3 RCNN algorithm flowchart

The model first uses the selective search algorithm to generate about 2, 000 target region proposals on the input image, then normalizes proposals and then sends them to AlexNet convolutional network to extract features. In AlexNet network there are five convolutional layers that can extract features. After a round of training, each region proposal can get a 4, 096-dimensional feature vector. Then the extracted features are introduced into the SVM classifier for classification. Finally, a regressor (dx, dy, dw, dh) is trained by using the output of convolutional layer to make the region proposal close to the real labeled region. The emergence of RCNN liberates science researchers who no longer need to design a large number of manual features artificially and the accuracy has been greatly improved compared with the traditional detection algorithm. However, RCNN requires the fixed size of the image input into convolutional layer, so the size of the original picture needs to be changed. This will deform the image, leading to the loss of certain features and lower detection accuracy. For detection each time, certain time is needed to generate 2, 000 region proposals. With time-consuming operation, RCNN takes about 47s to detect a picture on the VOC2007 data set, which cannot meet the real-time requirements.

3.3.SPP-NET NETWORK

In 2015, He et al. found that the features of Region of Interest, (ROI) could correspond to the features of the corresponding position on the feature graph one by one and proposed the SPP-Net network model, which needs convolution operation for once at a time and greatly improves the detection speed (about 100 times higher than that of RCNN). The SPP-Net network model first uses the selective search algorithm to generate about 2, 000 target region proposals for the input image and divides the size of each region proposal into 4×4, 2×2 and 1×1 blocks. Then the Spatial Pyramid Poooling (SPP) layer is used for pooling operation which yields the feature vector with dimension of $(4 \times 4 + 2 \times 2 + 1 \times 1) \times 256$. Finally, the feature vector is output in the output layer as the input of the full connection layer. The core of the SPP-Net network model is to add a SPP layer after the convolutional layer. The SPP layer can generate fixed-size pictures without cropping image, which therefore reduces feature loss. Moreover, only one time of convolution feature extraction is required against image in the whole process, which greatly improves target detection speed of general objects. However, the data need to be divided into several training stages through complex steps .

3.4.FASTER RCNN

Deposit their high accuracy of target detection, RCNN network model and SPP-Net network model need about 2, 000 region proposals before detection, which lengthens target detection time. The greatest contribution of Faster-RCNN models to abolish selective search algorithm. It generates region proposal using Region Proposal Network (RPN) and extracts image features through shared convolution operation, which greatly reduces computation volume and improves detection speed. The Faster-RCNN structure diagramt is shown in Figure 4:
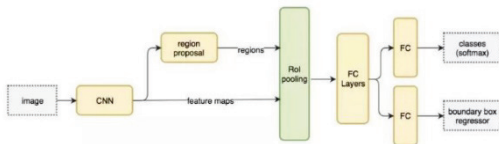
Fig.4 Faster-RCNN structure diagramt

The RPN network first generates k anchor frames of different sizes on each pixel of the n-dimensional feature graph and assigns a binary label to each anchor frame (whether it is the target or not). It is marked as a positive label, if the overlap area between the anchor frame and the actual target is more than 0.7 times higher than the total area but a negative label if the area is less than 0.3 times than that of the total area. Then a sliding window sized s × s is used to generate an n-dimensional feature, and connection is finally made to the classification layer and regression layer to determine whether there is a target and record the target location.

Faster-RCNN uses RPN network to reduce the time for candidate boxes generation and combines Softmax classifier with regressor. Without the need of training network models separately, it has both detection effect and speed superior to RCNN and SPP-Net networks. The average accuracy of the test that the author made in PASCKL VOC 2007 data set is 0.73. However, the sliding window is used in RPN network to traverse the convolution feature graph so the process may entail a longer time.

3.5.YOLO SERIES

According to all the target detection algorithms above, it is required to divide the target region proposal first before predicting the target categories. By contrast, YOLO treats the region proposal division and category prediction of the target region as one regression issue, outputs the positions and categories of multiple targets on the picture directly and detects targets very quickly on the premise of ensuring high accuracy in order to better meet the actual needs. YOLO has a total of three versions: YOLO, YOLOV2 and YOLOV3, all of which are introduced below.The YOLO structure diagram is shown in Figure 5:

Fig.5 YOLO structure diagramt

YOLO uses the improved Inception V1 model to extract picture features. As the size of input picture must be 448 × 448 according to Inception V1 model, the size of the input picture should be adjusted that size first and then the whole resized picture can be used as the input of convolution network. The original picture is divided with a grid sized S × S. At this time, the central point of the object in the picture will fall into a grid element, and 9 the corresponding grid element will be responsible for detecting the object. The author put forward the YOLOV2 model, which contained five improvements on the basis of the YOLO model in the same year. First of all, a Batch Normalization (BN) operation was added after each convolutional layer to normalize the data and speed up convergence. Secondly, the fully connected layer of output layer was replaced by convolutional layer to adjust the input size of the picture delicately so that the network adapts to the input of different sizes better. In 2018, the author improved the speed and accuracy of YOLOV2, and put forward the YOLOV3 model, which extracts features using Darknet-53 network. The network above plays a crucial role in improving the accuracy of YOLOV3. In order to further strengthen the ability of detecting small objects, YOLOV3 uses multi-scale features to detect targets. It takes 22 ms for YOLOV3 to detect an image sized 320x320, and the average accuracy is 28.2%.

3.6.RECURRENT NEURAL NETWORK

Gate recurrent unit (GRU) (Cho et al., 2014), as a kind of Recurrent Neural Network (RNN), was created to solve the gradient in long-term memory and back propagation. GRU can yield considerable results and be trained more easily in comparison to Long Short-Term Memory Network (LSTM), finally improving the training efficiency dramatically. The input and output structures of GRU are the same as those of ordinary RNN, and its principle is very similar to LSTM, which means using gating mechanism to control input, memory, etc. GRU has two doors, the reset gate and the update gate. To be specific, the reset gate determines how to combine the new input information with the previous memory and the update gate defines the proportion of the previous memory saved under the current moment. A standard RNN model can be obtained by setting the reset gate as 1 and the update gate as 0. LSTM has three gates: input gate, forgotten gate and output gate. The input gate and forgotten gate correspond to the update gate of GRU. GRU does not control or retain internal memory or have the output gate in LSTM.

Traditional LSTM is provided with fully connected LSTM network, considers no spatial correlation and contains a lot of redundant spatial data. In view of the problem above, the researchers proposed the Conv LSTM method (Shi et al., 2015), the essence of which is the same as the traditional LSTM: Taking the output of the upper layer as the input of the next layer. The difference is that Conv LSTM is provided with convolution structure, enabling it to not only have the time series modeling ability of LSTM but also extract spatial features like CNN. The transition between states is replaced by convolution calculation so that it also has time space characteristic. Conv LSTM can be intuitively extended to other prediction issues with spatiotemporal sequences, such as tracking.

3.7.GENERATIVE ADVERSARIAL NETWORKS

Generative Adversarial Networks (GAN) mainly includes generator and discriminator; to be specific, the former

makes the generated image more real by learning the real image distribution to deceive the discriminator; the latter needs to distinguish whether the received image is true or not. In the process of training, the generator strives to make the generated image more real while the discriminator tries the best to identify image truthfulness. With training iteration, the generator and the discriminator constantly confront each other so as to enable the network to reach Nash equilibrium as much as possible: The image generated by the generator is very much like the real image distribution but the discriminator cannot distinguish the true image from the false one. The whole system can be trained by back propagation. Representative GANs include DCGAN (deep convolution generative adversarial networks) (Radford et al., 2016), WGAN (Wasserstein GAN) (Arjovsky et al., 2017), WGAN-GP (Gulrajani et al., 2017), etc.

3.8.AUTO ENCODER

The Auto Encoder (AE) (Vincent et al., 2010) is a kind of data compression algorithm, in which the data compression and the decompression function are data-dependent, lossy and automatically learned from sample. The structure of AE generally consists of two parts: encoder and decoder, both of which can be under any model. In general, neural network model is used as the encoder and decoder. The input data is encoded by neural network dimensionality reduction and then decoded by another neural network to get a generated data which is as similar as possible to the input original data. The parameters of the encoder and decoder in network are trained by comparing the two data and minimizing their difference. When the process training is finished, a more compact feature can be generated through the encoder. In addition, a decoder that is as consistent as possible with the original data can be generated by using the encoder and inputting a code randomly.

Improved on the basis of AE, Variational Auto Encoder (VAE) (Kingma and Welling, 2013) has a structure similar to AE and is also composed of both encoder and decoder. For AE, it is better to input an image and generate a hidden vector through the encoder than randomly taking a random noise, because it contains the information of the original picture and the hidden vector can be decoded to get the picture corresponding to the original picture. However, AE cannot generate any image, for the hidden vector cannot be constructed artificially. In view of the above, an image needs inputting to the encoder to get the hidden vector. To solve the problem, VAE emerged, which sets more restrictions in the coding process, forcing the hidden vectors that it roughly generates to follow a standard normal distribution. Therefore, after VAE training, the task of generating new data can be done only by granting a random hidden vector that follows the standard normal distribution through the decoder. We can usually use the two statistics of mean and standard deviations to synthesize hidden vectors in practice. The default encoded hidden vector follows a normal distribution. The features learned by VAE can be applied to tasks such as recognition, noise, reduction, representation, visualization, etc.

3.9.OTHER DEEP LEARNING MODELS

Other representative deep learning models include reinforcement learning (Hester et al., 2018) and meta-learning (Al-Shedivat et al., 2018).

Reinforcement learning (RL), as a kind of machine learning, has been widely used in the field of artificial intelligence (AI), such as Alpha Go, Atari 2600 games, natural language processing etc. and is mainly used for selecting the optimal action of goal realization through learning for an intelligent agent that can perceive the environment. Q-learning, which is most widely used in reinforcement learning, usually needs to define a Q function Q (s, a), showing that action "a" in the state "s" can maximize the return "R", and then update the "Q" value iteratively and constantly. If the Q function is accurate enough and the environment is determined, then it is only required to take the strategy of maximizing Q value action. Traditional Q-learning stores Q values in a Q table, whose rows represent different states and columns represent all possible actions. If there are few states, this method can solve some problems very well. But the reality is that there are usually nearly 10, 000 different states, making it impossible to build such a large Q table. The above sets restrictions on Q-learning which can hardly solve practical problems. Therefore, Deep Q-learning was proposed, which uses a deep neural network to simulate the Q function; mean square error is used in the Q value to measure the difference between the current value and the target value, and then the difference is taken as the objective function and optimized by stochastic gradient descent (SGD). In order to improve the performance and learning speed of Deep Q-learning, further improvements can be made: Use three kinds of losses to update the network, that is, the double Q learning loss, the supervised large marginal classification loss and the L2 regularization loss on network weight and bias, so that the network has better ability; the model speed becomes higher through the time difference update mode. Despite its dramatic achievements in many aspects, reinforcement learning still has a common problem: Algorithm processing is limited by environment stability. Environment is usually unstable and changes along with time in reality, which often leads to the failure of strategies learned through reinforcement learning and forces intelligent agents to make self-adjustment constantly during training and operation in order to achieve good results. For the purpose of solving the above problems, Meta Learning can be used to improve the traditional reinforcement learning method (Al-Shedivat et al., 2018) to realize strategy dynamic self-adaptation. The main idea of this method is to first train a good initialization network, so that a network adapting to new task can be updated by using only a small amount of data once there is a new task. The main approach is to create a new strategy based on historical experience (such as historical strategies and historical tracks). Such a way means imitating the human's thinking mode, which means using historical experience to adjust strategies, so as to quickly adapt to the new environment.

4.DEEP LEARNING DASED TARGET TRACKING

ALGORITHM

4.1.SYMMETRIC NETWORK BASED TARGET TRACKING ALGORITHM

There is a learning method detecting matching rate, which uses Siamese symmetric convolution network to determine whether two image blocks belong to the same goal through inputting detection image blocks of the same size. There are usually three topology forms of Siamese network structure, as shown in Figure 6.
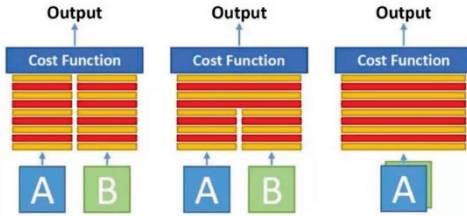

Fig.6 Three Siamese topology diagrams

The experimental results show that the third kind of network structure can yield better discrimination results. Therefore, Lealtaixe et al. used the third topology form of Siamese network to train and calculate the matching similarity between the two tests. The original detection features include regularized LUV images I1 and I2, and optical flow image O_1 and O_2 with component in x, y direction. These images are scaled to 121x53 and superimposed together to form a 10-channel network input features. Convolutional network consists of 3 Conv-Layers, 4 FC-Layers, and binary-softmax-loss, as shown in formula 1.

$$E = \frac{1}{2N}\sum_{n=1}^{N}(y\Phi\ (d_1,d_2)+(1-y)\max(\tau-\Phi(d_1d_2),0)) \quad (1)$$

Where, Φ (d_1, d_2) represents the output characteristics of the two detectors d_1 and d_2 after convolution. Y indicates whether it corresponds to the same target. If d_1 and d_2 are from the detection of the same target, y = 1; otherwise, y = 0. The training samples are extracted from the real tracking data. The same track detection pair obtained by using detection algorithm is taken as positive sample and detection from different tracks is taken as negative sample. In order to increase the diversity of samples and enhance the generalization ability of classifier, negative samples also include image blocks with small overlap rate that are randomly collected around the detection.

4.2.MINIMUM MULTICUT GRAPH MODEL BASED TARGET TRACKING ALGORITHM

LUV image format and optical flow image are used to match the two detections in the above algorithm. Tang et al. found that the optical flow like feature (Deep Matching) calculated by deep learning can also obtain good target tracking results by working together with the model with stronger representation ability . It was found by observing the detection results in the target tracking that only considering the detection matching between two frames does not bring the best model representation. As shown in formula 2, in consideration of the detection inaccuracy and detection matching relation between and among images, establishing the corresponding graph model has wider representation ability than considering the graph model of detection matching between frames only.

$$\min_{x\in\{0,1\}^E}\sum_{e\in E}c_e x_e$$

$$\text{s.t.}\quad \forall C\in \text{cycles}(G) \qquad \forall e\in C:x_e \leq \sum_{e'\in C\setminus\{e\}}x_{e'} \quad (2)$$

4.3.TARGET TRACKING ALGORITHM BASED ON TIME SPACE DOMAIN ATTENTION MODEL

Besides the deep network architecture which can solve the problem of target recognition, a suitable deep network model can also be designed according to the characteristics of multi-target tracking scenario to learn the detection matching feature. Chu et al. made a statistical analysis on the drift of the tracking algorithm in the pedestrian multi-target tracking and found that mutual blocking is an important reason for the drift of the tracking algorithm when different pedestrians interact with each other.

In order to solve this problem, Space-Time Attention Model (STAM) to learn occlusion and to identify the possible interference targets. As shown in Figure 7, the spatial attention model is used to generate feature weights when occlusion occurs. When the candidate detection features are weighted, the estimated target tracking results are obtained through selection via classifier and the weighted loss function is obtained by time attention mode weighted with historical samples and current samples to update the target model online.
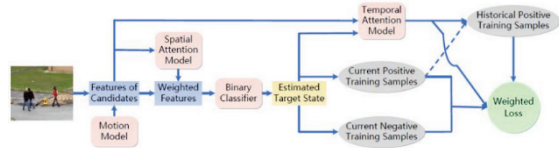
Fig.7 STAM model framework

In this model, each target independently manages and updates its own STAM and feature model and selects candidate detection for tracking. Therefore, this method essentially means the extension of single-target tracking algorithm in multi-target tracking. In order to distinguish different goals, the key step is how to model the occlusion state and distinguish different goals accessed.

4.4.TARGET TRACKING ALGORITHM BASED ON RECIRCULATING NETWORK DISCRIMINATION AND FUSION APPEARANCE MOTION INTERACTION

The deep network models used in the algorithms above are all based on convolutional network structure. As target tracking means judging the new target status by historical track information, it is also feasible to design a network structure that can memorize historical information and learn matching similarity measurement according to historical information to enhance the performance of multi-target tracking.

Sadeghian et al. designed a feature fusion algorithm based on long-term and short-term memory cycle network model (LSTM) to learn the matching similarity between trajectory history information and current detection, as shown in Figure 8.
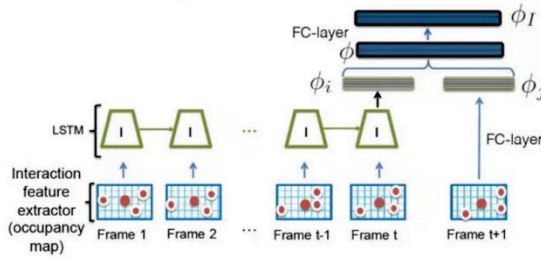
Fig.8 Target interaction feature matching architecture based on LSTM model

4.5.TARGET TRACKING ALGORITHM BASED ON BILINEAR LONG SHORT TERM RECIRCULATING NETWORK MODEL

The author used LSTM as the historical information model representation of appearance model, motion model and interaction model in the multi-target tracking algorithm based on recirculating network discrimination and fuse appearance motion interaction. After analyzing the design of each gate function in LSTM, Kim et al. believe that using the basic LSTM model alone is not the best solution for apparent characteristics. Kim et al. designed the apparent feature learning network model based on bilinear LSTM .

As shown in Figure 9, besides the traditional LSTM, the output and input features of LSTM are spliced for matching learning. The author designed a bilinear LSTM model based on multiplication and learned matching classifier by taking the product of the hidden layer feature (memory) information and input of LSTM as the feature.
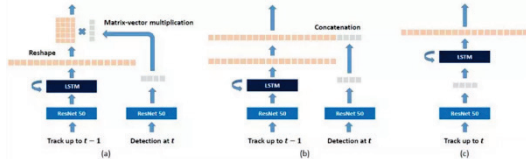
Fig.9 Three matching models based on LSTM

For hidden layer feature ht-1, it is imperative to reshape before multiplying it by the input feature vector xt. See the formula below for details:

$$h_{t-1} = o_{t-1} \circ \tanh(c_{t-1})$$

$$H = [h_{t-1,1} | h_{t-1,2} | ... | h_{t-1,r}]^T, m_t = f(H_{t-1}^{reshaped} x_t) \quad (3)$$

Where, f is the nonlinear activation function and m_t is a new feature input. However, the original detection image uses ResNet50 to extract 2, 048-dimensional features and reduces it to 256 dimensions through full connection. The following table verifies the impact of apparent feature learning on tracking performance under different network structures, network feature dimensions, and different LSTM history lengths.

5.THE TYPICAL SYSTEM AND APPLICATION
5.1.APPLICATION IN INTELLIGENT MONITORING AND SECURITY SYSTEM

The traditional monitoring system analyzes the obtained monitoring video with the help of people, which is time and labor-consuming. By contrast, the intelligent monitoring system can automatically analyze the target scene and detect anomalies through target tracking, recognition and other technologies. With the rapid development of deep learning in the field of computer vision, intelligent video analysis technology has played a vital role in the competition of security enterprises, and the related technology has been very accurate. For traditional security technology, more attention is paid to the effectiveness of post verification. However, with the popularity of HD cameras, how to use these resources to make the devices "active" has attracted the attention of an increasing number of security enterprises. With video analysis, abnormalities in videos can be found in time, so as to give response as soon as possible and minimize the loss arising therefrom. In particular, deep learning based target tracking is one of the hot research issues.

A typical security system should be functioned as follows: firstly, the rough warning point information is marked in map image; then the accurate warning point information is given according to the warning point information in virtue of interactive electronic map and positioning system; at this time, start the visual tracking system to detect and track the warning area and determine the abnormality; fuse with image information further with other detection means to improve the accuracy of abnormality judgment. The deep learning based target tracking technology has gradually become one of the core technologies in this process.

5.2.ANALYSIS OF CONGESTD CROWD

Crowd stampede is one of the most catastrophic events in congested crowds . When the density of people gathering in one place is too high, physical contact becomes inevitable. If it is the case, a pedestrian's force against the people around him/her will continue to spread out like a ripple, and interact with forces of different sizes in other directions to finally push people back and forth in the crowd. At the same time, due to the increase of population density, the temperature in the crowd also increases. The crowded space and the muggy environment will make people feel dizzy and tired. If someone falls accidentally at this time, it will trigger a series of chain reactions under the influence of domino effect--People around him/her will also fall one after another, thus causing large-scale stampede casualties. The safety of congested people is of great significance in the fields of emergency management, fire safety, architectural design, etc.

However, annotated video data sets in the field of pedestrian tracking are unavailable for a long time, so it is difficult to analyze them by computer vision. However, Zawbaa et al. used the HUER data set to model six different pilgrimage sites recently, which can be used to classify ritual sites in different pilgrimage video scenes. The system includes four stages: preprocessing, segmentation, feature extraction and location classification. The video frame is input to K Nearest Neighbor (KNN), Artificial Neural Network (ANN) and Support Vector Machine (SVM) classifier in the identity of input. The system generally improves the recognition accuracy of six Hajj rituals with accuracy higher than 90%. Although the system is more accurate in identifying Hajj rituals, it is not enough to warn stampedes.

For the purpose of solving the above problem, Helbing et al. analyzed the parameters such as density, speed and pressure in the congested crowd and found that the

pressure in the crowd is the key factor leading to stampede. Once the pressure exceeds 0.02, the stampede is inevitable. An early warning mechanism is proposed against stampede. In reality, stampedes are mostly caused by emergencies. Zhao et al. studied emergencies and found that people will scramble to escape towards the exit after an emergency, causing a very high density of people near the exit area, deepening the degree of crowdedness among people and slowing down the speed of escape. In view of the problem above, Zhao et al. set up obstacles similar to panels at the exit to guide pedestrian diversion and reduce the crowd density in the exit area, and experiments show that this method can improve evacuation efficiency and reduce casualties. Therefore, to design effective evacuation methods for congested people helps reduce economic losses and casualties caused by panic and conformity, which is also of great significance to improve the strategy to cope with emergencies .

5.3.APPLICATION IN VEHICLE DRIVING
Pilotless automobile is an important field where the computer vision technology is applied. In the process of automatic driving, basis can be provided for more advanced behavior selection, obstacle avoidance and path planning functions through recognizing lane line, vehicles in front and at back side and pedestrians accurately. One of the key technologies is target tracking. Due to the road complexity, the aided driving technology based on traditional target detection can be hardly improved a lot. With the development of technology, deep learning can be used to directly learn and perceive the characteristics of roads and the vehicles on roads. After a period of correct driving process, the relevant driving skills in the actual road conditions can be learned and perceived, making it unnecessary to perceive the specific road conditions and a variety of goals and improving the performance of the aided driving algorithm.

6.PROBLEMS AND PROSPECTS
6.1.PROBLEMS IN DEEP LEARNING BASED TRAGET TRACKING
As deep learning makes it possible to build a more robust appearance model, to apply it to target tracking tasks has become an inevitable trend. The current tracking algorithm can cope with simple scenes well but becomes ineffective in designing a tracking algorithm with high precision, high robustness and real-time performance in the face of complex environment. Different from other visual tasks such as detection and recognition, target tracking task has some problems when deep learning is applied due to its particularity, such as insufficient offline training data, difficulties of real-time online training and target occlusion.

6.1.1.TRAINING DATA PROBLEMS
The offline training network is critical to deep learning. The loss function is used to train network parameters through the given training data. In order to ensure that the training network can achieve the goal and the corresponding functions, deep learning entails massive of training data. There is no off-line training process for target tracking before using deep learning method in the future, so there are only a few tracking databases available,

such as OTB50, OTB100 and VOT. These tracking databases have less data and some similar sequences, making them particularly unsuitable for offline training of target tracking tasks.

Tao et al. (2016) proposed the SINT algorithm on the ICCV in 2016, and used the ALOV300 database with 300 sequences to train the network parameters. Although the sequences which are identical to OTB and VOT in ALOV300 are removed, the background of some video sequences is similar, making it impossible to avoid over-fitting. In Siam FC algorithm published in the same year, Bertinetto et al. (2016b) applied ILSVRC database to offline training process of target tracking task. ILSVRC database is a detection database, which contains 4, 417 video sequences, but the purpose of establishing this database lies in target detection task. Therefore, target does not exist always in the database and in one frame, there are multiple targets, which is not consistent with the target task. In addition to ILSVRC database, SiamRPN (Li, 2018a) also used a large-scale sparse tagged video data set Youtube-BB for training, which can provide videos of 50 times in terms of quantity, ensuring the full training of deep neural network. Valmadre et al. established the database of Tracking Net (M ü ller et al., 2018) in 2018. Tracking Net database, which was specially designed for target tracking task and different from the general big data which marks a target for every few frames, marks the target in every frame of data set. Tracking Net database contains more than 30, 000 video sequences and 14.2 million annotation boxes, which has a large amount of data, and can meet the needs of offline training to a certain extent.

6.1.2.REAL TIME TRACKING PROBLEMS
The advantage of deep learning is that it can realize learning through a large amount of data. However, in the process of real-time target tracking, the label data of the first frame is completely accurate only and it is difficult to extract enough training data. The network model of deep learning is more complex with many network parameters involved. Training network parameters online through a large number of data to meet the tracking requirements will affect the tracking speed largely. Siam FC (Bertinetto et al., 2016b) only used ILSVRC database to train network offline instead of online. Although this method can realize the timeliness of tracking algorithm, the expression ability of the offline training network to the current target is limited, making it difficult to achieve the most accurate target tracking. In the Dsiam (Guo et al. 2017) algorithm published in ICCV in 2017, Guo et al. improved the algorithm on Siam FC, proposed that dynamic Siamese network and achieved offline training by training the change matrix online. However, this method does not complete the offline training process from the perspective of deep learning, that is, there are no online training network parameters. Big problems still remain.

6.1.3.SERIOUS OCCLUSION AND DISAPPEARANCE OF TARGETS IN LONG RANGE TRAGET TRACKING
Target occlusion is not only an important cause of tracking failure, but also a key problem for realizing long-range

target tracking. The tracking task tracks only one target in the entire process. Once the target is obscured, the tracking accuracy will be affected dramatically and tracking may fail. Therefore, the requirements of the target tracking task are stricter once occlusion exists. At present, target occlusion can be divided into two situations: partial occlusion and complete occlusion. Partial occlusion means that there are still some targets in the image, and the position of the target can be determined by judging the visual part. Complete occlusion means that the target cannot be found at all in image, which may occur when a large object completely obscures the tracking target.

With the promotion of deep learning in the field of target tracking, the general changing characteristics of the target can be learnt by training network, which provides a new idea to solve the problem of target occlusion. At present, there are two main ways to solve the problem of partial occlusion in deep target tracking. One is to add occluded targets to the training samples during offline training and learn the changes when the targets are partially occluded through loss function. Then, use offline trained network to judge the test samples in the process of online tracking to realize accurate tracking; second, divide the tracking target into several parts and extract the deep features of the target respectively. When the target is occluded, test the deep features of test sample and the target template through matching. If there are considerable similar parts, the sample is judged as the target. At present, the main method against complete occlusion is to search the whole image of reference target detection. Match the deep features of the whole image with the features of the target template to find the test samples that may be the target. However, target cannot be judged accurately in the matching process due to the large size of the whole image and the large amount of data.

6.2.PROSPECTS

At present, the deep learning based target tracking method is still restrained in the characteristic application level of Image Net pre-training. In recent years, Image Net video data sets are also gradually used to learn deep features that are more suitable for target tracking, with some progress achieved. With Tracking Net and other large-scale data sets, it is possible to learn the deep features on the basis of massive tracking video in an end-to-end manner, which is expected to further promote the breakthrough of deep learning in visual target tracking. Relatively speaking, it is more difficult to label long-range tracking video and build large-scale data sets. One key direction worth concerning for future visual target tracking research is how to build a suitable long-term target tracking model based on the characteristics of long-range tracking task and its relationship with short-term tracking task and in virtue of transfer learning and deep learning.

7.CONCLUTION

The introduction of deep learning technology into the field of target tracking can better cope with all kinds of challenges in video target tracking, which can effectively improve the robustness of tracking methods. To be specific, this paper briefly introduces a variety of deep learning models suitable for target tracking first and then elaborates all kinds of deep learning based target tracking algorithms. Then, this paper summarizes the practical application of deep learning based target tracking method. At last, on the basis of the current research situation of deep learning based target tracking method, this paper analyzes and summarizes the three main problems of the current method. Oriented to the above three kinds of problems, this paper predicts the future development of deep learning based tracking methods. With the emergence of larger data sets, further breakthroughs may be made to deep learning in visual tracking. How to build an appropriate long-term target tracking model based on the task characteristics and the relationship between tasks as well as transfer learning and deep learning is also one of the key development directions for target tracking research in the future.

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Review of my country's Fresh Agricultural Products Cold Chain Logistics Research under New Retail

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Abstract: With the improvement of the living standards of urban residents, consumption concepts are becoming fresher, diversified and faster. New retail under the rapid development of fresh e-commerce, fresh agricultural products cold chain logistics cannot keep up with the development of e-commerce, there are backward infrastructure, lack of logistics technology, information level is not high. In order to solve the "last mile" problem of fresh agricultural product cold chain logistics urban distribution, this article deeply studies the current research status of my country's fresh agricultural product cold chain logistics under new retail, it is expected to provide theoretical reference for the development of cold chain logistics of fresh agricultural products in my country.
Keywords: new retail; fresh agricultural products; cold chain logistics; research review

1.RESEARCH STATUS OF THE MEANING OF NEW RETAIL

Since Jack Ma first proposed the "new retail" at the Alibaba Cloud Conference in October 2016, the traditional retail industry has ushered in new development opportunities.With the rise and development of new retail, fresh food e-commerce has entered the new retail era after three stages of development.Fresh cold chain logistics has developed with the development of fresh food e-commerce. The main task is to complete the delivery of goods.As an important part of new retail, it is a key factor that affects consumer experience. It not only requires the speed of logistics to reach "extreme speed" and "on time", but also emphasizes the quality of fresh products.Under new retail, consumers are increasingly demanding the quality of fresh agricultural products.The cold chain logistics of fresh agricultural products has become a hot topic in recent years. Many domestic experts and scholars have done a lot of research on the cold chain logistics of fresh produce.Therefore, it is necessary to summarize the research on cold chain logistics of fresh agricultural products in my country under the new retail, grasp the research status, and explore research trends.

The meaning of new retail has attracted a lot of attention among Chinese scholars, and scholars from all walks of life are also constantly researching, giving more interpretations and expansion of the connotation level. Jack Ma pointed out that the new retail is a deep integration of "online cloud platform services + offline store experience + efficient new logistics", a new retail model. Zhang Yong, CEO of Alibaba, believes that the new retail is a new business form formed by the reconstruction of "people, goods, field" and other business elements through big data and the Internet. In 2017, Ali Research Institute pointed out in the "C Era New Retail-Alibaba Research Institute New Retail Research Report": "New retail is a data-driven pan-retail form centered on consumer experience".XieSixin believes that new retail refers to a new retail model that relies on big data technology to promote the deep integration of "online", "offline" and "logistics" in order to meet the comprehensive needs of consumers as much as possible. LiuYuanhua believes that new retail refers to companies relying on the Internet to upgrade and transform the production, circulation and sales processes of commodities through the use of advanced technology such as big data and artificial intelligence, thereby reshaping the business structure and ecosystem.A new retail model that deeply integrates online services, offline experience and modern logistics.From the understanding of most experts and scholars on the meaning of new retail, it can be concluded that the essence of "new retail" is still retail, which uses a new generation of marketing tools, or takes meeting consumer needs as the starting point.

2.RESEARCH STATUS OF LOGISTICS DEVELOPMENT UNDER NEW RETAIL

New retail requires a brand new logistics. With the rapid development of new retail, a new round of changes has taken place in the logisticsindustry.Smart logistics, real-time logistics, and green logistics have become the focus of the logistics industry, and many experts, scholars and pragmatists have carried out relevant discussions.ChengXingji studied the construction of a new logistics system under the background of new retail, analyzed the new logistics operation process, proposed to build a new logistics system in terms of customer-centric, building an agile supply chain, building a store-based front-end

warehouse, and business outsourcing distribution system.After analyzing the changes in logistics demand under new retail, Yang Jieying proposed the development strategy of the logistics industry in terms of supply chain management, logistics technology and equipment, shared logistics, and financial support.LvLongfei studied the opportunities and challenges that logistics faced in the development of new retail, combined with the advantages and disadvantages of the logistics industry, put forward the development countermeasures of the logistics industry under the new retail.ZhangHongying pointed out that building an efficient logistics ecosystem can boost the development of new retail, and at the same time proposed a path for the construction of a logistics ecosystem under the background of new retail.ZhangJingyi and Zhang Meng explored the new logistics and distribution model in the new retail era, proposed to build smart logistics, build a multi-level warehouse network system and distribution model, and build a self-built warehouse and distribution integrated logistics system.XieMeie analyzed the existing logistics distribution model and existing problems, and put forward the innovation strategy of logistics distribution model under the new retail format.LiuJiaxin studied the development strategies of smart logistics storage and distribution under the background of new retail, and pointed out that under the new retail, the logistics warehousing and distribution links must be transformed to smart, and the overall efficiency should be improved to support the launch of new retail.

3.RESEARCH STATUS OF COLD CHAIN LOGISTICS OF FRESH FOOD

In recent years, fresh food e-commerce has developed rapidly, and the country has issued a number of policies to support the development of cold chain logistics.The fresh cold chain has become a "competitive place" for Internet companies and logistics companies, and there are many studies on the fresh cold chain.ZhangJunshan and Huang Qiaozhi summarized the problems of cold chain logistics in the fresh food e-commerce market and proposed measures to improve the efficiency of cold chain logistics in fresh food e-commerce.Based on the fresh food e-commerce environment and the development trend of cold chain logistics, Liu Xiaoli proposed several modes of cold chain logistics joint distribution to solve the problems faced by fresh food e-commerce and cold chain logistics.WeiGuochen put forward a new logistics mode of third-party distribution around the logistics mode of fresh agricultural products of e-commerce enterprises.LiangKun applied the Internet of Things technology to the real-time monitoring system of fruit and vegetable cold chain logistics to improve the informatization and transparency of cold chain logistics, thereby improving product quality.Ma Jian studied the operation mode of fresh product full cold chain, analyzed its related characteristics, divided the operation mode into different stage modes, and proposed that fresh product operators should choose different stage modes with their own advantages, so as to achieve the optimal operation mode.WengQingqing and Chen Yanguo analyzed the characteristics of the e-commerce fruit and vegetable cold chain and the current problems, and put forward corresponding suggestions on how to build the whole cold chain and improve the level of cold chain logistics specialization.Fu Kaifeng, Zhou Guolin and Zhong Jiefan analyzed the current situation of the supply chain of litchi, and based on this, took Guangdong litchi as an example to analyze and compare the three modes of fresh cold chain logistics, and put forward suggestions and countermeasures to improve the fresh cold chain logistics in China.XiaWenhui, Zhang Xia, Xia Qianyin elaborated on the problems and reasons that urban logistics distribution restricts the development of fresh food e-commerce cold chain logistics, and proposed the cold chain logistics distribution model and coordination mechanism of urban fresh agricultural product e-commerce.

4.RESEARCH STATUS OF COLD CHAIN LOGISTICS OF FRESH AGRICULTURAL PRODUCTS UNDER NEW RETAIL

There is less literature on the cold chain logistics of fresh agricultural products for graduate students under new retail.XieSixin and Liu Huixian built a fresh cold chain logistics evaluation index system based on the new requirements of new retail for the fresh cold chain logistics system, and pointed out the current problems in my country's fresh cold chain logistics system.Finally, the "trinity" strategy for optimizing the fresh cold chain logistics system is put forward from the three aspects of government, technology and information.YangXiaohua and Guo Jianjian took a fresh food e-commerce company in Shanghai as an example to construct a fuzzy planning model for the closed-loop logistics network of fresh products under new retail.Shen Chuanqi took Hema Xiansheng as an example to analyze and study the cold chain logistics mode under the new retail, in order to promote the development of cold chain logistics.MaoLimin proposed the development path and method of the agricultural product logistics industry in the new retail era, establishing a more practical and efficient agricultural product logistics system, and promoting the development of agricultural product logistics under the new retail.

5.CONCLUSION

To sum up, there are many researches on cold chain logistics around fresh food e-commerce in the existing research, and there are also many researches based on the development of logistics under new retail. However, there are not many researches based on the cold chain logistics of fresh agricultural products under new retail, and there are even fewer studies on the cold chain logistics of fresh agricultural products in a specific city under new retail. With the continuous improvement of urban residents' living standards, people's demand for fresh agricultural products and their purchase methods have undergone major changes, especially the "last mile" requirement for the cold chain urban distribution of fresh agricultural products. Therefore, the research on the cold chain logistics and distribution of urban fresh agricultural products under new retail is very important.

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Analysis on The Development of Cold Chain Logistics of Agricultural Products Under The "Live Broadcast+Agricultural Products" Marketing Model

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Abstract: In 2020, due to the impact of the new crown epidemic, offline activities were restricted, and online live broadcast shown its talents. Driven by the live broadcast, the circulation and speed of agricultural products have been greatly improved. With the prevalence of the "live broadcast+agricultural product" marketing model, the cold chain logistics of agricultural products is also facing great challenges. Based on the current development situation of agricultural products under the background of live broadcast, this article analyzes the problems faced by the cold chain logistics of agricultural product and puts forward corresponding suggestions for reference.
Keywords: live broadcast+agricultural products; Cold chain logistics of agricultural products; Impact Analysis; Development Strategies.

1.PREFACE

The development of the Internet announces that the development of the e-commerce industry has entered a relatively mature stage. The emergence of short video platforms has also provided unlimited possibilities for the promotion of agricultural products. At present, many businessmen are sensitive to the short video advertising marketing which is regarded as an e-commerce channel, and use short video, live broadcast and other methods to enhance the visibility of the agricultural products they are marketing and increase the interactive features of the products. This method can not only expand the marketing channels of agricultural products and stimulate users' desire to purchase agricultural products, but also greatly increase the sales of agricultural products. However, with the continuous increase in agricultural product transaction volume, the development of cold chain logistics for agricultural product is also facing new opportunities and challenges. How to solve the problem of the cold chain logistics development for agricultural products is related to the final quality of agricultural products and user experience, so it is of great significance.

2. THE IMPACT OF THE "LIVE BROADCAST + AGRICULTURAL PRODUCTS" MARKETING MODEL ON THE DEVELOPMENT OF AGRICULTURAL PRODUCTS

Short videos, also called micro videos, have the characteristics of fast transmission, short content information, and less viewing restrictions. With the rise of the Internet, short video platforms such as volcano video, QQ micro video, and Douyin have emerged one after another. The emergence of these platforms has brought a lot of space for the promotion of agricultural products. On the one hand, some merchants use short videos to promote agricultural products on platforms such as Douyin, on the other hand, more merchants are aware of the power of live broadcast, the power of "net celebrities", so they sell agricultural products through the method of live broadcast. Live streaming has the characteristics of simple entry, low cost, direct promotion, and few sales links. It mainly uses the power of fans behind the anchor and the preferential prices to facilitate transactions. After the large-scale outbreak of the new crown epidemic in 2020, the rural areas in our country, especially the impoverished mountainous areas, were severely affected by the epidemic, and a large number of agricultural products were backlogged. To help remote mountainous areas open up agricultural products sales channels, in March 2020, the Douyin platform united six impoverished counties launched a live broadcast of agricultural product sales, and the cumulative sales of agricultural products reached 356, 000 catties, while the cumulative sales of the three live broadcasts reached 5.65 million, which to a large extent helped poor counties open up high-quality agricultural products sales channels. In recent years, the promotion of agricultural product sales through platforms such as Taobao Live and Douyin Live has gradually become the consensus of new agricultural product retail in the era of big data. The "live broadcast + agricultural products" marketing model has brought the agricultural products which trapped in the mountains into the eyes of everyone, and it also increased the circulation and sales of agricultural products, and finally promoted the great development of agricultural products.

3. OPPORTUNITIES AND CHALLENGES BROUGHT BY THE "LIVE + AGRICULTURAL PRODUCTS" MARKETING MODEL TO THE COLD CHAIN LOGISTICS OF AGRICULTURAL

PRODUCTS

3.1. The increase in sales of agricultural products promotes faster development of cold chain logistics

As an important object of cold chain logistics, agricultural products have the characteristics of short storage time, easy corruption and deterioration, and have high requirements on temperature and storage conditions. The prevalence of the "live broadcast + agricultural products" marketing model has brought about a sharp increase in agricultural product transactions. The increased agricultural products need cold chain logistics to ensure their quality and safety. In the "Opinions on Accelerating the Development of Circulation and Promoting Commercial Consumption" issued by the State Council in August 2019, it was also proposed to accelerate the construction of a market system for agricultural products in producing areas, implement the "Internet +" agricultural product export project from the village to the city, and accelerate the development of agricultural cold chain logistics, Improve the agricultural product circulation system, and Strength the support for the construction of integrated collection and distribution facilities such as sorting, processing, packaging, and pre-cooling of agricultural products. Therefore, the increase in sales of agricultural products will greatly promote the faster development of cold chain logistics.

3.2 The increase in sales of agricultural products puts forward higher requirements on cold chain logistics

The increase in sales of agricultural products means an increase in the basic input of cold chain logistics. At present, the overall cold chain logistics infrastructure construction in China is as follows: as of 2019, there is a total of 48 cold chain logistics industrial parks, and mainly distributed in Shandong, Shanghai, Hebei, Guangdong and so on; the total amount of cold storage exceeds 600 billion tons, and the new storage capacity is 8.145 million tons, with a year-on-year growth of 15.56%, and the proportion of comprehensive cold storage continues to increase. In terms of refrigerated transportation equipment, at present, the proportion of road refrigerated transportation in China is 70%, refrigerated transportation is 15%, water transportation is 8%, air transportation is 7%, and there are 180, 000 refrigerated trucks in possession. From the perspective of infrastructure construction data, the development of cold chain logistics in our country is rapidly, but compared with the circulation of cold chain objects, there is still huge room for improvement. In addition, since the agricultural products are mainly sourced from remote areas such as rural areas, the cold chain logistics foundation in these places is still weak. With the increase in sales, it puts forward higher requirements on cold chain logistics infrastructure, quality standards, supervision standards and so on.

4. SUGGESTIONS ON THE DEVELOPMENT OF COLD CHAIN LOGISTICS OF AGRICULTURAL PRODUCTS UNDER THE "LIVE BROADCAST + AGRICULTURAL PRODUCTS" MARKETING MODEL

4.1 Strengthen the investment in infrastructure equipment to ensure the quality and safety of agricultural products

Agricultural products are perishable items. To ensure the quality of their circulation, they must rely on cold chain logistics. According to our country's current cold chain logistics infrastructure equipment investment, it still can't meet the demand. Moreover, the agricultural products are mostly from rural and remote areas in our country, where the cold chain logistics infrastructure is even weaker. Therefore, it is necessary to strengthen the investment in cold chain logistics infrastructure, especially in rural areas. For example, establish cold storage in the production area of agricultural products, do a good job in pre-cooling and storage at the production place, increase investment in equipment such as refrigerated trucks in rural area, and strictly ensure the initial quality of agricultural products. According to the circulation needs of agricultural products, combined with local economic conditions, we should establish more cold chain logistics parks, increase the number of comprehensive cold storage, increase the proportion of off-road transportation, and invest more in refrigerated transportation equipment.

4.2 Standardize the source of channels and ensure the original quality of the source

At present, the supply of goods through live broadcast is uneven. The sales of goods mainly rely on the power of the anchor to attract fans. When the anchor sells the goods, it is more based on the relationship of interest to sell, and give little attention to the quality of the goods, which leads to customer's bad reactions after purchasing the goods for the widespread existence of problems such as poor quality of the goods, this is especially serious in agricultural products. Inferior agricultural products not only affect the reputation of the anchor, the reputation of the merchants, and bring bad social effects, but also directly affect the quality of later circulation and endanger the personal safety of consumers. Therefore, under the "live broadcast + agricultural product" marketing model, the establishment of a special quality control department to carry out initial quality inspection and quarantine of agricultural products in accordance with the law, regulate the source of agricultural products, and ensure the initial quality is of vital importance to the cold chain logistics of agricultural products.

4.3 Improve cold chain logistics standards and unify circulation requirements

At present, the agricultural products under the "live broadcast + agricultural products" marketing model are mainly packaged by merchants or farmers after sales, and choose the transporter for transportation by themselves. Due to the lack of farmers' awareness of cold chain logistics and the cost considerations of merchants, the agricultural products sold under this model have bad packaging and often use common vehicles to undertake transportation. Therefore, while

increasing sales, it is necessary to improve relevant cold chain logistics standards, including pre-cooling standards, processing standards, packaging standards, storage standards, transportation standards, distribution standards, etc. and unify circulation requirements, including temperature control requirements, gas conditions Requirements, etc., to ensure the quality of agricultural products in the circulation process, reduce damage to goods, and extend the shelf life.

4.4 Improve the quality supervision system to ensure continuous chain throughout the whole process

At present, the live broadcast of goods through the platform is simple to get started and easy to operate. The carriers promote and drive sales of agricultural products, but are often not responsible for the quality of agricultural products. This has led to the occurrence of some fake and inferior goods. Therefore, on the one hand, the platform can establish a quality supervision team to ensure the source and quality of the goods, on the other hand, it can improve the quality supervision system, such as signing responsibility attributions with third parties such as goods processing, packaging, storage, and transportation, or directly establishing the third-party quality supervision system, strictly guarantees that the goods will be continuously chained throughout the whole process from entering the platform to selling to consumers so that to achieve high-quality circulation.

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Research on The Development of Cross-Border E-Commerce of Small and Medium Sized Foreign Trade Enterprises in Guangdong Province

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Abstract: Guangdong Province is a big economic and trade province in China, which plays an important role in China's foreign trade and economic development. Under the background of "Internet plus", cross-border e-commerce has become an important channel for small and medium-sized enterprises to explore the international market. This paper analyzes the development status of cross-border e-commerce of small and medium-sized foreign trade enterprises in Guangdong Province, points out the main problems, and puts forward corresponding countermeasures and suggestions for the future development of cross-border e-commerce of small and medium-sized foreign trade enterprises in Guangdong Province.
keywords: cross border e-commerce; Guangdong; small and medium foreign trade enterprises; enterprise transformation

1. DEVELOPMENT STATUS OF CROSS BORDER E-COMMERCE IN GUANGDONG PROVINCE

In recent years, with the continuous development of modern electronic information technology, the pace of economic globalization is accelerating. Cross border e-commerce is favored by more and more small and medium-sized foreign trade enterprises because of its high efficiency, low risk and low cost. As a big trade and economic province in China, many traditional small and medium-sized foreign trade enterprises in Guangdong have taken cross-border e-commerce as an opportunity for enterprise transformation and upgrading, actively exploring overseas markets and gaining competitive advantages.

In the case of the sharp reduction of traditional foreign trade orders, the development of cross-border e-commerce in Guangdong province maintains a good development trend. The total import and export volume of cross-border e-commerce in Guangdong Province increased from 22.8 billion yuan in 2016 to 172.65 billion yuan in 2020 (excluding the import and export channels of overseas warehouses and postal express). The import and export volume of cross-border e-commerce in Guangdong Province has increased by 87.99 billion yuan in four years, creating a growth rate of 4.86 times in four years. In 2020, novel coronavirus pneumonia affected Guangdong province. Through the

implementation of a new mode of cross border business facilitation and customs clearance, which was "smooth logistics, convenient customs clearance and effective supervision", the cross border electricity supplier hub of all kinds of businesses developed in an all-round way. In 2020, the province's total import and export volume of cross-border e-commerce included in the statistics will be 172.65 billion yuan, an increase of 51.5%, accounting for 59.5% of the total value of cross-border e-commerce in China. As the largest province in foreign trade, Guangdong's total import and export volume of cross-border e-commerce between China and Guangdong from 2016 to 2020 is shown in Figure 1. There are more than 380000 enterprises engaged in cross-border e-commerce in Guangdong Province, which are distributed in electronic products, home furnishings, building materials and other fields. In the cross-border export e-commerce field of small retailers, small and medium-sized sellers occupy the mainstream of the market.
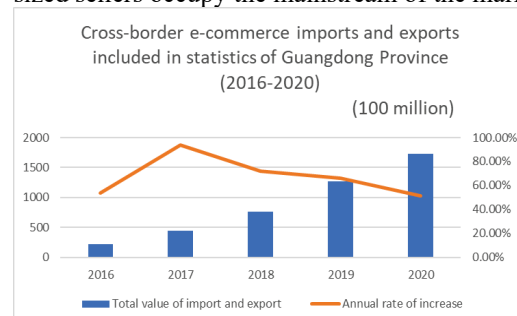
Figure 1. Total import and export volume of cross border e-commerce in Guangdong Province from 2016 to 2020
Data sources: General Administration of customs, Guangdong Branch of General Administration of Customs

Guangdong Province has formed a relatively mature cross-border e-commerce industry chain.According to incomplete statistics, there are nearly 100000 enterprises engaged in cross-border e-commerce platform, payment, logistics, warehousing and comprehensive services. Cross border e-commerce in Guangdong Province has a variety of e-commerce platforms to choose from, including not only well-known e-commerce platforms at home and abroad, such as Amazon, global express, e-bay, T-mall global, but also excellent local e-commerce platforms in

Guangdong Province, such as yMatou, Vip shop, honey bud baby, etc. The existing operation modes of e-commerce platforms include B2B, B2C, O2O and other mainstream modes.There are three traditional ways of cross-border payment in Guangdong Province: telegraphic transfer, letter of credit and express remittance.Other payment methods include credit card collection (suitable for cross-border e-commerce retail platform and independent B2C) and wire transfer (traditional B2B payment mode, suitable for large transaction payment).

The comprehensive pilot zone policy helps the development of cross-border e-commerce in Guangdong Province. The advantages of the comprehensive test zone lie in the efficient exchange of data among customs, national inspection, taxation, foreign exchange management and other departments, and the formation of a government management mode of "information exchange, mutual recognition of supervision and mutual assistance in law enforcement", so as to realize the integration of customs clearance and other trade facilitation. On the other hand, effective data exchange among e-commerce, logistics, banking and other institutions will be realized to facilitate financial services and logistics services, reduce the financing, exchange difficulties and logistics transportation costs of e-commerce enterprises. On May 6, 2020, the Chinese government website issued the reply of the State Council on Approving the establishment of cross-border e-commerce comprehensive pilot zones in 46 cities and regions, including Xiong An new district. Seven new comprehensive pilot zones have been added in Guangdong. At present, there are 13 cross-border e-commerce comprehensive pilot zones in Guangdong Province, ranking the first in China.

2. THE REASONS FOR THE DEVELOPMENT OF CROSS BORDER E-COMMERCE BY SMALL AND MEDIUM SIZED FOREIGN TRADE ENTERPRISES IN GUANGDONG PROVINCE

Firstly, the traditional small and medium-sized enterprises are facing the trend of order fragmentation. The customers' demand for orders presents the trend of personalization and small batch. The customers' demand for product added value is higher and higher, which is a great impact on the traditional foreign trade industry. Secondly, traditional small and medium-sized enterprises are facing high operating costs. Most of the traditional foreign trade enterprises in Guangdong are labor-intensive industries. In recent years, with the increasing rent, raw materials and labor costs, the profit space of small and medium-sized enterprises is increasingly compressed. Thirdly, the traditional trading mode of foreign trade enterprises is relatively primitive, which makes the trading process too long and inefficient, and a series of transaction costs will be generated in the trading process, resulting in high transaction costs, and the profits that export enterprises can obtain are very limited.

3. PROBLEMS FACED BY SMES IN GUANGDONG PROVINCE IN DEVELOPING CROSS BORDER E-COMMERCE

3.1. Cross border e-commerce talent shortage

Cross border e-commerce is a way of trade that has sprung up in recent years and developed rapidly. The market has a great demand for cross-border e-commerce professionals, and there is a lack of talent supply. The e-commerce majors in most colleges and universities lack the teaching concepts of school-enterprise cooperation and industry-university co-construction. They pay too much attention to the cultivation of theoretical knowledge and cannot provide practical talents to enterprises. On the other hand, cross-border e-commerce needs interdisciplinary talents, who not only need to be proficient in internet operation, but also need to have a variety of post skills in art, customer service and packaging, and be proficient in using foreign languages. However, due to the limited scale and development platform, it is difficult for small and medium-sized enterprises to attract skilled and professional talents. The shortage of talents has become a major factor restricting the development of cross-border e-commerce of small and medium-sized enterprises.

3.2. Product homogeneity is serious, and enterprises lack brand awareness

The vast majority of small and medium-sized foreign trade enterprises in Guangdong Province are concentrated in the Pearl River Delta region. Most of them are OEM production and OEM production. They do not have their own brand. They only rely on the price advantage to obtain the market and do not have strong pricing and bargaining power in the international market.And most of the products are labor-intensive products with low technology content, low added value and low profit margin. Most foreign trade enterprises adhere to the traditional business philosophy, do not pay attention to product innovation and brand awareness; intellectual property awareness and legal awareness are relatively weak, leading to their products in the international trade market status is not high, reputation is not good.In the minds of foreign consumers, "made in China" often means low price and lack of quality.

3.3.Challenges to cross-border transaction security

In cross-border e-commerce activities, the completion of transactions mainly relies on B2B and B2C e-commerce platforms, while payment for goods relies on third-party payment platforms such as PayPal, credit card payment or telegraphic transfer. However, the government lacks effective regulatory measures on the third-party payment platform, and the credit systems and laws and regulations of different countries are different, which leads to the lack of unified credit standards in cross-border e-commerce transactions, and the imperfect cross-border credit mechanism, which poses a certain threat to the capital security of enterprises. At the same time, the Internet has a certain

openness and virtuality, its security is difficult to be guaranteed, such as: network virus, network system failure and hacker attacks.

4. SUGGESTIONS ON DEVELOPING CROSS BORDER E-COMMERCE FOR SMALL AND MEDIUM ENTERPRISES IN GUANGDONG PROVINCE

4.1. Improve the training system of cross-border e-commerce professionals

Guangdong provincial government should strengthen the training of e-commerce foreign trade talents, rely on Colleges and universities, and actively guide the government. Colleges and universities in Guangdong Province should increase the investment in e-commerce and the training of teachers, actively carry out "school enterprise cooperation" with foreign trade enterprises in Guangdong Province, establish training bases, and cultivate students' practical operation and problem-solving ability. In addition, the Guangdong provincial government should introduce relevant policies and measures to attract more senior cross-border e-commerce professionals. Small and medium-sized enterprises need to establish a good salary system and talent incentive scheme to provide a good career development platform for cross-border e-commerce talents.

4.2. Pay attention to product innovation and brand development

When developing cross-border e-commerce, small and medium-sized foreign trade enterprises should adjust their business philosophy, first ensure product quality rather than blindly pursue low price, on this basis, continuously innovate and upgrade products, optimize product structure and improve after-sales service. We should not follow the market and mass produce whatever products are popular in the market; we should conduct market research through foreign trade platforms and exhibitions, and conduct product positioning in combination with our own situation. From the traditional "price war" marketing mode to brand strategy mode, relying on cross-border e-commerce platform for brand promotion to attract customers.

4.3. Improve the cross-border payment system and credit system

The security of cross-border e-commerce transactions involves cross-country and cross bank fund transfer and trade settlement. In order to make both parties enjoy safe and convenient financial services on the virtual internet platform, it is not enough to rely on the strength of the enterprise itself. Third party payment platform should strengthen the research and development of information security technology to ensure the stability and security of system operation and data transmission. The government should improve the cross-border electronic payment, clearing and settlement service system, and establish a sound credit mechanism and supervision system to ensure the security and reliability of the cross-border payment network environment, so as to provide technical support for the rapid development of cross-border e-commerce of small and medium-sized enterprises.

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Research on Grinding and Processing of Irregular Metal Punch

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Abstract: Aiming at the existing problems of irregular punch grinding and repairing of various metal molds to improve. However, the metal punch grinders currently in the market generally can only grind round punches, and some auxiliary tools are needed to grind irregular punches. At the same time, it is necessary to complete multiple clampings to complete the processing, and there are high requirements for the technical level of relevant practitioners, otherwise it is difficult to ensure the dimensional accuracy of the metal punch. Aiming at the existing problems in the grinding machine grinding industry, this designed grinder irregular metal punch grinder has a clever design, low production cost, high grinding precision, and multiple functions. It can not only grind round diameter workpiece, but also facilitate grinding and processing square, polygon, flat and ellipse and other special-shaped workpiece, which solves the problem of difficult grinding and high manufacturing cost of irregular metal punch.
Keywords: Metal Punch; Grinder Design; Grinding Process

1. INTRODUCTION

Irregular metal punch grinding equipment is mainly used on the work surface (disk) of surface grinders, which can conveniently target various metal punches. Irregular metals such as common circles, regular polygons, squares, flats and ellipses are ground for grinding. At present, there are circular punch grinders with simple structure on the market, but they are only suitable for machining circular metal punch, and they are not suitable for grinding other irregularly shaped metal punch.

With the continuous progress and development of mold manufacturing technology, the requirements for mold materials and processing accuracy are getting higher and higher, and the automation of machining equipment is getting higher and higher. In the mold manufacturing process, especially hardware metal molds cannot be separated from the grinding processing of multiple types of metal punches, and the current punch grinders in the market generally can only grind round punches. The grinding of metal punches with different rules requires some auxiliary tools, multiple clamping's are required to complete the grinding process, and there are high requirements on the technical level of the mold maker, otherwise it is difficult to ensure the dimensional accuracy of the metal punch .In response to these problems, a device

that can grind metal punches of different rules at the same time is designed. It can grind and process metal punches of various shapes in the mold, such as round, square, regular polygon, ellipse, and flat workpieces. The main structure and the top view of the grinder machine are shown in figure 1 and figure 2.
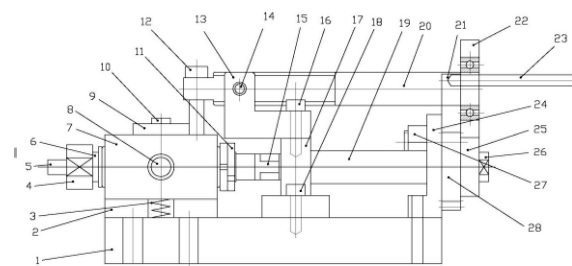
Figure 1 Main structure of grinding machine

Grinder bottom plate; 2. Dovetail seat; 3. Adjusting spring; 4. Workpiece locking bolt;5\Workpiece; 6. Grinder spindle; 7. Floating slider; 8. Positioning spindle screw; 9. Pressing sheet; 10. Compression screw; 11. Locking screw; 12. Floating slider adjustment screw; 13. Lever support　; 14. Lever pin; 15. Cross coupling; 16. Fastening screw A;17\Support seat; 18, fastening screw B; 19, drive shaft;20\Lever; 21, big gear; 22, roller; 23, handle; 24, gear carrier; 25, profiling;26, retaining ring; 27, big gear fastening nut; 28, small gear.
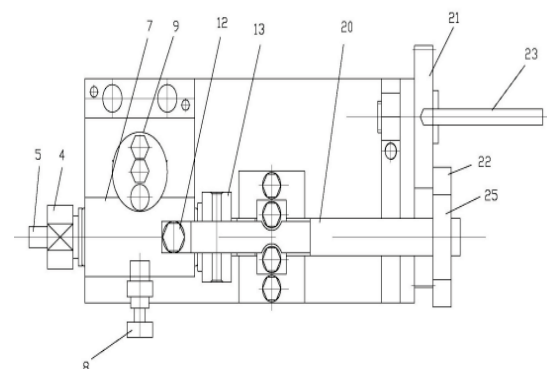
Figue 2 The top view of the grinder

2. GRINDING EQUIPMENT DESIGN

As shown in Figure 1 and Figure 2, the irregular metal punch grinding and processing equipment includes a grinder spindle 6 arranged in the left and right directions, a fixed workpiece component (workpiece locking bolt 4) that fixes the workpiece 5 on the left end of the spindle 6, and a drive shaft 19, gear set (including meshing large gear 21 and

small gear 28) and handle 23, the transmission shaft 19 is arranged in the left-right direction and connected with the main shaft 6 (connected by the cross coupling 15), the handle 23 is mounted on the big gear 21, the pinion 28 is fixedly mounted on the right end of the drive shaft 19, the big gear 21 is mounted on the gear frame 24 by a fastening nut 27;the shaking handle 23 sequentially drives the large gear 21, the small gear 28, the transmission shaft 19 and the main shaft 6 to rotate so as to drive the workpiece 5 to rotate;

It also includes:

Set the floating slider 7, which moves up and down, the floating slider 7 is a horizontally arranged cylinder and allows the left end of the main shaft 6 to pass through, the lower part of the floating slider 7 is in contact with one end of the adjusting spring 3, the upper part of the floating slider 7 is screwed with a floating slider adjusting screw 12;Set the positioning spindle screw 8, the positioning spindle screw 8 from the front of the floating slider 7 into the floating slider 7 and through the floating slider 7 can touch with the spindle 6 to cause the positioning of the spindle 6 (" can "means that when the circular outer diameter is processed, there is no need to touch and positioning), the positioning spindle screw 8 is elastic screw.The position of the floating slider 7 on the main shaft is limited by the lock nut 11, so that the floating slider 7 will not slide left and right; by setting the pressing piece 9 to limit the floating position of the floating slider 7, the pressing piece 9 is pressed by the screw 10 positioned.

A lever 20 is provided, and the lever 20 is arranged above the transmission shaft 19 in the left-right direction, the lever support 13 is connected to the lever 20 through the lever pin 14 and supports the lever 20, the lever support 13 is fastened to the support 17 by the fastening screw A16, the supporting seat 17 is fastened to the bottom plate 1 by a fastening screw B18, and the left end of the lever 20 is connected with the floating slider adjusting screw 12;

Set a master mold 25, the master mold 25 is set at the right end of the transmission shaft 19 and rotates around the transmission shaft 19, a retaining ring 26 is set to fasten the master mold 25 and the transmission shaft 19;

A roller 22 is provided. The roller 22 is installed at the right end of the lever 20 and abuts against the master 25. The roller 22 rotates with the master 25 and synchronizes the vertical movement of the lever 20 with the track of the master 25.

The floating slider 7 is installed on the dovetail seat 2.

The shape of the master mold 25 is consistent with the ellipse of the workpiece 5 to be processed into an ellipse, and its size is enlarged by 5 times.

The spindle 6 is provided with a precision indexing groove.

The bottom plate 1 is also provuided, the dovetail seat 2, the other end of the adjusting spring 3 and the gear

frame 24 are all mounted on the bottom plate 1.

3. Working principle of metal punch grinder

When grinding a general circular punch, directly clamp the workpiece 5 on the spindle 6 and fix it with the workpiece locking nut 4. Loosen the floating slider adjusting screw 12 completely, so that the floating slider adjusting screw 12 is separated from the floating slider 7; or the master mold 25 is not installed.Shake the handle 23 to make it rotate, adjust the position of the grinding wheel, and control the diameter and accuracy of the grinding workpiece.

When grinding flat and square punch, the workpiece 5 is directly clamped on the spindle 6, and the workpiece is fixed by locking the nut 4, and the adjusting screw 12 of the floating slider is completely loosened, so that the adjusting screw 12 of the floating slider is separated from the floating slider 7, or the mold 25 is not installed. Position the spindle 6 with the positioning spindle screw 8, move the grinder table left and right, and grind the first side of the workpiece 5.When the grinding of the first side is completed, lift the positioning spindle screw 8, shake the handle 23 to rotate the workpiece 5 by 90°, use the positioning spindle screw 8 to position it, and grind the second surface to achieve the dimensional accuracy of the drawing. Then, repeat the above steps until the workpiece 5 is completed. When processing flat and square punches, the clamping is performed at one time, and because the spindle 6 has precision indexing grooves, the processed punches have relatively high precision, which improves the assembly accuracy of the mold. When processing other regular polygons, only the rotation angle changes depending on the specific situation.

When processing the elliptical part punch, lift the positioning spindle screw 8 to prevent the spindle 6 from positioning, install the master mold 25, press the floating slider adjusting screw 12 against the floating slider 7, and clamp the workpiece 5 on the spindle 6, shaking the handle 23, the big gear 21 rotates, driving the small gear 28 and the master 25 to rotate synchronously, The roller 22 on the lever 20 transmits it to the floating slider adjustment screw 12 along the track of the profile 25, make the floating slider 7 and the trajectory of the master 25 float up and down synchronously, at the same time, it manipulates the distance of grinding wheel of the grinder to grind to the dimensional accuracy.

4. Conclusion

Irregular punch grinding equipment is mainly aimed at the improvement of the existing metal punch grinding and processing technology field. The existing grinder is used for single processing, and it is changed to grinding and processing multiple types of die punches. After repeated trials of equipment research, it is placed on the worktable (disk) of a hand-operated surface grinder, which can grind various metal punches of different regular shapes (such as flat, round, regular polygon, square, ellipse, and flat). After repeated

testing and verification of equipment, the processing can meet the expected design requirements.

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A Study on Intertextuality in Literature

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Abstract: Intertextuality theory is a modern text theory formed and developed on the basis of western structuralism theory. It was first put forward by the semiotician Julia Kristeva. Since then, it has attracted the attention of scholars all over the world. In the 1980s, this theory was introduced into China and was warmly welcomed by many critics. This paper uses the method of comparison to analyze the intertextuality in Chinese and Western classic literary works, focusing on the novels of Hemingway and Shen Congwen. From the aspects of theme and characters, this paper studies the different intertextuality of the two writers in terms of inspirations, characters and regions, so as to further broaden the scope of Chinese and Western literature works' research perspectives, and deepen the significance of research.
Keywords: Intertextuality; Western Literature; Chinese Literature

1. INTRODUCTION

Intertexuality, a term originally explicated by Julia Kristeva in the school of poststructuralism, intertextuality has taken on a variety of meanings since her discussion of the term in the 1960s. It first appeared in Julia Kristeva's *Semeiotike* (1969), which means "the relationship between a certain text and other texts quoted, rewritten, absorbed, expanded, or transformed in general". In other words, any text does not exist in isolation, in which there are other texts more or less in various forms, so it needs the help of other texts to be fully interpreted. Since it came into China in the 1980s, it has been widely used in literary text research as an analytical tool, method rather than concept. Since then, it has been gradually applied in non literary fields, including educational research on reading and writing in classroom environment, cultural research on genre intertextuality in oral discourse, and intertextual social semiotics research on multimodal hypertext discourse in network environment. It also studies the visual effect of intertextuality in film and television discourse. At present, there are few researches on the combination of intertextuality and Literature Teaching in China. Based on the application of intertextuality in the appreciation of Chinese and Western literary works, this paper focuses on the intertextuality in the novels of Hemingway, the great master of Western literature, and Shen Congwen, the famous Chinese writer, and analyzes the significance of intertextuality in literature teaching and research [1].

2. INTERTEXTUALITY IN WESTERN LITERATURE

The *Bible* is an inexhaustible resource for many British and American writers. Hemingway is one of them. He grew up in a Christian environment, religion has a great influence on his life. Biblical symbols and allusions almost run through all his stories, which help his works full of Intertextuality.

2.1 Intertextuality of Love

Love is an eternal element in the *Bible*. The influence of the *Bible* is everywhere in Hemingway's works. The doctrines of the *Bible*, such as love, charity, patience and reward, are embodied in his works. One of the important themes in Hemingway's works is love. Whether it is the love between men and women, such as Catherine's unconditional love in *A Farewell To Arms*, or the love between the old man and the little boy in *The Old Man And The Sea*, love is an indispensable part of our life. In Hemingway's works, love conquers everything and makes painful days happy. In *The Old Man And The Sea*, by vividly describing the harmonious relationship between nature and the old man, we can see the old man's deep love for nature. Like Jesus Christ, Santiago is very concerned about the weak and the vulnerable. In *A Farewell To Arms*, Catherine's love for Henry is not only the love between husband and wife, but also the selfless love without asking for return. According to the *Bible*, Christianity is the love of God and man. When Jesus Christ was crucified on the cross, he worried about his people, not himself. Similarly, Catherine showed the same selfless love for Henry. She gave her love and sacrifice to Henry, and never asked for anything in return, which is the same as God's unconditional love [2].

2.2 Intertextuality of Pursuing

Pursuit is a very old and common theme in western literature. Usually, the hero or nobleman in mythology will suffer both physically and mentally. Suffering from all kinds of torments, they still work hard to seek the real meaning of life, because they want to fight for their beliefs and make their survival valuable. Some critics think that the theme of pursuit can be traced back to the *Bible*, because we can find a lot of pursuit in the *Bible*. Jesus Christ is a very important person in the biblical culture. He is the epitome of the people who are overwhelmed by evil, and a model of tolerance, patience and pain. According to the *Bible*, Jesus sacrificed a lot for his people to save the suffering people, and finally he sacrificed himself for all mankind. Since the day he was born, he has experienced all kinds of hardships and torments. His life is full of pain and redemption.

Hemingway created the theme in his works according to the life experiences of Jesus. In *A Farewell To Arms*, Henry also experiences a journey of pursuit. His first task was to find his own value and position in the war.

His original purpose was to create a new life and fight for his ideal, but he could not find the value of survival in the army, and his pursuit of the value of survival was unsuccessful. Later he began to seek love. He met the beautiful and considerate Catherine. They were together for a short time, but very happy. However, when Catherine gave birth to her baby and died, Henry fell into loneliness.

In Hemingway's another masterpiece *The Old Man And The Sea*, the whole story is about an old man pursuing a big fish. Santiago was an unfortunate old man. He hadn't eaten fish for eighty-four days, and other fishermen began to laugh at him. Worst of all, he didn't have enough food to eat. Despite his bad luck, he went fishing as usual and believed that he could catch big fish in three weeks. He got nothing day after day, but he was determined to turn his luck around and sail further than other fishermen. Finally, when he got the marlin and tried to put it in the boat, he found that it was too big to put in. Therefore, when sharks get close, When the boat started tearing the marlin, he decided to tie the fish to the side of the boat. He fought against sharks, faced them bravely, and was not willing to give up easily. The process of struggle is a process of pursuit, which highlights the outstanding quality of Santiago. When fighting with the marlin, he fought until the end, which is very similar to God. Although he experienced all kinds of hardships, even his own life, he was not willing to give up and tried his best to save others.

3. INTERTEXTUALITY IN CHINESE LITERATURE

Shen Congwen's novels are around the beautiful and simple Xiangxi. This kind of description not only appears in his local novels, but also in all his works. The fragmentary scenes in each seemingly unrelated work can be combined into a complete and vivid geographical area. This is the culture and thought that the author presents to the readers. There are hundreds of characters in Shen Congwen's novels, which have great similarities, but the similar characters show subtle differences, and these characters tend to be a common type. In Shen Congwen's works, there are two typical images of intertextuality.

3.1 Intertextuality of Xiangxi Girls' Images

The girl images in Shen Congwen's works, such as *San San* and *Border Town*, present each other and form the unique image of "Xiangxi girl". Cui Cui, a girl in the *Border Town*, has always been a typical image of Chinese modern and contemporary literature researchers who like to study, but this girl image has already appeared in *San San* in 1931. Some scholars even think that San San is the rudiment of Cui Cui's image. The natural characteristics of San San, her hazy cognition of life and the world, her inexplicable yearning and fear of urban life, and her confused feeling of love all have more similarities with later Cui Cui. San San and Cui Cui are mutual expression in different texts, mutual explanation and interdependence of different images in different texts.

The intertextuality of *San San* and *Border Town* makes the two different texts form an artistic contrast and brings a new aesthetic feeling to the different text world. San San lived in an incomplete family. Her father died when she was young, and only her mother accompanied with her growing up. Cui Cui also lived in a broken family, her parents died early, and her grandfather raised her. It is this incomplete family structure that makes San San and Cui Cui feel the dissatisfaction and even suffering of life in their relationship with others. It is not difficult to find these Xiangxi girls in Shen Congwen's works. They not only live in the same natural environment of Xiangxi, but also are similar in age, character and life experience. Seemingly similar people have different names, personalities and plots. From the intertextual relationship between these characters, it's helpful to analyze the continuous development of Shen Congwen's creative consciousness in the process of girl characters' creation [3].

3.2 Intertextuality of Urban Male Images

The melancholy, cowardly and morbid male characters in Shen Congwen's urban novels are another group of characters with obvious intertextuality. These characters are not only intertextual, but also influenced by the male description in the modern literary world of the 1920s. Shen Congwen keenly grasped this trend and created a lot of dignified male characters in his novels. The connection between these images is the focus of intertextuality research. Lan Sheng in *Morning* is a married secretary of the Ministry of Finance. Although there is no improper relationship between him and other lady in this story, he has shown signs of indulging in other lady and betraying his family. I in *Chang Xia*, *Huang Jun's Diary* and *Old Dream* inherited Lan Sheng's bad habit of indulging in women, and put it into action so as to actually destroy his family. Therefore, in his early novels, Shen Congwen always satirized and criticized the male characters. In 1928, Mr. Tianfu in *The Learned Man* showed the progress of Shen Congwen's characterization. The characters in the novel are more rational. They are no longer images that are easy to lose themselves in front of ladies. Mr. Rex in *The Lantern Festival* and the gentleman in *The Gentleman's Wife* are both addicted to women but still rational. In the picture of *Eight Running Horses*, Mr. Darcy has been engaged. He has a fiancee in his hometown, however, he fell in love with another lady. This situation is very similar to that in *Huang Jun's Diary*. But the "I" in *Huang Jun's Diary* chose to forget his wife and children and fulfill his love and desire, while Mr. Darcy is swaying from side to side. It can be seen that the author adds more rational thinking in the shaping of Mr. Darcy. Behind the increasingly complex characterization is a more profound image of the author. Shen Congwen has realized the great transformation from writing for living in his early days to realizing his literary ideal [3].

4. CULTURAL INTERTEXTUALITY BETWEEN CHINESE AND WESTERN LITERATURE

The application of cultural intertextuality in literature teaching requires teachers to guide students to establish correct values, treat the differences between Chinese and Western cultures objectively, establish cultural self-confidence, and avoid Chinese Cultural Aphasia. For example, when introducing Banyan's *The Pilgrim's Progress*, teachers can make a comparative study with *Journey to the West* to explore the intertextuality of the two works in theme, religion and other aspects under different cultural backgrounds. This kind of "intertextuality" interpretation based on the cultural level is not only conducive to deepen the understanding of Christian spiritual salvation in pilgrimage, but also helps students thinking of Chinese culture in *Journey to the West*. When learning *The Cantos* written by Ezra Pound, an American imagist poet, teachers should help students fully feel the Chinese cultural elements represented by a large number of Chinese characters, classical poetry and Confucian classics, and realize the profound influence of Chinese culture on Western culture. Obviously, the application of cultural intertextuality model in teaching can facilitate students cross the text and culture in the reference of different cultures, feel the charm of Western literature, and enhance the pride and self-confidence of national culture [1].

5. CONCLUSION

Teachers apply intertextuality in literature teaching, encourage students to discuss in groups based on their own literature reading experience, and guide them to express their personal opinions actively, which helps students to change from passive receivers to active participants, and is conducive to build a platform for communication and interaction between teachers and students, students and students, increase the interest of literature course, and create an active and relaxed literature class atmosphere. In addition, the application of intertextuality in literature teaching can investigate literary phenomena in a broad cultural context by means of cross-cultural communication, and connect the history, politics, and culture of China with the west's, so that they can truly understand the significance of literature curriculum, which could change literature teaching from the knowing of literary background, characters, works and trends of thought to achieving the purpose of literature class's educational function by broadening vision, understanding life and enriching spiritual and cultural life [1]. Intertextuality as a guiding concept of literature teaching, runs through the teaching activities, so that students can experience the vitality of the text and the aesthetic feeling of reading. This can not only stimulate students' interest in learning literature, but also increase their multiple understanding of literary works, which is conducive to improving the teaching effect of literature courses. At the same time, it can help students to establish the awareness of intensive reading, it can upgrade the old teaching methods, making students become the main body of teaching activities, making English and American literature teaching more authentic and independent, so as to cultivate students' ability to read, appreciate and understand the original literature, and effectively promote the improvement of literature teaching quality [4].

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Research on Grain Quantity Detection Method in Grain Storage Based on Pressure Detection Value

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Abstract: In this study, according to the urgent need and specific requirements of on-line inspection of grain storage quantity in China, the mathematical relationship between the pressure of granary bottom cloth and the height of grain pile was studied by using multiple regression and pattern recognition techniques. Taking advantage of the feasibility of estimating the grain quantity in grain storage based on pressure detection value, a grain quantity measurement model in grain storage based on the mean polynomial of output value of single-loop pressure sensor is proposed. The real warehouse detection shows that the proposed model and detection method have high detection accuracy, are suitable for various granary structure types, and can meet the needs of remote online detection of grain quantity in grain storage.
Keywords: Pressure Sensor; Pressure Detection Value; Detection Model; Detection Accuracy

1. INTRODUCTION

In the process of grain storage, the pressure detection value fluctuates greatly, which will inevitably affect the accuracy of grain storage quantity detection. To solve this problem, this paper focuses on the grain storage quantity detection model based on the polynomial term of the output mean of the bottom single-circle sensor.

2. THEORETICAL MODEL

(1) Theoretical basis

Granary includes bungalow, shallow silo and silo, etc. After the grain is put into the warehouse, the top of the grain pile needs to be leveled. The shape of the grain pile in bungalow is roughly a cube with different sizes, while that in shallow silo and silo is roughly a cylinder with different sizes. Through the stress analysis of grain pile, it can be concluded that the relationship between the weight of grain pile in granary and the pressure distribution in granary is shown by the following formula

$$W = \int_{S_B} Q_B(s)ds + \int_{S_F} f_F(s)Q_F(s)ds \tag{1}$$

Among them, W Is the weight of grain pile; $S_B \setminus S_F$ They are the bottom and side of the grain pile; $Q_B(s) \setminus Q_F(s)$ tThey are the bottom of the grain heap S_B And sides S_F middle s Pressure at a point; $f_F(s)$ for the bottom of the grain heap S_B And sides S_F Coefficient of friction between.

Divide the bottom surface of grain pile into discrete parts n_B A small area of equal area, with the area of each area as follows ΔA_B, the pressure at the center of gravity of each area is $Q_B(s_i)$, $i = 1,...,n_B$; Divide the side of the grain pile into discrete parts n_F A small area of equal area, with the area of each area as follows ΔA_F, the pressure at the center of gravity of each area is $Q_F(s_j)$, $j = 1,...,n_F$, assuming that the average side friction coefficient is f_F, Then

$$\hat{W} = \Delta A_B \sum_{i=0}^{n_B} Q_B(s_i) + \Delta A_F f_F \sum_{j=0}^{n_F} Q_F(s_j) \tag{2}$$

Among them, $\hat{W}$ Estimate the weight of the grain pile. Obviously

$$\lim_{\substack{\Delta A_B \to 0 \\ \Delta A_F \to 0}} \hat{W} = W \tag{3}$$

For granaries such as bungalow warehouses, shallow round warehouses and silos, the finishing formulas (1), (2) and (3) are as follows

$$\hat{W} = A_B[\overline{Q}_B(s) + K_c f_F H \overline{Q}_F(s)] \tag{4}$$

Among them, A_B is the bottom area of grain pile, C_B is the perimeter of the bottom of the grain heap; H is the height of grain pile; f_F is the average friction coefficient between the side of the grain pile and the side of the granary; $\overline{Q}_B(s)$ is the average pressure on the bottom of

$$\overline{Q}_B(s) = \frac{1}{n_B} \sum_{i=0}^{n_B} Q_B(s_i)$$

grain heap, , $\overline{Q}_F(s)$ is the mean value of side pressure of grain pile and has

$$\overline{Q}_F(s) = \frac{1}{n_F} \sum_{j=0}^{n_F} Q_F(s_j)$$

. make

$$\overline{P}_f(s) = f_F \overline{Q}_F(s) \tag{5}$$

$\overline{P}_f(s)$ Is the average friction force per unit area on the side of grain pile. Then

$$\hat{W} = A_B[\overline{Q}_B(s) + K_c H \overline{P}_f(s)] \tag{6}$$

Obviously, the weight of the grain pile is equal to and only equal to the average pressure on the bottom of the grain pile $\bar{Q}_B(s)$, Average friction force per unit area of side surface $\bar{P}_f(s)$, And the height of the grain pile H Related. Therefore, the core of grain quantity detection in grain storage based on pressure sensor lies in $\bar{Q}_B(s) \backslash \bar{P}_f(s)$ and H Detection and estimation of three parameters.

(2) Layout model of single ring pressure sensor on the bottom of granary

The layout model of single-ring pressure sensor on the bottom of granary is shown in Figure 1. Under the condition of ensuring convenient loading and unloading of grain, the distance d between each pressure sensor and the side wall is generally 1-2 meters. In order to ensure the universality of the detection model, the distance d between the pressure sensor and the side wall of each granary should be the same.
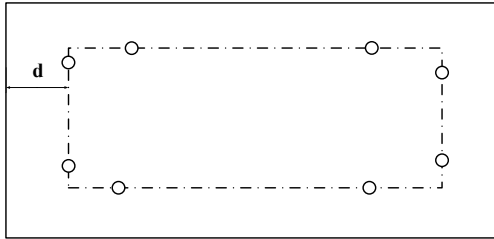

Figure1 Single ring pressure sensor layout model in granary bottom

3 BASED ON $\bar{Q}_{SL}(s) \backslash \bar{Q}_{SS}(s)$ DETECTION MODEL OF GRAIN QUANTITY IN GRAIN STORAGE BASED ON MEAN POLYNOMIAL

(1) Data preprocessing

For the layout model of single circle pressure sensor on the bottom of granary shown in fig. 1, the sensor output value sequence is assumed $Q_B(s(i))$, $i = 1, 2, ..., N_S$, N_S Arrange the number of single circle pressure sensors on the bottom of granary. The output value sequence is sorted by size, and the median point is obtained. The median point is adjacent to the left N_{LM} Output value points, the median point is adjacent to the right N_{RM} Output value points, forming a sensor output value sequence of median adjacent points $Q_{Med}(s(i))$.

In the research of this project, generally take $N_{LM} = 2-3$, $N_{RM} = 2-3$. Calculate the output value sequence of the selected sensor $Q_{Med}(s(i))$ Mean of $\bar{Q}_{Med}(s)$.

$$\bar{Q}_{Med}(s) = \frac{1}{N_{LM} + N_{RM}} \sum_{i=1}^{N_{LM}+N_{RM}} Q_{Med}(s(i)) \tag{7}$$

The value sequence output by that sensor $Q_B(s(i))$ and mean $\bar{Q}_{Med}(s)$ Calculate the standard deviation of sensor output value $SD_{Med}(s)$.

$$SD_{Med}(s) = \sqrt{\frac{1}{N_S - 1} \sum_{i=1}^{N_S} (Q_B(s(i)) - \bar{Q}_{Med}(s))^2} \tag{8}$$

Among them, $\bar{Q}_{Med}(s)$ Is the mean value of the adjacent output points on both sides of the median point. Then the sensor output value point removal rule of the single-ring pressure sensor arrangement is as follows

If $\left| Q_B(s(i)) - \bar{Q}_{Med}(s) \right| \geq T_{SD} SD_{Med}(s)$,

then remove $Q_B(s(i))$ point $\tag{9}$

Among them, T_{SD} the threshold coefficient of sensor points arranged for the single-circle pressure sensor can be removed, which can be adjusted reasonably according to the error change of grain quantity detection model in grain storage.

The removal rule of output value points of single-loop sensor shown in formula (9) is based on the mean value of adjacent output value points on both sides of the median point $\bar{Q}_{Med}(s)$ Standard deviation of $SD_{Med}(s)$ in order to eliminate the influence of randomness of sensor output value, and realize the adaptive adjustment of sensor output value point removal threshold and standard deviation of single-circle pressure sensor arrangement $SD_{Med}(s)$ If it is large, the removal threshold of output value points increases, and vice versa; At the same time, a single-circle pressure sensor based on the error change of the grain quantity detection model in grain storage is introduced to remove the threshold coefficient T_{SD} To realize the reasonable adjustment and optimization of the sensor output value point removal threshold.

For a sequence of sensor output values $Q_B(s(i))$, $i = 1, 2, ..., N_S$ According to the sensor output value point removal rule shown in formula (9), after removing the sensor output value points meeting the rule, a removed sensor output value sequence is formed $Q_{BS}(s(i))$, $i = 1, 2, ..., N_{BS}$, N_{BS} Is the number of sensor output value series data after removal. According to the partition rules shown in formulas (10) and (11), the sensor output value sequence after removal is $Q_{BS}(s(i))$ Small value sensor output value sequence divided into single-loop sensors $Q_{SS}(s(i))$ and a sequence of large sensor output values $Q_{SL}(s(i))$.

If $Q_{BS}(s(i)) < C_{MV} \bar{Q}_{Med}(s)$,

Then $Q_{BS}(s(i)) \in Q_{SS}(s(i))$ $\tag{10}$

If $Q_{BS}(s(i)) \geq C_{MV} \bar{Q}_{Med}(s)$,

Then $Q_{BS}(s(i)) \in Q_{SL}(s(i))$ $\tag{11}$

Among them, C_{MV} dividing the adjustment coefficient for the output value sequence of single-circle sensor can be adjusted reasonably according to the error change of grain quantity detection model in grain storage. Then the small value sensor of the single-turn sensor outputs a

value sequence $Q_{SS}(s(i))$ Mean of $\overline{Q}_{SS}(s)$ as follow

$$\overline{Q}_{SS}(s) = \frac{1}{N_{SS}} \sum_{i=1}^{N_{SS}} Q_{SS}(s(i))$$

(12)

Among them, N_{SS} Is the output value sequence of the small value sensor of the single-loop sensor $Q_{SS}(s(i))$ the number of data.

Output value sequence of large value sensor of single-loop sensor $Q_{SL}(s(i))$ mean of $\overline{Q}_{SL}(s)$ as follow

$$\overline{Q}_{SL}(s) = \frac{1}{N_{SL}} \sum_{i=1}^{N_{SL}} Q_{SL}(s(i))$$

(13)

Among them, N_{SL} It is the output value sequence of the large value sensor of the single-loop sensor $Q_{SL}(s(i))$ the number of data.

(2) Detection model

The average value of the output value sequence of the small value sensor using the bottom single-loop sensor shown in formula (12) $\overline{Q}_{SS}(s)$ and the average value of the output value sequence of the large value sensor shown in formula (13) $\overline{Q}_{SL}(s)$ polynomial construction $\overline{Q}_B(s)$, $\overline{P}_f(s)$ and H The estimate of as follow

$$\hat{\overline{Q}}_B(s) = \sum_{m=0}^{N_B} b_B(m)\overline{Q}_{SL}(s)^m$$

(14)

$$\hat{H} = \sum_{j=0}^{N_H} b_H(j)\overline{Q}_{SL}(s)^j$$

(15)

$$\hat{\overline{P}}_f(s) = \sum_{n=0}^{N_F} b_F(n)\overline{Q}_{SS}(s)^n$$

(16)

Among them, $b_B(m)$, $b_H(j)$, $b_F(n)$ respectively $\overline{Q}_B(s)$, H and $\overline{P}_f(s)$ estimate the coefficient of the term, $m = 0,...,N_B$, $j = 0,...,N_H$, $n = 0,...,N_F$, N_B, N_H, N_F respectively $\overline{Q}_M(s)$, H and $\overline{P}_f(s)$ estimated polynomial order. Substituting formula (14) to formula (16) into formula (6), as follow

$$\hat{W} = A_B\{\sum_{m=0}^{N_B} b_B(m)\overline{Q}_{SL}(s)^m +$$

$$K_c\{\sum_{j=0}^{N_H} b_H(j)\overline{Q}_{SL}(s)^j\}[\sum_{n=0}^{N_F} b_F(n)\overline{Q}_{SS}(s)^n]\}$$

(17)

Finishing formula (17) and limiting $\overline{Q}_{SL}(s)$ the maximum order of an item is N_B, restrictions $\overline{Q}_{SS}(s)$ the maximum order of an item is N_F it can be concluded that

$$\hat{W} = A_B\{\sum_{m=0}^{N_B} a_B(m)\overline{Q}_{SL}(s)^m +$$

$$K_c\sum_{n=1}^{N_F}\sum_{m=0}^{N_B} a_F(n,m)\overline{Q}_{SS}(s)^n\overline{Q}_{SL}(s)^m\}$$

(18)

Among them, $a_B(m)$, $a_F(n,m)$ to estimate the coefficient of the term, $m = 0,...,N_B$, $n = 1,...,N_F$, N_B, N_F respectively $\overline{Q}_{SL}(s)$, $\overline{Q}_{SS}(s)$ order of the item. Obviously, the total number of the first item in formula (18) is N_B+1, the maximum order is N_B. The total number of items in the second item is $(N_B+1)N_F$, $\overline{Q}_{SL}(s)$ and $\overline{Q}_{SS}(s)$ the maximum order sum of product terms is N_B+N_F. In order to limit the nonlinearity of the detection model shown in Equation (18), the maximum order sum of the product terms in the second term should be controlled. Therefore, in order to facilitate the optimization of the total number of terms in the model, formula (18) is arranged, and the second term is calculated according to $\overline{Q}_{SL}(s)$ and $\overline{Q}_{SS}(s)$ sum of orders of product terms N_{n+m} In ascending order, N_{n+m} press at the same time $\overline{Q}_{SS}(s)$ order from low to high, then

$$\hat{W} = A_B\{\sum_{m=0}^{N_B} a_B(m)\overline{Q}_{SL}(s)^m +$$

$$K_c\sum_{N_{n+m}=1}^{N_F+N_B}\sum_{m=m_b}^{m_e} a_F(N_{n+m}-m,m)\overline{Q}_{SS}(s)^{N_{n+m}-m}\overline{Q}_{SL}(s)^m\}$$

(19)

Among them, N_{n+m} in the second item of the detection model, $\overline{Q}_{BMed}(s_{Inner})$ and $\overline{Q}_{SS}(s)$ order sum of product terms, the value interval is [1, N_B+N_F], m_b, m_e. The values are shown in the following two formulas.

$$m_b = \begin{cases} N_{n+m}-1 & N_{n+m} < N_B \\ N_B & \text{otherwise} \end{cases}$$

(20)

$$m_e = \begin{cases} N_{n+m}-N_F & N_{n+m} > N_F \\ 0 & \text{otherwise} \end{cases}$$

(21)

Obviously, the total number of product terms of the second term of formula (19) is $(N_B+1)N_F$, total number of model items N_{Term} the maximum value of is $N_B+(N_B+1)N_F+1$. In order to limit the nonlinear degree of the model, it can be obtained from the tail of the model (paragraph $N_B+(N_B+1)N_F+1$ product term), remove several product terms to reduce the total number of model terms N_{Term}. Equation (19) is based on the proposed $\overline{Q}_{SL}(s)$, $\overline{Q}_{SS}(s)$ Mean polynomial model for grain quantity detection in grain storage.

4 MODELING EXPERIMENT

(1) Modeling of wheat warehouse sample data

For three wheat bungalows in Shandong Qihe Grain Depot, Wuhan Grain Depot and Guangdong Xin 'an Grain Depot, the stored grain weights are 2220.253 tons, 4441 tons and 3236 tons respectively. 351 samples were selected from the test data. 240 samples were taken as multiple regression samples and maximum order selection samples, while others were taken as test samples. For the formula (19) based on $\overline{Q}_{SL}(s) \setminus \overline{Q}_{SS}(s)$ based on the polynomial model of grain quantity detection in grain storage, the optimized modeling parameters are shown in Table 1, and the obtained parameters are shown in Tables 2 and 3. The grain weight calculation errors of the modeled samples are shown in Figure 2, and the grain weight calculation errors of all samples are shown in Figure 3. From these results, it can be seen that the calculation errors of the grain weight of the model samples and the test samples are less than 0.368%.

Tab. 1 The modeling parameters optimized

T_{SD}^{*}	N_{B}^{*}	N_{F}^{*}	N_{Item}^{*}
0.65	3	5	19

Tab. 2 Model coefficient $a_B(m)$

m	$a_B(m)$
0	12280
1	-95.31
2	0.2462
3	-2.115E-4

Tab. 3 Model coefficient $a_F(n,m)$

m	$a_F(n,m)$		
	$n=1$	$n=2$	$n=3$
0	-23.38	-1.481	-0.00111
1	0.3248	0.01549	-3.017E-5
2	-0.0026	-2.781E-5	5.034E-8
3	2.056E-6	2.865E-8	-6.531E-11

Tab. 3 (Cont) Model coefficient $a_F(n,m)$

m	$a_F(n,m)$	
	$n=4$	$n=5$
0	1.5E-5	-1.35E-8
1	-4.864E-9	
2	3.288E-11	

Figure 2 The percentage errors of grain weight calculation of the modeling samples
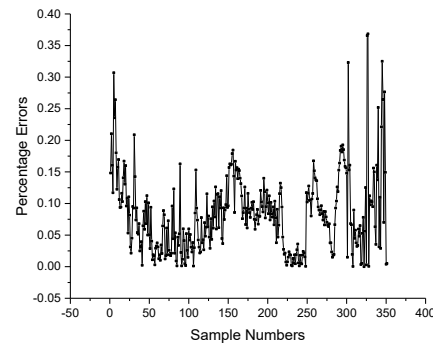
Figure 3 The percentage errors of grain weight calculation of all samples

(2) Modeling of Rice Warehouse Sample Data

For 4 rice granaries in Tongzhou Grain Depot and 2 rice granaries in Hongze, the stored grain weights are 6450 tons, 4420 tons, 3215 tons, 64500 tons, 2455.6 tons and 2099.9 tons respectively. 1231 samples were selected from the long-term detection data. 922 simultaneous multiple regression samples and the maximum order selection samples were selected, and others were used as test samples. For the formula (19) based on $\overline{Q}_{SL}(s) \setminus \overline{Q}_{SS}(s)$ based on the polynomial model of grain quantity detection in grain storage, the optimized modeling parameters are shown in Table 4, and the obtained parameters are shown in Tables 5 and 6. The grain weight calculation errors of the modeled samples are shown in Figure 4, and the grain weight calculation errors of all samples are shown in Figure 5. From these results, it can be seen that the calculation errors of the grain weight of the model samples and the test samples are less than 0.185%.

Tab. 4 The modeling parameters optimized

T_{SD}^{*}	N_{B}^{*}	N_{F}^{*}	N_{Item}^{*}
1.15	4	4	17

Tab. 5 Model coefficient $a_B(m)$

m	$a_B(m)$
0	-969.2
1	2.309
2	0.01118
3	-4.127E-5
4	3.491E-8

Tab. 6 Model coefficient $a_F(n,m)$

m	$a_F(n,m)$	
	$n=1$	$n=2$
0	83.63	-0.3004
1	-0.3673	0.00146
2	2.382E-4	-2.224E-6
3	7.707E-7	7.884E-10
4	-8.383E-10	

Tab. 6 (Cont) Model coefficient $a_F(n,m)$

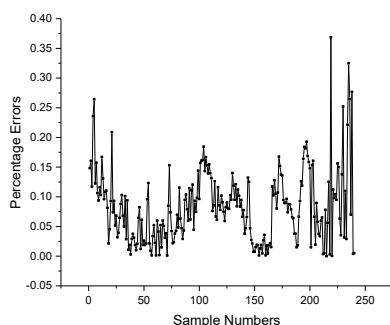| m	$a_F(n,m)$	
	$n=3$	$n=4$
0	3.245E-4	-7.295E-8

| 1 | -1.224E-6 |
| 2 | 1.475E-9 |
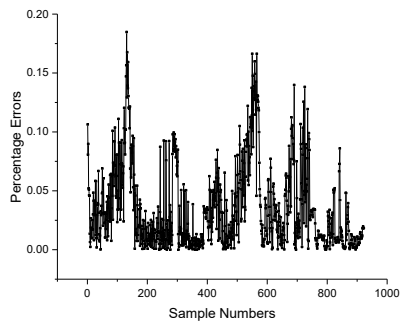
Figure 4 The percentage errors of grain weight calculation of the modeling samples
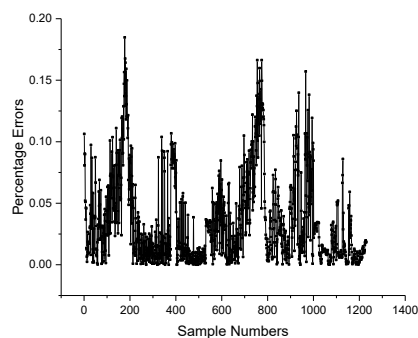
Figure 5 The percentage errors of grain weight calculation of all samples

5. CONCLUSION

In this chapter, the grain quantity detection model based on polynomial term of output mean of bottom single-circle sensor is proposed, which solves the error problem caused by the large fluctuation of sensor output value after grain feeding. Through the real wareh ouse inspection of different grain varieties in many areas, the model meets the national requirement that the detection error of stored grain quantity should not exceed 3%.

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Optimization of Plc Design in Industrial Control System

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Abstract: With the rapid development of modern science and information technology, the development of modern industrial technology in my country is advancing by leaps and bounds. The traditional industrial control mode can no longer fully meet the actual needs of the development of modern industrial technology. The modern automation and operation industrial model have gradually become an important technological breakthrough for the development of my country's industrial technology. In recent years, my country's industrial science and technology has made great progress, and there have been important technological breakthroughs in the research and development of plc industrial automation production technology. At present, this advanced technology is widely used in all aspects of my country's industrial production technology, for the entire country's industrial production operations and production management. Model construction plays a key role in promoting. The use of PLC enterprise automation process control management system has greatly improved the actual work efficiency of enterprise staff and reduced the loss of various human resources. At present, there are still many difficulties in the development of automatic process control management system based on PLC level. Technicians still need to vigorously study and learn new key technologies, earnestly study and study old technical problems, and earnestly study and solve practical contradictions, so as to contribute to the further promotion, development and application of this key technology. Based on this, this article has taken the relevant theoretical content in the design of the industrial design plc application automation process control equipment system performance optimization program design as an example to carry out the theoretical analysis.
Keywords: Plc Control System; Automatic Control; Optimized System Design

1. ANALYZE THE THEORY AND PRINCIPLE OF PLC TECHNOLOGY APPLICATION
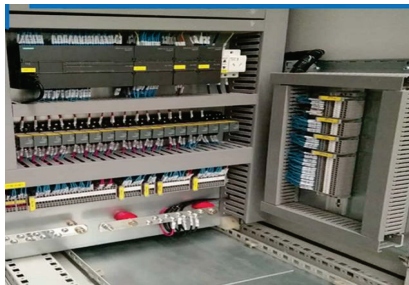
Figure 1 PLC automation control system

PLC programmable controller is a technology developed to replace the traditional relay control circuit. This technology combines computer technology, Internet technology, automation technology and so on. The numerical control technology has greatly improved the work efficiency of enterprise automation equipment production, and provided a set of automation remote control management system for many automation equipment production enterprises. The control system personnel can at any time according to the actual needs of the enterprise staff, using various control software to cooperate with each other to carry out fully electrified automatic remote control of various equipment. Compared with other traditional large electrical industry automation network control management system technology, PLC electrical automation network control management system not only has more obvious technical advantages, its network connection far less than other traditional control system, and each control line through different control software contact each other. The control system also has many advantages such as strong network anti-interference ability, convenient maintenance, simple expansion and so on. The correct implementation of each program instruction is performed in accordance with the fixed operating procedure, and there is rarely any error, which is more practical. The program basically does not need any adjustment in the process of normal operation. At the beginning of the establishment of the PLC automation control system, reasonable PLC equipment must be selected. This is an optimization of work efficiency, which can reduce labor costs and improve product quality. At the same time, it has a promoting effect on communication capabilities, acquisition performance, and computing efficiency. It can realize the storage of data and information, and it can also be executed for less complex programs. As the name suggests, the power supply part is to provide the necessary electric energy for the system operation. The processor plays an important role in the system, which aims to analyze the collected information and obtain some equipment information. The performance of the processor means whether the system can run efficiently.

2. PLC DESIGN OPTIMIZATION

(1)Basic design of control input and output circuit

In the selection of the components of the mobile power supply terminal power supply, the power supply range that needs to be selected is relatively wide. But in order to effectively deal with all kinds of possible electromagnetic interference, it is necessary to timely add some corresponding electromagnetic isolation protection components, as well as grounding isolation measures can be used to effectively reduce the terminal circuit board in

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the process of operation management may produce electromagnetic interference. Generally speaking, the power system will continue to use the plc system when it has a large load. It needs to fully consider the load capacity to avoid safety issues such as power short circuit. This is very critical for how to ensure the operational safety and stability of the system. Because once the system has a power overload short-circuit phenomenon, it may have a great adverse effect on the operating efficiency of the system using plc, and its power load capacity should be twice the input and output power of the system in most use cases.

(2)Enter the structure design of the output control circuit
According to the actual needs of current industrial production, the automatic start and stop of various high-frequency equipment need to be driven by high-frequency transistor devices to complete high-frequency output. It is more suitable for high-frequency mechanical actions, and the response time is short; in other cases, it is more suitable for high-frequency output on low-frequency relays. This is not only helpful for us to realize the optimized design of the high-frequency output control circuit, it is also a great help for the continuous improvement of the system's automatic anti-interference ability. For the two more critical output quantities, not only the automatic interlock must be realized inside the system, but also the automatic interlock must be realized outside of the system, so as to improve the movement reliability and stability of the normal operation of the system. If the company uses some common AC load switch drive type AC load drive form, it needs to automatically complete a corresponding AC drive by applying the relay function of the middleware.

(3)Anti-jamming circuit design
With the continuous progress and development of industrial automation manufacturing technology, the wide application of frequency conversion system speed control devices has gradually become more and more widespread. On the one hand, the operating performance of the system is greatly improved, and on the other hand, it also brings a lot of air pollution at the application level of the AC power grid, as well as its anti-interference performance. Therefore, when we design the structure of the frequency conversion system, we must fully consider the performance of anti-interference. Generally speaking, we need to use the following three isolation methods: one is isolation. Since the frequent high-frequency line interference in the high-frequency system is mainly caused directly by the absence of capacitive coupling between multiple capacitors. Therefore, it is necessary to consider the use of an ultrasonic isolation high-frequency transformer device to shield and ground a neutral point through multiple capacitive couplings. The second is shielding. We often need to use various metal-based housing components to directly complete the role of the shield. The system components are installed in various metal shielding devices, and then the inner shell is shielded and grounded in order to isolate the metal magnetic field and avoid the high-frequency interference to the weak current signal. The third is wiring, in the

system layout of high-frequency lines in the operation process, we should pay special attention to whether the separate broadcast of strong current, weak current two signals, in order to improve the network security of the system. Industrial software design process design is also very important, the main principle is according to the corresponding technical standards of the industry will be a variety of process of the specific program to achieve the transformation into a ladder diagram, process programming is mainly the form of its specific process to achieve the diagram. In the stage of enterprise application development, a good product design is obviously very critical.

(4)Application software design
The basic production procedure can not only directly use the independent production procedure to carry out cost control and process management for simple product producers and process links, but also may be combined into a modular basic unit production procedure. There are many types of institutions in the basic unit program, and reasonable program selections should be made according to the needs of different producers. Modular application program is mainly to divide the program control target application program control of a system as a whole. Then first get multiple small application program control modules, and then program and debug them one by one, and finally integrate them to form a complete application program. In the current industrial automation management system, most companies also adopt the concept of this system design, because each industrial production management module does not have other independence, and there is always a certain mutual connection between each other. Mutual modification can be carried out freely, which is suitable for more complicated industrial production management processes.

3. CONCLUSION
In short, the PLC industrial automation process control system has a very important role in promoting the technological development and progress in the field of modern industrial numerical control in my country. With the continuous development of the information age, the technical optimization and innovative design of my country's plc industrial automation process control management system should be continuously strengthened. Continuously explore the use of advanced engineering science and technology to carry out technological innovation and optimization of system functions, so as to efficiently improve the overall operability and efficiency of the overall industrial automation process control management system. The design of plc industrial automation operation control management system should be classified as an electronic industry operation control system, which often has great practical application development prospects in the electronic industry application field. Designers often need to extensively collect the technical opinions and design suggestions of relevant first-line enterprise staff, and fully integrate these design ideas into the system design plan. The overall design can improve the reliability, safety and work efficiency of the system. The designer needs to collect the

opinions and suggestions of front-line staff extensively, integrate these ideas into the design plan, and improve the reliability, safety and efficiency of the system as a whole.

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Simulation Calculation of Mechanical Properties of Fe-Mn Binary Alloy

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Abstract: In this study, the CASTEP module in Materials Studio 8.0 was used to study and calculate Fe-Mn binary alloy. Firstly, the Material Studio was used to import the body-centered cubic crystal structure of the Fe-Mn binary alloy, and then the obtained body-centered cubic structure was optimized by using CASTEP to obtain the optimal crystal structure, and the doping calculation of the optimized crystal structure was carried out for the supercell model. The simulation program used in this project is CASTEP (Cambridge Serial Total Energy Package), which is a computing software packages. The crystal structure of a supercell model with 25% Fe and Mn content, 50% Fe-Mn content and 75% Fe-Mn content was simulated and optimized by using the first-principle pseudopotential-plane wave method (which is actually density functional theory). After the crystal structure of pure iron and binary alloy with different Mn content was constructed, the electronic structure and mechanical properties of the alloy were calculated by the first principle theory. The theoretical calculation results showed that doping with different concentrations of Mn had different degrees of impact on the hardness, stability, plasticity, elasticity and other properties of binary alloy.
Keywords: Fe-Mn Binary Alloy; Mechanical Property; First-principle

1.BUILD SUPER CELL

In this experiment, we built 4 supercell models whose number of grid-point are 2×1×1, cell parameters are a=b=5 and α=β=γ=90°.We use these super cells to simulated state density and elastic constants. Iterative optimization for supercells should have done before the BFGS method is used to calculate each constant. And then, very stable crystal structure is obtained[1][2]. Figure 3-1 shows structures of crystal cells. In fact, Fe atoms are replaced by Mn atoms in different positions in the body centered cubic (bcc). By this way, can we simulate different atomic doping concentrations[3].
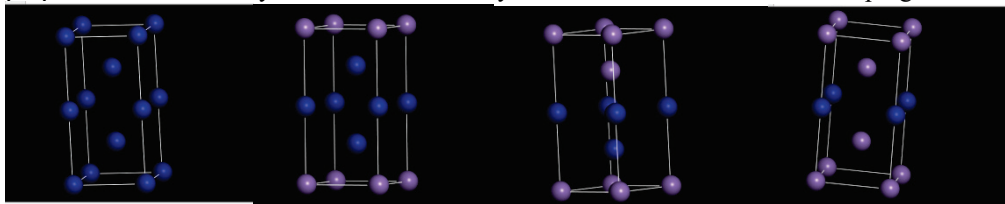
FIG.1-1 Fe Fe-Mn25% Fe-Mn50% Fe-Mn75%

2 THE SIMULATION RESULTS

2.1 Density of States.
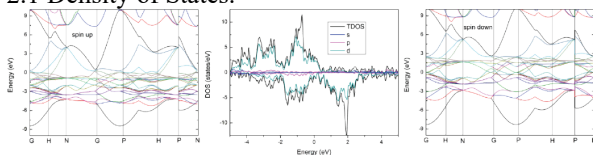
FIG.2-1-1 Energy band, total state density and fractal state density of the spin resolution at Fe-Mn 0%

From the band structure in figure 2-1-1 can observe both spining up and spining down at the Fermi level have the band overlap, states that this is a metal material. In order to further understand the electronic structure of materials, we state density diagram is given. At the Fermi level, both the spin direction has contribution to the electronic state, this just confirmed that the metallic properties of the materials[4][5]. Another spin up electronic state under the Fermi level distribution, and spin down electronic relatively evenly distributed in the valence band and conduction band, this is consistent with the dispersion of the corresponding bands in the respective regions. It is found from the fractal wave state density diagram that the total density of states mainly by Fe - d orbital contribution, and Fe - s and Fe - p state density is small, the impact on the total density of states, almost can be ignored.
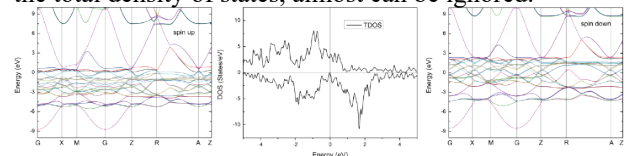
FIG.2-1-2 Energy band and total state density of the spin resolution at Fe-Mn 25%
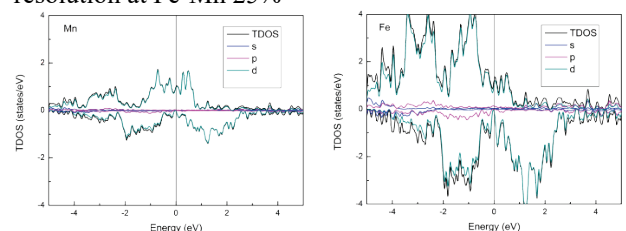
FIG.2-1-3 Partial wave density of Fe-Mn 25%. A positive value means spin up, and a negative value means spin down
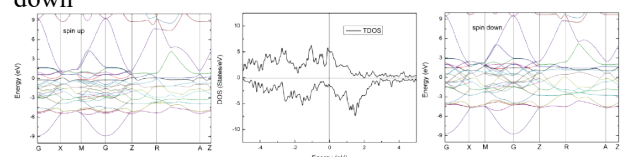
FIG.2-1-4 Energy band and total state density of the spin

resolution at Fe-Mn 50%

By analyzing the energy bands in both directions of spin, the metallic behavior was still observed[6]. It is showing that doping the original material with 25 percent Mn atoms did not change its original metallic properties. From the total density of states, it is found that the spin up shows stronger metallic properties than the spin down, possibly due to the addition of Mn atoms. In order to understand the origin of the total state density we give the wave-state density of the material. For the total state density Fe atoms is dominant. The hybridization of Fe atoms with doping Mn leads to the enhancement of its metallic properties[7]. In addition, the D orbital contributes the most to the density of each atom's state.

With the increase of doping of Mn atoms, the ratio of Mn atoms to Fe atoms reaches 1:1, at this time, the information expressed by the energy band is still metal properties. Looking at the total state density diagram, it can be found that at the Fermi level, the electron states in both directions of spin increase, indicating that their metallic properties become stronger and stronger[8]. It can be observed from the wave-state density diagram that as the number of Mn and Fe is similar, the contribution of Mn to total density is comparable to that of Fe to total density. Moreover, the enhancement of the metal properties in the spin-up direction is due to the state density in the spin-up direction of Mn, and the metal behavior in the spin-down direction of the material is due to the hybridization between Mn-d and Fe-d orbitals[9]. The contribution to Mn/Fe's s orbital and p orbital are very small, almost zero.

FIG.2-1-5 Energy band and total state density of the spin resolution at Fe-Mn 75%

FIG.2-1-6 Partial wave density of Fe-Mn75%. A positive value means spin up, and a negative value means spin down

Continue doping in the original material doping Mn atoms, found that the band change is not very much, at this time the material still shows metallic properties. From the total state density diagram, it is found that the state density is almost unchanged when Mn i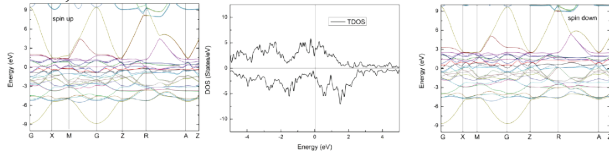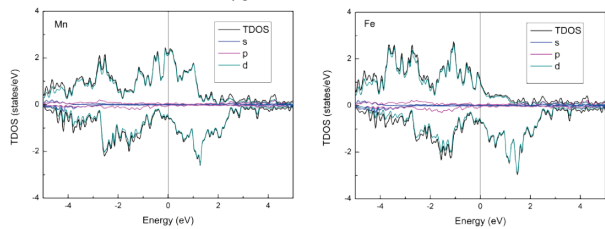s doped again. It implies that the contribution of Mn atoms to the material has reached its maximum. By observing the fractal wave state density[10], it can be seen that although the ratio of Mn atom and Fe atom in the material has reached 3:1 at this time, the contribution of Fe atom to the state density does not decrease, indicating that Fe atom occupies a very important position in the material. The other thing that

hasn't changed is the contribution of the D orbital to the material.

2.2 Elastic constants

Calculated by the analysis of the obtained data can be seen that the flexibility of body centered cubic crystal structure coefficient matrix in three separate tensor[11]: C11, C12 and C44.Therefore, it can be constructed that three kinds of simple cell deformation associated with them. Using the local density functional method, three binding energy curve is obtained respectively, and the second derivative of the binding energy curve at the obtained equilibrium point can be solved[12]. Calculated C11, C12 and C44, elastic constants can be got. Once you solve for C11, C12 and C44, you can represent the complete matrix.

```
TOTAL ELASTIC MODULI (kBar)
Direction    XX        YY        ZZ        XY        YZ        ZX
--------------------------------------------------------------------
XX        2594.9649  1526.0052  1526.0052    0.0000    0.0000    0.0000
YY        1526.0052  2587.0309  1524.5811   -0.0000    0.0000    0.0000
ZZ        1526.0052  1524.5811  2587.0309   -0.0000    0.0000    0.0000
XY           0.0000    -0.0000     0.0000  1117.9383    0.0000    0.0000
YZ           0.0000     0.0000     0.0000     0.0000  1118.1497    0.0000
ZX           0.0000     0.0000    -0.0000     0.0000     0.0000  1117.9383
```
FIG.2-2-1 Fe-Mn0%

```
TOTAL ELASTIC MODULI (kBar)
Direction    XX        YY        ZZ        XY        YZ        ZX
--------------------------------------------------------------------
XX        2878.9007  1824.1569  1824.1569    0.0000    0.0000    0.0000
YY        1824.1569  2957.9245  1804.3934    0.0000    0.0000    0.0000
ZZ        1824.1569  1804.3934  2957.9245    0.0000   -0.0000    0.0000
XY           0.0000     0.0000     0.0000  1500.6692    0.0000    0.0000
YZ           0.0000     0.0000    -0.0000     0.0000  1428.6424    0.0000
ZX           0.0000     0.0000     0.0000     0.0000    0.0000  1500.6692
```
FIG.2-2-2 Fe-Mn25%

```
TOTAL ELASTIC MODULI (kBar)
Direction    XX        YY        ZZ        XY        YZ        ZX
--------------------------------------------------------------------
XX        3521.7049  2013.6620  2013.6620    0.0000    0.0000   -0.0000
YY        2013.6620  2482.0396  2917.4631    0.0000    0.0000   -0.0000
ZZ        2013.6620  2917.4631  2482.0396    0.0000   -0.0000   -0.0000
XY           0.0000     0.0000     0.0000  1380.0049    0.0000    0.0000
YZ           0.0000     0.0000    -0.0000     0.0000  1756.3425    0.0000
ZX          -0.0000    -0.0000    -0.0000     0.0000    0.0000  1380.0049
```
FIG.2-2-3 Fe-Mn50%

```
TOTAL ELASTIC MODULI (kBar)
Direction    XX        YY        ZZ        XY        YZ        ZX
--------------------------------------------------------------------
XX        3101.8310  1741.4073  1741.4073    0.0000    0.0000    0.0000
YY        1741.4073  1232.1910  1121.4198    0.0000    0.0000    0.0000
ZZ        1741.4073  1121.4198  1232.1910    0.0000   -0.0000    0.0000
XY           0.0000     0.0000     0.0000  1148.5434    0.0000   -0.0000
YZ           0.0000     0.0000    -0.0000     0.0000  1638.7533    0.0000
ZX           0.0000     0.0000     0.0000    -0.0000    0.0000  1148.5434
```
FIG.2-2-4 Fe-Mn75%

Tab. 2-2(1) Elastic constants C_{11}, C_{12}, C_{44} of undoped and doped Fe

	0%-doped	25%-doped	50%-doped	75%-doped
C_{11}	2594.9649	2878.9007	3521.7049	3101.831
C_{12}	1526.0052	1824.1569	2013.662	1741.4073
C_{44}	1117.9383	1500.6692	1380.0049	1148.5434

These data are used to estimate young's modulus, shear modulus and bulk modulus by the following formulas[13].

$B_0 = (C_{11} + 2C_{12})/3$ (2-2-1)

$G = (3C_{44} + C_{11} - C_{12})/5$ (2-2-2)

$E = 9B_0G /(3B_0+G)$ (2-2-3)

Thus, it can be obtained that the absolute value of bulk modulus B_0, Young's modulus E, shear modulus G and G/B_0 of the binary alloy with pure iron and doping Mn content of 25%, 50% and 75%, as shown in Tab. 2-2(2).

Tab. 2-2(2) B_0, G, E of undoped and doped Fe

	0%-doped	25%-doped	50%-doped	75%-doped
B_0	1882.3251	2175.738167	2516.342967	2194.881867
G	884.55492	1111.35028	1135.61152	961.21078
G/B_0	0.469927	0.510792	0.451294	0.437933
E	2294.283093	2848.973022	2961.353759	2516.307765

On the basis of Pugh empirical criterion, Chen et al. proposed the formula for calculating the hardness of polycrystalline materials[14]:

HV=2(k^{2}G)$^{0.585}$-3 (2-2-4)

K = G/B$_0$.Formula (3-4) shows that hardness is positively correlated with shear modulus G and volume modulus B$_0$.According to Formula (2-2-4), the unified empirical formula for material hardness calculation (2-2-5) is as follows:

HV=0.151G (2-2-5)

It can be seen that hardness is directly proportional to the shear modulus G. Therefore, the hardness change of Mn-Fe binary alloy after doping various Mn atoms is calculated and analyzed through Material Studio simulation[15]. In combination with Tab. 2-2(2), it can be seen that the hardness of the ferroalloy doped Mn element is higher than that of the undoped pure iron. After doping more than 50%, the hardness of binary alloy decreases at some point between 50% and 75%.

3. DISCUSSION

Using the CASTEP total energy program package in MaterialStudio, based on the first principle of density functional theory, the supercell model of pure iron and alloy with Mn content of 25%, 50% and 75% was used to calculate the state density and elastic constant. And the results showed that:

1) By analyzing the state density diagram of the cells doped with pure iron and alloy doped with Mn atoms at 25%, 50% and 75%. It can be seen that the total state density is mainly contributed by Fe-d orbitals, while the state density of Fe-s and Fe-p orbitals is small, and the contribution to the total state density is weak, which is almost negligible.

2) As the number of Mn and Fe is similar, the contribution of Mn to the total density is getting closer and closer to that of Fe. Moreover, the enhancement of the metallic property in the spin-up state is due to the density of Mn spin-up state. And the metal behavior in the spin-down state of the material is due to the hybridization between Mn-D and FE-D orbitals. The contribution to Mn/Fe's S, P orbitals is very small, almost zero.

3) The doping Mn content is respectively 25%, 50% and 75% of binary alloy and pure iron. The doping Mn makes the ferroalloy more brittle, and after the doping Mn exceeds 50%, the plasticity of Fe-Mn alloy is improved to a certain extent.

4) Compared with pure Fe, the supercell doped with 25%, 50% and 75% Mn atoms respectively shows that the hardness of the binary alloy doped with Mn atoms is higher than that of the undoped pure Fe. After the doping exceeds 50%, the hardness of fe-Mn alloy is reduced at some point between 50% and 75%.

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Sleep Staging Based on CRNN Attention Mechanism

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Abstract: As the basis for evaluating sleep quality and diagnosing sleep disorders, sleep staging has attracted more and more attention. Traditional sleep staging requires manual extraction of features and then classification, which is not only limited by prior knowledge but also time-consuming and labor-intensive. Therefore, this paper proposes an original single-channel electrooculogram (EOG) staging model based on the CRNN attention mechanism. This model uses CNN to automatically extract the local to global features of the electrooculogram. After the first convolutional layer, the attention mechanism is introduced to strengthen the efficient mining of feature signals by the CNN model. And feed the characteristic signal to BiLSTM, a variant of RNN, to mine the dependency between each sleep stage, and realize the automatic staging of sleep data. The original single-channel eye electrical signal (ROC-LOC channel) of the open-source data set Sleep-CAP was used to verify the model, and the overall accuracy rate was 97.1%. This model effectively improves the classification accuracy rate and is better than traditional classification models.

Keywords: EOG; Sleep staging; convolutional neural network; long- and short-time memory network; attention mechanism

1. INTRODUCTION

Sleep, as a basic physiological activity, is an important part of the body's recovery and consolidation. Effective sleep is the basis for maintaining health [1]. In recent years, more and more people have been suffering from sleep disorders, and a series of diseases such as hypertension and diabetes caused by sleep disorders have attracted everyone's attention [2]. Sleep staging is the key basis for the diagnosis of sleep disorders, and the efficiency and accuracy of staging are of great significance for the diagnosis and treatment of related diseases.

A typical sleep staging system uses traditional machine learning models to split the classification task into two parts: feature extraction and classification. The first part requires manual design to extract the classification features, and the second part inputs the feature signal into support vector machine (SVM), decision tree and other classifiers for signal classification. Yang [3] et al. extracted 38 features from a single electrooculogram channel, and used Random Forest (RF) algorithm to perform sleep staging, achieving an accuracy of 87.87%. Kuo [4] extracted a total of 24 features such as multi-scale entropy from the EOG signal, and fed them into a linear classifier for sleep stage classification,

achieving an accuracy of 83.3%. Although the typical staging system has achieved good results, it is limited by prior knowledge in feature extraction, and it is difficult to make breakthroughs in research.

In recent years, deep learning has developed rapidly and has achieved great success in the fields of image analysis [5] and natural language processing [6]. Compared with traditional machine learning, deep learning can automatically mine the global information of data and classify it, getting rid of the limitation of prior knowledge and the cumbersomeness of artificially defining features, and the classification results are better than traditional models. Wang [7] et al. used Deep Belief Networks (DBN) and Long Short-Term Memory (LSTM) two methods to perform sleep staging on the eye electrical signal data, reaching 75.6% and 83.4% classification accuracy respectively. Lee [8] and others constructed an EEGNet-BiLSTM model for sleep staging of EOG signals and achieved a classification accuracy of 83.3%. Although sleep staging based on deep learning has achieved good results, there is still room for improvement in classification accuracy.

Based on the above research, this paper proposes a sleep staging model based on CRNN combined with attention mechanism. Different from the existing application of deep learning to the EOG sleep staging model, the model proposed in this paper adds the attention mechanism layer after the first convolutional layer of CNN to assign the weight of feature information, enhance the network learning effect, and achieve improvement. The rest of this article is organized as follows: The second part introduces experimental data and staging related theories. The third part introduces the proposed model in detail. The fourth part introduces specific experiments and results, and conducts a specific evaluation of the proposed model. The fifth part summarizes and prospects the model proposed in this paper.

2. DATA ACQUISITION AND ANALYSIS

2.1 Sleep staging

Nocturnal polysomnography (PSG) is an important basis for monitoring sleep status and diagnosing related diseases. In order to analyze PSG records, Rechtschaffen and Kales proposed R&K standards based on the amplitude and frequency characteristics of sleep electrical signals [9]. According to the R&K standard, each 30-second segment of the sleep period is marked as one of the six sleep stages of wake, non-rapid eye movement (NREM), N1, N2, N3, N4, or rapid eye movement (REM). Among them, the non-rapid eye movement N1 and N2 are the light sleep period, and the

N3 and N4 are the deep sleep period. The rapid eye movement stage appears during the dreaming period, accompanied by rapid eye movement [10]. As shown in Figure 1, it shows the sleep stage record of the subject throughout the night.
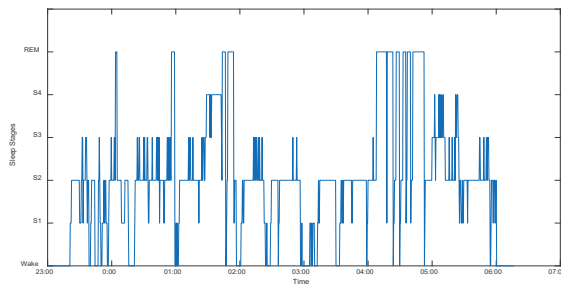

Figure 1. Sleep staging throughout the night

2.2 Experimental data

The sleep data used in this study comes from the CAP sleep database publicly available on PhysioNet [11]. Nine subjects were selected from the database for the experiment. Sleep experts manually score the corresponding sleep patterns based on the Rechtschaffen and Kales scores into eight categories: WAKEN, N1, N2, N3, N4, REM, MOVEMENT, and UNKNOWN. The MOVEMENT and UNKNOWN classes were excluded in the experiment. In this study, the EOG signal of ROC-LOC channel without any preprocessing was selected for sleep staging task. The sampling frequency of the channel eye electrical signal data is 128 Hz, and all the data have been marked by the sleep expert at 30s epoch. Table 1 lists the results of the sleep expert's classification of the experimental data.

Table 1. Expert statistical results of sleep data

Category(AASM)	Number/30s	Proportion/%
AWAKE	16624	40.37
S1	1552	3.77
S2	12492	30.33
S3	3440	8.35
S4	2088	5.07
REM	4988	12.11
Total	41184	100

3. MODEL ARCHITECTURE
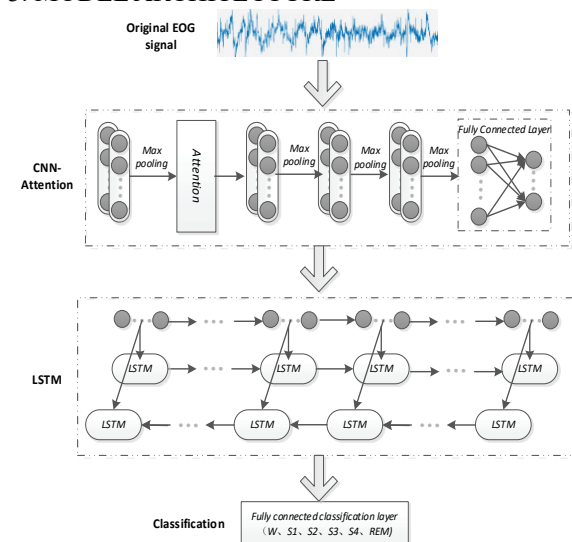
Figure 2. CRNN attention mechanism model network structure

At present, deep learning network has been successfully used in sleep staging. Aiming at the advantages and disadvantages of deep learning network in sleep staging, this paper designs a crnn structure of convolution pooling and circular recursion. After the first convolution layer, the attention mechanism is introduced to enhance the CNN model's efficient mining of feature signals, and the feature signals are fed to BiLSTM to mine the dependence between sleep stages, so as to realize the automatic classification of sleep data. The network structure design is shown in Figure 2.

The model mainly has the following parts: convolutional neural network combined with attention mechanism layer (CNN-Attention), long and short-term memory network layer and fully connected classification layer. The original EOG data is input into CNN to mine the sleep stage signal, and then the attention mechanism is introduced after the first convolution layer to allocate the weight of the signal. Finally, the 4-layer convolution neural network is used to mine the local feature information efficiently. The final feature vector is used as the input of BiLSTM. BiLSTM is used to mine the dependencies between sleep stages and extract deep feature signals. The output of BiLSTM is used as the input of the fully connected classification layer, and finally the sleep stage prediction is performed through the fully connected layer.

3.1 CNN -Attention

Traditional machine learning models need to manually define and extract features, which are limited by prior knowledge, while CNN can automatically mine and extract deep features, providing an end-to-end solution, which has been successfully applied to sleep scheduling tasks and has better performance than traditional machine learning models. Therefore, a 9-layer CNN model is introduced in this paper for in-depth mining of EOG sleep stage features. This module is composed of 4 convolutional layers, 4 pooling layers and a full connection layer. After each convolutional layer, a pooling layer is connected. The structure of the layer is shown in the second part of CNN-Attention in Figure 2, and the main parameters are shown in Table 2.

Table 2. CNN main parameter settings

Layer	Filters	Size	Stride
Cov1	16	(5, 5)	1
Cov2	32	(5, 5)	1
Cov3	64	(5, 5)	1
Cov4	32	(5, 5)	1
Pool		(2, 2)	2

The difference between the CNN model introduced in this paper and the existing CNN model is that the CNN model proposed in this paper introduces the attention mechanism after the first convolution layer. The features are weighted in the two dimensions of feature channel and feature space, and then added with the original features to adaptively adjust the features, focusing on the deep features related to sleep stages in

EOG signal, so as to improve the classification effect. This paper introduces the attention mechanism module after the first volume, inspired by the CBAM attention model proposed by Park [12] and others in a paper published in 2018.

CBAM attention module is a hybrid attention mechanism model, which weights the two dimensions of feature channel and feature space. In this paper, the serial structure is adopted, and the channel is weighted first, as shown in Figure 3. The feature map F output by the first convolutional layer is processed by the channel attention M_c to obtain the feature F', and then passed into the spatial attention M_s of the feature space and processed to obtain F". F" contains the prominent key features and adds the original feature F to get a new feature map, which is transferred to the next convolution layer. The specific calculation formula is as follows:

$$F' = M_c(F) \otimes F \qquad (1)$$
$$F'' = M_s(F') \otimes F' \qquad (2)$$

Among them, $\otimes$ is the dot multiplication between elements, F is the output feature after the first convolution layer, Mc is the attention extraction operation on the feature channel dimension, F' is the feature graph after the feature channel processing, Ms is the attention extraction operation on the feature space dimension, and F" is the feature graph after the feature dimension processing.
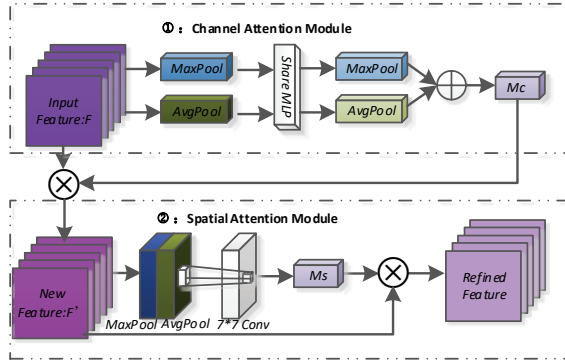

Figure 3. CBAM attention module

The channel attention process is shown as ① in Figure 3. Firstly, the average pooling and maximum pooling operations are used to compress the feature graph in the spatial dimension, and then a one-dimensional vector is obtained. Through average pooling and maximum pooling, two one-dimensional F_{avg}^c and F_{max}^c vectors are generated, which represents average pooling feature and maximum pooling feature respectively. Then two one-dimensional vectors are forwarded to a shared network composed of multi-layer perception (MLP) and a hidden layer. After the shared network is applied to two descriptors, the sum of elements is used to merge the output eigenvectors. The specific calculation formula is as follows:

$$M_c(F) = \sigma\left(MLP(AvgPool(F)) + MLP(MaxPool(F))\right)$$
$$= \sigma\left(W_1\left(W_0(F_{avg}^c)\right) + W_1\left(W_0(F_{max}^c)\right)\right) \qquad (3)$$

F_{avg}^c and F_{max}^c represent the features after maximum

pooling and average pooling, respectively. W_0 and W_1 represent the two-layer parameters in the multi-layer perceptron model. The feature between W_0 and W_1 are treated with relu as the activation function, and σ is the sigmoid function.

The spatial attention process is shown as ② in Figure 3, which is a supplement to channel attention. The spatial attention module uses average pooling and maximum pooling operations to perform channel-level compression on the feature map output after the channel attention operation, and obtains two two-dimensional features F_{avg}^s and F_{max}^s, which are spliced together according to the channel dimension to obtain a feature map with 2 channels, and then convolutes it with a hidden layer containing a single convolution kernel to ensure the final spatial dimension feature is consistent with the input feature graph. The specific calculation formula is as follows:

$$M_s(F) = \sigma\left(f^{7\times7}([AvgPool(F); MaxPool(F)])\right)$$
$$= \sigma\left(f^{7\times7}([F_{avg}^s; F_{max}^s])\right) \qquad (4)$$

σ is the sigmoid function. The convolution layer of this part uses the convolution kernel of 7x7. F_{avg}^s and F_{max}^s represent the features after maximum pooling and average pooling, respectively.

3.2 BiLSTM

Sleep data contains a lot of temporal information, which plays an important role in the judgment of sleep stage. Capturing temporal information dependency before and after can more accurately determine sleep stage, and BiLSTM can just meet this requirement. In this paper, BiLSTM is a bidirectional recurrent neural network composed of two RNN networks. It not only has a strong ability to capture time information, but also avoids the problem of gradient explosion or disappearance, which helps to capture long-term dependence.

BiLSTM consists of forward propagation and backward propagation. Forward propagation takes the output eigenvector of CNN as the input, calculates forward from time 1 to t through forgetting gate, input gate and output gate in turn, and obtains and saves the output of forward hidden layer at each time; while back propagation calculates backward from time t to time 1, and obtains and saves the output of backward hidden layer at each time. Finally, the final output is obtained by combining the results of forward propagation and back propagation at each time. The main calculation formula is as follows:

Forgetting gate output:
$$f_t = \sigma\left(W_f \cdot [h_{t-1}, x_t] + b_f\right) \qquad (6)$$
Input gate output:
$$i_t = \sigma(W_i \cdot [h_{t-1}, x_t] + b_i) \qquad (7)$$
Memory cell output:
$$c_t = f_t * c_{t-1} + i_t * m_t \qquad (8)$$
Output gate output:
$$o_t = \sigma(W_o \cdot [h_{t-1}, x_t] + b_o) \qquad (9)$$
Module output:
$$h_t = o_t * \tanh(c_t) \qquad (10)$$
In the above equation, x_t represents the input at time

t, W represents the weight matrix, b represents the offset unit, m_t represents the input of the current node, σ represents the sigmoid function, and tanh represents the hyperbolic tangent function.

3.3 Fully connected classification layer

After deep feature extraction by CNN-attention, BiLSTM is fed to capture the temporal dependence of EEG signals, and then two-layer full connection layer and SoftMax classifier are introduced for classification. The ReLU activation function is introduced into the fully connected classification layer to avoid the gradient explosion problem. Finally, the SoftMax function is used to output the probability prediction value of correct classification in each sleep period, which indicates the reliability of correct classification. The main calculation formula is as follows:

$$SoftMax(z_i) = \frac{e^{z_i}}{\sum_{i=1}^{c} e^{z_i}} \qquad (11)$$

e^{z_i} is the output value of the ith node, and c is the number of sleep stages.

4. ANALYSIS OF EXPERIMENTAL RESULTS

4.1 Experimental parameters

The experimental environment is running on Linux Ubuntu 18.04 system with 2080 gputi, and programming with Python 3.7.0 as the basic framework. In the training process, random gradient descent is used to optimize the cross entropy loss. The optimal learning rate is 0.001 and the number of iterations is set to 100. In this experiment, 70% of the original EOG data is used as the training set and 30% as the test set.

4.2 Evaluation index

In order to comprehensively evaluate the classification effect of the proposed model, different indicators are used to evaluate, including overall accuracy (ACC), precision (PR), specificity (SP) and recall (RE). The calculation method of each index is as follows:

$$ACC = \frac{TP + TN}{TN + TP + FP + FN} \qquad (12)$$

$$PR = \frac{TP}{TP + FP} \qquad (13)$$

$$SP = \frac{TN}{TN + FP} \qquad (14)$$

$$RE = \frac{TP}{TP + FN} \qquad (15)$$

Among them, TP means the number of positive classes predicted as positive classes, TN means the number of negative classes predicted as negative classes, FP means the number of negative classes predicted as positive classes, and FN means the number of positive classes predicted as negative classes. Because this paper studies the problem of multi classification, we take the category to be evaluated as positive category and other categories as negative category to calculate each index.

4.3 Result analysis

The CRNN attention mechanism sleep staging model proposed in this paper hardly needs any prior knowledge and provides an end-to-end solution. Validated under the CAP-sleep database, after adding the attention mechanism, a positive 4.9% improvement in classification accuracy was achieved from 92.2% to

97.1%. From Table 3, we can see the classification accuracy, recall rate and accuracy of different sleep periods. It can be seen that the classification accuracy of all periods is not much different, all between 95.6% and 97.4%; In terms of recall rate, the recall rate in the S2 period is slightly lower than that in other periods, but the overall results have been good; in terms of accuracy, all periods have achieved very good results. It can be seen that the model proposed in this paper achieves good results by using EOG for sleep staging.

Table 3. Evaluation index of experimental results

	Precision	Recall	specificity
Awake	96.7	99.6	99.5
S1	95.6	96.8	99.8
S2	97.4	94.8	98.9
S3	95.7	96.2	99.6
S4	96.1	98.6	98.3
REM	97.4	98.1	98.2

4.4 Comparison with existing methods

In order to verify the effectiveness of the CRNN attention mechanism model proposed in this paper, the results of using EOG for sleep staging were compared with the results of using EEG, EOG, EEG+EOG for sleep staging proposed by previous scholars, as shown in Table 4.

Table 4. Compared with the existing results

Method	Signals	Model	Acc/%
Ref.[3]	EOG	Artificial features+RF	87.87
Ref.[7]	EOG	LSTM-RNN	83.4
Ref.[8]	EOG	EEGNet-BiLSTM	83.3
Ref.[13]	EEG	CCN-SE	88.1
Ref.[14]	EEG+EOG	CNN-BiLSTM	92.21
The proposed method	EOG	CRNN+Attention	97.1

It can be seen from table 4 that the sleep staging method based on the attention mechanism of CRNN proposed in this paper achieves the best results. The experimental results show that compared with the traditional two-stage method based on hand-designed features, the proposed CRNN attention mechanism model almost does not need any prior knowledge, and compared with the existing deep learning model, the classification accuracy of the proposed method is significantly improved. Compared with the 87.87% classification accuracy of the previous proposed two-stage model Artificial features+RF, the 83.4% accuracy of the existing deep learning model LSTM-RNN and the 83.3% accuracy of EEGNet-BiLSTM, the proposed model achieves the best classification accuracy of 97.1%.

Most of the current sleep staging studies are based on EEG signals or combined with EOG, EMG and other signals. Only a few scholars use EOG for sleep staging. Table 4 shows that the effect of using EOG for sleep staging in this experiment is equivalent to EEG. It is even better than the EEG signal, so it can be concluded that only using the EOG signal for sleep staging can also achieve a better classification effect, which provides experience for future research.

5. CONCLUSIONS

In this paper, a CRNN model combined with attention mechanism is proposed to study the sleep stages of the original EOG signal. Different from the existing deep learning model applied to EOG sleep staging, this model uses CNN to automatically extract the local to global features of EOG. After the first convolution layer, the attention mechanism is introduced to enhance the CNN model's efficient mining of feature signals. More attention is paid to the features related to sleep stages, the weight of feature information is allocated, and the feature signals are fed to LSTM to mine the dependence between sleep stages, so as to realize the automatic sleep data staging. The experimental results show that the proposed model can automatically extract the features of the original EEG signals and perform sleep staging, and its classification accuracy is higher than most existing models. However, this study does not consider the impact of data imbalance, which can be further detailed in the future research.

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On the Innovation of English Writing Teaching Mode of Colleges and Universities under the New Network Carriers

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Abstract: The teaching of English major in colleges and universities began to make the best of online education platforms such as MOOC, Microlecture, and Flipped Classroom to reform and innovate the original theoretical teaching of indoctrination with the rise of Internet information technology, big data and cloud computing technology. Focusing on the teaching of professional course of college English writing, in this article, we explored the problems in theories of teaching materials of college English writing, practical cases, etc., as well as the gap between offline English writing education and the professional skills requirements of social talents. In order to ensure the efficiency of English writing teaching and the improvement of teaching quality, we have put forward the use of network interactive course teaching based on this, and set up scientific and reasonable situations, contents and methods of teaching.
Keywords: New Network Carrier; Colleges and Universities; English Writing; Teaching Mode

1.INTRODUCTION

As one of the most important parts of *Contemporary College English---Intensive Reading* and *A Basic Course in Writing*, the teaching of writing course of College English has a positive effect on students' reading comprehension, writing practice and translation learning. The writing courses education activities of College English in colleges and universities should be based on the requirements of the *Reform Outline of China's Medium and Long-term Education Development (2010~2020)* and the *Ten-Year Development Plan for Education Informatization*. In this way, it is able to integrate vocabulary, grammar, sentence patterns, etc. of basic writing, and guide students to participate in online writing practices and interactive communication on questions. Eventually, students' writing vocabulary and sentence reserves and innovative development of writing skills for College English will be promoted.

2. OVERVIEW OF THE CONTENTS OF NETWORK COURSE TEACHING MODE

In China, the interactive course teaching based on the Internet has usually included online education programs such as MOOC and Valuable Courses in recent years. Early originated in 2012, MOOC was the large-scale open online courses launched by China. Well-known colleges and universities such as Peking University and Tsinghua University adopted the "Internet + Education" model and took the lead in launching online MOOC courses. Subsequently followed up by other domestic universities,

MOOC has so far developed more than 1, 000 courses in 750 universities, covering science and engineering, law, psychology, foreign languages, economics and management, medicine and health, etc. As long as students log in to the MOOC platform, they can learn the courses required for free.

Valuable Courses, as an online teaching program proposed by the Ministry of Education in 2018, is an online education course corresponding to "Easy-A Courses". In the current "Double 10000 Courses Plan" for the construction of first-class courses in higher education institutions, it means that about 10, 000 national-level first-class courses and 10, 000 provincial-level first-rate courses would be built. Online and offline "Valuable Courses" will be effectively combined to strengthen the core position of professional quality talent training. According to the deployment of different professional teaching materials, student-centered interactive teaching situations will be set. The teaching process will be formed with explanation of important and difficult knowledge by teachers, students' independent exploration, online test, case demonstration, and interactive comment. The cloud service platform will be borrowed to conduct practical exercises of virtual simulation of professional projects, so that students are more intuitively, quickly and in-depth to get hold of professional theoretical knowledge and practical expression skills.

3. RENOVATION OF ONLINE TEACHING TO TRADITIONAL ENGLISH WRITING OF COLLEGES AND UNIVERSITIES

The online course teaching of "Internet + Education" is a kind of reform and innovation of the original classroom teaching contents and teaching methods of "instilling and teaching". By means of online video teaching, online and offline English writing teaching resources will be classified and reorganized, and interactive teaching situations and online course teaching processes will be deployed and designed. (1) The online teaching program of network medium usually considers students as the main body and teachers as the guidance. Teachers play a central role in the classroom in the teaching of traditional theoretical knowledge. In the online interactive English writing education through the Internet, however, the online teaching contents of about 10-20 minutes are set according to learning status and individual needs of different students. By doing so, students will be guided and provided with supplementary education, in which case they will autonomously participate in the learning of English writing course.

(2) The online teaching resources of network media is massive with outstanding important and difficult points of teaching. Relying on the online video teaching of MOOC and Valuable Courses, it is able to collect and integrate the theoretical contents of writing textbooks of College English, as well as extracurricular multimedia software, PPT courseware and other teaching resources in general. Then, the teacher will focus on one or two reading text contents and writing practice cases in each lesson, thereby expanding the explanations involving new words, grammar, and sentence patterns. In order to deepen students' cognition and understanding of the English knowledge system of each unit or lesson, teachers will also arrange a series of reading comprehension and online writing test teaching activities in the classroom at the same time.

(3) English writing teaching under the carrier of network information dissemination facilitates the integration of online and offline course teaching modes. Teachers will combine the teaching schemes of offline English writing knowledge to enhance the advantages of offline English vocabulary, sentence, grammatical structure and other education in the development of national courses such as MOOC and Valuable Courses in Chinese colleges and universities. By the integration of online, diversified and real-time resources with the teaching, teachers can convey more information about English writing courses in a shorter time to meet the writing learning needs of different students. (4) Online teaching feedback and teaching evaluation of the online media are more accurate. Compared with the single teaching evaluation method based on English writing test scores of students, online course teaching involves more and more comprehensive teaching evaluation indicators, during which questions raised in classrooms, online tests, self-inquiry learning and interaction and evaluation modules such as communication and test scores are all included.

4. ANALYSIS OF PROBLEMS IN ENGLISH WRITING TEACHING OF COLLEGES AND UNIVERSITIES

4.1. Absence of Students-based English Writing Education Philosophy and Teaching Objectives

Teaching materials such as *Contemporary College English---Intensive Reading* and *A Basic Course in Writing* are still used in most College English writing courses. In view of the existing English vocabulary, grammar, sentence patterns and reading texts in the textbooks, teachers uniformly adopt the basic knowledge explanation scheme of large-scale class teaching, and conduct the instillation and teaching of English writing, reading and writing skills. It can be seen that the formalization of the entire teaching process is extremely serious.

However, the main reason for this problem is the lack of student-based English writing educational concepts and teaching objectives. Teachers often use their own teaching experience to explain scattered vocabulary and sentence patterns to students. For students, however, they can only passively accept the English writing teaching contents conveyed in the classroom. Students' enthusiasm and self-inquiry to participate in classroom learning have been continuously reduced by the English writing teaching which takes test scores as the ultimate goal.

4.2. Absence of Network Interactive Platforms and Instructional Software for English Writing Course

Generally, multimedia software, PPT courseware and other network equipment are used in the teaching of theoretical knowledge, practical applications and other content of college English writing. In offline classrooms, teachers explain English vocabulary, grammar, and sentence patterns to students, and introduce and analyze different writing styles and writing skills. It is a pity that the application of online interactive platforms such as MOOC and Valuable Courses is still lacking.

On the one hand, some colleges and universities not only arrange fewer hours for College English writing courses, but also lack of relevant information-based video recording and sorting equipment. In this case, teachers do not have too much energy and rich experience to engage in the production of online English courses. On the other hand, the teaching software and online communication software used in English MOOC or Microlecture video production and teacher-student interactive communication also need to be improved. In contrast, teachers have to conduct the explanation of their college English writing teaching based on the MOOC courses of other colleges and universities. Unfortunately, the problems of incompatible knowledge systems and lack of emphasis are also extremely prominent.

4.3. Lagging Teaching Contents and Educational Pattern of English Writing Course

The deployment and setting of college English writing course in colleges and universities has shown a single lagging development trend, facing the rapid development of international business trade, correspondence writing, and communication writing. Compared with the bloom development of international courses, MOOC and Valuable Courses, college English writing teaching in China pays too much attention to the theoretical knowledge of textbooks, with less introduction and application of extracurricular teaching resources. First of all, there is no quantitative reading materials and writing case content to support college English writing teaching. In addition, English curriculum education projects and teaching tasks planning are not that much for Business English, English for International Settlement, English for Foreign Business Correspondence, and English for Translators. From the perspective of the college English writing education model, the subsequent teaching and answering of theoretical knowledge of English writing and difficult questions in the entire classroom ha neither built a complete online interactive platform, nor have they been well-designed in terms of teaching situation, explanations of important and difficult content, online tests, and interactive communication. As a result, the English writing teaching efficiency and teaching quality achieved are not satisfactory.

4.4. Imperfect Practical Communication and Teaching Evaluation for English Writing Teaching

The basic theoretical knowledge of College English writing teaching and the comprehensive evaluation of

students' English performance and English learning process are regarded as important means to test the results of both online and offline College English writing teaching. In the teaching practices of traditional English writing courses, however, most teachers rarely provided students with opportunities for writing and interactive communication in class. On the contrary, they only explained and conveyed the important and difficult teaching contents of existing English vocabulary, grammar, sentence and other theoretical knowledge. Not only that, but the teaching evaluation of students' learning status in each unit or class usually paid more attention to the evaluation of students' test scores, which cannot truly reflect their English writing learning status.

5. EXECUTION PROCESS OF ENGLISH WRITING COURSE FOR COLLEGES AND UNIVERSITIES SUCH AS MOOC AND VALUABLE COURSES

5. 1. Objectives of English Writing Teaching

In combination with the explanation of theoretical knowledge in classroom, network multimedia video, etc., the College English writing teaching usually focused on the organization and design of specific teaching execution process. In consequence, students are expected to gradually get hold of the writing text of Business English, English for Foreign Business Correspondence, and English for Translators, and Tourism English in the learning process of basic English theoretical vocabulary, phrases, sentence patterns, and grammar, as well as English reading expressions in different occasions. These are the objectives in relation to blended teaching of English. Only in this way can students improve their professional ability to participate in social and writing practices of English in international trade.

5. 2. Content Setting of English Writing and Students' Autonomous Learning before Class

Preview before class is regarded as an important part of the teaching of College English writing course. In particular, each unit of the *Contemporary College English---Intensive Reading* is set up with reading texts for example, "Half a Day", "Message of Land" and "Kindness of Strangers" for a certain topic. In consequence, teachers can make the best of online teaching platforms to send students well-made teaching courseware of vocabulary, grammar, and sentence, as well as translation content of reading texts. Afterwards, students will independently participate in preview before class and understand and analyze important and difficult problems.

5. 3. Integration of Teaching Resources and Innovation of Teaching Methods of English Writing Course

College teachers sort out the contents of writing textbooks of College English and extracurricular teaching resources, including the collection of reading texts, excerpts from classics, discussion topics, and assignment tasks. Then, these contents will be made into MOOC (Valuable Courses) videos with a duration of about 10-20 minutes, highlighting the important and difficult point of knowledge. Accordingly, students can watch, acquire and share learning resources in online classrooms. Teachers will make the best of multimedia software, PPT courseware, etc., to set up a teaching situation oriented on the theme of "College Students' Job Hunting", and explain the usage of "majors, strange, find it, It sounds" and other vocabulary or sentence patterns to achieve better effect of English Writing teaching. Meanwhile, they provide the writing task of "Job Hunting" for students. Guided by teachers, students will conduct independent exploration and group interactive communication to complete writing practice. Eventually, the problems encountered by students in learning writing theory and writing skills will be solved.

6. RESEARCH ON THE INNOVATION OF ENGLISH WRITING TEACHING STRATEGY OF COLLEGES AND UNIVERSITIES UNDER THE NEW NETWORK CARRIERS

6.1. Establishment of Students-based Multi-modeling English Writing Teaching Philosophy

Supported by Internet information interaction technology, big data and cloud service computing, the teaching of college English writing has begun to integrate multi-modal teaching modes, for example, MOOC and Valuable Courses. They deployed the English writing teaching knowledge system and classroom teaching content according to different students' English learning status and individual needs. For example, teachers selected the key and difficult knowledge of English writing and combine them with online education channels to create MOOC courses that included text, images, videos and audios based on reading texts, and writing contents of English for International Settlement, English for Foreign Business Correspondence, and English for Translators, and Tourism English, and in combination with online education channels. Therefore, students will be guided to actively participate in offline English theoretical knowledge and online English practical learning. In this way, teachers can also teach organizational skills such as functional words for writing, grammar, and sentence pattern. Eventually, students' English writing enthusiasm and autonomous inquiry ability will be improved.

6.2. Enrichment of Network English Writing Teaching Resources and Teaching Methods

Relying on the teaching of MOOC, Valuable Courses and other courses based on network media carriers, the knowledge system such as basic English writing vocabulary, transformed vocabulary, grammar, and sentence patterns will be formed in combination with the contents of offline English writing teaching in classroom, covering English teaching courseware, PPT learning materials, writing cases, online test questions and other MOOC video resources.

Online MOOC and Microlecture video teaching are the mainstay, and offline explanations of theoretical knowledge in classroom are supplemented. Teachers should record about 10-20 minutes of online MOOC video during the teaching process. Next, they will give a comprehensive explanation of the important and difficult vocabulary and reading cases in the different chapters of Text A and Text B. Subsequently, the problem-oriented and step-by-step English writing education concept should be adopted to set up the online English writing

teaching situation, teaching methods, interactive communication mode and other links, thereby setting the teaching theme, key and difficult knowledge of each lesson. Teachers will ask students questions about English culture, tourism, grammatical norms, sentence patterns, etc., and carry out teaching of different types of accumulation of English writing and writing skills. In classroom, they will give online writing tests for students to complete the learning activities such as English writing practice and writing translation by virtue of independent exploration and interactive communication.

6.3. Enhancement of Overall Evaluation of English Writing Teaching and Students' Learning

As an important basis for measuring the implementation effect of online or offline English teaching, the teaching evaluation system of college English writing course can also provide guidance for subsequent teaching of teachers and learning activities of students. Accordingly, education departments of colleges and universities mainly start from such aspects as teachers, students, teaching processes and network resource platforms to make objective evaluations of teachers and learners of English writing based on the guidance of fair, just and objective teaching evaluation objectives.

With respect to the evaluation of writing teaching of college English teachers, attentions are paid to their knowledge reserve of professional English writing, teaching ability, as well as the assessment and evaluation of reading texts and explanation level of writing practice cases. In the evaluation of students' English writing learning status thereafter, it is necessary to value English reading learning in classroom, themed writing test, writing and translation, and mid-term or final exam results of students. In this way, it is able to achieve a comprehensive evaluation of writing learning. Both online and offline evaluation methods are combined to ensure the quality of teaching.

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Research on University Teaching Management Under the Background of Double First-Class Construction

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Abstract: With the continuous advancement of China's education reform, quality education has become the theme of the whole society, and the teaching work in Colleges and universities has been further optimized under this background. Nowadays, double first-class has become the new development goal of all kinds of colleges and universities. To achieve the new change in this new period, we must strengthen the top-level design of college teaching, give play to the effectiveness of macro policy guidance, constantly improve the scientific level and mode of college teaching management, improve the actual teaching quality, and provide a more superior growth platform for many students. In the current management of colleges and universities, teaching management is the core node of all work, and it is also the fundamental to ensure the realization of teaching objectives. This paper will take the problems existing in the current university teachers' teaching management and the relationship between the double first-class construction background and the university teaching management as the breakthrough point, and make a preliminary analysis and Discussion on the development strategy of university teaching management in China, hoping to play a certain reference value for the relevant practitioners.
Key words: Double First-Class Construction Background; University Teaching Management; Education Reform; Quality Education

1.INTRODUCTION

teaching management in Colleges and universities is very complex, which not only covers the teaching plan management, teaching process management, teachers' teaching quality evaluation and other contents, but also involves multi-level fields such as specialty, discipline, classroom teaching, experimental courses, practice base construction, teaching management system formulation, teachers' team construction and so on. Therefore, from the perspective of the actual direction of teaching management in Colleges and universities, scientific and effective teaching management is the key to ensure the full implementation of double first-class construction in Colleges and universities. In the education environment of double first-class construction, the scale of all kinds of colleges and universities is constantly expanding, the degree of specialization within colleges and universities and the number of teachers are also growing, which not only puzzles the teaching practice of many teachers themselves, but also puts forward higher requirements for teaching management, looking for more scientific teaching development strategies, and also becomes the

focus of the current development of colleges and universities .

There is a very close relationship between teaching management and the construction of double first-class universities. Teaching management is an important means to ensure the realization of the goal of double first-class construction, and the background of double first-class construction also provides a good environment for the reform and innovation of teaching management in universities. Both of them influence and promote each other.

1.1. The improvement and innovation of teaching management in Colleges and universities provide basic conditions for the smooth implementation of double first class construction

For the development of colleges and universities, the purpose of double first-class construction is to give full play to the advantages of colleges and universities in personnel training, build first-class colleges and universities, create first-class teaching environment and division, and comprehensively cultivate the innovative thinking of students and teachers. The improvement and optimization of teaching management in Colleges and universities can provide more effective basic means for colleges and universities in the construction of double first class, facilitate the smooth implementation of teaching means and various innovative teaching modes, effectively improve students' innovative thinking, and cultivate first-class talents for the development of our society. Therefore, from the perspective of the relationship between influence and function, the reform and innovation of teaching management in Colleges and universities can create good basic conditions for the construction of double first class in Colleges and universities.

1.2 the comprehensive promotion of double first-class education can effectively promote the reform and optimization of university teaching management

As early as 2017, China has completed the construction of double first-class universities and double first-class disciplines. The list of universities has been formulated. The actual development goal of universities is clearer, and the direction of talent training is clearer. Personnel training is the primary work of colleges and universities, and colleges and universities to promote the construction of double first-class, but also for the traditional teaching work in the personnel training level of the defects and development, double first-class construction work can provide more scientific guidance for the reform and innovation of colleges and universities, all kinds of

management work in Colleges and universities to build double first-class colleges and universities as the goal, in this environment, the adjustment of its teaching management work Integration and optimization will also be fully guaranteed.

1.3 the level and quality of teaching management have a direct impact on the specific results of the construction of double first class in Colleges and universities

Cultivating high-level talents is the core goal of implementing teaching management in Colleges and universities, and the teaching management in Colleges and universities needs to be in line with the development of the times. Only by ensuring the effective integration of teaching management and students' physical and mental development characteristics, can we really cultivate a talent team with high-quality cultivation and knowledge and skill level, and this work is also its own promotion and development for colleges and universities The inevitable process of exhibition. The higher the management level and quality of colleges and universities, the smoother the double first-class construction. On the contrary, if the teaching management of colleges and universities does not conform to the characteristics of the times and students, not only will it not promote the double first-class education construction, but also will bring great obstacles to the comprehensive development of students.

2. ALL KINDS OF PROBLEMS EXISTING IN THE TEACHING MANAGEMENT OF COLLEGE TEACHERS

2.1. The teaching concept is seriously backward

Influenced by many factors, the management of colleges and universities in our country has long been dominated by management. Students are only passive receivers of management. Students can only passively accept or implement the contents and policies stipulated by the school. Teachers and other staff are seriously lack of innovative development thinking and carry out management work mechanically, which leads to a huge gap between students and schools The school did not really promote the all-round development of students, and the teaching management of teachers failed to be responsible for the future of students. In addition, at the level of teaching philosophy, many colleges and universities also lack of humanized ideas, the actual management efficiency is very low, and the mode is rigid and rigid. [1]

2.2 the teaching management system needs to be further improved

In recent years, with the continuous promotion of the popularization of higher education in China, the enrollment scale of colleges and universities continues to expand. However, most colleges and universities have not effectively adjusted their own system in this process. There is a huge difference between the connotation of the system and the current situation of colleges and Universities. There are also many loopholes in the number of teaching managers, quality, working system and mechanism Some universities are also seeking reform and innovation, but their management ability still does not meet the needs of social development.

2.3 the quality of teaching management personnel is insufficient

Teaching management personnel should not only have sufficient management experience and knowledge, familiar with the workflow and characteristics, but also have a higher level of humanistic quality and personalized management ability according to the social development background and the characteristics of students. Only in this way can we ensure the effective synchronization between university teaching management strategy and management practice Analysis shows that there are still many problems in the quality of teaching management personnel.

2.4. The construction of teaching management team is lack of standardization

For university administrators, most of them don't really understand the significance of teaching management standardization. There are conflicts between management right and ownership right in many management work, and even the difficulties of multi management and decentralized management. These problems not only disrupt the normal teaching management order, but also make the quality of teaching management decline seriously. [2]

3. PRACTICAL STRATEGIES OF STRENGTHENING TEACHING MANAGEMENT IN COLLEGES AND UNIVERSITIES UNDER THE BACKGROUND OF DOUBLE FIRST CLASS CONSTRUCTION

3.1 establish a scientific concept of university teaching management

In the new era, humanistic management and management standardization are the basis to ensure the scientific development of university teaching management, and the double first-class construction and university teaching management have something in common in essence. If we want to really strengthen the actual effect of university teaching management, we must change the traditional teaching management concept, so that the teaching management and the double first-class construction can achieve real interaction Motivation and promotion.

First of all, the teaching management work in Colleges and universities needs to take students as the core, abandon the traditional simple management idea, and give students enough independent rights. Colleges and universities can provide students with more flexible teaching management system, so that students can exchange majors according to their own interests, so that students can experience real fun in learning and find their own development path.

Secondly, in the treatment of students, colleges and universities need to establish guiding thinking, so that students can learn to combine their own learning reality, adjust the learning order and time of knowledge within a certain range, and encourage those students with strong autonomous learning ability to complete their studies ahead of time. In the actual teaching work, teachers need to stimulate students' interest in learning all kinds of knowledge as much as possible, let students have the right to choose teachers independently, use emotional guidance, let students realize personalized development, and form a

better learning atmosphere in the campus.

Finally, the school needs to establish a people-oriented management thinking, as far as possible to guide students' daily activities and learning, improve the equal communication between teachers and students, establish a good relationship between teachers and students, and achieve high-level personalized management goals by means of emotional cooperation.

3.2. Promote the modernization of teaching management and create the basis of efficient management

With the rapid development of network information technology, the reform of higher education is also deepening. Modern teaching methods such as Internet and multimedia have been widely used in practical teaching activities. Although these new teaching methods have high charm in form and effect, this work still needs more attention from many teachers and university administrators Reform and innovation. For school administrators, we need to let every staff understand the impact of modern teaching management concept on management, keep pace with the times in ideological level, constantly improve the teaching management environment inside the campus, and promote the positive cycle of modern teaching management.

Relevant colleges and universities need to improve the management strategy and system according to the problems and loopholes existing in the current teaching management, and combine with the characteristics of students' daily activities to create a positive development space for the growth of students' ability and thinking. A good management environment is the basis for the rapid development of efficient management means. Therefore, the school should also equip the management workers with the necessary modern office equipment, and set up a more integrated information management platform in the campus, based on teaching management, so that every student can express their views and opinions in the management platform. At the same time, colleges and universities should also strengthen the leading position of teaching management in the daily management process of the whole school, strengthen publicity and education, guide teaching management personnel purposefully, and carry out necessary training for teaching management workers in combination with the actual requirements of management, so as to create good external conditions for the improvement of their overall level. [3]

3.3 deepen the construction of teaching management team and comprehensively carry out management system assessment

Under the background of double first-class construction, teaching management in Colleges and universities needs a large number of high-level new management talents. Therefore, colleges and universities need to establish a complete evaluation and supervision system for

management personnel according to the development needs of the actual talent system, strengthen the supervision and institutionalized evaluation of management personnel, take students as the main body, and avoid the influence of individual management personnel's own factors on the overall development of colleges and universities. In addition, colleges and universities should also establish a dynamic talent management mechanism to conduct a comprehensive investigation on all kinds of teaching staff who participate in teaching management. According to their personal abilities and preferences, as well as their performance in the actual management work, they should form a joint force talent flow system within the campus to improve the adaptability and actual effect of teaching management. Under the background of double first class construction, the teaching management of colleges and universities should also pay attention to their own management, eliminate all negative phenomena and ideas in the management team, and purify the management team.

4.CONCLUSION

To sum up, under the background of double first-class construction, in the process of teaching management, colleges and universities need to fully recognize their own management defects and loopholes, strengthen the management system and personnel team construction, change the traditional management thinking, take students as the main body, endow students with higher self choice space in teaching management, and establish assessment and supervision system for the teaching management process Mechanism, improve the control effect of teaching management, so as to form a positive cycle between the double first-class construction work and the teaching management of colleges and universities, and comprehensively promote the pace of modernization reform of colleges and universities in China.

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Prediction and Analysis of Zhejiang Province GDP Based on ARIMA-BP Combined Model

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Abstract: GDP refers to the market value produced by all of products and labors in all of economic activities in a country or a region over a period of time, which is regarded as the important index to measure national and regional economic conditions and development level. This paper predicts and analyzes Zhejiang Province GDP from 2020 to 2022 by using ARIMA Model, BP Neural Network and ARIMA-BP Combined Model. It is found that the predictive result of ARIMA-BP Combined Model is more accurate and provides with larger reference value among three models as well.
Key Words: ARIMA Model; BP Neural Network; GDP Prediction; Combined Model

1. INTRODUCTION

Gross domestic product(GDP) refers to the value sum of labors and products produced by all of units in a country or a region over a period of time, which usually indicates the economic conditions of a country or a region, and it is an important index to measure the overall economic conditions of a country or a region. Chinese economic conditions and comprehensive national power have been significantly improved under current economic globalization. More and more people are looking into dynamic changes of GDP. As at the top level of China GDP, Zhejiang Province GDP tread indicates its future development and national economic development trend from another point as well. If it is possible to predict its GDP trend accurately, it shall provide important support for economic development strategy and plan made by government and different departments.

Although there are many GDP predictive methods, domestic and foreign scholars widely use Grey System Theory, combined model, neural network model, etc. ARIMA Model is one of time series prediction methods with simple modelling. It is widely used as one of data prediction methods at present. Many domestic scholars have used it for modelling and analyzing. ARIMA Model is used to predict and analyze price index of domestic agricultural commodities in Reference [1], and good result is obtained. In recent years, along with IT development, machine learning is welcomed by many scholars. BP Neural Network is another method to often use for data prediction, which has stronger non-linear mapped capacity and a good predict effect on non-stationary data sequence as well. In Reference [2], apply BP Neural network in predicting stock price of China Everbright Bank, and obtained the average relative error is only 3.6%, which shows its excellent predictive effect.

Although both ARIMA Model and BP Neural Network are more mature methods, each predictive model has its own characteristics and limits which leads to some differences between the presented data, so combined model is used by more and more scholars. Reference [3, 4, 5] uses combined model to predict GDP of some Chinese places, thus reduces predictive errors in some extent. Based on the above researches, this paper uses error variance mean square reciprocal method by integrating ARIMA Model and BP Neural Network to confirm the respective weight, then combine them together, in order to improve the predictive accuracy. Besides, use Zhejiang Province GDP from 2000 to 2019 to analyze in a practical way, finally predict Zhejiang Province GDP from 2020 to 2022.

2 ARIMA MODEL

2.1 Model Principe

ARIMA Model (also called Autoregressive Integrated Moving Average Model) put forward by Box and Jenkins is a kind of time series prediction method. This model describes the linear relation between the previous sequence value and the following one, which can solve the problem of fitting non-stationary time series, so it is widely used in a practical way. It is supposed to be the difference combination between AR (Autoregressive) Model and MA (Moving Average) Model, and the mathematical expression of ARIMA (p, d, q) Model is:

$$(1 - \sum_{i=1}^{p} \phi_i L^i)(1 - L)^d X_t = (1 + \sum_{i=1}^{q} \theta_i L^i)\varepsilon_t$$

Where p is the number of Autoregressive; q is the average number of moving, d is order of differencing, usually it is the difference number of data converted into the stationary sequence; L is lag operator. ARIMA (p, d, q) Model converts the studied sequence into the stationary sequence through differential operation in limited times. The formula of corresponding differential operation is as follows:

$$\nabla^d x_t = \nabla^{d-1} x_t - \nabla^{d-1} x_{t-1}$$

If corresponding time series of ARIMA (p, d, q) Model is stationary, no further differential operation is required, that is, the model is converted into ARIMA (p, q) Model.[I]

2.2 Data Selection

The data of this paper is obtained from Zhejiang Province gross domestic product (hereinafter called GDP) from 2000-2019 in official website of National Bureaus of Statistics, shown as Table 1.

2.3 Stationary Test

There are three common test methods at present: (1) According to data trends, observe whether the data fluctuates within a constant range and whether there has periodical trend change. (2) Draw the diagram of

Autocorrelation and Partial Autocorrelation, and observe whether there is trailing or truncating. (3)Judge according to ADF. If all values of statistics is lower than critical value in different horizontal section with probability value lower than 0.05, the sequence is stationary, and vise verse. Here use software SPSS to draw time series diagram, so as to test the stationarity of Zhejiang Province GDP from 2000 to 2019, and see the details as Fig.1.

Table 1 Zhejiang Province GDP from 2000 to 2019

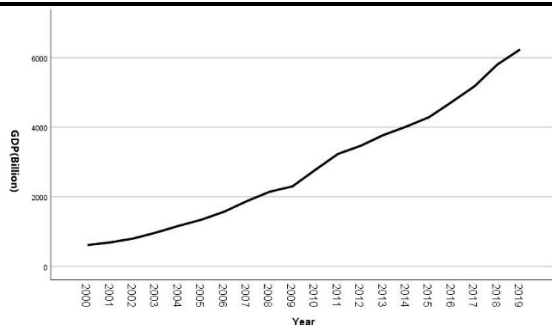| Year	GDP(Billion)	Year	GDP(Billion)
2000	614.10	2010	2772.23
2001	689.83	2011	3231.89
2002	800.37	2012	3466.53
2003	970.50	2013	3775.66
2004	1164.87	2014	4017.30
2005	1341.77	2015	4288.65
2006	1571.85	2016	4725.14
2007	1875.37	2017	5176.83
2008	2146.27	2018	5800.28
2009	2299.04	2019	6235.17

Fig.1 Time Series Diagram of Zhejiang Province GDP from 2000 to 2019

It is obvious from Fig.1 that Zhejiang Province GDP is a typical non-stationary sequence with a rapid growth trend, therefore it shall carry out differential operation to the original data.

Because the data is non-stationary sequence, it shall determine the value of d in the model by differential operation. Besides, determine the value of p (Autoregressive) and q (Average Moving) by Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF), so as to complete the construction of model. GDP becomes steady after first differential operation by software SPSS, and it can be thought to be the stationary sequence. The corresponding diagram of Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) for the first difference is shown as Fig.3 and Fig.4.
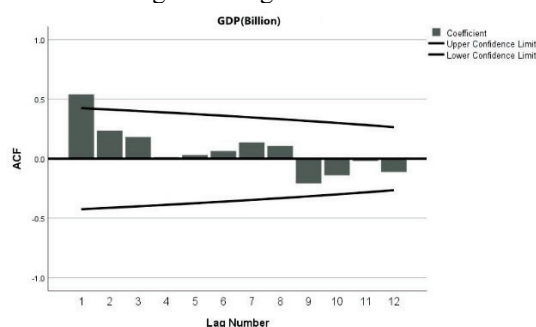
Dia.3 ACF of First Difference
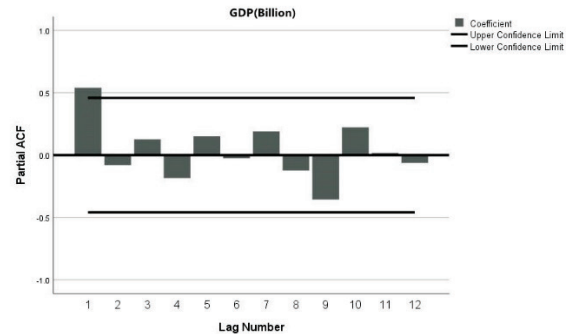
Fig.4 PACF of First Difference

From the diagram of ACF and PACF, it can be seen that the data becomes steady after first differential operation within the confidence limit, and the number of difference is 1.

2.4 Construction and Test of Model

The sequence after differencing can determine the value of p and q initially according to the diagram of ACF and PACF. ACF and PACF present trailing of first difference after lagging the first difference and fall within the range of double standard deviation from Fig.3 and Fig.4, so it can say ARIMA (1, 1, 1) is workable model. From the residual in the diagram of ACF and PACF, the ACF coefficient and PACF coefficient of model residual sequence are distributed around 0, and all absolute values of ACF coefficient and PACF coefficient is smaller than 0.5. It is supposed that the residual sequence is independent without Autoregressive, which is white noise sequence. It indicates this model is effective, so it is workable to predict Zhejiang Province GDP.

After determining the value of different parameters, use aforementioned ARIMA (1, 1, 1) Model to predict Zhejiang Province GDP from 2000 to 2019. It shows from Dia.5 that the predictive value and actual value fit very well. The final actual predictive value and relative errors are as shown in Table 2.
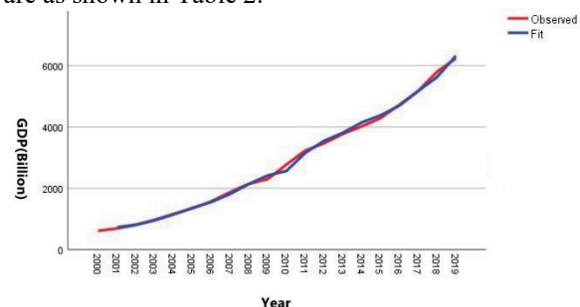
Fig.5 Comparison Between the Predictive Value and Actual Value

Table 2 the Predictive Value and Relative Error of ARIMA Model

Year	Forecast	Relative Error (%)	Year	Forecast	Relative Error (%)
2000	-	-	2010	2704.57	2.5
2001	704.11	2.0	2011	3175.10	1.8
2002	847.94	5.6	2012	3626.33	4.4
2003	979.90	1.0	2013	3722.46	1.4
2004	1186.72	1.8	2014	4077.44	1.5
2005	1396.01	3.9	2015	4277.54	0.3
2006	1562.15	0.6	2016	4567.17	3.5
2007	1824.97	2.8	2017	5105.32	1.4

| 2008 2173.70 1.3 | 2018 5566.37 4.2 |
| 2009 2424.52 5.2 | 2019 6295.55 1.0 |

3 BP NEURAL NETWORK

3.1 Principle of Model

BP (back propagation) Neural Network is the concept put forward by some scientists led by Rumelhart and McClelland in 1986, which is a kind of Multilayer Feedforward Neural Network with Error Back Propagation Training and the most widely used neural network. The data is input through input layer, then weight sum according to different weight values between layers, and output after activating function and processing. A complete neural network structure is composed of many neurons between different layers, and the structure is shown as Fig.6.
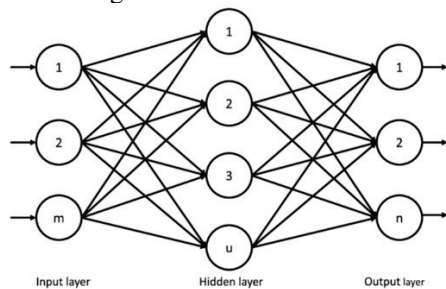
Fig.6 BP Neural Network Structure

3.2 Data Pre-processing

Firstly, cluster the collected data. The training data is Zhejiang Province GDP from 2000 to 2017, the test data is Zhejiang Province GDP from 2018 to 2019, and the detailed data is shown as above Table 1. Then pre-process the training data by normalization, and process the test data by applying the normalized format used in training data. After modelling, restore the predictive data to the practical data by reverse normalization, in order to better observe and carry out the next test.

3.3 Model Parameter Setup

Before modelling, firstly determine the number of neurons in hidden layer in neural network, at present, there are three main common methods to determine the number of neurons, and that is experience formula:

$$n = \sqrt{a+b} + c, n = \sqrt{ab}, n = \log_2 a$$

Where a is the number of neurons in input layer, n is the number of neurons in hidden layer, and b is the number of neurons in output layer. Here c values from 1 to 10, change value n according to the changes of value c, compare models one by one, and finally select the most appropriate value n. This paper selects the first experience formula, and it is found the MSE (mean square error) model is the smallest as the number of neurons is 6, so the number of neurons in hidden layer is determined to be 6.

In order to get the best model relatively, it often needs to limit the model during training. In this paper, the minimum error of the set training target is $1 \times e^{-12}$, with 1000 training times and 0.01 learning rate.

3.4 Construction and Test of Model

After obtaining reasonable BP Neural Network Model, next predict Zhejiang Province GDP from 2018 to 2019, and calculate the relative error, in order to better judge the model, and the result is shown as Table 3. It is known from the relative error that the predicted GDP from 2018 to 2019 is close to the actual value with good predictive effect. Whereas comparing to ARIMA Model, the relative error is on the high side.

Table 3 Predictive Value and Relative Error of BP Neural Network

Year	Actual	Forecast	Relative Error(%)
2018	5800.28	5531.37	4.9
2019	6235.17	6395.55	2.5

4 ARIMA-BP COMBINED MODEL

4.1 Model Principle

Analyze and predict Zhejiang Province GDP by ARIMA Model and BP Neural Network respectively in the previous paper, in which the average relative error of ARIMA Model is 2.4% and 3.7% respectively. Although the relative error of ARIMA is smaller, the method and principle of single predictive model is different with different view on digging up information. Many researches prove that it can reduce the predictive error effectively and improve the model accuracy if integrate several single prediction models into combined model, thus some scholars put forward the concept of combined model.

The combined model is the best way to improve the accuracy of prediction model, which can assign weight of sub-models according to specific methods. Based on bigger weight of model with high predictive accuracy and smaller weight of model with low predictive accuracy, the method for determining weight to verify the combined model is significantly important. There are three common methods for determining combined model: Equally Weighted Method, Simple Weighted Method and Error Variance Mean Square Reciprocal Method. This paper uses Error Variance Mean Square Reciprocal Method finally, and its formula is:

$$w_j = \frac{E_j^{-1/2}}{\sum_{j=1}^{J} E_j^{-1/2}}, j = 1, 2 \cdots, J$$

Where E_j means error variance of J predictive models, the essence of this method lies in: the bigger sum of error variance of predictive models, the worse effect of predictive models, then the weight coefficient in combined model is smaller and vice versa.

4.2 Construction and Test of Model

ARIMA Model and BP Neural Network is assigned weight of 0.58 and 0.42 respectively through calculation of above formula, and combined model is obtained. Then predict Zhejiang Province GDP from 2015 to 2019 according to combined model, the calculated relative error is shown as Table 4. The average relative error is only 1.5% from the result, and it is smaller than other two models.

Table 4 Predictive Value and Relative Error of Combined Model

Year	Actual	Forecast	Relative Error(%)
2015	4288.65	4177.54	2.7
2016	4725.14	4667.17	1.2
2017	5176.83	5265.32	1.7
2018	5800.28	5871.37	1.2
2019	6235.17	6395.55	0.6

Predict Zhejiang Province GDP from 2020 to 2022 based

on obtained combined model. Firstly, obtain the predictive value respectively by ARIMA Model and BP Neural Network, then calculate the weight by formula, finally obtain the predictive value shown as Table 5 from ARIMA-BP combined model.

Table 5 Zhejiang Province GDP from 2020 to 2021 by Combined Model Prediction

Year	Forecast
2020	6561.54
2021	6722.12
2022	7012.02

5. CONCLUSION

This paper analyzes Zhejiang Province GDP in a practical way based on two common data predictive model-time series ARIMA Model and BP Neural Network. Although the relative error of both models is within 5%, they have their own shortcomings.

Because the dynamic prediction of ARIMA model is based on the real value except the first value, and the rest depends on the obtained value for the further prediction, so it isn't too accurate for long-term prediction. Whereas the integrated trend of BP Neural Network is close to the actual value, the individual value isn't accurate.

Therefore this paper builds up a combined model by combination of obtained ARIMA Model and BP Neural Network, and the purpose is to integrate advantages of two models and obtain more accurate predictive value. It proves that predictive average relative error of the combined model is only 1.5% comparing to other two models. It indicates that Zhejiang Province GDP shows a state of stable growth from the predictive data in next few years, which is in accordance with the current economic conditions.

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The Innovative Exploration of College Physical Education in the Background of Internet Plus

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Abstract: As the development and innovation of Internet technology, there is a wide range of applications in all fields of society. With the advent of" Internet+" era, the innovation strategy of" sports teaching" should be strengthened in order to promote the good development of" Internet+" era. This paper analyzes and studies the reform of college physical education in the era of" Internet+", with the main aim to realize the expected goal of university physical education.
Keywords: Internet+; College Sports; Teaching Measures; Innovative Methods

I. THE INFLUENCE OF THE AGE OF INTERNET + ON THE TEACHING OF PHYSICAL EDUCATION IN UNIVERSITIES

In the course of the development and advancement of the times, the development mode of the traditional industry cannot adapt to the development demand of the age of the Internet, based on the reasonable use of the Internet, so as to form a form of the application of the Internet+ trade or field. This paper analyzes the influence of the advent of the Internet+ era on the physical education teaching in universities in detail, and puts forward the innovative strategies to promote the long-term development of physical education teaching in universities in our country.

1. 1 Helping to Promote Innovation and Improvement in Teaching Methods

The rapid development and widespread use of the Internet have contributed to the development. The era of "Internet+" is gradually approaching. The advent of the Internet+" era has brought development opportunity and great challenge to the PE teaching in universities, and has brought about some changes in all aspects of PE teaching in universities. Because of the influence of examination-oriented education, schools, teachers and parents all attach more importance to students' academic achievement and examination scores. Some schools do not pay much attention to physical education, and some schools do not even care about the teaching conditions of PE curriculum. The traditional mode of PE teaching mainly consists of teaching students to participate in basic sports activities, such as running and basketball. Students in the university stage are relatively free and mature. They are not very interested in a single traditional model of physical education. Usually, a physical education teacher needs to teach dozens of students. It is difficult to ensure the overall quality and efficiency of physical education. It can promote the good development of the university's PE teaching in the background of" Internet+" and strengthen the teaching of the theory of sports system effectively through the scientific use of the Internet platform, and make the difficult knowledge of physical education into video for broadcast.

1. 2 Helping to Promote the Personalized Development of University Students

With the widespread use of the Internet, many students are already using it. Start online learning with the Internet and connect to the InternetThe Internet is a good way to communicate with teachers and classmates, which is also a popular way to learn in the era of Internet+. Students can access and master more learning information and resources through the Internet, and the information sharing function of the Internet is effective in expanding students' knowledge, make use of leisure time, communicate and communicate with teachers at any time through the use of the Internet platform communication module, and ask questions to teachers, and receive teachers' feedback in a timely manner. Students can also participate in online learning interaction through the use of Internet platform, and give reasonable suggestions and opinions according to the actual application status and learning situation, which will help to enhance the rationality and systematicness of the sports knowledge structure. Because many students do not pay enough attention to physical education, the combination of the Internet and the university's physical education teaching can help expand the university's physical education resources, promote the diversification of the university's physical education teaching methods and methods, and use the Internet technology to make interesting teaching methods, so as to promote students' athletic ability and physical quality and individual development effectively.

II. THE REFORM OF COLLEGE PHYSICAL EDUCATION TEACHING IN THE AGE OF "INTERNET+"STRATEGY

2. 1Strengthening the Reform of the Principles of Physical Education in Universities

First of all, they are influenced by traditional educational thinking, which leads to very More schools, teachers and students attach great importance to PE teaching Inadequate, mainly because school managers and teachers do not fully realize the importance and necessity of physical education, and the teaching concept does not reform and change with the change of times, the traditional teaching idea is no longer suitable for the development of physical education in universities under the age of "Internet+". Traditional PE teaching mode is more inclined to practice class teaching, that is, to arrange students to take part in sports training, but neglect the teaching of sports theory. In addition, students at the university level are free to study and are more interested in cultural subjects, so they are not enthusiastic about participating in physical education activities. In the era of "Internet+" we should strengthen the innovation and

reform of the concept of physical education teaching in universities, and use the information technology of the Internet to formulate the teaching method and sports training plan suitable for contemporary college students. School managers and physical education teachers should have a clear understanding of the importance and necessity of physical education teaching, through physical education teaching can help students to exercise consciousness, integrate Internet information technology into physical education activities, fully arouse students' interest, so that students can actively participate in physical education, so as to improve students' physical quality and promote their healthy development effectively.

2. 2 Strengthening the Reform of the Teaching Methods in Physical Education in Universities

Traditional Physical Education in the Age of "Internet+"The way is no longer enough to satisfy the learning needs of the contemporary college students. It is also one of the reasons why the physical quality of contemporary college students is decreasing. Through the rational application of Internet information technology and strengthening the innovation and reform of the physical education teaching mode in universities, it can break the fetters and fetters of traditional teaching mode effectively, can help realize the diversification and systematization of physical education, and can help meet the learning needs of contemporary college students. First of all, we can accelerate the construction of physical education platform based on the knowledge of physical education textbooks and the theory of difficulty points, so that students can learn and master sports skills in an all-round way. Through the integration of the Internet and university PE teaching, we can turn the static and boring textbook knowledge into vivid video form, which not only facilitates students to learn and master relevant sports knowledge points, but also to arouse students' subjective initiative, for some students with poor understanding and receptivity, we can help them to understand and grasp the theoretical knowledge of sports system.

2. 3. Strengthening the Innovation of the Resources of Physical Education Teaching in Universities

Usually, many schools have practical and practical aspects of physical education. The effect of teaching is not very important. There are even some PE teachers. In order for students to get credit through physical education examination and to carry out practical teaching, students are arranged to participate in physical education training as soon as they arrive at physical education class, and they usually run and basketball, but ignore the teaching of theoretical knowledge, which is the main source of physical education teacher's explanation and practice according to the teacher's demonstrated sports activities, which causes the university's physical education resources to be seriously lacking. In the background of the "Internet+" era, we can build a systematic database of sports knowledge and teaching resources through the scientific application of Internet technology, and strengthen the integration of theoretical knowledge and practice training. Physical education teachers can incorporate resources such as data collection and

integration into the physical education resources platform, where students can access rich information and information on the learning platform, helping to enrich and enrich the students' knowledge base. In the era of" Internet+" the traditional classroom teaching method develop into diversified ways, can share teaching resources effectively, can provide sufficient teaching resources, strengthen students' understanding of sports knowledge, at the same time build up the platform and database, expand students' access to and study the overall efficiency of PE teaching effectively, so as to promote the healthy development of PE teaching in universities.

2. 4 Strengthening the Innovation of the University's Physical Education

In the past, the teaching process of physical education at universities was mainly dependent. Using teachers to explain and promote physical education to students in class Knowledge, which usually occupies the dominant position in classroom teaching, students are more passive in learning. This kind of learning condition and method cannot fully arouse students' interest in learning, and neglect the students' subjective position, thus cannot guarantee the quality and effect of the college PE teaching effectively. In order to fully mobilize the students' subjective activities, first of all, we can strengthen the organic combination of on-line and off-line teaching through the scientific use of information technology, and make full use of on-line teaching and off-line teaching. Teachers can upload their own courseware, such as APP and videos, to online platforms, making it easier for other students to learn online and to get more outstanding information about sports. Because of the relatively easy time for university students to teach, students often need to learn self-awareness. When students learn in their spare time, they can get help from teachers through the Internet. Through online communication, teachers can receive the feedback, not only help students to interact amicably, but also help them solve problems. "In the age of "Internet+", by combining the Internet with the university's PE teaching, we can effectively expand the students' access to knowledge of physical education and help them develop their learning methods, which will help to stimulate students' enthusiasm in learning and fully implement them. " a student-centered teaching philosophy.

3. CONCLUSION

In summary, with the rapid development of the economic age, The research and development of Internet information technology has been further intensified. In this way, the Internet information technology is developed and widely used, and it has a promising future in all fields of society. In order to promote the long-term development of physical education in our universities, we should strengthen the innovation development of sports teaching ideas, teaching methods, resources and learning methods, and improve the overall efficiency of physical education teaching in universities.

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Physical Education Teachers' Cognition and Countermeasures of Physical Risk

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Abstract: While the progress of the domestic school physical education curriculum reform is accelerating, the content of physical education is also diversified, and the teaching of optional courses is gradually increasing. This survey mainly uses questionnaire survey method and personal interview method to randomly survey physical education teachers in Changge City middle schools, and conduct personal interviews with randomly selected individual teachers. According to the investigation, the main problems are: physical education teachers do not know much about physical education risks, the harm of physical education risks has no relevant restrictions on physical education teachers, the related system of physical risks is not perfect, and the school's management of physical education equipment is not comprehensive.
Keywords: PE teacher; PE risk; Cognition and avoidance

1. INTRODUCTION

The areas in which the sports risks of Changge City Middle Schools occur are diverse and multi-faceted. In the main areas where school sports risks occur, the proportion of extracurricular sports training is as high as 66.67%. Through interviews with some teachers, they clearly stated that: extracurricular training lacks relevant guidance from physical education teachers, poor self-organization ability of students, and weak safety awareness, which are often caused by The main cause of sports risk. However, sports risks in the field of physical education training and competition accounted for 16.67%. This trend puts forward strict requirements on physical education teachers. It also investigates the areas where sports risks have occurred in various schools. In the areas where school sports activity risks occur, the probability of sports risks occurring in physical education classes is as high as 38.89%, and the proportion of sports risks occurring in extracurricular sports activities cannot be ignored. From the analysis of the main areas where sports risks occur, the field of extracurricular physical exercises has the highest probability of sports risks. We can clearly question the professional quality of physical education teachers and the safety awareness of students. Physical education is organized and managed by teachers. The probability of physical risks is still so high. This reveals that we have to think about education. Effective measures taken by the department.

2. THE STATUS OF TEACHERS' PERCEPTION OF SPORTS RISKS

2.1 A Survey of Teachers' Awareness of Sports Risks

According to the survey of teachers' awareness of sports risks, only 10% of the physical education teachers in the five senior middle schools in Changge have a very good understanding of sports risks, and 30% do not. This phenomenon indicates that the physical education teachers in the middle schools in Changge have less knowledge of sports risk and lack of knowledge of sports risk.

2.2 PE classroom teaching risks

The highest probability of sports risk is the risk of sports classroom teaching. A complete physical education class includes: preparation part, basic part, and end part. In the questionnaire interviewed by PE teachers in middle schools in Changge City, PE teachers reflected that 45.25% of sports risks occurred in the preparation part, 20.15% of sports risks occurred in the basic part, and 24.60% of sports risks occurred in the end part. The risk of sports activities has the highest probability of occurrence of sports risks in the preparation part. The main function of the preparation part is to increase the temperature of a part of the muscles, reduce the viscosity of the muscles, and prevent sports injuries. Preparatory activities must be sufficient before physical exercise, so as to reduce the sports injury caused by the violent muscle contraction and improve the functional level of internal organs. One of the functional characteristics of internal organs is greater physiological inertia, that is, when the muscles maximize their functional level, the internal organs do not immediately enter the "optimal" state of activity. This greatly increases the possibility of sports risks. The probability that sports risk occurs in the basic part also occupies a certain percentage. During the interview, the physical education teacher clearly stated that it is mainly because the physical education teacher's classroom organization and management ability and the student's awareness of physical risk are weak that cause the physical risk. High school physical education teachers have not yet fully understood the health and athletic ability of students. They believe that high school students already have the corresponding athletic ability and skills, and lack attention to a comprehensive understanding of the specific conditions of high school students. This may cause students' physical risks; students are learning. There is a gap between some abilities and goals; teachers use improper auxiliary and protection methods in student practice; exercise methods are not suitable for learners to participate in or activities, there is no inspection of venues, equipment and other equipment, and there is no risk factor. Predictive, inadequate or inappropriate arrangement of warm-up exercises; lack of professional ability of physical education teachers; physical education teachers are not familiar with first aid procedures; physical education teachers lack first aid knowledge and professional ability, lack of first aid measures for student injuries; improper

organization of physical education classes, Physically punishing students, improperly or failing to take first-aid measures in response to a student's injury. Will pose a threat to the safety of students. The probability of the ending part is very small. The relevant teachers indicate that the sports injury accidents in the ending part are mainly due to the teacher's dragging the class and the students expecting to dismiss the get out of class. Under this situation, the probability of the students obeying the teacher is reduced. Avoidable risks.

2.3 Investigation on the risks of sports equipment

Through the investigation of the venue equipment of Changge City Middle School, the main risks in sports equipment are: non-standard sports venue equipment, unreasonable management of sports venue equipment, lack of normal maintenance and maintenance of venue equipment, including school sports Sports venues that do not meet the specifications account for 25.13%. For example, some middle school sports venues are not the standard 400-meter track; the sports venues are improperly managed, accounting for 32.33%. For example, the entry of animals during physical education classes causes panic or panic to students. It is dangerous; 42.54% of the equipment lacks normal maintenance and maintenance of the equipment and equipment, and the equipment of the sports equipment is incomplete; the management of the equipment of the sports equipment is unreasonable; the equipment and the equipment lack the normal maintenance and maintenance; the first aid and the school sports injury Insufficient preventive measures; the low safety factor of school sports venues can not guarantee the safety of students, which will increase the probability of sports risks. For example, the damage of the school's sports equipment can no longer meet the teaching requirements. If the horizontal bar is exposed to the outdoors for a long time, it is inevitable that there will be rust. In this way, the physical education teacher must carry out strict inspection of the equipment. So as not to break due to the corrosion of the equipment, fall and hurt the student or it is easy to cause the student's arm to be worn and cause sports injury. In this case, the sports equipment venues of various middle schools in Changge City have great safety risks. This requires the management departments of the relevant schools to strengthen the safety factor of the school venues, so as to ensure the normal development of school physical education and the comprehensiveness of students. Healthy development.

3. THE STATUS OF PHYSICAL EDUCATION TEACHERS' RESPONSE TO SPORTS RISKS

3.1 Refer to relevant laws and regulations

Teachers should have relevant legal knowledge when dealing with sports risks, and protect their own safety and legal rights. Some physical education teachers reported that "schools will cancel more difficult sports, " and "highly difficult and dangerous sports or sports with obstacles are generally not carried out in schools." This illustrates two problems: First, although the Ministry of Education promulgated the "Measures for Handling Student Injury Accidents" in 2002, this is currently the only national administrative legislation dealing with

student injury accidents in my country, and some provinces, municipalities and regions have also issued regulations on student injury. Regulations and regulations on the handling of injury accidents. School sports injury accidents are a type of student injury accidents, and the relevant laws and regulations promulgated by the above-mentioned countries and localities apply. These laws and regulations all put forward specific requirements for the prevention and handling of personal injury accidents that occur during the school life of students. These are the important legal basis for school sports administrators to deal with school sports injury accidents. However, the lack of guidance for the development of school sports work and the unclear implementation of the work have led to the lack of optimism in the management of sports risk work at this stage; second, my country's school sports risk management legislation is insufficient, and the policies are not sound enough, and law enforcement is supervised. The intensity is too small, the implementation of responsibilities is not clear enough, and the interests of school physical education teachers are not protected. This shows that when we understand the relevant laws and regulations, we can effectively protect our legitimate interests in accordance with the law when we encounter sports risks related to ourselves.

3.2 Sports risk management policy formulated by the school

In order to prevent the occurrence of sports risks, the school conscientiously implements and implements the spirit of the "Opinions" (Zhongfa [2007] No. 7) and actively develops the "Sunshine Sports for Hundreds of Young Students". At the same time, the Ministry of Education, the Ministry of Finance, and China Insurance The Supervision and Management Committee has decided to implement an accidental injury school liability insurance system in senior middle schools across the country to increase schools' awareness of liability insurance, enhance their awareness of liability, risk and insurance, and strive to create a good combination of safety education and liability insurance. Atmosphere, promote the school to establish and improve the risk management service system. According to the survey of several middle schools in Changge City, the middle school physical education teachers stated that their school has formulated the "Sports Safety Management System", but they cannot equate safety issues with risk management issues. The school has serious risk management operations. insufficient. The school sports management system not only seriously lacks risk management regulations, but also does not set clear risk management goals. For example, 87.25% of teachers stated that they had not set risk management goals in their work, and more than 90% of physical education teachers claimed that they had never registered school sports risks. Such an approach would be detrimental to the school's strengthening of sports risk management, which in turn affected the school. The normal development of sports risk management.

3.3 Teachers' knowledge and skills of sports risk

If you want to do well, you must first sharpen your tools. The same is true for school sports risk management. To

solve problems related to sports risks, we must first equip our minds with advanced sports risk theories. In this way, schools are required to provide on-the-job education or pre-job knowledge and skills training. However, it is learned from the survey that most physical education teachers have made it clear that they have not experienced training and learning in this area at all. The study of knowledge theory is mainly obtained through the media of their own learning in colleges, the Internet, and the case around them. The information, the level of understanding of physical education risk of physical education teachers is only defined in the heard. The risk of school sports injury accidents is mainly the risk that students appear in the specific activity of participating in sports activities at school. It is the risk that students may encounter in all stages or links of participating in sports activities, that is, there is the possibility of injury accidents during activities. Sex. The risk of school sports injury accidents is caused by unfavorable conditions of sports activities or interference events, which are uncertain and sudden. The result is that students may be injured during sports activities. The existing risks are mainly divided into the risks from the students themselves and the risks from the physical education teacher and the activity environment and other aspects. There are various risks and combinations of these risks in students' physical activities, and the possibility, frequency and severity of their occurrence are also different. In view of different levels of sports risks, our current management of sports risks needs to be improved. There is no clear and specific relevant policies for guidance. Due to the lack of funds in relevant physical education teaching, some sports projects in the school cannot be carried out normally, such as goats in gymnastics, horizontal and parallel bars, etc., which reduce the teaching content to a certain extent. Difficulty, so that the content of sports becomes simplistic, which cannot meet the needs of students at this stage. Therefore, it is necessary to continuously improve policies and provide support in actions, so that physical education teachers in various middle schools can earnestly implement the requirements of the new physical education syllabus under the guidance of the policy. The survey data shows that 61.54% of physical education teachers will seriously consider the venue equipment and design teaching plans, and 9.15% of physical education teachers said that they will actively consider the physical education that may occur in the teaching process according to the needs of teaching management requirements and the cases that occur around them. Risk problems and the use of a series of reasonable first aid measures for problems.

4. CONCLUSION

The areas where sports risks occur in senior middle schools in Changge City are diversified, multi-faceted, with high probability, low harm, and great influence on physical education teachers. There is a higher proportion of males in high school sports and the risk-occurring population, and the school-age group has the highest probability in the first grade. Physical education teachers have little knowledge about sports risks and lack of first aid knowledge about sports risks. The senior middle schools in Changge City have imperfect sports risk management related systems.

Improve the risk awareness and sense of responsibility of physical education teachers, and increase physical education teachers' knowledge of sports risks. Physical education teachers should also strengthen the cultivation of students' awareness of risks in sports activities, and establish a safe view of sports, a comprehensive view of physical fitness, a correct view of skills, and a good moral view. Physical education teachers need to strengthen the safety inspection of activity equipment, ensure the safe use of equipment, and urge the school's equipment management department to strengthen the maintenance and maintenance of sports equipment and equipment. Choose different management strategies according to the accident rate of sports risk and the severity of the injury. Conduct regular or real-time evaluation and improvement of sports risk management countermeasures.

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Investigation on The Current Situation of Badminton Development in Junior Middle Schools in Poor Counties

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Abstract: In order to understand the current situation of the development of badminton in Pubei junior middle school, this paper takes the current situation of the development of badminton in Pubei junior middle school as the research object, using the methods of literature review, questionnaire survey, interview, mathematical statistics and so on; from the school leaders' attention to the development of badminton, this paper makes a comparative analysis in the field facilities, teachers, teaching and so on Analysis; and put forward suggestions for the existing problems, in order to provide a useful reference for the extensive development of badminton in Pubei County junior high school. Research shows that: Pubei County junior high school badminton venues and facilities are insufficient; Pubei County junior high school badminton teachers are relatively weak; Pubei County junior high school badminton curriculum arrangement is not reasonable; school leaders do not attach great importance to it, but students love badminton more. Badminton in Pubei County urban junior high school cannot get better development, looking forward to further improvement.
Keywords: Poor Counties; Middle School; Badminton; Sports

1. RESEARCH OBJECT AND METHOD

According to the notice of "healthy China 2030" issued by the CPC Central Committee and the State Council, it has become the primary task of school physical education at the present stage to strengthen school physical education, actively carry out extracurricular physical training, cultivate students to actively participate in physical exercise, and further improve students' physical health level; with China's badminton constantly making outstanding achievements in the international and national level With the improvement of popularity, badminton has attracted more and more attention. Relevant research shows that badminton is one of the sports with high degree of participation, and the number of badminton lovers in China is gradually increasing. Badminton has the advantages of strong appreciation, interest and entertainment. Badminton can bring infinite fun to people. With the further deepening of the reform of teaching mode and quality education in primary and secondary schools, school badminton class is becoming more and more popular The establishment of Cheng can effectively cultivate students' habit of exercising in their spare time, which plays a great role in enhancing their physical quality and improving their psychological quality.

Relevant research shows that the current middle school students have heavy learning burden and do not like sports, which leads to poor sports ability. Badminton has the advantages of small amount of exercise, easy to use, high safety and no physical confrontation in the process of sports At the same time, it can cultivate students' positive spirit and good perseverance, which is very in line with the behavior of middle school students' exercise. It can be seen that further deepening the extensive research on badminton has important practical significance.

Huangchuan County is located in the south of Henan Province, with a total population of 920600. However, the current situation of badminton development in junior middle schools in Huangchuan County, the participation of students, whether the school facilities and teachers can meet the actual needs of students, and so on, has not been studied. Therefore, this paper takes the current situation of badminton development in junior middle schools in Huangchuan County as an example As the background, its purpose is to understand the local school badminton venues and facilities, physical education teachers, teaching status, students' extracurricular practice and students' sports motivation to carry out investigation and research, and to find out some useful theoretical basis, to provide some effective help for the development of Huangchuan County junior middle school badminton.

1.1 research objects

The research object of this paper is the current situation of badminton development in junior middle schools in Huangchuan County.

1.2 research methods

1.2.1 literature method

By consulting the relevant books about the development of middle school badminton in China HowNet Journal of Zhoukou Normal University Library, and collecting the journal papers and related materials about the development of middle school badminton through China HowNet, we can comprehensively understand the current situation and frontier trends in the research field, and provide reference for the topic selection of the paper, the design of the questionnaire and the analysis of the research results Solid theoretical foundation.

1.2.2 questionnaire survey

In this paper, after consulting the relevant literature, according to the research content of this paper, we use stratified random sampling to select Huangchuan middle school, Huangchuan second middle school, Zhanghuang middle school, Jinpu middle school, Huangchuan foreign language middle school, Longmen middle school; design

two types of questionnaire. Four hundred questionnaires were sent out from the students' questionnaire on the current situation of badminton development in junior middle schools in urban area of Huangchuan County (68 in Huangchuan middle school and Jinpu middle school respectively; 66 in Huangchuan No.2 Middle School, Zhanghuang middle school, Huangchuan foreign language middle school and Longmen middle school respectively); 380 valid questionnaires were collected, with an effective rate of 95%; 40 questionnaires were sent out from teachers' questionnaire on the current situation of badminton development in junior middle schools in urban area of Huangchuan County 36 valid questionnaires were collected, and the effective rate was 90%.

1.2.3 interview method

According to the needs of the research and school principals, sports team leaders and physical education teachers to visit the survey, and badminton to carry out exchanges and opinions.

2. ANALYSIS OF RESEARCH RESULTS

2.1 badminton facilities of junior middle schools in Huangchuan County

The survey results show that 96% of the students think that the facilities are very poor; 1% think that the facilities are standard and 3% think that they are average. After understanding that these students participate in sports less often, they do not have too high requirements for the venues, and think that they can use them; the survey results show that there are two venues in six schools, namely Huangchuan foreign language middle school and Jinpu middle school, However, there are no badminton racks and nets; the other four schools have no professional venues.

Field visits found that the six schools have common characteristics, school basketball court, volleyball court in the majority, and learned that badminton lessons are generally in the volleyball court, the six schools have a common ground phenomenon, the lack of venues and facilities is very poor, the school badminton court can not be reasonably arranged.

In terms of badminton equipment, these six schools all have badminton equipment, but the equipment is very limited. There are several classes in junior high school PE class, and the number of classes is large, so it can not guarantee that every student has a racket and a ball in his hand. Badminton racket can only meet the general technical learning, not suitable for professional learning. Badminton is a sport that consumes more equipment, Most of the racket lines of the school are worn, and most of the badminton is incomplete; coupled with the poor facilities, the venue is outdoors, and the weather conditions will also have a certain impact on Badminton Class, which in principle can not meet the needs of teaching and students for badminton, so long-term development will seriously frustrate students' enthusiasm for physical education and cultivate students' enthusiasm for badminton Only suitable facilities and sufficient equipment can better carry out badminton and teaching.

2.2 badminton teachers in primary middle school in Huangchuan County

The results show that there are 36 physical education teachers in the six schools, 30 in basketball, foot, volleyball and track and field, 3 in the field of table tennis, martial arts, gymnastics and majors, and no teachers in Aerobics for the time being; only 3 teachers studying badminton, accounting for 8% of all the sports teachers, most of them have bachelor degree and have junior college degree The PE teachers with academic background account for a few, and the master degree is not. The education level of teachers is a very important indicator of the construction of teachers' team. It reflects the teaching level of teachers, is also the key to the smooth development of school sports and the improvement of the overall teaching of the school. Students will also be affected by the knowledge and theoretical level of teachers. It can be seen that the badminton teachers in primary middle schools in Huangchuan County are relatively thin, and the development of badminton can not be paid attention by the school leaders. The teaching focus of these six schools is on the development of big ball and track and field events, which leads to the school badminton sports not to be well developed, which seriously affects and hinders the development of badminton in primary middle schools in the urban area of Huangchuan County The school should introduce high-quality teachers to make badminton and teaching better implemented.

Through interviews, it is found that teachers have high enthusiasm for physical education, and believe that professional courses need professional teachers to teach. However, the school attaches more importance to students' achievement and promotion rate, and has not paid much attention to sports courses; it leads to the "sheep like" teaching status in Physical Education, while some classes directly regard physical education as cultural class, which leads to the decline of physical quality of some students, and the same as It makes students' morality, intelligence and physical development unbalanced, and it is not easy to form students' interest in badminton and exercise habits, and on this basis, it has hit the enthusiasm of PE teachers in class.

2.3 badminton teaching status of primary middle school in Huangchuan County

The results show that the six schools have set up courses of big ball and track and field, two schools have small ball courses, two schools have martial arts and gymnastics courses, and sports games have not been carried out at the school for a while; in the exchange with teachers, it is known that the school's big ball and track and field events have been well developed, which is because the school can better host the friendship between the freshmen The results of Table 4 show that the six school PE courses are mainly in the setting of big ball and track and field events. Through interviews, we learned that badminton has not been well developed in the primary middle school in Huangchuan County. Only two schools temporarily plan badminton into special courses and in the physical education teaching plan, both of them are better schools, which are better than other schools. The other four schools have not taken badminton as a special course for the time

being. Badminton class is equivalent to free activity class. The reason is that there is no professional teacher to teach and guide students. There are few professional badminton teachers, and the school leaders pay less attention to physical education and pay more attention to the rate of promotion.

Through interviews, we can see that badminton courses in these six schools are not opened in the whole school. Only the second grade of the primary school is opened, badminton is once a week, and the courses are not reasonably arranged; the third grade students are facing the middle school entrance examination, and they have two physical education classes every week to attend the class around the contents of the secondary school entrance examination, and also face the pressure of the entrance examination. Therefore, two physical education courses a week can not be guaranteed The other two grade students can choose their favorite sports equipment.

Through field investigation, it is found that most students choose badminton, have a high love for badminton and have a high interest in badminton; however, students in the process of playing badminton appear disorderly and have no standardized actions, do not know the rules very well, teachers do not correct them in time; teach badminton teachers to master the theory and skills insufficient, and give students lessons to students The explanation and demonstration of badminton is relatively simple, and the teacher has not conducted in-depth teaching and explanation. The course content is relatively single, which leads to the limitation of students' learning; the course of badminton is not provided with good substantive teaching; therefore, it is known that the primary school badminton movement in the urban area of Huangchuan County is not well developed, which needs to be popularized and improved.

2.4 after class badminton practice of junior middle school students in Huangchuan County

The results show that boys tend to choose basketball, football and badminton, accounting for 25%, 14% and 17% respectively, while girls mostly choose badminton, accounting for 24%. It can be seen that boys prefer sports with strong physical antagonism and high intensity, while girls prefer sports with small amount of exercise, such as net sports and other sports Through the data, it can be seen that boys' choice of badminton is slightly lower than that of girls; this also shows that in these sports, badminton is more popular among girls, and the choice of badminton in these sports is only second to basketball; after communication with students, students practice badminton less frequently, and the school is more competitive There is no organized badminton competition. Due to the restriction of school venues and equipment and the lack of correct understanding of badminton, the school has no clear requirements for students' extracurricular practice, and the practice time is generally more than 30 minutes, which is freely arranged.

3. CONCLUSIONS

3.1.badminton venues and facilities are poor, equipment is limited, schools have the phenomenon of sharing venues, at the same time, students' demand for badminton is restricted.

3.2 the lack of badminton teachers in junior middle schools in Huangchuan County leads to the lack of professional teachers' guidance in teaching and the lack of substantive teaching in curriculum setting.

3.3 the school's physical education mainly focuses on the development of big ball games and track and field sports. The development of badminton has not been paid attention to by the school, so that badminton has not been well carried out.

3.4 students practice badminton after class less times, the school has no specific requirements, are free organizations.

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Research on Henan's External Communication Strategy Under the Background Of COVID-19

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Abstract: In the context of COVID-19' s major public health emergencies, xinhuanet. com Henan channel, Henan radio, Dahe newspaper, Henan legal journal and other media platforms have been actively playing the good tradition of public opinion oriented and omnidirectional information dissemination, spreading the content of epidemic policy, collecting live news reports and epidemic prevention knowledge, and spreading to the general public. People convey the most vivid, true and objective anti epidemic content to complete the guidance and regulation of positive ideas and values, social network public opinion, and meet the needs of correct value orientation of external information dissemination.
key word: COVID-19; Henan; external communication; strategy

1. INTRODUCTION

The novel coronavirus pneumonia news before and after the Spring Festival in 2020 has spread rapidly in the domestic or international network platform, and even to some extent, it has caused some people' s panic. Under this situation, novel coronavirus pneumonia epidemic situation, government action and folk reaction are reported by selecting objective and accurate news or information reporting angles, which has become the focus of attention of different regions in radio, television and newspapers. Taking the response of Henan media to the public opinion of COVID-19 news reports as an example, this paper discusses the implementation strategy of information and news external communication with the help of new media under the network environment, so as to ensure timely clarification of COVID-19's false news and timely broadcast of accurate information.

2020In the process of the outbreak, the number of infected people increased to the gradual outbreak, the rapid spread of different news information in the network made the ordinary people panic about the epidemic itself and the development of the epidemic situation, and a variety of discussions and false rumors were rampant. First of all, western countries restrict the entry of Chinese tourists and social activities, and cancel China' s direct flights to other countries. Later, China also closed Wuhan City, requiring all people in China not to leave, which exacerbated the panic of the public. The main reason for this problem lies in the fact that the news media failed to convey accurate and objective COVID-19 information to the public in the shortest time.

2. EPIDEMIC PUBLIC OPINION CAUSED BY MALICIOUS RUMORS OR DEFAMATORY INFORMATION

China's novel coronavirus pneumonia China is spreading all over the world, and the number of confirmed cases in the United States and Europe has been rising. China's stigma and rumors have been increasing. The spread of false information such as "Chinese virus origin theory" and "Wuhan pneumonia" not only reflects the western media's habit of violating occupation ethics, but also seriously damages China. The positive image of the international community has led to extensive discussions on COVID-19's opinion in the domestic network. Although these fabricated false rumors, malicious rumors, pseudo-scientific arguments and other information will not affect the domestic people's ideas, but make the whole network public opinion ecology gradually deteriorate, so we should take corresponding information control measures to stop them.

3. THE COMMUNICATION DILEMMA OF LAGGING EPIDEMIC INFORMATION OR NEWS REPORTS

With the control of novel coronavirus pneumonia in China, international COVID-19 has become a public health emergency of universal concern. Different media in China have begun to show a tendency toward normalization of epidemic information or news reports. However, due to the lag of some news media on COVID-19, the news dissemination has been restricted and negative news content has been spreading. Moreover, when most ordinary people do not know the truth, they may listen to the unreasonable double standards of the international community and their negative views on a united anti epidemic incident. For example, on April 7, 2020, China sent a medical rescue team to the UK, but it was abused and accused by the western media, and the spread of the epidemic "threw the pot" to China. However, the domestic news report on the epidemic lags behind, which makes the public opinion control and event interpretation of the epidemic deviate.

Two, Henan media COVID-19 information or news external communication innovation strategy research

1. Timely dissemination of authoritative COVID-19 news information with traditional media

Novel coronavirus pneumonia has been reported. Authoritative media such as the people's daily, Xinhua news agency, cctv. com and other news media have released the news about epidemic development and epidemic prevention and control in the first time. The news media in Henan also entered Wuhan in accordance with their superiors' requirements, and did not report on the spot interviews in the first place. On January 31, 2020, three special reporters from Dahe Daily rushed to Wuhan to interview and write the liveliest anti epidemic news at different times by implementing the 24-hour duty system, and then sent back to the operation and

maintenance center of the provincial government through network channels to release authoritative information and real-time news about the epidemic situation to the outside world.

At the same time, Henan Legal Daily also set up the brand column of "live broadcast of law" to report the epidemic news in Henan and Wuhan by means of on-the-spot interview. For example, "my family is in Wuhan, focusing on the life of ordinary Wuhan citizens", "Henan epidemic prevention and control is further upgraded, and we go deep into the front line to inquire about the epidemic prevention status of the return expressway", and also broadcast every epidemic news conference held by the provincial government in the form of live video. Li Donghong, chief editor of Henan Legal Daily, also published articles on the Internet micro news client, such as "leading cadres should have the courage to take responsibility in the battlefield of" epidemic "and" building confidence in victory with noble and upright spirit ", reporting the advanced deeds of Party members and cadres in various regions, Red Cross Society and other main bodies, holding the feelings of their country and taking responsibility, as well as the news that the confirmed cases were discharged after diagnosis and treatmentTo enhance the determination and self-confidence of ordinary people to participate in epidemic prevention and control.

2. Using Internet media to clarify false news rumors and slander

The holographic, full effect and full range characteristics of the new media information dissemination on the Internet will help COVID-19's information or news release and respond to false rumors and false rumors in a timely manner. In February 12, 2020, Hubei novel coronavirus pneumonia case was newly diagnosed in 14840 cases, causing some regional public questions and panic: "why is the number of confirmed cases increased so much in 1 days? "After that, Zhengzhou radio station in Henan broadcast the media platform like WeChat public address and so on. What is the reason behind the official account explosion? Here comes the expert interpretation! "To explain the different ways of diagnosis to the public.

Foreign media, such as the United Kingdom, France, Germany, Italy and other countries, began to issue a series of false rumors with the titles of "there are super communicators", "super communicators have appeared", "the mode of infection and serious harm of super communicators". After the rumors came, the news media of Henan radio and TV station, elephant news client and other news media, the elephant news client issued the new national media platform, including micro-blog official account, WeChat public number and Tencent news, and released the "national Wei Jian committee": there is no news about the "super communicator" epidemic, which is in response to the general public's concern about the current development of the epidemic situation, and smash malicious rumors. Slandered untrue rumors.

3. The anti epidemic news and touching stories are mainly based on Chinese stories

The external communication of China's "anti epidemic story" is an important channel to publicize positive values and spread a good national image. It is also a "window" to enhance China's international influence and let countries in the world understand China. Under the guidance of this value orientation of external publicity and communication, Henan media make full use of the communication form of Internet new media to tell the moving stories behind the fight against the epidemic through the combination of text, pictures, video and audio. They get a lot of watching, transmitting and comments on different platforms, and arouse strong resonance among the general public at home and the international community.

For example, Dahe Daily, Henan legal news, Henan Radio and television network clients, with the help of microblog, wechat, Toutiao, penguin and other third-party platforms, tell touching stories of front-line medical staff, police officers, as well as ordinary express brother, takeout brother and Breakfast owner in society. Among them, Dahe Daily launched the "face" feature column of Henan video, with the theme of "Henan man crying under the car to see off Wuhan wife, I love you!"Let people see the touching scene of Zhengzhou medical staff supporting the front line and rushing to Wuhan. The official account of Henan legal system published on the WeChat public address: "9 year old daughter wrote to my father, I am worried about you, but I can't help you, because you are a people's policeman". The special program of Henan radio and TV station, "campaign diary", was reprinted by the people's daily, cctv. com and other rights Witkey households, causing widespread reading and discussion of the netizens, and strengthening the common masses to overcome difficulties and epidemic. The self-confidence of Bing Sheng has greatly improved the credibility and influence of the official news media on the spread of anti epidemic.

4. EPILOGUE

The novel coronavirus pneumonia epidemic information dissemination proper response, requests the broad traditional media, the new media social channel, displays its immediate information interaction dissemination, the social public opinion guidance function. According to the network malicious rumors, international slander and other untrue information, Henan Radio, Henan Legal Daily, Dahe Daily and other mainstream media take the initiative to guide their own social public opinion and report the real news, and organize and disseminate the anti epidemic text, pictures, video or audio information, so as to realize the objective communication of correct ideas, values and epidemic newsOutside broadcast.

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Research on The Cultivation of Information Technology Literacy of Primary and Secondary School Teachers

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Abstract: With the rapid development of Internet interaction technology, big data and cloud computing technology in China, information technology professional courses also begin to enter the primary and secondary school classroom, and are taught by teachers with relevant experience, which puts forward higher requirements for teachers' information technology literacy. Starting from the development of information technology courses in primary and secondary schools, this paper analyzes the cultivation of teachers & apos; information technology professional skills and professional quality, and puts forward the training strategies of information technology practical application such as network courses and migration orientation.
key word: Primary and secondary school teachers; information technology literacy; training; strategy

1. THE SIGNIFICANCE OF INFORMATION TECHNOLOGY SKILLS AND LITERACY TRAINING FOR PRIMARY AND SECONDARY SCHOOL TEACHERS

As the most advanced technology in the new era, information technology is of great importance to social economy, industrial upgrading, education and teaching. In this case, primary and secondary school teachers should focus on information technology professional skills, professional quality and other aspects, make their own information technology application, teaching ability review and reflection, and the majority of primary and secondary schools should also vigorously introduce network information technology theory, online course teaching mode, carry out information technology education and training for teachers, professional ability training, and constantly improve teachers' ability in information technologyProfessional skills in teaching.

1.To meet the teaching needs of information technology courses at different levels

In the information age, the training of teachers' information technology theoretical knowledge and practical education skills is based on the opinions of the Ministry of education on the implementation of the national primary and secondary school teachers' information technology application ability improvement project 2.0, and the organization of relevant network teaching resources and classroom teaching contents according to the information technology teaching materials and professional teaching requirements of different school age stages.Therefore, adopting the information technology theory that meets the teaching requirements of primary and secondary schools and teachers' needs, strengthening the integration of information technology professional content and computer education can ensure the smooth development of information technology curriculum education activities in different school age stages.

2.Promote the resource sharing and practice exchange of information technology education

Compared with the traditional education in which teachers learn information technology textbooks by themselves, online courses such as MOOC, micro class and flipped classroom are the main channels for information technology teaching and training. More information technology resources can be collected from the network and uploaded to the corresponding teaching platform for teachers to consult and learn, so as to realize the sharing of diversified educational resources.Moreover, the centralized face-to-face teaching and video lecture teaching and training of network courses provide primary and secondary school teachers with opportunities for classroom participation and online practice, including the answers of basic information technology multiple-choice questions, blank filling questions or application questions, as well as participating in the computer simulation practice training in the network platform.

3.Improve teachers' IT knowledge reserve and teaching ability

With the rapid development of MOOC, wechat, flipped classroom and other online teaching means, as well as microblog, wechat, QQ and other interactive media, primary and secondary schools can carry out all-round information technology theoretical knowledge and practical English education and training for teachers' information technology professional education ability and professional quality without the restrictions of space, time and place.At the same time, teachers can also choose the information technology content they need according to their own information technology knowledge, carry out active and independent inquiry learning, and improve their information technology knowledge reserve and professional teaching ability.

2. THE PROBLEMS OF INFORMATION TECHNOLOGY APPLICATION ABILITY AND PROFESSIONAL QUALITY EDUCATION OF PRIMARY AND SECONDARY SCHOOL TEACHERS

1.Information technology education lacks the concept of skill training based on teachers

Traditional information technology education, teaching

and training usually focus on the transmission of basic information technology theory.Usually, in the spare time of winter and summer vacation, we take the way of face-to-face knowledge explanation to cultivate the information technology content and professional application ability of primary and secondary school teachers.But in the whole process of information technology classroom teaching, it is still based on the unified education of "large class teaching". The trainers explain the basic information technology theory in the classroom, and the teachers passively accept the course content.Therefore, the development of information technology education and training activities ignores the teachers' information technology knowledge reserve and learning status, and seldom carries out the application training of professional skills, which makes some teachers lose their subjective initiative in learning.

2.The education content and teaching method of information technology training are single and old

The education of information technology teacher training in primary and secondary schools mainly focuses on the syllabus of teaching materials, specific theoretical knowledge, and the organization design of the whole teaching and training content.However, due to the obsolescence of information technology teaching materials, the theoretical knowledge of information technology involved in them can not be used as the guidance of information technology curriculum education in the new era. Therefore, these information technology teaching contents have little effect on Teachers' teaching guidance and promotion.At the same time, some primary and secondary schools do not pay attention to the development of information technology courses in the setting of teaching methods of information technology major. There are few professional skills training and learning time for information technology education, and there is no "enlightening and guiding" classroom teaching situation. In the classroom, the use of multimedia technology and PPT courseware for information technology practice education is also very few, especially the participationThe lack of hardware facilities of information technology practice leads to the serious formalization problem of information technology professional practice and application education.

3.Information technology education and training lack of interaction with teachers

Most primary and secondary school teachers are trained by experts and lecturers with relevant experience in video teaching of online lectures. According to their own information technology content learning situation and subjective needs, teachers carry out online and offline autonomous learning for different information technology theoretical knowledge and professional practice application content.However, the education, teaching and training of information technology courses rarely provide teachers with opportunities to participate in classroom interaction, and there is also a lack of online interactive communication window, which makes the teaching effect of information technology training poor.

3.　RESEARCH　ON　THE　STRATEGY　OF

INFORMATION　TECHNOLOGY　LITERACY TRAINING　OF　PRIMARY　AND　SECONDARY SCHOOL TEACHERS

1.Creating teacher centered educational situation of information technology transfer

The theory of "transfer education" is to introduce more relevant curriculum contents according to the basic knowledge that individuals have mastered, and to carry out "enlightening and guiding" education step by step, so as to achieve the expected teaching effect of different professional knowledge.First of all, starting from the concept of information technology and basic theoretical knowledge, set up the teaching situation of "problem introduction" as the main content of information technology, and lead teachers into the thinking and learning of information technology curriculum content and key and difficult problems, so that they can gradually understand the logical correlation between different theoretical knowledge and computer practice cases.After that, through the simple case setting of information technology teaching in primary and secondary schools, teachers are guided to review the information technology theory they have learned, so that they can transfer their thinking and solve problems in the practice of information technology specialty.

2.Strengthen the education of network information technology content and interactive practice

On the basis of the content teaching of information technology textbooks in primary and secondary schools, it is also necessary to introduce the extracurricular network information technology education content and online education means to continuously improve the information technology training activities for teachers, so as to achieve better professional skills training effect.Therefore, with the help of online teaching platforms such as MOOC, micro class and flipped classroom, we can organize and integrate the collected information technology theoretical knowledge and demonstration practice cases, and make them into multimedia education videos, which can complete the innovative teaching of teachers' information technology professional quality.

On the one hand, the network service platform of information technology in primary and secondary schools should be set up to collect, upload and store massive information technology resources for teachers to consult their own information technology teaching materials at any time in the learning of information technology teaching materials and extracurricular expanding knowledge content.On the other hand, the online and offline mixed education of information technology training should be strengthened. Generally, the network teaching content within 20 minutes should be set around the key and difficult knowledge, and the online interactive communication window should be provided on the relevant education platform. Learning tests, problem discussion, computer simulation practice and other activities should be carried out to improve teachers' information technology application teaching ability.

3.Pay attention to the assessment and evaluation of teachers' information technology application

teaching

The cultivation of primary and secondary school teachers' information technology literacy should pay special attention to the assessment and evaluation of teachers' information technology professional knowledge reserve and teaching ability. Through the setting of a variety of online and offline evaluation indicators, the objective and fair evaluation of teachers' information technology literacy can be ensured.For example, online evaluation is introduced into MOOC education platform, in which the test questions of basic information technology knowledge and practical cases are set to investigate the learning situation of teachers' information technology knowledge.Offline evaluation provides classroom teaching opportunities for different teachers by organizing information technology open courses, and makes objective assessment on their information technology application ability and teaching level, so as to realize the cultivation of teachers' information technology professional quality.

4.EPILOGUE

Under the situation of rapid development of Internet information technology, the training and education of information technology teachers in primary and secondary schools should rely on the concept of "migration education", and be led by various education and training departments. According to the information technology theory reserves and actual learning situation of different teachers, we should create a migration teaching situation in line with their subjective cognition, theory and practice needs, and carry out "enlightening and guiding" teachingInformation technology content education enables teachers to apply the basic theory content to the practical education of information technology courses, so as to achieve better results in personnel training.

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Research on The Development Model of Aging Service Industry in Henan Province

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Abstract: In the environment of population imbalance at different ages in China, population aging, aging and empty nest have gradually become the main problems that must be faced by the regional economic and social development. Based on the current situation and characteristics of population aging in Henan Province, this paper makes a comprehensive analysis and understanding of the construction of hardware facilities and software services of social service industry for the elderly, and puts forward development strategies in pension policy, investment and financing, talent introduction, service management and other aspects, so as to meet the diversified and professional pension service needs of the elderly.
key word: Henan Province; aging; pension service industry; development model

1. CURRENT SITUATION AND CHARACTERISTICS OF POPULATION AGING IN HENAN PROVINCE

Facing the increasingly severe situation of aging population, Henan provincial government and its relevant administrative agencies should start from the intelligent elderly care service industry, speed up the construction of all kinds of nursing homes, nursing beds and medical cooperation pilot institutions in the whole province through the support of pension policies and investment funds, and then integrate the diversified elderly care service resources around the community to truly realize the goalThe demand for elderly care, and the effective docking between online and offline elderly care services, improve the service quality of the elderly care industry.

1. The development of population aging in Henan Province

20Since the beginning of the 20th century, the growth rate of the elderly population in Henan Province has accelerated significantly. Since 2005, it has been growing at an annual rate of 3%. It is a severe challenge for social and economic development to "get old before getting rich". According to the survey data of Henan Aging Committee, in 2005, there were 8. 24 million people over the age of 60 in Henan Province, but in 2007, the number rose to 11. 22 million, accounting for 11. 96% of the total population of Henan Province. Then in 2020, the Henan population development report released by Henan Provincial Bureau of statistics pointed out that in 2020, the total population of Henan Province will reach 109. 52 million, including 16. 89 million elderly people, accounting for 16. 45% of the total population of Henan Province, and the aging degree will continue to deepen.

At the same time, because Henan Province itself is a labor exporting province, a large number of young people go out to work or live in other developed areas, which further deepens the development trend of the aging of the permanent population. Although in recent years, the birth population of Henan Province ranks among the top in China, according to the data released by Henan population development report, the birth population in 2017 is 1. 4 million, that in 2018 is 1. 27 million, that in 2019 is 1. 2 million, and that in 2020 is 991000, showing a downward trend year by year.

2. Analysis on the main characteristics of population aging in Henan Province

(1) The elderly population has a large base and a rapid growth trend. By the end of 2020, China's population over 60 years old has reached 253. 88 million, while the elderly population in Henan Province is 16. 89 million, accounting for 6. 65% of the total elderly population in China and 16. 45% of the total population in the whole province, which has evolved into a serious aging society. Moreover, in recent years, it has continued to grow at a rate of 3%. No matter in the number and growth rate of the elderly population, it has an absolute advantage in the whole country.

(2) The sex ratio of the elderly population is unbalanced. As the life expectancy of men is generally shorter than that of women, the gender difference in population mortality is obvious, and the number of elderly women is far more than that of men. According to the survey data of "Henan Province population aging Development Trend Prediction Research Report (2006-2050)", in 2024, the number of elderly population aged 60 and above in Henan Province will exceed the number of children for the first time. In 2048, the number of female elderly population in Henan Province will be 2. 5539 million more than that of male elderly population, and the proportion of female in the elderly population is larger. The sex ratio of each age group is decreasing with the increase of age, and the proportion of female population in the elderly population will gradually increase.

2. PROBLEMS IN THE DEVELOPMENT OF PENSION SERVICE INDUSTRY IN HENAN PROVINCE

1. Contradiction between supply and demand of hardware facilities in pension service industry

The lack of hardware facilities such as pension service institutions and pension beds is the main problem facing the development of pension service industry in Henan Province. The contradiction between supply and demand between the small number of pension beds and the large elderly population needs to be solved by local governments and relevant institutions. According to the Research Report on the market prospects and investment opportunities of China's pension industry from 2020 to 2025 issued by China Business Industry Research

Institute, "by the end of 2020, the number of pension institutions in Henan Province has reached 2527, with 208900 pension beds, which is the largest in China. "However, the number of elderly people in Henan Province has reached 16. 89 million, and there are still many elderly groups who can not enter nursing homes and enjoy care, medical treatment, culture and entertainment services. The main difficulties faced by the elderly residents in Henan Province are that they can not afford to live in public nursing homes and private nursing homes.

2. The pension service industry is lack of private capital injection

At the present stage, the investment and construction of pension service institutions in China is still dominated by the investment of civil affairs departments, and the investment scale of private enterprises in the industry of pension institutions is relatively small. The main reason for this problem is that it is difficult for pension institutions and apartments for the elderly to make profits in a short time. Most private enterprises are unwilling to invest in the pension service industry, and can only rely on government investment to reduce the deficit gap. For example, there are 21 nursing homes in Zhengzhou city of Henan Province, including 16 public nursing homes, and most of them are facing the loss of investment in pension services. The investment of Shuxin apartment for the aged is about 4 million yuan, and its monthly operating profit is only 1080 yuan, while Wanqing villa apartment for the aged is in a loss for a long time.

3. The lack of pension service talents and difficulties in operation and supervision

Most of the existing service personnel of pension institutions in Henan Province are laid-off personnel without professional qualification certificate. These personnel have low education background, lack of professional medical and nursing knowledge, and are unstable and mobile in the process of work. However, there is no clear leading organization for the supervision of the operation and development direction of the pension service industry. Instead, the Ministry of civil affairs, the Ministry of finance, the health and Health Commission and other departments jointly participate in the formulation of a series of market supervision norms, which leads to different levels of construction of the pension industry, uneven service levels and chaotic charging standards, making the supervision of pension service more difficult.

3. RESEARCH ON THE INNOVATION OF THE DEVELOPMENT MODE OF AGING SERVICE INDUSTRY IN HENAN PROVINCE

1. Government and private enterprises' collaborative investment in pension services

In the face of the increasing pressure of elderly care services, Henan provincial government should vigorously cooperate with social enterprises to invest in the establishment of elderly care service institutions, elderly apartments and other industries, so as to form a collaborative investment between the government and private enterprises. In particular, some local governments have limited financial funds, and the level of capital investment and planning in the pension service industry is not high. Through a series of industrial support, tax incentives and other policy support, actively absorb the strength of non-governmental organizations and social enterprises, and participate in the specific projects of the pension industry, which can effectively guarantee the financing of the industry, the level of pension service, and keep in touch with the local communityIt will adapt to economic development.

2. Improve the software and hardware facilities of the pension service industry

In terms of the development planning of the aging service industry, the most important thing is to continuously increase the number of pension institutions and the number of pension beds, as well as increase pension service projects and improve the service level. For example, more than 3200 pension institutions have been built in Henan Province. On this basis, 120 nursing homes will be expanded and 4000 new beds will be added. While expanding the scale of pension institutions, the balanced development of pension service industry projects and service demands in various regions will be coordinated.

At the same time, in terms of software investment in the elderly care service industry, we also use big data, cloud computing and other technologies to build the "12349" home-based elderly care service information platform, providing catering, bathing, cleaning, medical treatment, first aid and other services to the elderly. More than 3 million people have joined the network to participate in elderly care services, which fully meets the needs of community and institutional elderly care servicesFunctional requirements.

3. Improve the quality and management level of elderly service personnel

In order to ensure the market-oriented and standardized development of the pension service industry, it is necessary to start from the pension professional service personnel, through professional skills training and professional quality education, so that the nursing personnel and medical personnel who have been employed can hold professional qualification certificates, and constantly optimize the team structure and service level of pension professionals. After that, the Ministry of civil affairs of the people's Republic of China, as the main body, formulates the standard of home service and rehabilitation medical care for elderly care institutions, and strictly supervises the accommodation environment, diet and medical level of different elderly care institutions, so as to effectively improve the service level of elderly care institutions and the well-being of aging groups.

4. EPILOGUE

According to the international standard, as long as the population aged 65 or above is more than 7% of the total population, it can be called an aging society. Since 2000, Henan Province has entered the aging society, and the aging degree is deepening year by year. It further leads to the deepening of aging. Therefore, increasing capital investment, expanding the scale of pension institutions and professional service personnel training, and building a smart pension service industry can meet the diversified

service needs of the aging population.

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Research on College English Teachers' Informatization Teaching Ability and Its Influencing Factors Under the Background of Education Big Data and Informatization

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Abstract: On the basis of Internet information interaction, big data and cloud computing technology, multimedia software, PPT courseware, online education and other teaching methods have been introduced into the education and teaching of College English major courses to reform and innovate the existing "indoctrination teaching" course content and teaching methods. Based on the current situation of online and offline English education in Colleges and universities, this paper discusses the development of English teachers & apos; professional teaching ability and professional quality of information technology, as well as the influencing factors of English information course education, and puts forward strategies to improve teachers & apos; English information teaching skills.
keyword: Education big data; College English teachers; information teaching ability; influencing factors

1. THE MAIN CONNOTATION AND REQUIREMENTS OF COLLEGE ENGLISH TEACHERS&APOS; INFORMATION TEACHING ABILITY

At present, the Ministry of education of our country has printed and issued the "education informatization 2. 0 action plan" and other documents. Starting from the informatization of school curriculum education content and teaching methods at different stages, this paper puts forward the development strategy of comprehensively promoting the informatization teaching mode. In order to improve the quality of English classroom teaching and the level of teachers' information-based teaching, it is necessary to carry out the training of applied information-based education theory content and teaching application ability according to the existing English teachers' information-based awareness and network teaching ability.

1. Information teaching consciousness and education idea
The information-based teaching consciousness of College English curriculum education is to get rid of the old single concept of classroom explanation in the past, and use a variety of multimedia software, PPT courseware network equipment to carry out problem-based and enlightening English teaching. According to the learning situation of College English vocabulary, grammar, sentence and other theoretical knowledge of different students, as well as their oral communication and writing practice ability, the network teaching of English application ability development is carried out. Therefore, in the process of teaching implementation, teachers should always maintain the awareness of information-based teaching, and use the education concept of real-time information dissemination and key and difficult knowledge teaching on the network to complete the teaching. The situation guided teaching of students' English learning.

2. Information teaching content and organization
In the face of the continuous emergence of Internet information interaction, big data processing and other technologies, English teachers should also be able to collect massive information-based English teaching content with the help of education portal website and network cloud service platform, so as to integrate text, image, video or audio and other teaching resources, and make corresponding online English video. For example, according to the "American Dream: everyone can succeed as long as the works" in unit 4 of the comprehensive course of College English volume 1The theme of "hard" is to collect the relevant teaching content on the Internet, integrate it with the existing English teaching materials, and carry out the network teaching of MOOC, micro class and flipped classroom, showing the teachers' ability of information resource integration and technology application.

3. Practical application ability of information teaching
College English teachers' information-based teaching application ability usually includes the ability to use multimedia software, network teaching video production, etc., as well as the information-based professionalism to participate in English teaching. Such as teachers learn to use multimedia tools, web production tools, English information teaching video production. Or with the help of microblog, wechat and website interaction channels, we can learn and exchange English theoretical knowledge and practical content with students, and upload relevant information courseware to the network platform, so as to meet the information resource acquisition and use needs of different students.

2. ANALYSIS ON THE INFLUENCING FACTORS OF COLLEGE ENGLISH TEACHERS&APOS; INFORMATIZATION TEACHING ABILITY UNDER THE BACKGROUND OF EDUCATION BIG DATA AND INFORMATIZATION

1. Lack of software and hardware facilities in English information teaching
The education of basic theoretical knowledge and reading application content of English Majors in different colleges

and universities still adopts the teaching scheme of teachers' teaching and students' passive acceptance, which not only makes the whole classroom content and teaching method too single and obsolete, but also makes students less active in English learning. The main reason for this problem lies in the lack of computer hardware and software programs for English information teaching in Colleges and universities. Although multimedia software, PPT courseware and other network equipment have been introduced, the teaching system based on MOOC, micro class and flipped classroom has not been constructed. At the same time, teachers will not use a variety of multimedia software, web video production tools to record and upload English teaching videos, but more to consult and download the existing online English materials, so the operation level of its information-based teaching is not high.

2. The pressure of English teaching hours and tasks is great

College English teachers' information-based teaching ability is relatively low. Another influencing factor they are faced with is that the teaching hours of comprehensive college English course and New Horizon College English reading and writing course are arranged less, and the teaching task per unit time is too heavy, so teachers are under great pressure in English teaching. Most teachers usually put more energy and time on English textbook preparation, network courseware content organization, and how to guide students to participate in classroom learning and interactive communication. They seldom have time to carry out the setting and learning of information-based teaching situation, teaching content and teaching links, so it is difficult to get the improvement of information-based teaching ability and application level.

3. Lack of professional training in information-based English Teaching

Under the background of the continuous promotion of College English curriculum reform, the information-based teaching and training related to it has not been carried out at the same time. Most colleges and universities still employ English majors as the main body of different teaching materials. On the one hand, the university education department has not assigned professional and technical personnel of information technology to train teachers in the application of modern information technology and network software, which makes teachers feel strange to the video production of MOOC, micro class and cloud class. On the other hand, some teachers have a low awareness of information-based teaching and are unwilling to use a variety of information-based means to carry out online and offline integrated education of English courses, which leads to the inefficiency of information software.

3. STRATEGIES FOR IMPROVING COLLEGE ENGLISH TEACHERS&APOS; INFORMATION-BASED TEACHING ABILITY UNDER THE BACKGROUND OF EDUCATION BIG DATA AND INFORMATIZATION

1. On the construction of teachers' information consciousness in English Teaching

According to the applicability of English major courses, different colleges and universities should cultivate and shape teachers' awareness of information-based teaching, and gradually use a variety of information technology tools to organize and integrate online English teaching resources and online teaching videos, so as to complete the information-based content collection and teaching planning of English courses. First of all, adhering to the purpose of serving the content teaching of English majors, this paper summarizes the information resources in various English websites and academic forums, so as to facilitate the information access, browsing and downloading of College English teachers. Secondly, taking teachers as the center of information technology and application practice education, we should choose relatively simple and practical information content to carry out all-round education of multimedia software and network video production tools, so as to enhance teachers' ability to carry out information-based English teaching independently.

2. Strengthen the integration of English classroom content, information software and hardware

The combination of online teaching and offline teaching of English vocabulary, grammar and sentence is the main direction of the development of English information teaching in the future. Under the guidance of this English curriculum education concept, it is necessary to effectively integrate the teaching material content with the information software and hardware, and gradually improve teachers' information content organization and information technology ability in classroom teaching. First, with the help of the original multimedia technology and PPT courseware, the online internet teaching situation, course content, online oral communication, learning test and other teaching processes are set up, and the instructional online teaching video is made to stimulate teachers to participate in the practice of information-based teaching. Secondly, offline education resources, including basic theories such as text vocabulary, grammar and sentence, should be integrated into the process of information-based English teaching to deepen the relevance between theoretical knowledge and application expression, so as to ensure the teaching effect of College English majors.

3. Pay attention to the network information teaching and training of English teachers

In the teaching of informatization course, College English teachers should pay special attention to the professional teaching training of teachers, guide teachers to participate in the organization of network teaching courseware and the process of online video production, and constantly deepen their cognition and understanding of the basic theoretical knowledge of informatization and the application of network software. For example, it application lectures and online teaching video production courses can be carried out after class, network information teaching training can be carried out by professionals, and extensive teaching interaction, experience sharing and operation practice can be carried out with teachers through

wechat, QQ and website platforms, so as to truly realize the cultivation and improvement of English teachers' information teaching ability.

4. EPILOGUE

With the development of information technology in College English teaching, higher requirements are put forward for teachers' information-based teaching ability. Therefore, the cultivation of College English teachers' information-based teaching ability should rely on Multimedia software and online education software to strengthen the cultivation of teachers' information-based awareness, information-based application practice ability and information-based professional quality, so as to ensure the improvement of teachers' Comprehensive English teaching ability and meet the requirements of students' diversified information technology education.

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A study of cultural infiltration in College English Listening Teaching

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Abstract: With the continuous development of social business English and cross-cultural communication English activities, higher requirements are put forward for college students to master English culture and cultural communication ability. In the teaching process of College English major courses, we should keep pace with the times, increase the classroom cultural background and cross-cultural teaching content of College English listening, guide students to participate in the learning of English cultural knowledge and communication content, and improve students' Comprehensive English listening and oral expression ability.
key word: College English; listening teaching; cultural infiltration; research

1. THE SIGNIFICANCE OF CULTURAL INFILTRATION IN COLLEGE ENGLISH LISTENING TEACHING IN THE NEW ERA

The traditional teaching of College English listening course usually pays more attention to the explanation of English listening vocabulary, pronunciation, grammar and other materials, so that students can gradually improve their discrimination ability of similar English word meaning, dialogue content, grammar knowledge in different English listening learning, but less involves the cultural background and communication habits of English speaking countries. Therefore, in the face of the development of cultural interaction between the East and the West in the new era, college teachers need to introduce English cultural values, lifestyles, communication habits and other aspects, expand students' cultural vision and cultivate their listening comprehension ability, so as to realize the infiltration of cultural knowledge in College English Listening teaching.

1.Stimulate students' interest in learning English listening content

Compared with the learning of College Chinese course, different majors' memorization of the contents of College English comprehensive course and New Horizon College English may be due to their weak English learning foundation, resulting in the problems of low classroom participation enthusiasm and self exploration consciousness.The main reason for this problem lies in the boring teaching of College English course content and the serious situation of the whole classroom indoctrination teaching.Therefore, the introduction of English cultural and historical background, customs, lifestyle, communication habits and other expanding content into College English listening education can stimulate students' interest in learning English listening content through the creation of question situation and online demonstration situation.

2.Enrich the teaching contents and methods of English Listening Course

National culture, customs, lifestyle and communication habits of different Western English speaking countries are also one of the contents that need to be involved in English texts.Therefore, the education and teaching of College English listening course can excavate meaningful and valuable information from the content of English culture, and reform and innovate the existing single textbook content and indoctrination teaching scheme.For example, in College English comprehensive course 4, for the listening teaching of the topic of "College Students' job hunting", teachers can focus on the cultural expressions and interview habits of different English speaking countries to carry out the dialogue teaching of English resume making and interview, so that students can complete the key and difficult knowledge memorization and practical learning in the process of listening to different conversations and interacting with multiple subjects.

2. PROBLEMS IN THE TEACHING OF COLLEGE ENGLISH LISTENING

1.Lack of Student-Centered English listening education concept

The teaching of listening course for English Majors in different universities is usually still teacher centered, focusing on the listening vocabulary, grammar and sentence patterns of each unit/lesson.The teacher plays the recording of the teaching materials in class, including the listening recording of multiple-choice questions, pairs of topics and application questions, while the students passively accept the content of the listening recording and carry out listening exercises in class.They pay less attention to their own learning situation and interests.Therefore, the whole classroom teaching atmosphere is very dull, students' enthusiasm to participate in listening learning is not high.

2.The content and teaching mode of English listening course are single and lagging behind

Compared with the online and offline comprehensive English Curriculum Education in western universities, there are some problems in the English Listening Classroom Teaching in Chinese universities, such as single education content and lagging teaching mode.Especially in the face of the increasing application of International Business English, communicative English, tourism English and so on, we still use the way of collecting and integrating the theoretical knowledge of English textbooks to explain the content of English listening course, which makes the English course lack of

task planning and the introduction of extracurricular teaching resources, resulting in poor teaching guidance and teaching quality of English listening course.At the same time, on the other hand, in the setting of College English listening teaching mode, some colleges and universities lack online education platform, and do not create English listening teaching situation, multimedia demonstration, online test, interactive inquiry and other educational links, which makes students unable to complete the matching and memorization of the new and old knowledge system in the learning of English listening content.

3.Lack of extracurricular culture in English Listening Course

The teaching process of College English listening course is often based on the theoretical knowledge of English basic vocabulary, sentence, grammar and so on. Most teachers rarely introduce extracurricular English culture teaching content, and do not provide students with the opportunity of classroom listening practice and interactive communication, which makes English listening course still stay at the level of exam oriented education and exam content teaching.In the evaluation process of College English listening teaching, teachers only make the corresponding assessment of classroom learning content and learning results according to students' English listening performance, but they have no understanding of students' English cultural cognition and interactive English knowledge.

3. RESEARCH ON THE IMPLEMENTATION STRATEGY OF CULTURAL INFILTRATION IN COLLEGE ENGLISH LISTENING TEACHING

1.Creating a culture teaching situation of English Listening Course Based on Students

Due to the differences between eastern and Western cultures and between Chinese and English expressions, college teachers should focus on English cultural background, behavior norms, semantic communication habits and other contents to carry out a variety of situational teaching of English vocabulary, sentence patterns, grammar, etc. in the process of introducing the background of different English listening materials and explaining the theoretical knowledge, they can learn English wellStudents have a deep understanding of the history, culture, mode of thinking, local customs and living habits of English speaking countries.

For example, "American Dream: everyone can succeed as long as he works hard" is the theme in unit 4 of comprehensive college English course volume 1. It tells the story of how Italian immigrant pony realized his "American Dream" through his efforts.In the teaching of this English listening course, we need to introduce the American "individualism" and "liberalism" cultural situation, or take the American film "when happiness knocks" as a case, make a comprehensive and in-depth analysis of the value orientation and real life involved, put forward several listening problems related to English culture, and mobilize students' English listening learningTo make them understand the cultural connotation of "American Dream".

2.Innovating cultural teaching contents and interactive teaching methods of English Listening

In the face of International Business English, communicative English, tourism English and other social and cultural scenes, the organization of teaching content and teaching methods of College English listening course must introduce more diverse extracurricular cultural teaching content and interactive teaching methods, and make reform and innovation on the existing single old "indoctrination teaching" teaching.

First of all, according to the daily communication habits of Western English speaking countries, a series of dialogic cultural teaching contents are set up, such as "do you have a meeting this morning?", "yes, I do. Do you have a meeting as well?" "yes." to teach the students the cultural characteristics of the public rather than the private of the daily communication language.After that, online education platforms such as MOOC, micro class and flipped classroom can be added to set up the teaching methods of College English listening course, so as to guide students to carry out English cultural content and online interactive teaching, provide students with more diversified listening practice opportunities, and carry out online discussion and Discussion on the key and difficult English listening vocabulary, sentence patterns, grammar, etcProblem solving.

3.Implement extracurricular cultural explanation and teaching evaluation of English Listening Course

The organization of College English listening teaching activities in and out of class should be based on the understanding of different students' English culture, film and television information content, combined with a certain theme to organize cultural lectures and film activities.With the help of after class time, teachers can lead students to read a large number of western culture books and listen to the story dialogue, so that they can feel the pure English culture and authentic language dialogue.Through the extensive teaching of English listening cultural content and more objective and comprehensive teaching evaluation, we can truly reflect the students' learning situation of English listening basic theory and listening practice, and complete the understanding of the culture behind the listening materials.

4. EPILOGUE

English language has obvious Western cultural attributes, reflecting the cultural background, lifestyle, customs and language communication habits of different English speaking countries.Therefore, in the new era of global cultural integration, for the education and teaching of College English major courses, especially the education of listening content, we should introduce the cultural knowledge of English speaking countries, such as national history, cultural customs, local conditions and customs, and infiltrate the cultural content into College English listening course, so as to further deepen students' understanding of English vocabulary, sentence patterns and cultural knowledgeCognitive understanding.

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A Study of Exercise Intervention on Lifestyle in Adolescents with T2DM

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Abstract: Objective Investigate the effect of aerobic exercise on the healthy lifestyle of adolescents with type 2 diabetes mellitus (T2DM). Methods 184 adolescents with type 2 diabetes were selected as the research object, the experimental group was treated with aerobic exercise for 6 months, the indexes of glucose, lipid metabolism and health promotion lifestyle were compared between the experimental group and the control group, to evaluate the effect of different aerobic exercise on health promotion. Results After intervention, the total cholesterol, triglyceride, fasting blood glucose, insulin, C peptide, glycosylated hemoglobin and the total score of life style in the experimental group were better than those in the control group (P < 0.05), between the two groups of high and low density lipoprotein cholesterol mean no significant difference (P>0.05), there was significant differences between different sports groups of glucose and lipid metabolism and lifestyle score (P<0.01).Conclusion Six months of aerobic exercise with different forms had significant effects on the glucose and lipid metabolism in T2DM adolescents, and is conducive to the formation of a healthy lifestyle promotion on T2DM teenagers; The effects of aerobic exercise on the carbohydrate, lipid metabolism and lifestyle scores of T2DM adolescents were different.
Key words: Adolescents; Type 2 diabetes; Aerobic exercise; Health promotion;

1. RESEARCH OBJECT AND METHOD

Diabetes is one of the major chronic diseases threatening human life and health. In recent years, the number of people with global diseases has been increasing [1]. The prevalence of diabetes mellitus is mainly type 2 (accounting for 95%). The incidence rate of diabetes in China is about 5%, of which 2 of type 2 diabetes (T2DM) accounts for 90% of [2], and 70% of the patients with obesity are overweight or overweight. At present, T2DM is generally believed to be caused by excessive obesity, reduced exercise, genetic susceptibility and other environmental and genetic factors [3]. Insulin resistance is the main disease in the early stage of the disease. With the progress of the course of disease, insufficiently secreted insulin, the main symptoms of T2DM are chronic blood glucose rise, accompanied by protein metabolism and lipid metabolism disorder. Domestic research shows that the incidence of obesity incidence rate of [5] and T2DM has shown an increasing trend in recent years. The incidence of obesity in children and adolescents who are pinned on the future and hope of the motherland is increasing. A 2007 study shows that the proportion of T2DM patients in children and adolescents with diabetes has risen to more than 45% of [7], so it is very important to attach importance to the prevention and treatment of T2DM in Chinese adolescents.

As a new group of disease, teenagers have the advantages of short onset time and less complications compared with adult patients. Therefore, most of them are active intervention by means of exercise therapy and drug control. However, due to the influence of age, education years and experience, the awareness of health promotion is still very weak. For the diabetes that can not be cured at present, whether exercise intervention can make teenagers form a healthy lifestyle and benefit them for life is still facing many unknown. The existing research shows that long-term regular and moderate exercise can effectively improve insulin sensitivity, have better effect of reducing sugar, and effectively improve the quality of life of diabetic patients. It is one of the intervention methods of comprehensive treatment of diabetes. Therefore, this study conducted six months of different forms of aerobic exercise intervention in T2DM patients. By comparing the differences between the glucose and lipid metabolism indexes and the health promotion lifestyle of the patients in different groups after intervention, the intervention value of different forms of aerobic exercise in the prevention and treatment of type 2 diabetes mellitus in adolescents and the more ideal form of health promotion were discussed.

1.1. research object

184 young people with type 2 diabetes mellitus were selected in this group, all of which met the diagnostic criteria of type 2 diabetes proposed by American Diabetes Association in 1997. 87 odd array personnel (92 original, 5 people who stopped the experiment due to physical discomfort) were divided into experimental group according to the order of medical treatment for men and women (90 males and 94 females), and 92 even group were divided into control group. The age of the selected subjects was 11-17 years, with an average age of 14.8 ± 1.2 years. The fasting blood glucose level and glycosylated hemoglobin were 7.36 ± 0.79mmol/l and 6.67 ± 0.68) respectively. The results of independent sample nonparametric test showed that there was no significant difference between the two groups before intervention.

1.2. experimental scheme

(1) First, the past history, medication, exercise and complications of the selected patients were examined closely. The contraindications of exercise test stipulated by American Association of sports medicine (ACSM) are excluded [11]. All the selected patients need to sign informed consent form, and complete the questionnaire of health promotion lifestyle before and half a year after intervention according to the guidance of professional

ACADEMIC PUBLISHING HOUSE

personnel; (2) before exercise intervention, patients choose exercise walking, martial arts, fitness exercise according to their preferences Table tennis, badminton, air volleyball, basketball and football, etc., participate in the exercise of each sport from 4:20 to 5:20 p.m. from Monday to Friday, with 60 minutes (including 5 minutes for preparation and arrangement activities); 3) the control of exercise intensity of each item is based on the patient's 40% - 60% heart rate reserve + resting heart rate, and has been through exercise The subjective physical sensation level and physical signs and reactions in the process can adjust the intensity of exercise in real time, and simultaneously do the synchronous telemetry of heart rate, blood pressure and other related indicators, and the medical staff shall handle the emergency and complications at any time.

1.3. index test and method

All the medical indicators were tested by the medical examination department of the hospital of the University, and the subjects were collected by vein in the morning of the first day of the intervention and the first morning of the exercise intervention. The measurement of blood glucose and blood lipid was completed by the Netherlands vetu select-eplus automatic biochemical analyzer. The insulin and C-peptide were tested by m240172 γ radioimmunoaster produced by Beijing West and Western Grand Science and Technology Co., Ltd. the testing instrument of glycosylated hemoglobin is the United States bi0-rad-10 glycosylated hemoglobin instrument. The specific test steps and analysis methods are described in relevant instructions The standard operation of the book is based on the survey and evaluation of health promotion lifestyle, which is conducted by the American nurse Pender, and has good reliability and validity. The retest reliability of the scale in this study is 0.92. The questionnaire covers 6 dimensions (health responsibility, self realization, nutrition, interpersonal relationship, stress response and exercise). A total of 52 items include: using 4-level score, the higher the score indicates the higher the standard of life style; the score of 127 or above is good.

1.4. statistical analysis

All statistical data in this paper are analyzed by IBM SPSS statistics 22 statistical software. The mean, standard deviation and mean standard error are used to express the measurement data. The independent sample t test and multi independent sample K-W test are used in the comparison between the measurement data groups, and the difference is statistically significant with $P < 0.05$.

2. RESEARCH RESULTS

2.1 analysis of the metabolism index of sugar and fat in type 2 diabetes mellitus in adolescents

2.1.1. comparison of blood lipid and blood glucose indexes between experimental group and control group

The statistical results show that after six months of dry prognosis, the total cholesterol and other related indicators in T2DM adolescents in the control group still have the risk of abnormal metabolism of sugar and lipid, such as the average value of total cholesterol (5.15mmol/l) is only slightly lower than the standard (less than 5.2 mmol/l) proposed in the prevention and treatment of dyslipidemia

in China, and triglyceride content (1.93) The level of mmol/l is slightly higher than the standard (less than 1.7 mmol/l) proposed in the prevention and treatment of dyslipidemia in China The mean blood glucose (7.39mmol/l) of blood glucose was higher than the reference value of the normal people (3.9-6.1mmol/l), etc. in the experimental group, except for the two indexes of high and low density lipoproten cholesterol, the mean values of total cholesterol, triglyceride, fasting blood glucose, glycosylated hemoglobin, insulin and C-peptide were improved significantly, and the t-test results of independent samples showed that there was significant difference between the two groups The difference was ($P < 0.05$, see Table 2).

2.2. comparison of the metabolism indexes of sugar and fat in the experimental group

The results of K-W test showed that there were significant differences in metabolic indexes among different sports groups ($P < 0.01$). From the statistical results in Table 3, it can be seen that the average rank of cholesterol, HDL cholesterol and fasting blood glucose in exercise walking project group is the largest, the average rank of insulin index in martial arts group is larger, and the air exhaust is the largest The average rank of LDL cholesterol in the ball project group was the highest, and the average rank of triglyceride, glycosylated hemoglobin and C-peptide in basketball group was the highest. The results suggested that there were differences in the depth of influence of different sports events on the related indexes of glucose and lipid metabolism. 2.2.analysis of life style of T2DM adolescents

2.2.1. comparison of the scores of the life style of T2DM adolescents in experimental group and control group

The results of independent sample t test in Table 6 showed that there was significant difference in the mean scores of all dimensions between the experimental group and the control group ($P < 0.05$), except for the nutritional index. The statistical results in Table 5 also show that the scores of the total score, stress response and exercise of the experimental group are significantly higher than that of the control group, suggesting that six months of aerobic exercise intervention is beneficial to the health promotion of T2DM youth lifestyle. The results of logistic regression analysis of the total score of healthy lifestyle and scores of each dimension in the experimental group showed that the Wald statistics of interpersonal relationship and health responsibility were larger, indicating that six months of aerobic exercise intervention was more conducive to the enhancement of interpersonal relationship and health responsibility of T2DM adolescents.

2.2.2. analysis of factors influencing the total score of life style of T2DM adolescents

The results of multivariate ANOVA of the total score of lifestyle among type 2 diabetes adolescents showed that (see Table 8), there was no difference between the total scores of different genders ($P > 0.05$), and the significant difference was mainly reflected in the total score of different project groups ($P < 0.05$). In order to determine whether there is any difference in the overall distribution of total score of lifestyle in different project groups, this

paper also conducts multi independent sample nonparametric test for the total score of lifestyle of different project groups (see the table below).

From the results of the multi independent sample nonparametric test of the total score of life style of different project groups, it can be seen that there is significant difference in scores of different project groups (P < 0.01). The average rank statistics in Table 9 show that the average rank of badminton, football and table tennis is larger, suggesting that the different forms of aerobic sports have different influence on the total score of lifestyle.

3. DISCUSSION

3.1. the influence of different aerobic exercise on the glucose metabolism index of T2DM patients in adolescents

The mean fasting blood glucose in the experimental group was significantly lower than that in the control group (P < 0.01), indicating that the six month aerobic exercise had a good effect on the reduction of glucose in the adolescents with type 2 diabetes, The results of lisuying [13] also showed that the fasting blood glucose of exercise group was significantly lower than that of the control group (P < 0.05), and that of ludajiang [14] showed that the fasting blood glucose of Mulan Boxing group, fast walking group and fitness route group also decreased (P < 0.05). The mean of serum insulin and C-peptide in the experimental group after dry prognosis was significantly higher than that of the control group (P < 0.05), suggesting that six months aerobic exercise could effectively improve the glucose metabolism ability of type 2 diabetes mellitus in adolescents, which is consistent with the results of many scholars. The results of the study of songaihua and others showed that six months of moderate intensity aerobic exercise intervention could significantly improve the glycolipid metabolism and insulin resistance in community type 2 diabetes patients. The results of zhengxiajing et al. [16] showed that the secretion of insulin by islet B cells could be enhanced by regular exercise for 6 weeks, and the concentration of serum insulin and C-peptide increased. In addition, the statistical results in Table 3 show that different sports events have different regulatory effects on sugar metabolism index. Basketball has a profound impact on the glycosylated hemoglobin level and C-peptide content in T2DM patients, while badminton has a profound impact on the fasting blood glucose level of T2DM patients, and martial arts has a greater impact on the insulin level in the patients.

The reason why aerobic exercise can reduce sugar well and enhance insulin sensitivity may be that exercise can increase the number of glucose transporter 4 (GLUT-4) and the sensitivity of its receptor on the membrane of skeletal muscle cells [17], and the utilization of glucose by skeletal muscle cells is realized by GLUT-4 on the membrane of skeletal muscle cells, which can enhance the glucose outside the cell The energy metabolism of glucose was promoted by transferring into cells; on the other hand, it was probably caused by the exercise intensity used in this study was close to that of patients. The study confirmed that 70% of energy supply came from fat when the human body was engaged in relatively stable moderate intensity aerobic exercise. The continuous consumption of fat in patients not only reduces the accumulation of lipids in skeletal muscle cells, pancreatic cells and liver cells, but also reduces the toxic effect of lipids on them, thus improving the ability of skeletal muscle cells to take glucose, improve insulin sensitivity and the ability of pancreatic cells to secrete high-quality insulin.

3.2. the effect of different aerobic exercise on lipid metabolism in T2DM adolescents

The results show that the lipid metabolism disorder in diabetic patients is the result of various metabolic disorders, such as the deficiency of triglyceride metabolism will lead to the rise of free fatty acids in the liver, the excessive production of extremely low density lipoprotein and hyperglycerin trislipidemia in the liver. Before intervention, triglycerides, total cholesterol and LDL cholesterol were all at the "margin elevation" or In the range of "rising", triglyceride and total cholesterol levels decreased significantly after dry treatment, suggesting that six months of aerobic exercise had significant effect on the improvement of total cholesterol and triglyceride in type 2 adolescents diabetes mellitus, and had a significant effect on regulating lipid metabolism. From the statistical results in Table 3, it can be seen that different sports events have different regulating effects on lipid metabolism index. Basketball has a profound impact on the triglyceride level of T2DM patients in adolescents, while exercise walking is more likely to cause the cholesterol content in T2DM patients. The results showed that long-term regular exercise can reduce LDL and increase HDL in diabetic patients [19], and no similar results were obtained in this group.

The current views on the mechanism of long-term exercise can improve lipid metabolism are as follows: 1) when the body is in a resting state, skeletal muscle mainly relies on free fatty acids for energy supply, while the substances involved in energy supply in exercise state are glucose, free fatty acids and myoglycogen [20]. Although free fatty acids in blood increase during exercise, they can still be increased by muscle and liver The decomposition can provide energy; 2) long-term exercise can not only accelerate the body's fat mobilization ability, but also provide the energy materials needed for the liver and muscle during exercise. The concentration of free fatty acids in the blood will also be increased in a quiet state to ensure that the human body can obtain sufficient energy supplement and supply in the stage of the body's over recovery; 3) exercise can not only mobilize the fat group The fat woven can also reduce the lipid deposition in the adipose tissue and skeletal muscle cells by the regulation of triglyceride in the skeletal muscle cells. At the same time, triglyceride of skeletal muscle belongs to another kind of energy supply material, which can reduce the amount of lipid in the fat tissue and skeletal muscle, and improve the lipid metabolism.

In addition, the meta analysis results of Ritchie SK and other [21] people show that 0.8% to 1.3% of the patients with lipid metabolism disorder in adolescents are ineffective through diet structure adjustment and exercise intervention, and can only be treated by drugs; Pinas

Hamilton The study of O et al. [22] shows that many type 2 diabetes adolescents have already had obvious hyperlipidemia at the initial diagnosis, but only 1% of diabetic children have been treated with hyperlipidemia drugs, while abnormal lipidemia, especially hypercholesterolemia [23], is one of the main risk factors for coronary heart disease, while the rising TG and the elevated LDL are the main risk factors for coronary heart disease The combination of protein cholesterol and cholesterol also easily constitutes the high risk of coronary heart disease. Therefore, when choosing the intervention object, we must do a good job of investigation and inquiry. If necessary, drug treatment should be carried out at the same time as exercise intervention, not only the benefits of exercise, but also the treatment process of such patients.

3.3. The influence of different aerobic exercise on the lifestyle of adolescents with T2DM

Studies have shown that the harm of unhealthy lifestyle to health is constantly playing a role through the details of life [24], which is very easy to be ignored by people; before reaching the diagnostic standard of disease, changing unhealthy lifestyle and developing good habits have a positive role in prevention and treatment [25]. Because most of T2DM adolescents lack enthusiasm for health knowledge intake and health behavior development, the prevention and treatment of type 2 diabetes should focus on improving the awareness of health promotion. The results of this study showed that one year later, the total score of lifestyle, stress coping and exercise of the experimental group were significantly higher than those of the control group ($P < 0.05$), indicating that six months of aerobic exercise intervention was conducive to the formation of healthy lifestyle of T2DM adolescents; the logistic regression results of the total score of healthy lifestyle showed that there were two dimensions of interpersonal relationship and health responsibility In addition, the results of multiple independent sample nonparametric test also showed that the influence of different sports on the total score of lifestyle was different, and there was significant difference ($P < 0.01$). Badminton, football, table tennis and other items had a greater impact on the total score.

The research results of Qin Lin, Zhu Huan [26] show that 16 week walking combined with table tennis can improve the quality of life of elderly patients with type 2 diabetes to a certain extent, and it is easy for patients to develop good follow-up exercise habits. It is suggested that different intervention items and means should be adopted for different type 2 diabetes population. Therefore, in the exercise health promotion intervention for T2DM adolescents, we can build a scientific sports health promotion support platform, according to the physical fitness status, exercise habits and personal preferences of adolescents, adopt the principle of combining personalized and scientific guidance to select appropriate sports items for intervention, and comprehensively use various health promotion means to improve their physical health level. From the current relevant research results, Wang Jihong, Based on personal physique, basic medical indicators and behavior patterns, Yu Lijuan et al.

Constructed a decision support system for civil servants' physique and sports health promotion, including exercise prescription, nutrition prescription, psychological regulation and lifestyle regulation [27], which provides new ideas for the research of health promotion, and is also worthy of promotion and reference in the work of T2DM youth health promotion.

To sum up, the results of this study show that six months of personalized aerobic exercise has a significant effect on the glucose and lipid metabolism of T2DM adolescents, and different sports have different regulatory effects on the glucose and lipid metabolism indicators. Basketball has a profound impact on the glycosylated hemoglobin level, triglyceride and C-peptide content of adolescent T2DM patients, and badminton has a profound impact on fasting blood glucose Martial arts has a great influence on insulin level. Fitness walking exercise is more likely to cause the change of cholesterol content in T2DM adolescents. The results of follow-up survey one year later show that six months of different aerobic exercise intervention is very conducive to the formation of healthy lifestyle of T2DM adolescents, and there are significant differences in the impact of different sports on the overall score of lifestyle. The major influencing items are badminton, football and table tennis.

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Research on Model Analysis Method of Sports Action Characteristics

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Abstract: The level of sports in China is also improving with the improvement of comprehensive national strength. The improvement of sports level is not only related to the improvement of sports equipment, but also to sports athletes' scientific training methods and action planning. Therefore, many scholars have devoted themselves to the research of quantitative and modal analysis of sports action and have achieved certain results. In order to quantify and analyze the characteristics of sports movements more quickly and accurately, in this paper, the RANSAC algorithm is used to calculate and establish the quantitative and model analysis model of the characteristics of sports action. Through computer analysis, the applicability of RANSAC algorithm is proved by the test in this paper.
Keywords: RANSAC algorithm; quantifying the characteristics of sports action; pattern analysis

1. INTRODUCTION

At present, with the improvement of China's comprehensive national strength, China's investment in sports construction has gradually increased. Therefore, many experts and scholars are devoted to sports research and analysis. Not only will all kinds of sports equipment be continuously improved, but also the research on the movements of various sports training will be gradually scientific. The research on the quantification and mode analysis of sports action is deepening (Pan Het al2017) [1]. However, the quantitative analysis and mode analysis of sports action are limited to manpower analysis at present, and computer computing is fast and accurate. Therefore, the research in this paper is based on RANSAC algorithm. The method of quantitative analysis and mode analysis of sports action is analyzed by establishing a computer computing model, and the research method is perfected (Thu T Tet al2017) [2].

First, in this paper, a model of human physical movement characteristic is established. Through the establishment of this model, the objective and the calculation direction of the study are clarified to provide the theoretical basis for the calculation of the calculation formula below (Chen Qet al2016) [3]. After determining the direction and purpose of the calculation, the calculation model is established for the RANSAC algorithm. According to the calculation requirement of this paper, the calculation procedure and formula of the algorithm are optimized and analyzed, and then a computer computing model based on RANSAC algorithm is established (Kim H Het al2016) [4]. At the end of the paper, the RANSAC algorithm is tested appropriately. The practicability and reliability of RANSAC algorithm is proved by testing. The computational research in this paper not only extends the computational range of the RANSAC algorithm, but also puts forward our own views on the quantification and mode analysis of sports action in China (Dusmez Set al2017) [5].

2. STATE OF THE ART

The study of the characteristics of sports movements began early in foreign countries, and the sports undertakings in foreign countries are relatively early in China, so many research and analysis are more than in China. Foreign scholars and experts have studied many methods of quantitative characteristics, and have made some achievements (Urbančič Tet al2016) [6]. In addition, since the research of the RANSAC algorithm in the middle of the last century is mature gradually, after the analysis of the action image has a specialized computer algorithm, the quantitative research on the characteristics of sports action has a computer algorithm which accords with its own calculation, which provides a new way for the research of the characteristic of sports action (Eslami Het al2016) [7]. Moreover, the computation of RANSAC algorithm covers many aspects of video and pictures, and has made great contributions in many other fields.

The development of sports in China started late. Relatively speaking, the quantitative research on sports movement characteristics abroad is relatively weak, and the depth of research is relatively shallow (ŁukaszSzubaet al2016) [8]. However, by learning foreign advanced technology, China's quantitative research on the characteristics of sports movements is rising gradually. Especially since our country has studied the large-scale calculation of RANSAC algorithm, it is more handy to use RANSAC algorithm to quantify the characteristics of sports action and our country has achieved a definite achievement (StryjewsjaDet al2017) [9]. In our country, the application of RANSAC algorithm is first applied to image processing. After that, the research on the RANSAC algorithm has been extended to many new fields, and the quantitative research on the characteristics of sports action is a very important aspect (Gao Fet al2017) [10].

3. METHODOLOGY

3.1 The establishment of a quantitative model for the characteristics of sports action

The importance of sports action is self-evident. Standardized movements can help athletes achieve better results and achieve better training results. Sports action is so important that the standardization of sports action is more important. Only standardized movements can make sports actions more perfect. In fact, before the study, many scholars have established a standardized research model of sports action. Although this model can only use the camera to capture the action nodes of the human body, the

movement error and inaccuracy in the large direction can be analyzed and analyzed, and the coach can point out the athletes, but for the fine research, the traditional model is difficult to achieve a good calculation effect. But the calculation model based on RANSAC algorithm is different. The computation model based on RANSAC algorithm can capture the movements of athletes and compare them with the standard movements that we input into the computer ahead of time. Moreover, the action model in computer is a three-dimensional model. The calculations established in this article are used. The capture of the model is taken with a number of groups of cameras, and a number of azimuth photos are assembled into a stereoscopic action map of a human body, and then compared with the standard mode, which will not only show more accurately and clearly the places where the sports action is not standardized, but also carry out the detailed calculation research. This is the difference between the quantitative research model of sports action characteristics and the traditional model established in this paper. The movement of the human body is the result of the common action of many systems, and the coordination of many systems may not be very perfect, which leads to a lot of sports movements that are difficult to meet the requirements of standardization. The motion of human body can be simulated by computer in three dimensions. The stereoscopic image is shown in Figure 1 below.

Limb is different from other limbs, which has two movement modes of displacement and rotation, while other limbs can only rotate at the joint point as axis. In human motion, the relationship between the moving limbs can be represented by tree hierarchy. The movement of the upper limbs will drive the lower limbs and lower limbs to do the same exercises.

The model has the following characteristics: (1) The model can quickly and truly difficult new and standard sports action, with three degrees of space and time. (2) The model has motion track and action snapshot and can control movements freely and quickly, which is more intuitive and scientific in analyzing and researching actions. (3) The model is written and phonetic to facilitate teachers' teaching. (4) This model has the background rhythm music playing, which plays a benign stimulation to the perceived muscle strength, and also enhances the interest of learning. (5) The model has video and video sequence analysis, and video motion and animation action contrast analysis, making the comparison between right and wrong at a glance. (6) Through man-machine interaction, teachers and students are more likely to make quick and effective feedback.

The quantitative model of sports action characteristics established in this paper has four applications. The design of this article is designed around these four aspects. First of all, the first role is to give athletes anticipation of movement before some kind of movement, and give athletes the opportunity to think independently, which is more conducive to the proficiency of sports. When the coach explains, the explanation is carried through this model, and the homework is arranged in advance and so on. This three-dimensional and repeatable action model

can quickly make athletes proficient movement points. Second or so is the design of movement, and every sport has the possibility of improvement. Athletes or coaches can put forward their own opinions when observing movements. The optimization of the action can be optimized on the model, so that all of the people who use the model can quickly understand the new movements and help the development of sports. The third is action learning. The 3D model of the model can give athletes more accurate action instances. The last is the analysis of the action. Students' movements can be captured by cameras, and then be compared with the standard movements in the model, analyzing the gap and pointing out, which helps athletes to be more flexible in mastering the irregularities of their movements. The information processing form of the computer analysis model established in this paper is shown in Figure 2 below.

3. 2Research on the establishment and optimization of RANSAC algorithm calculation model

In today's image processing problems, RANSAC algorithm is a very convenient and fast way of image processing. Under normal circumstances, when we calculate the RANSAC algorithm, the data we face mainly consist of three kinds of data. The first is the correct data, which describes the stereoscopic model of the image we have established. It is correct, and can describe the data that we have established. The second is the abnormal data. This kind of data is obviously wrong, which will not only benefit the model we have established, but also cause some errors, which leads to the failure of the model. The third is noise data, which is different from the correct data and abnormal data, but tends to the right data. These data are expressed in the form of probability, which is the form of normal distribution.

The basic idea of the RANSAC algorithm is described as follows:

① For a data set of m sample set P, the minimum sample set size of n model, m is larger than n. A set of S is randomly selected from the sample set P, which covers n sample data, and an initialization model M is calculated.

② A certain algorithm model is used to carry out adaptability test of the data in the residual set P-S and the sample set of the residual set data for the model M is less than a set threshold of k. These samples are called the interior points of S and form a set S* together with S, which is a consistent set of S (Consensus Set).

③ If length(S *)>_N, it is supposed that the correct model parameters are obtained. Set S* is used to re-estimate the new model M* by some algorithm.

④ The new S is extracted randomly, and the above process is repeated. After the number of repeated samples reaches a certain amount, the algorithm fails if no consistent set is found. Otherwise, the internal and external points of a consistent set should be judged according to the maximum value of length(S). Finally, the algorithm ends.

In this paper, the calculation model and main idea of RANSAC algorithm are introduced and studied. Next, the

calculation formula of magic is calculated.

Before carrying out the calculation and analysis of the calculation formula, we need to first design the calculated model coordinate system, and then establish the calculation matrix, which is supported by both of them. We can do the calculation and study. Figure 3 below is the coordinate system diagram of the calculation model established in this paper.

Since the calculation of this paper is done in the form of matrix, the first step is to establish a computing matrix.

$$F = \begin{bmatrix} x_{11}, x_{12}, x_{13}, \cdots x_{1n} \\ x_{21}, x_{22}, x_{23}, \cdots x_{2n} \\ x_{31}, x_{32}, x_{33}, \cdots x_{3n} \end{bmatrix} \quad (1)$$

First, the formula for calculating K calculation process is established:

$$1 - (1 - C_m^n C_{m-1}^{n-1} C_{m-2}^{n-2})^k = \Phi \quad (2)$$

The m in the upper form is the total number of points in the point cloud, and n is the characteristic point number in the point cloud. Since m and n values are very much approximated, it can be gotten that:

$$1 - (1 - (1 - \tau)^4)^k = \Phi \quad (3)$$

Then:

$$K = \frac{\log(1-\Phi)}{\log(1-(1-\tau)^4)} \quad (4)$$

For the distance between two points, the formula is used to calculate:

$$d = \frac{m^T F m}{(Fm)_1^2 + (Fm)_2^2 + (F^T m)_1^2 + (F^T m)_2^2} \quad (5)$$

As for the optimization of RANSAC algorithm, the optimization of algorithm is derived from the following:

$$T = M(TC + TE) + M(n \times TT) \times Pf + M(nf \times TT) \times (1 - Pf) \quad (6)$$

In this paper, the calculation formula and computation

optimization problem of the RANSAC algorithm are completed. According to the above calculation process, the quantitative model of sports action characteristics has been completed. The establishment of this model has greatly accelerated the learning and promotion speed of sports action. With this open model, the analysis of the national sports action features can form a unique circle, so that the athletes and coaches can communicate in time.

4. RESULT ANALYSIS AND DISCUSSION

In the last part, a quantitative model of sports characteristics based on RANSAC algorithm has been set up, but a certain test is still need for the information processing ability of the model and the efficiency of calculation and analysis. The results of the test prove the effectiveness of the algorithm and the information processing ability of the model. Before testing, the data points used in the test need to be designed. The test calculation in this paper involves 720 points, and then sets up the data table.

Table. 1 Test Calculation Data Table

Numbering	α	β	X	Y	Z
1	1	1	1. 999695	1. 017451	1. 017452
2	1	3	1. 998477	1. 017428	1. 052636
3	1	5	1. 996043	1. 017568	1. 078451
4	1	7	1. 992395	1. 046697	1. 125368
5	1	9	1. 987538	1. 017468	1. 156324
6	1	11	1. 981478	1. 017268	1. 119564
7	1	13	1. 974222	1. 017431	1. 222357

Through the data preparation above, three groups of experiments can be carried out. The calculation of these three groups of experiments is done by four different computer algorithms respectively, and then the test data are analyzed and studied. The three sets of experimental results are displayed in the form of three tables below.

Table. 2 720-point simulation model parameter values and different methods extract results

Calculation method	a	b	c	r	Points/noise points	Extraction points
Setting parameters	1	1	1	1	/	/
Least Squares	1. 00	1. 00	1. 00	1. 00	720/0	720
Hough Transform	0. 98	0. 98	0. 98	1. 00	720/0	720
RANSAC	1. 00	1. 00	1. 00	1. 00	720/0	720

Table. 3 720: 100 point simulation model parameter value and different method extraction results

Calculation method	a	b	c	r	Points/noise points	Extraction points
Setting parameters	1	1	1	1	/	/
Least Squares	0. 97	0. 95	0. 95	1. 05	720/100	660
Hough Transform	0. 98	0. 98	0. 98	1. 00	720/100	720
RANSAC	1. 00	1. 00	1. 00	1. 00	720/100	725

Table. 4 720:360 point simulation model parameter value and different method extraction results

Calculation method	a	b	c	r	Points/noise points	Extraction points
Setting parameters	1	1	1	1	/	/
Least Squares	1. 01	0. 99	0. 99	1. 07	720/360	851
Hough Transform	0. 99	0. 92	0. 98	1. 00	720/360	730
RANSAC	0. 98	1. 00	0. 99	1. 02	720/360	729

Through the analysis of the data of the upper table 2/3/4, it can be seen that the three computer algorithms selected in this paper can extract the data points. This means that the three algorithms can establish the three-dimensional model needed, but the results of the three algorithms are not the same. The three algorithms have different emphasis on the calculation. With the increase of noise points, it can be seen that the least square method is the first to fail and to exit. It can be seen that the least square method is the first to be eliminated in the calculation of

this paper. In addition, the anti noise effect of Hough transform algorithm is better, but the key point of this algorithm lies in the selection of the center point. However, the computation of the limb part needs to be further calculated, which will increase the computation time and reduce the computational efficiency. The RANSAC algorithm used in this paper not only has good anti noise ability, but also has high accuracy. Although the central point is not as good as the Hough transform algorithm, the RANSAC algorithm can accurately calculate the positions

and movements of each limb, which is in line with the need for the calculation of this article. It can be seen that the RANSAC algorithm used in this paper has the best robustness and is the most suitable one in this paper. The human body motion analysis image conversion form implemented by the RANSAC algorithm used in this paper is shown in Figure 4 below.

In addition, a set of test experiments have been carried out in this paper. The computation time and accuracy of the algorithm are tested by adding the noise points calculated by the algorithm. The accuracy and computational efficiency of the three algorithms are shown in Figure 5 below. The test environment uses the test environment designed above, and four key points are selected for testing time. But for computing accuracy, the increase from 0 to 720 noise points is used to test in real time.

The above analysis shows that the RANSAC algorithm used in this paper is the best. The accuracy of the calculation is more than 90% and the accuracy of Hough transform algorithm is relatively low, but there are ups and downs in the middle. The least square method has the lowest calculation accuracy. In addition, it can be found that the calculation time of the RANSAC algorithm used in this paper is the shortest, which means that the computing efficiency of the RANSAC algorithm is the highest and the least square method has the lowest calculation efficiency. Thus, combined with the test results above, it can be confirmed that the RANSAC algorithm used in this paper has the best calculation effect and can meet the requirements of this paper.

5. CONCLUSION

The discovery of sports can not be separated from economic and scientific progress. The progress of science and technology is also pushing the development of sports. In particular, the state is paying more and more attention to sports. The combination of sports and computers burst out into a dazzling light. In this paper, the RANSAC algorithm is used for computing research, and a model of sports action feature quantification and pattern analysis is established. The calculation research of this model increases the standardized teaching of sports action. In this paper, it can be seen that the RANSAC algorithm can complete the calculation results and the results are good. Compared with the two algorithms, the calculation results are the best. The accuracy of calculation can reach more than 90%, and the computation efficiency is the best among the three algorithms. The computation efficiency can reach two times of the least square method. Through the calculation and study of this paper, the analysis of the quantitative analysis of the characteristics of sports action is provided, and this method can achieve good results, which not only promotes the development of sports, but also deepens the research of RANSAC algorithm.

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Experimental Study on Response Surface Analysis of Modified Carbonized Straw to Nitrogenous Waste water based on Ultrasonic

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Abstract: Under the condition of ultrasonic wave, adsorbent was prepared from corn straw activated carbon via activation by potassium hydroxide and ammonia nitrogen waste water was treated under ultrasonic condition. Based on single factor tests, the response surface methodology was used to apply Box-Benhnken central grouping method to design four factors and three levels test. Using ammonia nitrogen concentration, pH, temperature and treatment time as considering factors, removal rate as response value, to analyze and research. Research shows, the constructed response surface model was significant ($p < 0.0001$), the influence of various factors on the removal rate was as follow, ammonia nitrogen concentration>temperature>pH>time. In terms of multivariate quadratic response surface regression model, optimum adsorption condition was as follow, pH was 6.49, ammonia nitrogen initial concentration was 500 mg/L, temperature was 20°C, treatment time was 40 min, under this condition, the removal rate of ammonia nitrogen was 42.16%. This process was spontaneous and endothermic. Solid-liquid interface increased disorderly in the adsorption.
Keywords: Response Surface; Ultrasonic Wave; Ammonia Nitrogen; Removal Rate

1. INTRODUCTION

China is an agricultural country, producing a lot of straws. Many straws are abandoned or burnt. It doesn't make full use of straw resource, environmental problem caused by combustion of straws is increasingly serious, for example, the hottest smog problem now [1]. Nowadays, the research on activated carbon property is popular at home and abroad. For the modified preparation of activated carbon, Zhang Zhenchao et al. used corncob isolating air to make activated carbon through carbonization [2]. J. Rene Rangel-Méndez used iron to modify activated carbon for arsenic removal. It roots in the particles on adsorbent surface. Under the special condition, use microwave as auxiliary to combine fiber with ferric hydroxide, as a result, modified carbon has better ability to adsorb arsenic. The reason is that the function combining fiber with ferric hydroxide increased the quantity of activated point location [3]. Food processing plant, aginomoto waste water, pharmacy waste water, the landfill leachate resulted from garbage site, which are high concentration nitrogen waste water. Make sure water equality and water ecology safety, which can control efficiently nitrogen concentration in the water. The treatment technology of high concentration nitrogen waste water mainly include materialization, biochemical process. Long before Japan scholar Yuasa [4] by the method of adding to the reductant interchangeably removed nitrate nitrogen, and the used reductant was Zn. In a word, traditional technologies have some problems, such as high cost, complex process, easily causing secondary pollution [5]. Since the last century, the scholars at home and abroad combine water pollution control with ultrasonic wave to treat toxic or persistent organic pollutants, and there are some results, which verify that ultrasound will have a great prospect in this field. Yu Lisheng et al. combined Fenton with the activation effect of ultrasound to the treatment of organic waste water, thus realizing the goal of degradation. Compared with traditional single treatment method, it has better effect, more safety and save cost [6]. Xinbo Tian et al. published related articles in Journal of Environmental Sciences [7]. Based on mathematical thought, response surface method use function essence to express the research object by construction of polynomial. Li Jing et al. applied response surface method to optimize the extraction condition of Ficus Carica Polysaccharides (FCPS), and experimental results were verified under optimized conditions, indicating that the approach is scientific and reasonable [8].

On the basis of the previous research [9-11], this study used corn as material to carbonize, under the ultrasound condition, activated carbon adsorbent was prepared via activation by KOH. Using activated carbon to the treatment of nitrogen waste water for response surface analysis, which can reach the relationship between activated carbon adsorption character and influence factors, interaction of factors, prediction of optimal processing conditions. It not only solved environmental pollution problems, but also reached the goal of using waste to treat waste by the

recycle of residue.

2. EXPERIMENTAL PART

2.1 Material, Reagent and Instruments

Corn straw were from farmland on the suburb of Chengdu, Sichuan province.

Potassium hydroxide, hydrochloric acid, ammonium chloride, potassium iodide, mercury chloride, potassium sodium tartrate, these were analysis of pure drugs, from Chengdu jinshan chemical reagent limited company.

Electronic analytical balance: longteng ESJ120-4, Chengdu shengye istrument factory; electric thermostatic air drying oven: jinghong DHG-9140, Chengdu state-run xinxing instrument factory; thermostatic oscillator: THZ-032, Chengdu shengye instrument factory; visible spectrophotometer: meipuda V-1200, Chengdu shengye istrument factory; muffle: XL box-type high temperature furnace, Beijing beitiantong technology limited company; desktop CNC ultrasonic cleaning instrument: KH-250DB; electric digital display thermostatic water bath pot, HH-2, bangxi instrument technology limited company.

2.2 Corn Straw Activated Carbon Preparation via Modification

This experiment prepared activated carbon via corn straw as materials, the activation experiment of straw adopt chemical activation, the activator was potassium hydroxide. corn straw were immersed by distil water about 24 hours, washed by tap water several times till the impurities result from immersion were wiped off. Then drying in the electric thermostatic air drying oven under 100°C and cutting them 5 cm strip. Using silver paper to wrap the drying materials, then using electric furnace to carbonize. The carbonization was about 40 min, then cooling to room temperature, taking out, grinding and sifting (40-60 meshes). According to the ratio of mass 1:3, combing the carbonized straw with 3 mol/L KOH in the 100 mL conical flask with plug, capping the bottle immediately and treating under ultrasonic wave (temperature: 15°C, time: 30 min). After treating under ultrasonic wave, solid modified carbonized straw was obtained by filtration, washing with 1 mol/L dilute hydrochloric acid solution, then rinsing repeatedly with distilled water until neutral, and

drying to constant weight, selecting fine granular activated carbon for standby after the mortar grinding.

2.3 Adsorption Experiment of Nitrogenous Waste Water

(1) Ammonia nitrogen standard curve drawing

Using meipuda V-1200 visible spectrophotometer, fetching eight washing off and drying 50 mL colorimetric tube prepared before, adding different volume ammonia nitrogen standard solution to colorimetric tube, 0.0, 0.5, 1.00, 2.00, 4.00, 6.00, 8.00, 10.00 respectively, adding purified water to the mark after completion. Adding 1.0 mL sodium potassium tartrate solution and 1.0 mL Nessler's reagent, shake each time adding the solution and adding another. After adding two kinds of solution, shaking well and setting aside for 10 min, setting the spectrophotometer preheated to a wavelength of 420 nm, using 10 mm colorimetric tube and using water as a reference, the measurement of absorbance was shown in Table 1. Taking adsorbance blank corrected as the ordinate, taking the corresponding ammonia nitrogen concentration (ug) as abscissa, and drawing a standard curve, as shown in Fig. 1.
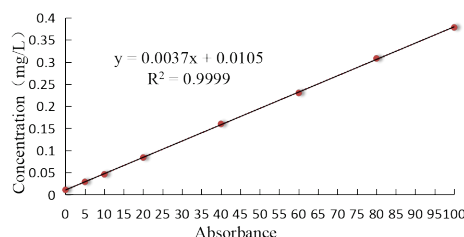

Figure 1 Ammonia nitrogen standard curve

(2) Singel factor experiment

Based on single variable, setting different factors gradient. Compared time, temperature, pH and ammonia nitrogen concentration as factors conditions, setting different factors gradient. Among this, time gradient was 10 min, 20 min, 30 min, 40 min; ammonia nitrogen concentration gradient was 500 mg/L, 1000 mg/L, 1500 mg/L, 2000 mg/L, 2500 mg/L; pH gradient was 4, 5, 6, 7, 8; and temperature gradient was 15°C, 17°C, 20°C. Researching the relationship between various factors and removal rate.

(3) Response surface experiment

Table 1. Response surface factor level

Level	Ammonia nitrogen concentration (mg/L)	pH	Temperature (°C)	Treat time (min)
1	500	5	10	60 (vibration) 20 (ultrasound)
2	1000	6	15	120 (vibration) 30 (ultrasound)
3	1500	7	20	180 (vibration) 40 (ultrasound)

Based on previous single factors experiments, using software Design-Expert 8.0.6, screening out obvious influence factors and rational experiment limit. Using Box-Behnken method [12] about four factors and three levels. Putting ammonia nitrogen concentration A, pH B, temperature C and treatment time D as influence factors, the response value was the removal rates R of modified activated carbon under different conditions. Setting three parallel experiments, including modifying and treating under ultrasonic wave

condition, modifying and oscillator processing under ultrasonic wave condition, and modifying and treating under oscillation condition. The following was experimental design scheme, as shown in the following Table 1.

2. EXPERIMENT RESULTS AND DISCUSSIONS

2.1 Single Factors Experiments Results

(1) The effect of time on removal rate

As shown in Fig. 2, with the increasing of treatment time, the removal rate had a rising tendency, but a

slightly decline when the treatment time was too long. In the preliminary judgment, within shorter time, the activation effect of ultrasound was in favour of the adsorption activated carbon to ammonia nitrogen, increasing the contact chance activated carbon to ammonia nitrogen solution. In addition, the activation effect resulting from the too long ultrasound time, may lead to the desorption of activated carbon physical adsorption. Thus, lowering the removal rate of activated carbon [13], so it's better to choose the ultrasound time for 30 min.
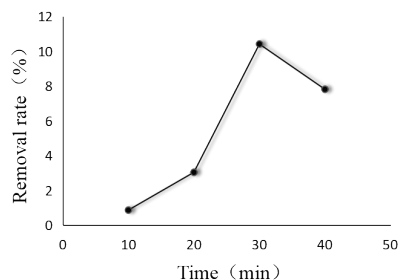
Figure 2 The effect of ultrasonic time on removal rate
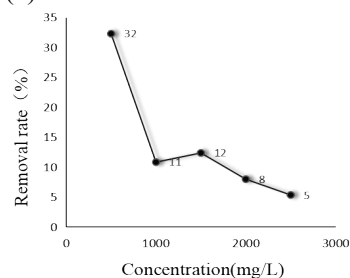(2) The effect of concentration on removal rate

Figure 3 the effect of concentration on removal rate
As shown in Fig. 3, the higher the concentration, the less obvious the removal effect was, the lower the removal rate. According to the single variable principle, ultrasonic frequency and power do not change in the operational process, thus activation and mechanical effects produced by attached ultrasound were not enhanced, meanwhile, under the high concentration condition, activation points tended to be saturated with the increasing of solution concentration. Activation bubbles also consumed energy when they collided with ammonia nitrogen molecules. Faced with the increasing of ammonia nitrogen molecules per unit volume, more energy was absorbed by the ammonia nitrogen molecules and dispersed, making the vibration of solution decline, and activation effect lower for lack of energy the moment activation bubbles collapsed [14]. Therefore, the removal rate of ammonia nitrogen was affected, the experiment used 500 mg/L, the effect was more obvious.
(3) The effect of pH on removal rate
As shown in Fig. 4, with the effect of pH, the removal rate first increased and then decreased, then increased. Under the highly acid condition, the ammonia stayed the same and more steady. While the external energy was unchanged, ammonia nitrogen molecules were sightly adsorbed by activated carbon. While pH was relatively high, under alkaline conditions, some

ammonium ions combined with hydroxide to form ammonia and volatilize, some others were adsorbed by activated carbon, and it's difficult to determine the specific adsorption capacity of activated carbon. Therefore, alkaline conditions were not used in subsequent experiments. By contrast, the optimal pH was 7.
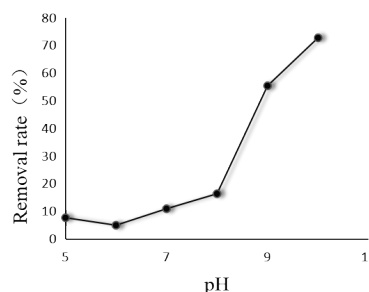

Figure 4 The effect of pH on removal rate
(4) The effect of temperature on removal rate
As shown in Fig. 5, with the increasing of temperature, the removal rate was rising. The removal rate can be increased by heating. It had to do with energy, temperature was rising, while the external supplied thermal energy, it sped up the molecular movement and facilitated molecular diffusion, the ammonia nitrogen molecules continued to diffuse into the pores of activated carbon. The ammonia nitrogen molecules were more easily adsorbed by activated carbon, the higher the adsorption efficiency was, and it's beneficial to the improvement of ammonia nitrogen removal rate [15]. Thus, choosing 20°C.
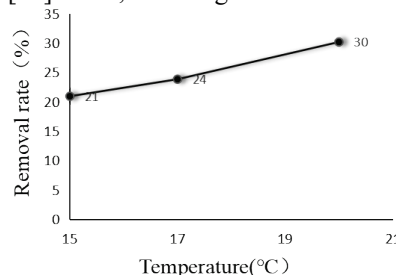

Figure 5 The effect of temperature on removal rate
2.2 Response Surface Results and Analysis
(1) Box-Behnken test design and results
Based on single factor experiments, choosing ammonia nitrogen concentrations, pH B, temperature C and treatment time D as influence factors, the response value was the removal rate R of modified activated carbon under different conditions. Using four factors and three levels Box-Behnken method [16] to research the adsorption condition of activated carbon. The experiment design scheme and results were shown in Table 2.
(2) Model establishment and significance test
Using Design-Expert 8.0.6 software to design multiple regression model, and reaching the matching regression equation.

$R = 14.71 - 0.96A - 8.51B + 1.62C + 1.87D - 1.36AB - 1.43AC + 1.07AD - 0.93BC - 0.76BD + 1.87CD + 5.39A^2 + 7.21B^2 - 3.17C^2 + 1.55D^2$ (1)

Table 2. Response Surface Experiment Design and Results

Serial number	Factors condition				Removal rate R/%
	Ammonia nitrogen concentration A/ (mg/L)	pH B	Temperature C /(°C)	Time D/(min)	
1	1500	6	20	30	17.03
2	1500	6	15	20	19.92
3	500	7	15	30	28.96
4	1000	6	20	20	23.26
5	1500	6	10	30	16.62
6	1000	5	10	30	8.52
7	1000	6	15	30	17.90
8	500	6	15	20	37.64
9	1000	7	20	30	20.55
10	1000	6	10	40	17.30
11	1000	7	10	30	10.79
12	1500	7	15	30	11.24
13	1000	5	20	30	10.79
14	1000	6	15	30	15.13
15	1000	6	20	40	22.72
16	1000	5	15	40	19.23
17	1000	5	15	20	15.67
18	1000	6	15	30	18.93
19	500	6	15	40	36.55
20	500	6	10	30	29.84
21	1000	6	10	20	22.10
22	1000	7	15	40	16.76
23	500	5	15	30	23.81
24	1500	5	15	30	9.80
25	1500	6	15	40	13.41
26	500	6	20	30	33.30
27	1000	7	15	20	18.93
28	1000	6	15	30	10.25
29	1000	6	15	30	11.33

In terms of Table 3, the F value of model was 13.61, p value less than 0.0001 and thus less than 0.05, showing the model was significant. Four influence factors affected interactively the removal rate of ammonia nitrogen, not simple linear relation, among this, B, D, A2, B2 and C2 were significant. For four factors, time A, ammonia nitrogen concentration B, pH C and temperature D, and the corresponding F value were 1.30, 101.90, 3.68, 4.94 respectively, indicating their effect on the removal rate was as follow, ammonia nitrogen concentration B > temperature B > pH C >

time A. Lack of fit of the model was 59.87, greater than 0.05, not significant, indicating there was no lack of fit factors. Coefficient of association R2 was 0.9832, showing the high fitting degree of equation; the variable coefficient was 15.6%, lower, showing the strong stability; signal to noise ratio was 12.695, greater than 4, indicating the high accuracy of model [17]. In conclusion, the model can evaluate the effect of various influence factors on ammonia nitrogen adsorption removal rate.

Table 3. Variance analysis

Resource	Quadratic sum	Degree of freedom	Mean square	F value	Prob>F	significance
model	1624.14	14	116.01	13.61	<0.0001	**
A-time	11.11	1	11.11	1.30	0.2727	
B-concentration	868.27	1	868.27	101.90	<0.0001	**
C-pH	31.38	1	31.38	3.68	0.0756	
D-temperature	42.11	1	42.11	4.94	0.0432	*
AB	7.35	1	7.35	0.86	0.3687	
AC	8.21	1	8.21	0.96	0.3429	
AD	4.54	1	4.54	0.53	0.4774	
BC	3.43	1	3.43	0.40	0.5358	
BD	2.31	1	2.31	0.27	0.6106	
CD	14.04	1	14.04	1.65	0.2202	
A^2	188.13	1	188.13	22.08	0.0003	*
B^2	337.37	1	337.37	39.59	<0.0001	**
C^2	65.18	1	65.18	7.65	0.0152	*
D^2	15.63	1	15.63	1.83	0.1971	
residual	119.29	14	8.52			
Lack of fit	59.87	10	5.99	0.40	0.8889	
Pure error	59.42	4	14.86			
Total deviation	1743.43	28				
R^2	0.9316	SNR	12.695	CV	15.16%	

Note: *significant (P<0.05), **extremely significant (P<0.001)

(3) Response surface analysis

Response surface figure was three-dimensional space surface diagram consist of response value and various

test variations, including ammonia nitrogen concentration, treatment time, pH and temperature. Fitted response hook face directly reflected the influence trend of each factor on the response value. The shape of contour line reflected the significance of the interaction between the two variables, oval indicates the interactive effect of two factors was significant, however, the round was opposite. According to the response surface diagram, observing the inclination of the inclined plane and determining the extent to which both affect response value. The higher the inclination was and the shaker the slope was, the more significant the effect was, combing with the positive and negative of quadratic regression equation coefficient, and judging the effect.

When pH and temperature were constant (C=6; D=15°C), as shown in Fig.6, while the ammonia nitrogen concentration is rising gradually, the removal rate is decreasing gradually, treatment time rise from 20 min to 40 min, the adsorption efficiency is rising, then decreasing and then rising. The response hook face concentration changed faster than time. Under the definite pH and temperature, the effect of concentration on removal rate was more significant than the effect of time on removal rate. The interactive effect of A and B was not significant, AB coefficient was -1.36, the interaction of two factors had a negative effect on the results [18].

When the concentration and temperature were constant (B = 1000 mg/L, D = 15°C), as shown in Fig. 7, with the increasing of time, the removal rate is on the rise. The removal rate is rising and then decreasing with pH, the longer the treatment time is, the little the fluctuation is. The interactive effect of factor A and factor C on removal rate was not significant. AC coefficient was -1.43, the interaction of two factors had a negative effect on the results.

When concentration and pH were constant (B = 1000 mg/L, pH = 6), as shown in Fig. 8, under the same treatment time condition, the higher the temperature is, the higher the removal rate is, the removal rate is rising, then decreasing and then rising with the variation of time. The interactive effect of A and D on removal rate was not significant. The AD coefficient was +1.07, the interaction of two factors had a positive effect on the results.

When time and temperature were constant (A = 30 min, D = 15°C), as shown in Fig. 9, with the increasing of pH, removal rate is rising, and while the pH is constant value, the tendency is increasing slowly and decreasing. The response hook face concentration change faster than pH, and the effect of concentration on removal rate is more significant. The interactive effect of B and C on removal rate was not significant. BC coefficient was -0.93, the interaction of two factors had a negative effect on the results. the interaction of two factors has a negative effect on the results.

When time and pH were constant (A = 30 min, pH = 6), as shown in Fig. 10, in the definite limit, removal rate is rising with the increasing of temperature. The resonant hook face concentration change faster than temperature, the effect of concentration on removal is more significant. The interactive effect of B and D on removal rate was not significant. BD coefficient was -0.76, the interaction of two factors had a negative effect on the results.
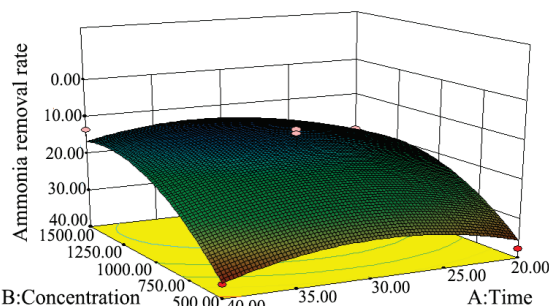

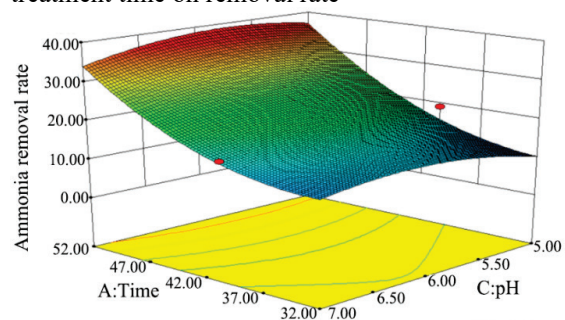Figure 6 The effect of solution initial concentration and treatment time on removal rate

Figure 7 The effect of solution pH and treatment time on removal rate

When time and concentration were constant (A = 30 min, B = 1000 mg/L), as shown in Fig. 11, under the condition of temperature 16-20°C, in the definite limit, the removal rate is rising with the increasing of pH. Under the condition of temperature 10-14°C and pH 5.5-6.5, the removal rate is the highest. The interactive effect of C and D on removal rate was not significant. BD coefficient was +1.87, the interaction of two factors had a positive effect on the results.
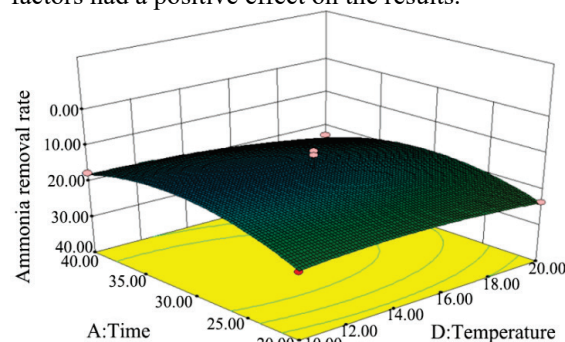

Figure 8 The effect of treatment temperature and time on removal rate
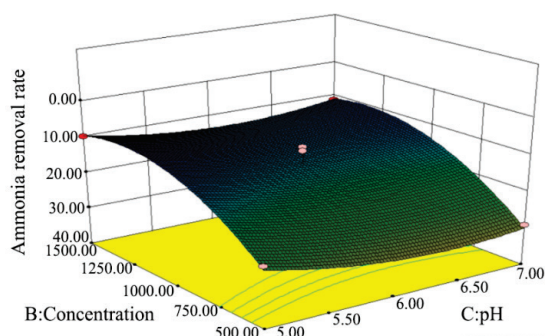
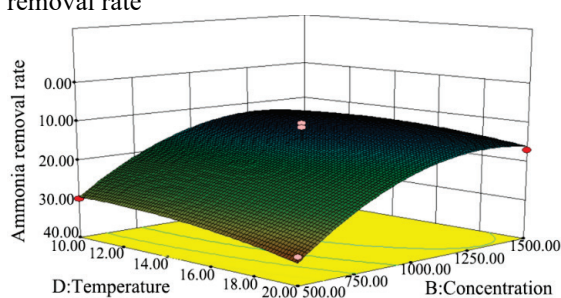Figure 9 The effect of initial concentration and pH on removal rate

Figure 10 The effect of initial concentration and temperature on removal rate
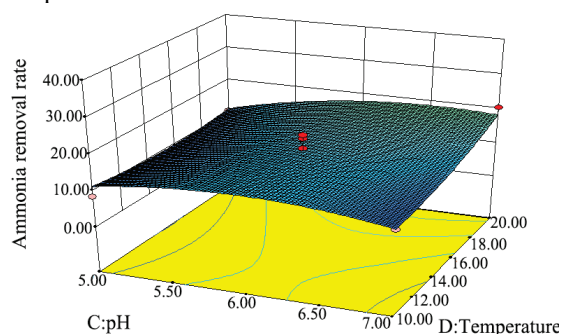

Figure 11 The effect of pH and temperature on removal rate

(4) Response surface optimization
Using the matching multiple quadratic regression equation and Design-Expert 8.0.6 software to further analysis, using the condition limit of experiment design, through analyzing, reaching the optimal value and the predicted value of optimal treatment condition. Predicted value was as follow, time 40 min, ammonia nitrogen concentration 500 ml/L, pH 6.49, temperature 20°C, removal rate 42.16%. The test value was as follow, time 40 min, ammonia nitrogen concentration 500 ml/L, pH 6, temperature 15°C, removal rate 36.5%. While the temperature was increasing, removal rate was on the rise. The empirical and predicted values fitted well, indicating it's viable to adopt the response surface method to optimize activated carbon adsorption ammonia nitrogen.

3. CONCLUSIONS
The experiment chose four factors, including time A, ammonia nitrogen concentration B, pH C, temperature D, the model they built was significant. The effect of various factors on removal rate was ammonia nitrogen concentration B greater than temperature D greater

than pH C greater than time A. Ammonia nitrogen concentration interacted with time, pH interacted with time, temperature interacted with time, initial concentration interacted with pH, and initial concentration interacted with temperature had a negative effect on removal rate, initial concentration interacted with temperature were positive effect. According to multivariate quadratic response surface regression model, the optimal adsorption condition was as follow, pH 6.49, ammonia nitrogen initial concentration 500mg/L, temperature 20°C, treatment time 40min, under this condition, the removal rate of ammonia nitrogen was 42.16%, which was consistent with reality.

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Blended Teaching Design Based on MOOC Platform with "Compilation Principle" as an Example

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Abstract: Blended teaching is a new type of teaching method that combines student-centered, face-to-face interaction between students, students and teachers, and students and resources, as well as online interaction. In the context of golden class, blended teaching is also gradually becoming the new normal of education in the future world, especially in the current form of epidemic prevention and control, to explore the application of blended teaching combining MOOC (massive open online courses, MOOC) and flipped classroom in the teaching of compilation principles. The implementation plan of the hybrid teaching of compilation principles is proposed, the implementation plan of the course, the organization of the flipped classroom and the lecture content are specified, and the practical results show that the teaching effect of the hybrid teaching method has improved.
Keywords: Blended teaching; Compilation Principle; Flipped Classroom

1. COURSE BACKGROUND

The online and offline hybrid first-class courses mainly refer to the use of appropriate digital teaching tools based on MOOC, SPOC(small Private Online Course, SPOC) or other online courses, and how to combine the school's actual curriculum transformation, arrange 20%-50% of the teaching time to implement online independent learning of students, and organic combination with offline face-to-face teaching to carry out flipped classroom, hybrid teaching In order to create a hybrid "golden course" that integrates online courses and classroom teaching in our school, we will carry out corresponding research. The course introduces the basic principles and basic methods of compiler construction. The objectives of the course are: to develop students' ability to design different compilation schemes according to the characteristics of high-level programming languages and the complexity of compilation; to improve students' ability to describe problems formally by analyzing and converting source programs with compilation knowledge; to design and implement compiled programs independently by retrieving relevant information using grammar and syntax analysis techniques [1-3].

Under the current form of epidemic prevention and control, universities have launched excellent courses on MOOC platforms. In the hybrid teaching combined with MOOC and flipped classroom, the teaching arrangement and course assessment methods should be adjusted accordingly. The main measures are: 1) 1 class of 60 students, 3 teachers for small class, flipped classroom teaching, and classroom online extension; 2) comprehensive experiments for developing system competence, as shown in Table 1; 3) 4 "practice" teaching + 2 "project-based group discussions" [4-6].

Table 1 Compilation principle experiments

Name	Experimental Objective	Experimental Content
Construction procedure of operator priority analysis table	To master the construction process of operator precedence analysis table.	Write the construction procedure of operator precedence analysis table, find the set of FirstVT and the set of LastVT of the non-terminal characters in the given operator precedence grammar, and construct the operator precedence analysis table.
Simple syntax analyzer	To master the process of operator precedence analysis.	To analyze the syntax of an expression according to the operator precedence analysis table and determine whether the expression is correct or not.

2. DESIGN AND ANALYSIS OF BLENDED LEARNING

Flipped classroom: Students complete their basic knowledge outside of class by watching videos, courseware and online forums. In class, teachers talk about difficulties, key points, ideas and methods, and students discuss and report, cultivating students' ability to learn independently and improving their communication and exchange skills.

Using China MOOC classes, create an asynchronous SPOC compilation principles course with a weekly flipped class. The pre-class, in-class and post-class schedule is as follows.

Before class: 1) release tasks and resources; 2) independent study and self-test; 3) organize results and record doubts; 4) check feedback and obtain learning

situation.

During the lesson: 1) teacher-student communication, answering questions and solving problems; 2) integration of testing and practice, consolidating knowledge; 3) application of innovation, cooperation and problem solving; 4) display of questions and in-

depth communication; 5) testing of learning, evaluation and reflection.

After class: personalized graded homework and Q&A, personalized adaptive learning and Q&A.

The examples of flipped classroom teaching for lexical analysis are shown in Table 2 [7, 8].

Table 2 Examples of flipped classroom teaching for lexical analysis

Before class	Post assignments, resources	Post video resources, pre-course assignments and pre-course study sheets on the China MOOC network
	Self-directed learning and self-testing	Follow the pre-course study sheet, watch the video
	Organizing results and recording doubts	Complete assignments, forum discussions, organize notes, and fill out questionnaires
	Check feedback, get learning	Obtain questionnaires on assignment completion, video viewing and knowledge point questionnaires or feedback on teaching methods based on learning data from the China MOOC platform
During class	Student-teacher exchange and question-and-answer sessions	Off-line discussions for discussion questions on lexical analysis overview, regular expressions and finite automata
	Test and practice integration, consolidation of knowledge	Teacher reinforces important points through question and answer format for teacher-student exchange
	Applying innovation and collaboration to solve problems	Group discussion on how to apply the principles of regular expressions and infinite automata to design a lexical analysis scheme
	Demonstrate questioning and in-depth communication	Students work in groups to elaborate on their solutions, conduct peer Q&A and group assessment
	Testing learning and evaluating reflections	Case reviews and knowledge checks to further improve the application of knowledge
After class	Individualized tiered assignments and question and answer sessions	Clustering analysis through pre-class learning task completion, assigning personalized tiered homework and answering questions on points that students are not mastering well
	Personalized adaptive learning and question and answer sessions	Organize students to participate in online discussions, personalized tutoring, and especially encourage students to answer each other's questions

Note: Meet and greet classes in an epidemic environment, using a live Internet format to replace offline teaching activities

3. EVALUATION MECHANISM OF BLENDED LEARNING

Evaluation mechanism of blended instruction using a total score allocation system and qualitative description-guided mutual evaluation.

1) Total Score Allocation System, where group members are given a score and the total score of the group members is a specified value (e.g., 10 points); individual score = group score*(individual gets total score/10). Design a scoring sheet for the total score distribution system, give each group member a score on the leave form, and use simple statements to describe what impressed you most about the student in the project, or describe his or her main contribution.

(2) Guide mutual evaluation through qualitative descriptions of the group members' "good performance" and "poor performance". Individual score = group score*(total individual score/average of group members' scores). The qualitative descriptions of the guided inter-rater questionnaire for the mutual evaluation of group members in the lexical analyzer process are shown in Table 3.

Table 3 Lexical analyzer student mutual evaluation questionnaire

Point	Content
0	The student did not participate in the group discussion and did not contribute to the experiment.
1	Although the student was present at the panel discussion, he did not speak.
2	The student made individual suggestions, did not participate in group collaboration tasks, and contributed less than ten percent.
3	The student consulted relevant materials and wrote a vocabulary analysis procedure, but was not very active in group work.
4	The student wrote the vocabulary analyzer code and test cases, and was able to actively participate in group discussions, review literature, and give advice and help to fellow group members.
5	The student has innovative ideas and is able to actively review literature, complete assigned tasks, help classmates, and drive a cooperative group atmosphere.

Peer assessment serves as a reference for teachers in the learning assessment process, but it cannot be used as the entire basis for final assessment. Peer assessment is more suitable for pre- and mid-term feedback evaluation, and is used to motivate peers who performed poorly in the pre- and mid-term to be more proactive and engaged in the later stages of learning.

4. CONCLUSIONS

Through the end-of-semester questionnaire and grade analysis, students changed from uncomfortable to comfortable with the blended teaching method based on affirmation. However, online teaching cannot completely replace classroom teaching, and improving teaching quality becomes the key to teaching reform during the epidemic. The pre-class pre-reading time of flipped classroom should not be too long, and the post-class review time should be larger than the pre-reading time. Teachers use the MOOC platform to fully analyze the completion of pre-class tasks with a view to meeting the class with a target. Using the WeChat MOOC classroom applet, students can quickly understand their learning situation in class, control the amount and difficulty of learning tasks, and stop negative aversion to learning. The amount and difficulty of the tasks are appropriately increased after the layout of the class to achieve the internalization of knowledge. The blended teaching based on MOOC

platform fully achieves student-centeredness and obtains better teaching effect and teaching quality.

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The Dissemination Mode and Rational Deconstruction of Internet Rumors among College Students

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Abstract: College students are a group active in new online media (WeChat, Weibo). In order to research the behavioral characteristics and problems faced by college students' participation in the Internet rumors, this article uses a combination of literature research and empirical investigation to conduct research. The results show that college students have certain characteristics in participating in the spread of internet rumors, including: the scope of communication within the acquaintance relationship, following the transmission path of transmission and reception, the transmission content is simplified, sharpened, and assimilated, and the transmission speed is the rapid trend of "point to area" and the spread of rationality and irrationality. At the same time, the dissemination of online rumors by college students is also facing a certain dilemma. This article proposes corresponding countermeasures.
Keywords: Internet rumors; Dissemination mode; Dilemma resolution; Countermeasures

1. INTRODUCTION

In the information age, people's online participation space is constantly updated, and the new information environment and communication environment have spawned two new online media platforms-Weibo and WeChat. The new network media, which integrates functions of entertainment, communication, information acquisition, and information transmission, has rapidly become popular among the general public. Due to the physical and mental characteristics of college students such as curiosity and desire for knowledge, they have become an important group active in the interaction space of Weibo and WeChat. In the process of participating in Weibo and WeChat, an important link is involved, namely information dissemination. In this process, each participant acts as the dual identity of the disseminator and receiver of information. Real information can be interacted and shared well through this platform, while information that has not been verified as authentic may mislead others in the process of transmission. The transmission of information with unclear authenticity is the spread of rumors. College students are an important participant group of new online media. Studying its characteristics in the spread of rumors on Weibo and WeChat and analyzing the reasons through rational deconstruction is an important content of ideological and political education for college students in the new era. In the micro-era promoted by the Internet, people's ways of thinking are jumping, and various events and social figures around us can be "miniaturized" [1].

Kapferer defines rumors as follows: "It refers to information that has appeared and circulated in society that has not been publicly confirmed by the government or that has been rejected by the government" [2]. Undergraduates participate in new online media such as Weibo or WeChat actively. College students are activists who accept new things. The transmission and sharing of information through the two new media of Weibo and WeChat is very common among college students. In the "Survey on the Spreading and Governance of Rumors on University Students' Weibo (WeChat)", we sampled 5000 college students from different schools, grades, and majors in Guangdong Province of China as a sample for investigation. The survey results show that 95.36% of the students actively participate in Weibo or WeChat, of whom 46.29% "use multiple times a day", 22.70% "use once a day", 25.69% "occasionally use once", The proportion of "never use" is only 5.33%. The data shows that college students are an important group active on Weibo and WeChat platforms, and their "internet-participation" behavior greatly affects the effect of network information transmission. The spread of rumors on Weibo (WeChat), and the driving force played by the university student community cannot be ignored.

2. DISSEMINATION CHARACTERISTICS OF INTERNECT RUMORS AMONG COLLEGE STUDENTS

2.1 Scope of Communication: Based on Acquaintances in the Trust Circle

The interpersonal communication circle of college students is mainly concentrated in the relationship of relatives, friends, classmates and other acquaintances. To a certain extent, this circle is correspondingly "copied" to the Weibo (WeChat) interaction circle of college students. This is the outstanding characteristic that distinguishes college students from other social groups. In this kind of acquaintance relationship, trust is an important basis for mutual information transmission and sharing. Based on trust, doubts and obstacles are greatly reduced in the process of

information transmission and sharing. "The spread of rumors is a typical shared meaning construction activity. The shared meaning construction of traditional rumors is a personal construction from 'knowing' to 'believing'" [3]. Acquaintance relationships are easier to transition from "knowing" to "believing". In the empirical survey, the sources of information on Weibo (WeChat) of college students are more from relatives and friends, accounting for 32.72%, while the proportion of information from strangers is significantly lower. Source information which the authenticity is undetermined is transmitted by relatives and friends to college students, and its credibility is naturally higher than that from strangers. It is within the scope of acquaintance relationship based on trust that the spread of rumors on the Weibo (WeChat) of college students is smoother.

2.2 Transmission Path: An Infinite Loop Mode of Transmission and Reception
The communication between people is not a one-way chain mode, which determines that the spread of rumors on Weibo (WeChat) cannot be a spread between the sender and the recipient. "Everyone can be a source of information, and everyone can be a disseminator." [4] The dissemination of rumors on Weibo (WeChat) is in fact an infinite loop mode. In this process, the spreader is also the recipient, and the spreader is transmitting the information, he himself was also the recipient of the information, that is "transmitted and received as one." Among college students, such a communication path is more obvious. College students are a relatively concentrated and closely related group. The interactive circles include dormitories, clubs, classes, grades, and fellow villagers' associations. In this tightly concentrated group, it is more conducive to the infinite circulation of rumors on Weibo (WeChat) in a short period of time. Under such high-intensity concentrated stimulation, usually people's ability to think is easily weakened, and they naturally become second-level spreaders of rumors.

2.3 Content of Communication: Simplified, Intensified and Assimilated Tendencies
In the dissemination of rumors on Weibo (WeChat), due to the characteristics of the platform, the number of words in its published content is limited, showing the characteristics of miniaturization and simplification. Also, because of its convenient operation. The source information of rumors on Weibo (WeChat) is generally not long talks, and it is generally not rigorous logical analysis and reasoning. It is usually just a brief summary of a matter in a few sentences. This is the main aspect that distinguishes Weibo (WeChat) from other platforms such as blogs and forums. Due to the college students' young and energetic physical and mental characteristics, they have great enthusiasm for the information of sensitive events, even if the information has not been officially verified as authentic. The more sensitive and stimulating events are, the easier it is for college students to use extreme and one-sided language to spread and evaluate interactions in Weibo (WeChat) participation. This interactive context within the entire group makes the spread of rumors shows an intensified trend. In addition, because college students have great commonalities in age, social interaction, knowledge level, speculative ability, social attention, etc., this makes it easy for college students to accept the rumors on Weibo (WeChat) in the centralized network interaction circle. They accept conscious judgments and emotional responses similar to those of the surrounding students, which promotes the assimilation of the content of the rumors on Weibo (WeChat).

2.4 Spread Speed: the Rapid Spread of "Point to Area"
The outstanding feature of the two major media platforms of Weibo (WeChat) is that the transmission and sharing of information that can form a certain interactive circle. Among registered users, friends follow each other to form a circle of friends. Once the information is released in the circle, the recipient can be users in the entire circle instead of a single individual. Individuals in the circle continue to forward to another circle, and in this way, the spread of information quickly increases exponentially. In the survey on the reposting objects of information with uncertain authenticity in Weibo (WeChat), 41.92% of college students chose the well-known circle of friends, 21.90% of students chose public platforms, and only a small number of them choose private chats. It can be seen that when college students are faced with information with uncertain authenticity, most of their forwarding objects are groups rather than individuals. This makes the spread of information from "points" to "area" in an instant. Such a rapid trend of dissemination makes it difficult for college students in ample time to think about the information with uncertain authenticity, but follow the trend to spread the information with the public, and the large-scale spread of rumors among various groups of college students has formed.

2.5 Spread Irrationality: Weak Awareness of Personal and Social Responsibility
Spreading irrationality here refers to the influence of certain irrational factors in the spread of rumors. In the spread of rumors on Weibo (WeChat), college students' irrationality is manifested to a certain extent as a weak sense of personal and social responsibility. In the Weibo and WeChat cyberspace, there is great freedom in the transmission of information, which eliminates the sense of responsibility of netizens in real life and traditional media platforms. Especially for college students, once they find stimulating and sensitive information, it is easier to arouse interest and enthusiasm for attention. In this process, whether the transmission of information has an impact on individuals and society is often overlooked. Regarding the investigation of the legal norms that "the same defamatory information has actually been clicked and viewed more than 5000 times, or has been forwarded

more than 500 times, if the circumstances are serious, it may constitute a crime of defamation", 39.39% of college students said they "Not Understand", 15.56% of college students said they "do not understand at all". It can be seen that college students' understanding of the relevant legal knowledge about the dissemination of false information on the Internet is not ideal, and they lack a sense of personal and social responsibility. In the participation in the spread of rumors on Weibo (WeChat), it is easy to ignore the punishment that individuals may face in order to pursue personal interests, and also ignore the negative impact that the spread of rumors may bring to society.

3. THE DILEMMA OF DISPELLING INTERNET RUMORS AMONG COLLEGE STUDENTS

3.1 "Gatekeeper" Status of University is Marginalized

Kurt Lewin put forward the famous "gatekeeper" theory that in the process of information flow, there are staff members who act as "gatekeepers", processing and filtering information according to certain standards, in order to a certain degree of public opinion towards work. In the era of traditional media, the role of "gatekeeper" has been reflected on a large scale. Paper media, television media, etc. are presented after certain editing and screening, and the controllable factors are relatively strong. In the self-media era, the presentation process of Weibo (WeChat) information is a simple, convenient, fast, and unorganized process, and the convenience of information "export" is usually proportional to the difficulty of information resolution. In the university environment, self-media platforms show the characteristics of diversity and decentralization, such as: various colleges, various institutions, associations, classes, WeChat official accounts or Weibo official accounts. These platforms play a direct role in the dissemination and sharing of students' information. However, in the real environment of colleges and universities, the identity of "gatekeeper" in the corresponding platform of student WeChat (or Weibo) is more obvious. The convenience and concealment of platform development, and the randomness of information release and sharing directly lead to the difficulty of colleges and universities in the management of college students' online public opinion. Related information is often unreviewed but has been widely disseminated among student groups. The "gatekeeper" of colleges and universities is marginalized in the massive amount of self-media information. In the face of the information that bursts the bank, the absence of the "gatekeeper" identity directly leads to the difficulty of effectively dispelling the rumors at the source or in the middle of transmission.

3.2 The Humanistic Care Nature of Internet Rumors Triggers Emotions in Public Opinion

Among the rumors that the audience pays attention to, it is not difficult to find that the incidents are often human, mostly involving the livelihood of society and people, vulnerable groups, major emergencies, politically sensitive events, etc., and are usually related to the physical and mental interests of individuals or surrounding groups, and thus cause greater attention. American social psychologist Allport concluded in "The Psychology of Rumors" that the influence of rumors is directly proportional to the importance of the event and the ambiguity of the event. The humanistic care nature of internet rumors makes the audience regard them as important events, and with the growth of self-protection sentiment, they take the form of information diffusion and arouse the attention of many parties to form a public opinion force mode. College students receive higher education, and their humanistic care is enthusiastic. This kind of emotional information dissemination mode usually lacks a certain rational trial, which makes it difficult to dispel rumors.

3.3 "Information Hunger" and "Group Psychology Convergence" of College Students

Since the media age, people are flooded in the information environment, and the demand for information is higher than in any previous period. During the event, when the information needs are not met, as a group with a strong desire for knowledge, college students often fall into a state of "information hungry", and once corresponding information appears, it directly fills the gap in information needs. The process is usually difficult to proceed in rational judgment. In addition, when information appears in large numbers and circulates wantonly, the power of the group begins to appear. When unilateral behaviors gradually spread to multi-party behaviors, the reliability of "rumors" has been strengthened in the psychological strengthening of the group, and rumors are difficult to break under the pressure of "group psychological convergence". Undergraduates live in a typical group life, such as campus groups, class groups, dormitory groups, and community groups. The mutual influence among groups is very large. In the process of mass dissemination of network information, the pressure of "group psychological convergence" is even more pronounced.

4. COUNTERMEASURES FOR DISPELLING INTERNET RUMORS OF COLLEGE STUDENTS

4.1 Improve the Official Internet Account of the Campus and Form an Effective Rumor Rejection Mechanism

"We are in an era of transformation-a new era of communication. In this era of communication that is being driven by Weibo, if we do not keep up with it, we may be abandoned by the era" [5]. The official public account means a certain degree of authority to the audience, and its credibility to dispel rumors is higher than other methods. Colleges has established official media platforms. Among them, the official WeChat public account and the official Weibo account are all media that represent official discourse. The attention of its "fans" (mostly students of the school) is based on certain interest and trust, which is also an important reason for the persuasive of the official

account. The authority and credibility of the official campus official account determines that this is an important port for dispelling rumors. A lot of facts show that once a crisis or sensitive event breaks out, the audience is expecting official information. Therefore, colleges should improve their official accounts, establish emergency and rumor-defying plans for media platforms, implement a responsibility system, and form an orderly, standardized, and rigorous rumor-defying mechanism. The campus official account plays its role as a guide in the process of information circulation. Under the circumstances of crisis events, environmental turbulence, and confusion of public opinion, it shapes its credibility and authority, and speaks in a timely manner. After thorough questioning and careful judgment, at critical moments Purify the network public opinion environment of colleges and universities.

4.2 Attach Importance to Online Legal Education, and Enhance College Students' Behavioral Awareness

The virtual nature of the network has increased the difficulty of its standardized management. Therefore, legalized management is an important way to purify the internet space and control internet rumors. Among college students, the spread of internet rumors does not lie in the inability to control regulations, but in the fact that the corresponding legal regulations are not well known and valued by participants. The inadequacy of college students' understanding of the corresponding legal restrictions on the spread of Internet rumors strongly illustrates this point. Therefore, strengthen the network legal system publicity and education, and guide college students from the cognitive level. Cognitive identification can cause behavioral resonance, and achieve the unity of cognitive internalization and behavioral externalization. Online legal education in colleges and universities can be carried out by combining college students' ideological characteristics and acceptance preferences. On the one hand, through online legal propaganda, set up online columns, newspaper columns, propaganda columns, etc., to carry out a series of publicity on the social harm of online rumors, legal consequences, etc., to strengthen college students' understanding of the legal system; Activities, special lectures, online legal system study and discussion around online rumors, to understand the negative impact of internet rumors in society and corresponding legal regulations. In the influence of the relevant legal system propaganda in colleges and universities and the participation of college students' personal legal education activities, the corresponding educational effect can be achieved to enhance the behavior consciousness of college students.

4.3 Strengthen the Prevention of Network Technology and Improve the Ability of College Students to Analyze Network Rumors

The ability of college students to discriminate against internet rumors is directly related to the spread of rumors in college student cyberspace. Improving the ability of college students to discriminate and analyze online rumors and rationally analyze, judge, and select rumors is the fundamental way to purify the cyberspace of colleges and universities. Colleges and universities should open up channels to strengthen network technology defenses. One is to establish a campus new media alliance. Colleges and universities are composed of many departments, colleges, student organizations and societies. Each group has its own new media port (such as WeChat official account or Weibo official account). All new media ports are managed in a unified manner, and an organized and systematic Campus New Media Alliance. The members of each new media portal shall conduct corresponding training, learning, technical training, etc. in the organization and management, which can improve their comprehensive media literacy and enhance the ability of information analysis; Second, strengthen the construction of new media work teams. The role of "gatekeeper" is clearly reflected in traditional media platforms, but in the new media environment, the identity of "gatekeeper" is weakened. The construction of the new media work team in colleges and universities is a repositioning of the importance of the role of "gatekeeper". In the WeChat and Weibo media platforms of colleges and universities, it is indispensable to conduct full-time information review on public platforms. This reflects the responsibility for the value orientation and social impact of campus network information. The information review and judgment of "gatekeepers" can affect the students' ability to analyze online rumors to a certain extent; third, strengthen the monitoring of online public opinion. The network public opinion work of colleges and universities is directly related to campus stability, and the monitoring of network public opinion runs through all stages and links. All departments of the school, the teaching and academic work teams of the college, student associations, class cadres, etc., should form a network public opinion monitoring system. Go deep into the network space of college students, learn about WeChat Moments, Weibo account dynamics, etc., and grasp rumor information in time, play an effective public opinion monitoring effect, and prevent it before it happens.

5. CONCLUSION

The characteristics of the spread of online rumors have a lot to do with the physical and mental characteristics of college students, the status quo of new media education in colleges and universities, and the characteristics of cyberspace systems. The wanton spread of internet rumors among college students may have a greater impact on college students' value judgments, ideological recognition, and behavior choices. This article proposes the corresponding countermeasures for the governance of internet rumors from the management and education levels, and hopes that with the joint efforts of multiple channels, the rumors can be stopped by the wise men.

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Research on Color and Substance Concentration Identification based on HSI Color Space Model

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Abstract: For the measurement of substance concentrate- ion, people traditionally used solution to react with specific test paper and compare the color of the test paper with the standard color card, but the accuracy of this method was greatly limited. With the collaborative development of electronic and computer technology, machine learning, neural networks, and computer vision, the color recognition process is becoming more and more automated and precise. Based on RGB and his color space, a HSI color space model was established to identify color and substance concentration in this work. As the test paper characteristics related to substance concentration can be reflected in the projection disc of H and S coordinates, the color characteristic value expressed by his coordinates was more suitable for describing human visual perception by using R language to analyze and judge the data.

Keywords: Colorimetric method; RGB color space; HSI color space; Color space dimension; Nonlinear regression; R language

1. INTRODUCTION

Colorimetric method was a commonly used method to detect the concentration of substances, but the accuracy of this method was greatly affected due to the difference of sensitivity of each person to color and observation error. With the improvement of photographic technology and color resolution, researchers hope to establish the quantitative relationship between color reading and substance concentration, that is, as long as the color reading in the photo is input, the substance concentration can be obtained [1, 2].

This work was based on RGB (Red-Green-Blue) model which was widely used in computer graphics. RGB model was a common way to express color information which used the brightness of red, green and blue to express color quantitatively. The computer usually used 8-bit color depth to represent each primary color, so the value range of each primary color was 0-255 [3, 4].

HSI model was proposed by H.A. Munseu, American colorist, in 1915 which reflected the way of human visual system perceiving color by hue, saturation and brightness. It was convenient to operate colors subjectively, as HSI model conformed to the visual and psychological characteristics of human observing and feeling colors. There were three components in the HSI model, **h**, s and **I**. The **I** component had nothing to do with the color information of the image, and the **H** and **s** components corresponded to the characteristics of people's perception of color [5, 6].

The coordinate of HSI color models can be converted by RGB coordinate as follows:

$$r = \frac{R}{R+G+B}, \; g = \frac{G}{R+G+B}, b = \frac{B}{R+G+B} \quad (1)$$

$$h = cos^{-1}\left\{\frac{0.5[(r-g)+(r-b)]}{[(r-g)^2+(r-b)(g-b)]^{1/2}}\right\}, \quad h \in [0,\pi], \; b \leq g \quad (2)$$

$$h = 2\pi - cos^{-1}\left\{\frac{0.5[(r-g)+(r-b)]}{[(r-g)^2+(r-b)(g-b)]^{1/2}}\right\}, \quad h \in [\pi, 2\pi], \; b \geq g \quad (3)$$

$$s = 1 - 3\,min(r,g,b), \; s \in [0,1] \quad (4)$$

$$i = (R+G+B)/(3 \cdot 255), \; i \in [0,1] \quad (5)$$

$$H = h \times 180/\pi, \; S = s \times 100, \; I = i \times 255 \quad (6)$$

where R, G and B were the red, green and blue components of the color respectively, and each value range was between 0 to 1 after normalization. **h** was the radian value of hue, and the corresponding **H** was the angle value of hue coordinates. The value range of saturation **s** ranged from 0 to 1, but the corresponding **S** ranged from 0 to 100.

2. RESEARCH ANALYSIS

This work aimed to study and solve the problem of color and substance concentration identification in the actual material measurement, but due to the difference of color sensitivity and observation error of different people, the accuracy of measurement data was greatly affected. With the development of photography and computer technology, it was possible to establish a model between the color reading in the photo and the concentration of the substance to be measured. As the luminance (lightness) component in the color information had nothing to do with the color information of the image, the other two components should be considered in the color processing. This work mainly studied the following three aspects.

(1) To study the color readings of five substances at different concentrations, including Potassium bromate, industrial alkali, potassium aluminum sulfate, urea in milk, histamine. Then, to determine the relationship and its pros and cons between the color reading and the substance concentration from these 5 sets of data.

(2) To study the color readings and concentration data of 5 substances, including potassium bromate, industrial alkali, potassium aluminum sulfate, urea in milk, histamine, etc. Then, to establish the research model between the color reading and the substance concentration and analyzed the error by R language.
(3) To study the influence of data volume and color dimension on the model.

3. SCHEME DESIGN

In view of the above research content, this work gave the following corresponding research scheme.
(1) Based on the data of five substances, to determine the relationship between color reading and substance concentration, and give the relevant criteria to evaluate the advantages and disadvantages of the five groups of data, and plot the five groups of data to find the corresponding relationship between color reading and different substance concentration.
(2) Based on the data of five substances, to establish the model of color reading and substance concentration, and analyze the error of the model. Through the analysis, to transform RGB into HSI coordinate, and discard I coordinate which was not related to color, and make a function F (h, s) to fit the relationship between color and SO2 concentration. And, it should be noted that when the concentration of SO2 was 0, it was necessary to average the measured values of H and s of 5 groups of SO2. As the color saturation pair was very small when SO2 concentration was 0, the fitting function f should be: F (H, S) = F (0, 0) = 0. Considering the decomposition of three primary colors, the distribution of different H values in (H, S) disk needed to be described by piecewise function.
(3) To analyze the influence of the amount of data and color dimension on the model. Firstly, through the transformation of color space, to transform the color in RGB three bit space into HSI three components. As the research of chromaticity showed that I component had little effect on color, it can be ignored in the study of the relationship between the color of test paper and the concentration of substance. Thus, a fitting problem with three independent variables (R, G, B) was transformed into a fitting problem with two independent variables (h, s). In the specific problem of SO2 concentration and test paper color, it would be founded that in the transformed H-S disk, the test paper color corresponding to different SO2 concentration only changed in the dimension of color saturation 3 degrees, while the hue dimension remained almost unchanged. Then, to establish the relationship between color saturation and SO2 concentration, so that the regression problem of only one variable was transformed from the initial three variables. According to the analysis, although the dimension of regression was reduced, the main characteristics of color change were retained, and the secondary factors were abandoned to establish a clearer and clearer numerical relationship.
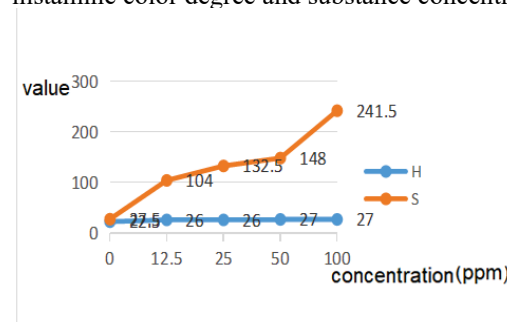
4. MODEL Building

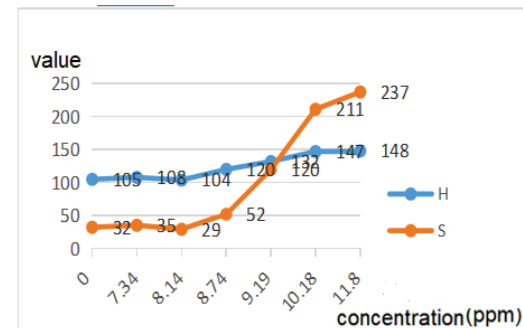The following was how to carry out the implementation.
(1) Drew the following chart based on the color reading and substance concentration of the test substance:
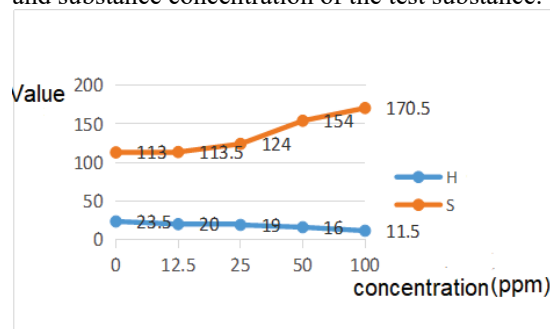
(a) Schematic diagram of relationship between histamine color degree and substance concentration

(b) Schematic diagram of relationship between Potassium bromate value and substance concentration
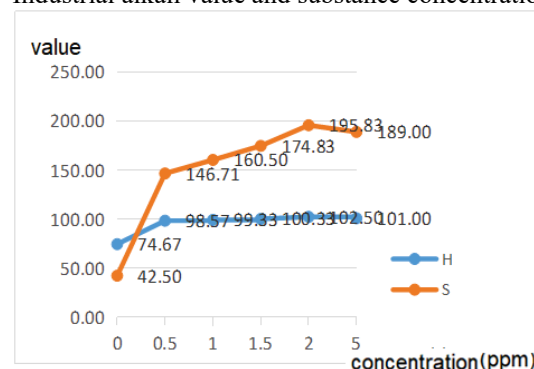

(c) Schematic diagram of relationship between Industrial alkali value and substance concentration

(d) Schematic diagram of relationship between Aluminum potassium sulfate and substance concentration

Figure 1 Schematic diagram of the relationship between the color reading and the concentration of the

substance
According to the analysis of the above Figure 1, the **H** (hue) of the substance had little effect on the substance concentration. With the increase of the substance concentration, the **H** (hue) basically remained unchanged. However, the **S** (saturation) of substance had a great influence on substance. With the increase of substance concentration, **H** (hue) gradually increased. On the contrary, with the increase of **H** (hue), the corresponding substance concentration was larger.
(2) Based on material data analysis, RGB and his models can be established, and H (hue), s (saturation) values can be solved. Calculated the values of H1 (hue) and S1 (saturation) by the values of R, G and B using the mathematical model of RGB and HIS. Histamine in five kinds of data, such as potassium bromate, industrial alkali, aluminum potassium sulfate, urea in milk and histamine, were analyzed. A group of data was taken, then the values of H1 and S1 were calculated through the values of R, G and B. the concentration of histamine solution C, RGB and H1 and S1 were obtained as follows:

C=0   R=68   G=110   B=121   S=111   H=23
S1=31.772575   H1=48.659592;
C=12.5   R=66   G=102   B=118   S=112   H=20
S1=30.769231   H1=42.519831;
C=25   R=62   G=99   B=120   S=122   H=19
S1=33.807829   H1=39.049437;
C=50   R=46   G=87   B=117   S=155   H=16
S1=44.800000   H1=35.111426;
C=100   R=37   G=66   B=110   S=169   H=12
S1=47.887324   H1=23.234416.

Through data analysis, it was found that H given by the data was proportional to H1 calculated by RGB: H1/h was about 2, and S was also proportional to S1.R language was used to calculate saturation S1 and hue H1 from RGB of all data, and linear regression analysis was performed with S and H measured. The detailed results obtained from the linear regression analysis of H1 and H were shown in the table below.
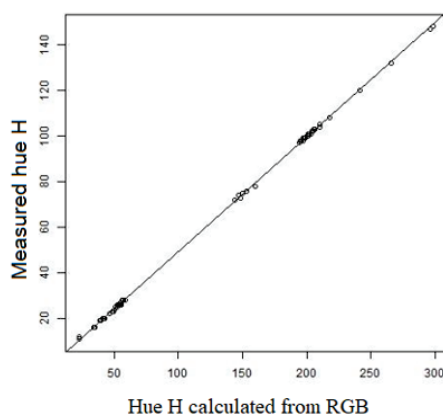

Figure 2 Linear regression analysis of RGB calculated the value of hue H and measured the value of H
According to the regression statistics and graph analysis in Figure 2 above, the regression coefficient 0.503441 was obviously not 0 (p < 0.001). The **R**

square term was 0.9998. It showed that the model fitted well. The prediction equation was
$$H=H1*0.503441-1.013987.$$
For the convenience of expression, it was be approximately considered that there was the following relationship: H1 = 2*H. The results of linear regression analysis for **S1** and **S** were shown in Figure 3.
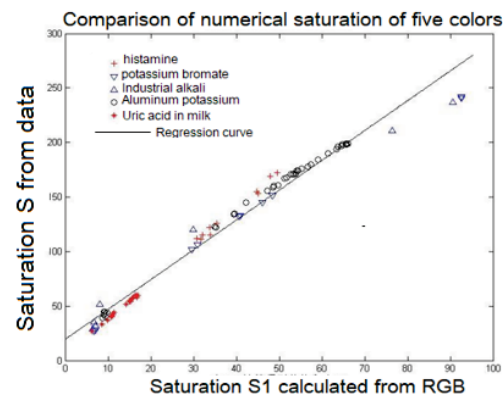

Figure 3 Saturation S value calculated by RGB and linear regression analysis of the measured S value
According to the regression statistics and graph analysis in Figure 1-3 above, the regression coefficient 02.73540 was obviously not 0 (p < 0.001). The **R** square term was 0.9783. The prediction equation was
$$S=S1*2.7354+19.47936.$$
It can be seen from figure 3 that the data of aluminum sulfate deviated from the regression line most recently, and the RGB measurement data was in good agreement with the measured **S** value. The data of industrial alkali deviated from the regression line farthest, and the data was not well.
(3) By transforming RGB to his coordinate and abandoning **I** coordinate which was not related to color, a function F(H, S) was used to fit the relationship between color and SO2 concentration.
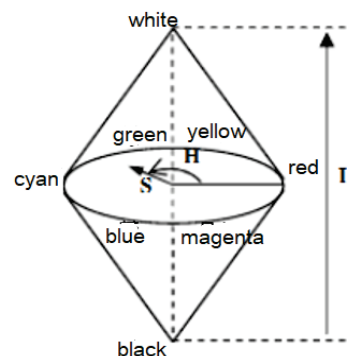
Figure 4 Representation of HSI space
It can be noted that when the concentration of SO2 was 0, by averaging the measured values of **H** and **S** of five groups of SO2, the average value of **S** was very small. The following assumption was used for the fitting function: F(H, S) = F(0, 0)=0 (Figure 4).
By analyzing the distribution of three primary colors red, green and blue on the (H, S) disk, Piecewise function was used to describe the model.
When 0<H<120,

$$F(H,s) = \frac{[H \times a \times S^2 + (120-H) \times b \times S^2]}{120} \quad (7)$$

When 120<H<240,

$$F(H,s) = \frac{[(H-120) \times b \times S^2 + (240-H) \times c \times S^2]}{120} \quad (8)$$

When 240<H<360,

$$F(H,s) = \frac{[(H-240) \times c \times s^2 + (360-H) \times a \times S^2]}{120} \quad (9)$$

where a, b, c>0, and **a** indicated the relationship between concentration and color saturation **S** when the color was red. **b** indicates the relationship between concentration and color saturation **S** when the color was green. **c** indicated the relationship between concentration and color saturation **S** when the color was blue. When the color was a mixture of the above three primary colors, the relationship between the concentration and the color saturation **S** was weighted average according to the difference between the angle **H** and the values of two adjacent pure colors.

The fitting function should have the form shown in Figure 5 below. In the region with small color saturation, the concentration of SO2 increased with the increase of the measured value of color saturation **s.**
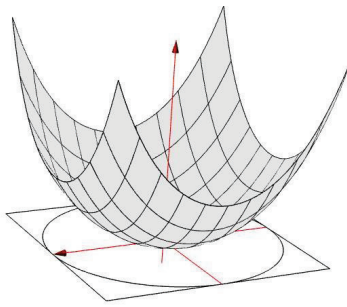

Figure 5 Schematic diagram of concentration fitting function

Through the analysis of SO2 data, it can be seen that in the process of SO2 concentration changing from 0ppm to 150ppm, the change of H was very small (which meant that the color change of test paper was very small), and it was not monotonous. There was a period of fluctuation when **S1** concentration was 100 ppm. The measured value of hue of test paper color was about 130, and the corresponding H1=2*H was about 275. So the piecewise function was in the interval of [240, 360].

As the change of H1 was very small, H1 was regarded as a constant in nonlinear regression. Only considering the relationship between SO2 concentration and color saturation **S**, the problem can be transformed into a nonlinear regression problem.

Assuming that the form of the model was C = a1*S2 and using the nonlinear regression a1 which was 0.0066844 in **R** language, the goodness of fit of the model was 0.9156571 through **cor** command of R language.

It can be seen that the characteristics of nonlinear regression were obvious. The prediction equation of SO2 concentration with respect to **S** was: C =

0.0066844 S2.

Using the exponential model C = A1*(a2s-1) to do the nonlinear regression, a1 = 0.722001, a2 = 1.041738, the goodness of fit was 0.9156571.

The two regression models were summarized as follows:

Quadratic function model: C=0.0066844*S^2

Exponential function model: C = 0.772001*(1.041738^s -1). Figure 6 showed the advantages and disadvantages of the two prediction equations.
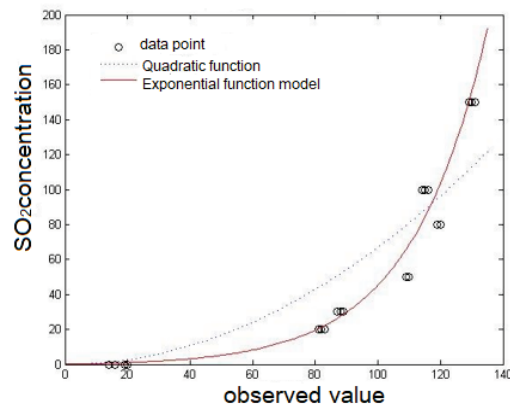
Figure 6 Comparison of two nonlinear regression models

MRE was used to calculate the error of the two regression models. Assume five data points with 0 concentration were ignored, MRE were calculated as 0.387693 by using Quadratic function module C = 0.0066844*S2. And for exponential function model: C = 0.772001*(1.041738s-1), MRE = 0.074. Obviously, exponential function model was better than quadratic function model.

(4) The amount of data also had a great impact on the model, so in the data collection, it should be reasonable to collect. Not only to meet the needs of establishing mathematical model, but also to consider the cost of the actual collection process. In order to explore the influence of color dimension on the model, BGR color space model was shown in Figure 7.
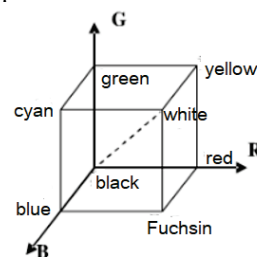
Figure 7 RGB space

5. CONCLUSIONS

A HSI color space model was established to identify the color and substance concentration based on RGB and HSI color space in this work. The analysis and simulation showed that the model was quite accurate and practical, and it was more suitable for describing human visual feeling.

More than this, the technology of this model can be applied not only to the detection of chemical

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concentration, but also to other color related aspects, such as the automatic measurement of fruit maturity, tobacco quality and forest coverage. The skills and techniques applied in this model can also be applied to computer image recognition, intelligent household appliances and artificial intelligence.

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The Cultivation and Improvement of Higher Vocational Teachers' Informatization Teaching Ability from the Perspective of *Internet+*

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Abstract: Vocational education is an important component of education in our country, and its information construction has gradually attracted the attention of the society. Under the impetus of education reform, teachers' informatization teaching ability has attracted widespread attention from scholars at home and abroad, but there are still few studies on teachers in vocational schools. This article starts with analyzing the status quo of vocational school teachers' informatization teaching and constructing a structural model of vocational school teachers' informatization teaching ability. It points out that by strengthening the construction of informatization infrastructure, creating a campus atmosphere for the application of digital resources, actively carrying out training, and carrying out innovative research on informatization teaching Encourage participation in the informatization teaching competition and other aspects to enhance the informatization teaching ability of higher vocational teachers, so as to improve the informatization teaching ability of teachers and promote the informatization construction of vocational education.

Keywords: Informatization education in vocational colleges; Informatization teaching ability; current situation, Structural model

1. INTRODUCTION

With the rise of the Internet, technology has continuously flooded people's lives and brought major changes to people's lifestyles [1]. The application of technologies in education has also brought about important changes in the form of education. "A piece of chalk + a blackboard" can no longer satisfy the current classroom teaching, and the teacher's responsibilities are no longer simply confined to "preaching and teaching work to solve puzzles", and students return to the main body of the classroom [2]. In the era of 5A (Anyone, Anytime, Anywhere, Anyway, Anything), students can obtain the resources they want through multiple channels, which challenges the authority of teachers. Informatization methods have brought extraordinary innovation to teaching [3]. If teachers blindly close themselves to the traditional teaching model, they will definitely be eliminated by the club. The "Ten-Year Development Plan for Educational Informatization" stated in the overall development goal that "by 2020, a complete informatization education system will be formed and the level of national educational modernization will be reached." [4] The development of the country lies in education, and the purpose of education is to cultivate society. High-quality talents are needed, and the key to the quality of education lies in teachers. This requires teachers to keep up with the pace of informatization and improve their self-teaching ability.

Informatization teaching in foreign countries has been developed earlier. In order to improve teachers' informatization teaching ability, various countries have issued relevant policies to guarantee it [5]. As early as 1995, the Singapore government promulgated the MIT Educational Information Plan, and successfully built an educational intelligence island seven years later [6]. The United States issued five "National Educational Technology Plans" from 1996 to 2015 to form educational technology alliances based on regions and encourage various non-profit organizations and private enterprises to support the development of teachers' teaching information technology capabilities. In 2010, the United Kingdom also put forward professional requirements for teachers, stipulating that teachers in the 21st century must have the knowledge, skills, and professionalism of information technology teaching, and clearly proposed shared services, E-learning and other contents have paved the way for the creation of an informatized education environment [7].

Compared with foreign countries, my country's informatization education started relatively late. The Ministry of Education of our country proposed in 2010 to explore the comprehensive integration of information technology and education to realize the co-construction and sharing of education and teaching resources. In recent years, modern information technologies such as artificial intelligence, big data, and virtual simulation have been widely used in the education and teaching process, which has promoted the comprehensive coverage of high-quality educational resources, shortened the difference in the allocation of high-quality educational resources between different regions, and achieved educational equity. In the context of the "Internet +" construction, comprehensively improving the information technology application capabilities of higher vocational teachers, giving full play to the advantages of

information technology teaching, and using information teaching methods for education and teaching have become an important direction for improving the quality of higher vocational education talents in the future.

2. STATUS QUO OF INFORMATIZATION TEACHING IN HIGHER VOCATIONAL COLLEGES

(1) Insufficient understanding of informatization teaching

The wisdom of vocational education is a new teaching concept that relies on modern information technology to provide high-quality digital resources and online services to learners to cultivate vocational skills and professionalism. It is an extension of traditional teaching concepts. It greatly enriches teaching methods and improves learning the effect has promoted the reform and innovation of vocational education. In the actual teaching process, some higher vocational teachers have outdated teaching concepts and backward teaching methods. Informatization teaching remains at the simple technical level such as making electronic courseware. The concept of wisdom education is fuzzy, teaching efficiency is not high, and students' learning effects are not good to a certain extent. Has affected the formation of student information literacy. So far, our country's informatization teaching model is still in the exploratory stage, and its popularity is not high. It needs to be continuously refined and summarized in teaching practice, and gradually eliminate those who think that informatization teaching increases the workload of teaching, and the resistance generated by it, let the general public Teachers enjoy the efficiency and convenience brought by informatization teaching, allowing them to actively participate in the wave of informatization teaching reform, and promote the steady progress of my country's higher vocational education reform.

(2) The information teaching environment needs to be improved

Informatization teaching has very high requirements on the campus network environment, requiring fast network speed, good stability, and wide coverage. The campus network environment of higher vocational colleges in my country still has a gap with this requirement. In addition, compared with ordinary higher education, my country's higher vocational education has a relatively slower pace of development and insufficient investment. The infrastructure that can adapt to informatization teaching is relatively backward. In order to adapt to the development of the times, some higher vocational colleges have made various efforts to build Smart classrooms and virtual simulation training rooms, but the number is seriously insufficient, and the capacity is difficult to meet the training needs of students; The degree of modernization is not high, and it is difficult to give full play to the advantages of modern information

technology in the education and teaching process. Teachers in higher vocational colleges are generally not motivated to teach informatization and their teaching level is generally not high. Old teachers with rich teaching experience are not strong enough in the application of information media technology in teaching, not skilled in operation, and the integration of classroom teaching and information media technology is low. The application effect is not good. The young teachers are easy to accept new things, but they have insufficient teaching experience and cannot organically integrate information media technology with the teaching process. As a result, the level of informatization teaching is not high, and the ability of informatization teaching needs to be improved.

(3) The traditional teaching mode of teaching practice needs to be reformed

In actual teaching in higher vocational colleges, many teachers still use traditional teaching methods. Under the traditional model, the dominant position of teachers is emphasized. Students' "learning" is centered on teachers' "teaching". What teachers say, what students learn, and what they learn are often out of touch with production practice. It is difficult for students to truly master the profession they need. Technical skills. Informatization teaching is based on the theory of constructivist learning, highlighting the main status of students, the guiding and supporting role of teachers, and students gaining knowledge through communication, cooperation, and independent learning. Information-based teaching can simulate the working situation of an enterprise and implement context-based teaching. Students can easily master vocational and technical skills, which is difficult to achieve with traditional teaching models. It can be seen that the traditional teaching model cannot meet the requirements of the development of informatization teaching. It must reform and innovate, change concepts and traditional concepts, and gradually form a modern vocational teaching concept with students as the main body, consolidate the theoretical foundation of informatization teaching, and promote higher vocational education information Reform of education.

(4) The teaching evaluation mechanism needs to be improved

Teachers in some higher vocational colleges have low level of information technology, and their application ability is not strong. The main reason is that at the ideological level, informatization teaching is not emphasized, the understanding of informatization teaching is insufficient, the lack of professional informatization teaching ability training, and the narrow belief that informatization teaching is to demonstrate PPT, play audio, video, etc. in the teaching process. At the technical level, modern information technology cannot be integrated into classroom teaching skillfully, information teaching is a formality, and the main function of information technology has not been fully utilized. At the system level, there is a

lack of evaluation standards and incentive systems for the evaluation of teacher informatization teaching effects, and the path to the identification of teacher informatization teaching results is not smooth, resulting in teachers not being motivated by informatization teaching, perfunctory, and the degree of integration of information technology and curriculum teaching is not deep enough. At the management level, higher vocational colleges generally lack specialized information-based teaching management and supervision departments to effectively supervise and manage the information-based teaching process of teachers, and effectively spur and encourage the improvement of teachers' information-based teaching capabilities.

3. CONSTRUCTION OF THE MODEL OF THE INFORMATION TEACHING ABILITY OF TEACHERS IN VOCATIONAL COLLEGES
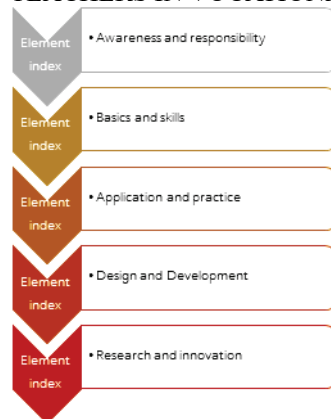

Figure 1 The framework diagram of the information teaching ability structure of teachers in vocational schools

Vocational college teachers' informatization teaching ability means that vocational college teachers use information technology, rationally design and develop teaching resources and apply them to teaching practice, and can create a teaching environment that is easy for students to understand to promote students' learning of knowledge. The ability required to successfully complete the teaching objectives. In order to enable teachers in vocational colleges to better adapt to the needs of informatization education, in order to improve the professional development level of teachers in vocational colleges, it is necessary to establish an informatization teaching competency framework, and on the basis of this competency framework, further development training and research work. Combining the previous survey and research results, combining the characteristics of teachers in vocational colleges, the actual teaching needs and teaching process of teachers in vocational colleges, and the relevant standards of teacher information education in our country, we have constructed a stepped performance structure Framework, the framework includes five capabilities, namely: ① Awareness and responsibility;②Basics and skills; ③

Application and practice; ④Design and development; ⑤ Research and innovation. Each ability contains multiple elements and corresponding indicators. As shown in Figure 1.

Awareness and responsibility; Informatization teaching has become the object of teachers' perception and thinking. Teachers' understanding of the basic laws of informatization teaching and the ability to use proper methods to learn, explore and apply in teaching and scientific research. Master the basic theoretical knowledge and basic skills related to information teaching, and be able to solve simple teaching problems through information technology. Including teachers' skillful use of various commonly used software and network tools, and the operation of some commonly used teaching equipment.□□

Application and practice: The existing information technology is reasonably and effectively applied to the daily teaching process and teaching practice, such as teaching preparation, teaching implementation, teaching evaluation, teaching reflection and other specific abilities in each link.□□

Design and Development: On the basis of teaching design, the use of information technology means to design and develop courses, teaching units, classroom activities and teaching resources, etc., in order to help students learn more efficiently and improve their hands-on ability, writing ability, and practical ability.

Research and innovation: It refers to the ability of vocational college teachers to use information technology to engage in teaching research, and creatively design teaching methods, teaching models and teaching environments suitable for the development of students' personality.

4. APPLICATION PRACTICE OF TEACHERS' INFORMATIZATION TEACHING ABILITY STRUCTURE MODEL IN VOCATIONAL COLLEGES

(1) Teaching preparation

Before class, adequate teaching preparation is very important. In vocational colleges, although there is no pressure to enter a higher education, they pay more attention to teachers' skill competitions. Sometimes teachers spend too much energy to participate in municipal, provincial, or even national skill competitions, resulting in insufficient time to prepare lessons. It will result in insufficient understanding of the new curriculum or difficulty in grasping the students' academic conditions. Insufficient teaching preparation will cause teachers to give lectures without logic, or read textbooks based on the text, which will make students lose interest, and teachers will not find the joy of teaching, which will also affect subsequent teaching careers. Some schools have organized collective lesson preparation. Teachers of the same subject will collectively discuss the new curriculum, grasp the important and difficult points of teaching, and effectively design classrooms. In teaching design, teachers should be able to correctly describe teaching

objectives, analyze teaching content, research and develop teaching resources, choose teaching media suitable for the level of academic development, and design interesting teaching group activities.

(2) Teaching implementation
In the process of teaching implementation, teachers are required to master higher skills:

① Teachers should be able to effectively organize and coordinate various resources according to actual needs to create an information-based learning environment;

②When designing teaching activities, teachers should be able to reflect the learner-centered, self-construction of knowledge meaning, and the evaluation of students' learning process according to the characteristics of the informationized teaching process, and focus on the use of information technology as a learning management tool, Information processing tools, social interaction tools, etc., to support the teaching process;

③Be able to use collaboration tools and network tools to effectively support the implementation and organization of project-based learning, so that students can truly complete a project of learning;

④Able to use information technology to assist the teaching implementation of abstract knowledge, dangerous operations, etc., to deepen students' understanding;

⑤Be able to use information technology to promote students' learning of knowledge, rather than one-way instilling knowledge, and transition the role of teachers from authoritative experts to guides, promoters, and helpers.□□

(3) Teaching evaluation
Teaching evaluation mainly includes students' evaluation of teachers' entire teaching activities and teachers' evaluation of academic learning. Its ultimate goal is to improve the quality of education and teaching. When evaluating students' learning, teachers need to be able to make formative and summative evaluations with the help of information technology, and based on the evaluation results, propose improvement measures to further improve teaching activities. In the process of evaluating students' learning interest, learning status, and learning results, teachers may encounter some technical problems. This requires schools to provide teachers with opportunities for informatization teaching and training, so that teachers can learn new technologies in time, and promote the continuous development of the technical system. The improvement can use pseudo-simulation technology, 3D modeling technology, online classroom, MOOC, etc. to improve education and teaching conditions, so as to better grasp the evaluation of students.□□

(4) Collaboration and communication
Teaching is a kind of social activity. Teachers not only need to deal with students, but also need to deal with all aspects of cooperation and communication to ensure the normal and orderly progress of teaching activities. Teachers need to do the following in terms of collaborative communication:

① Be able to use information technology and technology to communicate with teaching staff on the progress and problems of teaching work;

②Able to use information technology and technology to communicate with technical personnel on learning support and service issues;

③Able to use information technology and technology to communicate with parents and students on the development and growth of students in a timely manner, and record the learning process of students;

④ Able to use information technology to promote cooperation and exchanges between students and enterprises related to the major.

5. INFORMATIZATION COURSE DESIGN AND DEVELOPMENT

(1) Teaching design
At present, the teaching design awareness of vocational school teachers is not in place, and schools need to organize more teaching seminars to make teachers realize that informatized teaching design can indeed attract students' attention, thereby improving classroom teaching efficiency. Teachers are also required to design courses that meet the cognitive characteristics of students according to the cognitive level of students. Of course, teachers must first understand the cognitive level of students and clarify the needs of learning. In addition, teachers should be able to master the basic theories and basic steps of instructional design and the functions and effects of each step, grasp the connotation of instructional design, improve their own information literacy, and truly achieve W teacher-led in the classroom and students in the center. Teachers should be able to analyze and evaluate the teaching design plans of others, and be able to independently complete the writing and revision of teaching design plans in an information environment based on the knowledge of teaching design. In the process of writing, revising and implementing the teaching design plan in the information environment, teachers should constantly summarize and reflect on the characteristics and teaching methods of the courses they teach, and constantly organize and update the resources needed for teaching to achieve effective teaching.□□

(2) Curriculum design and development
Curriculum design requires teachers not only to complete the instructional design of a lesson, an activity unit and the corresponding resource design, but also to be able to complete a project-based teaching plan and complete the resource design based on the theory of instructional design. If necessary, the existing technical means can be used to complete the development of the resource and guide students to successfully complete the project. In teaching activities, teachers are required to provide reasonable information technology and tools for students' learning, help students effectively complete in-class learning and

extracurricular independent learning and communication, and be able to use diagnostic tools, assistive technology and information and communication technology resources to solve the problem. The course targets students with special educational needs.□□

(3) Management and evaluation

Informatization teaching evaluation refers to the understanding of students' mastery of the knowledge learned by observing the performance of learning in the learning process, and evaluating whether to achieve the goal of teaching design, complete teaching tasks, and improve the design of teaching activities through feedback information. Teaching evaluation takes place in the entire teaching activities. The content and method of evaluation are jointly determined by teachers and students, and multiple evaluations are encouraged, so that students can learn to self-evaluate while participating in teaching evaluation and be able to treat their own learning objectively. In the study of theoretical knowledge, teachers should design reasonable evaluation standards based on teaching content and teaching objectives to improve students' learning enthusiasm. In order to improve the practical ability of students, teachers should organize students to carry out learning activities based on project tasks in a specific information environment. In project activities, teachers should be able to design simple evaluation scales to facilitate students and teachers in the entire learning and learning activities. Evaluate yourself and others correctly in the process of practice.

(4) Teaching research

Vocational school teachers' teaching research is an important way to transform themselves from knowledge indoctrinators to "expert" and "research" teachers. In the survey of the status quo, it is found that there are many problems in the teaching research of teachers in vocational schools. Some teachers "only teach but not research" and basically do not write papers, resulting in their low educational research ability and also affecting the production of teaching resources. As a front-line teacher, if you "research but not teach", it will make the theory researched by the teacher divorced from practice, meaningless. The teaching and research consciousness of school administrators directly affects the teaching and research status of the entire school. A systematic teaching and research management system is formulated to improve teachers' teaching and research awareness. In the information environment, teachers should always have the awareness of teaching and research in teaching activities, master the commonly used teaching and research methods, and be able to conduct teaching research in combination with their own teaching or practical courses. Teachers should be good at discovering problems in teaching practice and record them at any time, learn through teaching and research platforms or discuss with other teachers to find the most effective way to solve problems, write teaching research papers, and share and cooperate with others on the network platform of their research results communicate with.□□

(5) Teaching innovation

Teaching innovation, from the perspective of teachers, is the transformation of teaching activities to cultivate innovative talents. First, vocational school teachers need to abandon traditional teaching concepts and change the way they use information technology. At present, although many teachers can use information technology, most of them simply use its basic functions, and it is difficult to integrate it into curriculum teaching. However, in order to better meet the needs of teaching and practice, teachers need to be able to use information technology to create a new information technology environment or information technology tools, based on the existing information technology environment, and be able to tap the characteristics of the curriculum and students. Features, innovate new teaching models, teaching methods or teaching processes that meet the needs of teaching and practice, and are suitable for the learning of students at different levels. In short, in order to carry out teaching innovation, teachers must first have a sense of innovation and be able to creatively solve problems in practice with the help of information technology in teaching activities.

6. CONCLUSION

We must correctly understand the significance of information technology in the reform and innovation of vocational education. The development of vocational teaching skills requires vocational school teachers to start. Improving vocational school teachers' information teaching ability is the key, so as to better improve the quality of vocational education. The society delivers quality talents. This paper collects data and analyzes the status quo of teachers' information and teaching ability in five higher vocational colleges through interviews and surveys, combining the survey results, the characteristics of teachers in vocational colleges, and the relevant standards of teachers in my country and the correlation of information education. Standards, construct a structure model of teachers' informatization teaching ability in vocational colleges, and discuss the model structure and its constituent elements systematically, which provides a reference frame for the improvement of teachers' informatization teaching ability in vocational schools.

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Exploration of New Teaching Methods for Bridge Engineering Course

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Abstract: The artificial intelligence technology such as knowledge graphs, expert systems and etc, has become more mature. Various communities are then being combined with artificial intelligence. The combination with artificial intelligence in other industries also brings new directions to the improvement of bridge engineering courses. As a comprehensive discipline, bridge engineering, that combines course teaching with artificial intelligence, can effectively improve teaching efficiency. This article mainly elaborates the inadequacies in traditional teaching, and the application of artificial intelligence to improve the teaching of courses. The goal of this new teaching form is to achieve better teaching results, and cultivate comprehensive talents adapted to the new era.
Keywords: Bridge engineering; Artificial intelligence technology; New infrastructure; Curriculum teaching practice and application

1. INTRODUCTION

In recent years, the rapid development of computer technology has promoted the continuous updates of artificial intelligence. Chinese technology development needs to be closely related to artificial intelligence, which is the core of national development [1]. Infrastructure construction is the foundation of Chinese economic development. The construction needs to be connected with artificial intelligence technology to achieve new development and transform into a new type of infrastructure construction. The development of civil engineering is a necessary part of Chinese new infrastructure construction, and the close integration with artificial intelligence technology is the core of development and an inevitable requirement.

Under the background of new infrastructure, civil engineering must achieve education first for continuous development. The key is to combine the teaching methods of related courses with artificial intelligence to innovate. As a core course of civil engineering (road and bridge direction), bridge engineering course must achieve a good combination of bridge engineering course teaching and artificial intelligence technology [2]. The application of artificial intelligence in bridge engineering courses can realize intelligent teaching and improve the advancement of knowledge. The goal is to cultivate talents with innovative thinking and comprehensive capabilities to promote the development of Chinese new infrastructure construction.

2. PRACTICE AND APPLICATION OF BRIDGE ENGINEERING NEW COURSE TEACHING

Bridge engineering refers to the work process of bridge survey, design, construction, maintenance and verification, as well as the science and engineering technology of studying this process. Bridge engineering is the focus of civil engineering (roads and bridges), including basic professional knowledge such as structural mechanics and structural design principles, and it is also the basis for bridge construction.

2.1 The practice of knowledge graph technology in the course of bridge engineering

Knowledge graph is a kind of semantic network with huge capacity, which can establish connections between knowledge points and knowledge points, between knowledge points and teaching resources, and better organize the subject knowledge system [3]. As a course that covers a wide range of subjects, bridge engineering will make the course content more direct and achieve better teaching effects by achieving precise and personalized teaching in the teaching process. The knowledge graph is used to ask questions and links to knowledge points. Through targeted questions and answers, classroom efficiency is improved, blind content explanations are avoided, course progress is accelerated, and class hours are saved. At the same time, the links to knowledge points also strengthen bridge engineering The feasibility of the intersection and connection between the course and other courses [4].

The knowledge map is used in the teaching of bridge engineering courses, to display the knowledge points of the course more clearly and concisely, to give students a more core knowledge line, to clarify the students' learning ideas, and to make the previous complicated knowledge points more organized and complete Knowledge system to avoid the formation of fragmented knowledge points [5-6].

2.2 Practice of Expert System Teaching in Bridge Engineering Course

Expert system is a program system with a large amount of specialized knowledge and experience. Based on the knowledge and experience provided by one or more experts in a certain field, it simulates the decision-making process of human experts, that is, a computer program system that simulates human experts to solve domain problems.

The teaching goal of the bridge engineering course requires students to master the design and construction principles of large and medium-sized concrete bridges [6], and at the same time, the bridge design ability is the key manifestation of the comprehensive ability of new infrastructure talents. The expert system is used in the construction of bridge engineering courses to realize the combination of artificial intelligence technology and bridge design, improve existing design methods, make bridge design better intersect with other fields, and

optimize design results.

In the course of bridge engineering, design and graduation design are the best embodiment of students' design ability. Traditional bridge engineering curriculum design and graduation design have the problems of singularity and similarity, lack of innovation, and cannot effectively improve the design ability, nor can they allow students to fully understand the principles of structural design, bridge engineering and other courses. Use all knowledge. The introduction of the expert system optimizes students' design schemes during the design process, improves details such as bridge section forms, bridge structure forms or bearing types, and diversifies the design schemes. The specific expert system puts forward new requirements for bridge design, so that students' programs in curriculum design and graduation design are more innovative, and their design capabilities are greatly improved to better adapt to the development of the new era and new infrastructure. Claim.

2.3 Application of Intelligent Agent in Bridge Engineering Course

Smart agents generally point to modules that give learners motivation and feedback in teaching software. The most common application of intelligent agents in teaching is teaching software. Experimental studies have shown that the teaching effects brought by using and not using intelligent teaching agents are quite different. The teaching software using intelligent agents will affect learning. The learner has a positive effect on the learning motivation, learning outcomes and cognition of knowledge points.

Intelligent agents mainly play a role in assisting and promoting teachers' teaching. The teaching software with intelligent agents can improve the bridge by detecting basic knowledge points such as bridge deck structure composition, bridge deck and support structure requirements, and pre-stressed reinforcement layout in the daily teaching process, and analyze error-prone knowledge points and doubtful points and difficulties.

Through intelligent agents, students are evaluated for their professional abilities, and an ability evaluation model is formed, allowing students to constantly make up for deficiencies in the learning process, achieve a basic balance in all aspects, and allow students to improve their personal abilities in different aspects. .

2.4 Application of extended reality (XR) and holographic projection technology in the new course of bridge engineering

Extended reality technology (XR) is a comprehensive term that combines the actual physical environment with the virtual network environment. It is a comprehensive embodiment of virtual reality (VR), augmented reality (AR) and mixed reality (MR) technologies. Taking VR technology as the main guide, supplemented by others, can effectively enhance the richness and advancement of bridge engineering courses.

Nowadays, bridge construction is developing rapidly. The advanced level of bridge construction technology determines the overall level of bridge construction. Therefore, the bridge engineering course is very important

for students' teaching in bridge construction and affects students' comprehensive ability after graduation and employment. Level. The VR technology-led extended reality technology applied to the teaching method of bridge engineering courses is different from the traditional teaching method. VR technology can truly show the various advanced bridge types and construction technologies that have been built to students in the classroom. In the past, the fixed, modular, and limited teaching styles in traditional teaching effectively improved students' participation and true feelings in actual projects, allowing students to learn more autonomously and voluntarily.

Using holographic projection and VR technology, the existing and advanced technologies such as the tensioning position, tensioning process, cantilever construction and assembly construction of prestressed steel bars are fully displayed.

3. BENEFICIAL EFFECTS OF NEW TEACHING METHODS

The application of artificial intelligence in the teaching of bridge engineering courses is dedicated to cultivating compound talents to achieve a good combination of artificial intelligence technology and bridge engineering practice. The teaching results are mainly reflected in bridge design and bridge construction technology.

Having a basic bridge design ability is the basic requirement of the bridge engineering course. Artificial intelligence technology is applied to the teaching of bridge engineering, so that students can be greatly improved on the basis of the original bridge design ability, and they have the quality to work in structural design. And ability. Artificial intelligence technology is used in the teaching of bridge engineering, so that students can better learn and consolidate the existing construction technology, and get in touch with new bridge construction technology, so that the construction ability can reach the qualified standard.

4. CONCLUSION

Bridge engineering, as a comprehensive traditional discipline, requires students in many aspects to improve their comprehensive ability. Bridge engineering is constantly being asked to cooperate with the continuous development of new infrastructure. Thus bridge engineering needs to be combined with artificial intelligence technology for course teaching, and cultivate comprehensive talents adapted to the new era even more. Then bridge engineering can be given new vitality for a greater development.

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Construction of Deep Learning Model for Diabetes Risk Prediction

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Abstract: To explore the construction and significance of deep learning model for diabetes risk prediction. Methods: 52 cases of diabetes high-risk population in our hospital from January 2020 to October 2020 were selected by comparative medical research method, and they were randomly divided into control group and study group with 26 cases in each group. According to the different algorithms used in risk prediction, they were equally divided into control group and study group. Back propagation neural network and convolution neural network are used to compare the prediction results of the two groups. Results: the diagnostic coincidence rate of the study group was 96.15% (25/26), which was significantly higher than 65.38% (17/26) of the control group (P<0.05). The accuracy and predictive value of the study group were better than those of the control group (72.46±0.12 vs 96.73±0.34, 68.39±0.46 vs 97.51±0.30, P<0.05). Conclusion: the construction of convolution neural network deep learning model for diabetes risk prediction has a high diagnostic coincidence rate and prediction effect in high-risk groups of diabetes, which is worthy of being widely used in disease management.
Key words: Diabetes mellitus; Risk prediction; Deep learning model; Construction

1. INTRODUCTION

Diabetes is a common type of chronic disease in the society, and it is characterized by many complications and different changes in the condition. As a preventable and treatable disease, comprehensive treatment is a feasible method to control the disease progression. Convolution neural network algorithm, compared with the traditional algorithm, has more obvious and prominent effect in the risk prediction of this disease. In order to explore the construction and significance of deep learning model for diabetes risk prediction, this paper analyzes the data of 52 high-risk diabetes patients from January 2020 to October 2020.

2. MATERIALS AND METHODS

2.1 General information

Using the method of medical research comparison, 52 cases of diabetes high-risk population in our hospital from January 2020 to October 2020 were selected and randomly divided into control group and study group with 26 cases in each group. According to the different algorithms used in risk prediction, they were equally divided into control group and study group. There were 13 males and 13 females in the control group, with an average age of (61.85±0.15) years (range, 53-71 years). There were 14 males and 12 females in the study group, with an average age of 61.75±0.25 years (range, 54-70 years). There was no significant difference in general information such as age and fasting blood glucose between the two groups, so this study was comparable. All patients were approved by the medical ethics committee, and the informed consent was signed by the patients or their families voluntarily, and no one lost the follow-up.

2.2 Method

Back propagation neural network and convolution neural network are used to compare the prediction results of the two groups.

2.3 Statistical analysis

Epinfo (statistics program for epidemiology on microcomputer26.0) was used for statistical analysis of all the research data. The comparison of sample rate was expressed by%, and the measurement data was expressed by (x±s) and t test. When p<0.05, there was statistical significance.

3. RESULTS

3.1 Comparison of diagnostic coincidence rate between the two groups

The diagnostic coincidence rate of the study group was 96.15% (25/26), which was significantly higher than 65.38% (17/26) of the control group (P<0.05). See Table 1.

Table 1 Comparison of coincidence rate between the two groups (x /%)

Group	Number of cases	Coincidence rate	Discrepancy rate
Control group	26	17(65.38)	9(34.62)
Research Group	26	25(96.15)	1(3.85)
X^2	/	9.453	8.412
P	/	0.001	0.003

Table 2 Comparison of other results between the two groups (x±s)

Group	Number of cases	Accuracy(%)	Estimate(%)
Control group	26	72.46±0.12	68.39±0.46
Research Group	26	96.73±0.34	97.51±1.30
t	/	9.037	12.732
P	/	0.028	0.000

3.2 Comparison of other results between the two groups

The accuracy and predictive value of the study group were better than those of the control group (72.46±0.12 vs 96.73±0.34, 68.39±0.46 vs 97.51±0.30, P<0.05). See Table 2.

4. CONCLUSION

The establishment of deep learning model integrates the reference standards to optimize the model parameters, which greatly improves the performance of the model. By taking appropriate steps to ensure the transparency and credibility of the model, we can make the risk prediction model of high-risk groups of diabetes become a better diagnostic tool and doctor assistant. According to the algorithm prediction score and heat map of different diabetes risk factors, the image area that can promote the algorithm to make this prediction is the best.

The research results of relevant scholars further show that deep learning technology based on the characteristics of data-driven learning has made great achievements in natural language processing, image processing, speech recognition and other fields; it promotes the further development of deep learning interpretability research framework from four aspects: self-explanatory model, specific model interpretation, agnostic model interpretation and causal interpretability [1]. The adaptive and intelligent deep learning feature extraction method of network intrusion detection and multi class classifier of support vector machine are applied, A network intrusion detection system based on deep learning feature extraction is formed. Compared with the support vector machine intrusion detection model based on self-coding network (an-svm) and the support vector machine model based on kernel principal component analysis and genetic algorithm (kpca-ga-svm), the accuracy is increased by 5.01% and the false alarm rate is reduced by 6.24%, The average detection time was reduced by 16% [2]. Deep learning is used to capture the features of unstructured data, and then the features obtained from the two parts of learning are combined. After linear transformation, the predicted overdue probability is finally obtained [3]. It also summarizes the seven aspects of parameter pruning, parameter quantization, compact network, knowledge distillation, low rank decomposition, parameter sharing and mixing mode. Secondly, it summarizes and compares the compression and acceleration effects of representative methods of several mainstream technologies on multiple open models [4].

To sum up, the construction of convolution neural network deep learning model for diabetes risk prediction has a high diagnostic coincidence rate and prediction effect in high-risk groups of diabetes, which is worthy of being widely used in disease management.

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Application of Data Encryption Technology in Computer Network Security

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Abstract: In recent years, with the continuous development of Internet technology, a variety of network security problems have emerged, which has been widely concerned in the society. At present, the most obvious security problem is the loss and tampering of data, which has caused a serious blow to the development of the network. Therefore, professionals should attach great importance to the application of encryption technology to provide a protective film for computer network security, which is of great significance to the development of the industry. Through data encryption technology, this paper discusses the application of data encryption technology in computer network security, hoping to provide some constructive suggestions for related industries.
Key words: Data encryption technology; Computer network security; Application

1. INTRODUCTION

In the computer network system, there are all kinds of information stored by people, which exist in the form of public or non-public. It is convenient for people to consult when they need it and provide convenience for daily life. The so-called interest is a double-edged sword. Since it is beneficial to people, it will be beneficial to lawless persons, resulting in network security problems. Therefore, in the future development, we should pay attention to computer network security issues, and give technical support to professionals. At present, the use of data encryption technology can be regarded as a good method, which can strengthen the security of data, ensure the healthy operation of the system, and ensure that the information is in a relatively safe state.

2. COMPUTER NETWORK SECURITY

2.1 Stealing personal information

Nowadays, the Internet is all around people's lives, and implanted in the state of daily life, people carry out online shopping, online speech and other behaviors. Online behavior needs to involve people's information, if the information is obtained by illegal personnel, it will cause serious consequences. At present, how to protect people's right to information is an urgent issue, and researchers need to strengthen their research. According to incomplete statistics, the problem of personal information theft is prominent. As Internet users, they should learn to protect their privacy.

2.2 Stealing enterprise information

The operation of enterprises will produce a lot of data, such as employee information, financial information, project information, decision-making information and so on. If they are attacked maliciously by hackers, they will lose a lot of rights and property. Therefore, we should start from the individual to guide the network security awareness of enterprise employees. At the same time, for the first-class important data for all-round protection, and design network security management scheme.

2.3 Viruses and vulnerabilities

The so-called virus is to attack the computer system, thus causing a certain degree of damage. This kind of attack is covert, and it is difficult to find through loopholes. In recent years, with the further development of network technology and computer technology, the types of viruses are also strengthening, and the consequences are serious. Among them, the well-known "Trojan horse virus" is the most rampant, hidden in the installation package, inadvertently attacking the computer. Computer vulnerability problem is more common, lawless people often attack malicious damage [1].

3. DATA ENCRYPTION TECHNOLOGY

The key of data encryption technology is the password, which is used to protect the data. In general, it is used to transfer and replace the data, so as to protect people's information. Specifically, the main form of data encryption technology is through the "ciphertext" to achieve, when faced with malicious attacks, not only can not be interpreted, but also have a layer of protection. So ciphertext decryption is also very rigorous, need to receive device, in order to ensure security again.

3.1 Symmetric encryption

First of all, the level of this encryption method is relatively low. It exists in the same key whether it is transmitting or receiving. Therefore, the security is relatively low, and it can not effectively protect important information, such as banks and large enterprises. There are also some advantages, that is, less resource consumption, fast transmission frequency, some small departments will choose it to protect files.

3.2 Asymmetric encryption

This kind of encryption technology applies two sets of keys. The key applied by the sender and receiver is different, and the prevention and control level of information security is very high. At present, this technology is widely used, and provides a huge advantage for the relevant units [2].

4. THE APPLICATION OF DATA ENCRYPTION TECHNOLOGY IN COMPUTER NETWORK SECURITY

4.1 Application of network database

In the computer system, the security of common information system is very low, and it is very easy to invade. A computer can steal relevant information, and

cause property damage. The storage and preservation of information needs to be carried out through the network database, which is also an important base for data preservation. Under the new situation, we should increase the encryption of the database, effectively protect the information, and form a healthy network atmosphere. In the past mode, the password protection is very limited, only using the password or password, in practical application will not produce any security. If the use of data encryption technology, will improve the security of the database, greatly protect the information, so that illegal personnel can not steal information, the information in the database will not be damaged, it can be seen that the application of data confidentiality technology is very effective. The key of network database lies in the two links of information storage and transmission, which should be protected in the process of data encryption technology. Professionals need to encrypt the server, and use the means of differential key to deeply protect the relevant content, so as to ensure the effective transmission of the later confidence. On the other hand, the staff should implement the backup work in case of emergency.

4.2 Application of e-commerce

In recent years, the application of cloud computing and big data is gradually strengthened, and promotes the further development of e-commerce. As we all know, e-commerce is a cutting-edge existence in computer network technology, which greatly promotes the online economy. The platforms mainly include: Jingdong, tmall, Taobao, Suning, etc., which bring convenience to people's life and provide a large number of employment opportunities for college students. The dependence of e-commerce on network security is very high, if there is a gap, it will cause serious economic accidents. Therefore, in the field of e-commerce, it is necessary to improve security and effectively link up data encryption technology to create a healthy operating environment for economic activities. In addition, the economic activities in the field of e-commerce need passwords, such as registration and payment. Improving security is also a kind of protection for consumers.

4.3 Application of virtual private network

With the continuous development of computer computing, there is a regional network, which is the common enterprise platform and University platform. In general, the establishment of regional network involves a wide range of contents, so it is necessary to rent professional connecting lines to provide space for virtual network. Therefore, it is necessary for enterprises and universities to apply data encryption technology, using a variety of private key encryption and public key encryption, in order to ensure the internal information security of the network.

4.4 Application of software encryption technology

At present, with a smart phone and 5g network, people's demand for software becomes more and more severe. There are countless software information in the market, which can effectively meet people's use. Ensuring computer security is closely related to software. Relevant personnel should try their best to reduce the risk of software, strengthen the prevention and control of software, use software related firewalls in a large area, and connect with data encryption technology, so as to promote the security of the whole network environment.

5. CONCLUSION

To sum up, it is a brief analysis of the application of data encryption technology in computer network security. In view of the above discussion, it can be seen that network security problems are always around people. In the new situation, only by making good use of data encryption technology can we ensure the healthy operation of this environment. This paper discusses the specific application of data encryption technology in computer network security, including the following four aspects: the application of network database, the application of e-commerce, the application of virtual private network, and the application of software encryption technology.

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Evaluation of Risk Management in Engineering Construction Based on BIM Technology

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Abstract: With the continuous development of information technology, the process of social modernization is also accelerating. With the continuous innovation of technology, various fields and industries have gained broader development space and prospects. For the field of engineering construction, the emergence of BIM Technology has also brought secondary innovation. In this paper, based on BIM Technology for project construction risk management evaluation, make specific research, for reference.
Key words: BIM Technology; Engineering construction; Risk management

1. INTRODUCTION

In order to ensure the smooth progress of the project, the key to adopt BIM Technology in engineering construction is to correctly grasp and recognize the risks. Nowadays, China is accelerating the pace of scientific and technological research and development. Under this background, it is of great significance to study the risk management and related issues of BIM Technology. On the basis of grasping and scientifically managing risks, BIM Technology can be more effectively applied in engineering construction and better developed [1-2].

2. OVERVIEW OF BIM TECHNOLOGY

BIM is building information modeling, which is a kind of digital model in construction project. It not only has physical characteristics, but also has functional characteristics. This shared information resource is a reliable support for decision-making in the project construction cycle. BIM can achieve a high degree of integration of data and information, and then use the software to establish the model basis. It can effectively solve various problems of today's building informatization, and also manage the whole life cycle of the construction project, so that the quality, safety, performance, progress and cost of each stage can be highly improved In this way, it can promote the management of construction engineering to develop towards intensive and refined direction, realize the information transmission and exchange between technology and management informatization, and further improve the management level and efficiency.

Compared with the traditional technology applied in the past, BIM technology has more advanced and superiority. In the past engineering construction, due to the influence of many factors, there are often problems such as rework, delay and accidents, which not only greatly reduce the efficiency of project construction, but also cause great losses. The application of BIM Technology in engineering construction can realize visualization, integration and intelligent management in the whole construction cycle, further optimize and innovate the traditional management mode, and achieve good results. The application of BIM Technology can also effectively coordinate the development of construction team. For construction projects, they are often more complex, requiring multiple teams to cooperate with each other, do their own division of labor, and complete the task objectives under coordination and mutual assistance. And BIM can play the role of platform, make the contact between the teams closer, promote the active cooperation and communication between them, maximize the integration of all aspects of information, and achieve better results. And the BIM model established in the design stage can also make early prediction for the problems that may be faced in the follow-up construction, so that corresponding measures can be taken to prevent problems. In addition, the application of BIM Technology in engineering projects can realize the optimization of project schedule, cost, quality and other factors, and further improve the efficiency of engineering projects as a whole. Therefore, now more and more engineering projects will introduce the application of BIM Technology, so that it can give full play to its great advantages.

3. EVALUATION OF RISK MANAGEMENT IN ENGINEERING CONSTRUCTION BASED ON BIM TECHNOLOGY

3.1 Risk identification of BIM Technology in engineering construction

The risk identification of engineering construction is to better identify the risks in the project, including their sources, scope, characteristics, consequences, risk types, causes and mechanisms. Risk identification is also the basic support for risk analysis, and whether the results of risk identification are effective will also have a certain impact on the subsequent risk analysis and response links. The method of risk identification based on BIM Technology should be more scientific, which is not only the first link of risk management, but also plays a fundamental role. Generally speaking, the methods of qualitative, quantitative and both comprehensive identification are mainly used in the risk identification of engineering projects. Based on the characteristics of BIM Technology, we can use the grounded theory method to collect the relevant data. On the basis of the collected data, we can obtain 10 risk categories through open coding. In this way, we can further determine the main risk category, and then we can effectively identify the risk factors of BIM Technology.

3.2 Risk analysis of BIM Technology in engineering construction

Risk analysis should be carried out on the basis of risk identification. Through probability, mathematical statistics and other methods, we can further evaluate the occurrence probability and influence scope of risks, and classify and predict the consequences, further determine the level of risks, and grasp some key risk factors, and then deal with them accordingly The establishment of risk management system can classify the risk according to different influence degree, and implement risk management. The application of BIM Technology in project management can not only make the project construction achieve higher efficiency, but also give full play to the management advantages effectively, but at the same time, it is also accompanied by certain risks. When BIM Technology is applied in project construction, there is a correlation between its risks and the risks of traditional project management, and the two restrict and depend on each other. Therefore, in the risk analysis, DEMATEL method can be applied to determine the key factors that will affect BIM Technology through the analysis of the correlation between the risk elements. In the risk analysis, it has high applicability and feasibility. In this way, based on the results of risk analysis, through personnel scheduling and configuration, we can effectively supervise some core risks, and help construction enterprises and relevant departments to take certain countermeasures and policy suggestions according to the results of risk analysis.

3.3 Risk response of BIM Technology in engineering construction

In the risk management of applying BIM Technology in engineering construction, the last link is risk response. For the corresponding risk management team, the formulation of risk response process is crucial, and its scientific also has a direct impact on the effect of risk management. The management process of risk response is highly comprehensive. Based on the identification and analysis of risks, the relevant risk management team should further determine the objectives of risk response, and on this basis, put forward targeted response strategies. Then, on the basis of the analysis of risk response skills, formulate corresponding plans, and implement risk monitoring on the objectives. Especially for some key risk factors, we should also strengthen monitoring. At the same time, for some long-term risks, it should also be through the analysis and research of factors, the introduction of specialized countermeasures, so as to reduce the risk probability. When making and arranging the risk response process, whether it is scientific and reasonable is of great significance for the risk management of BIM Technology in engineering construction.

4. CONCLUSION

in summary, in engineering construction, if we want to apply BIM technology smoothly and bring into full play its great advantages, we should not only ensure the advanced nature of the technology itself, but also have certain BIM application management level, especially risk management. Therefore, it is necessary to do a good job in BIM Technology Risk Identification and analysis, and put forward scientific risk response measures, so as to provide effective guidance and reference for the application of BIM Technology in engineering construction.

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Digital Packaging Printing and Its Development Trend

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Abstract: In recent years, science and technology and information technology are becoming more and more mature. China has entered the digital era. For packaging and printing technology, it plays an important role in many industries. With the development of the times, it and it technology are gradually integrated and integrated, which makes the technology continuously optimized and upgraded, and promotes its digital development and technology transformation and upgrading Based on this background, this paper discusses the digital packaging and printing technology development trend for reference.
Key words: Packaging; Digital printing; Technology development

1. KEY TECHNOLOGIES IN THE DEVELOPMENT OF DIGITAL PACKAGING AND PRINTING

1.1 Digital and virtual simulation technology of packaging and printing product design

For the packaging and printing operation, in order to improve the packaging quality and beauty in the actual operation process, it is necessary to design the overall packaging appearance. In addition, the packaging structure and its function design, printing process design, and product virtual simulation are also very important links. The range of diversified technologies involved is also important for the development of packaging and printing work In recent years, with the continuous development of technology, computer and advanced intelligent design software, as well as digital display and output equipment and other related factors are gradually integrated into this operation link, which makes a series of links in packaging and printing, such as material properties, structural parameters, printing processing, surface decoration, sample simulation and practical production, etc Parameters, attributes and other contents can be expressed and reflected through scientific digital technology and operation methods, so as to effectively improve the operation quality and efficiency of packaging and printing enterprises, and constantly strengthen their enterprise competitiveness [1].

1.2 Digitization of packaging and printing process control

Packaging and printing in the actual operation process, the actual application of printing methods are more diverse, but under the current background, the packaging and printing work under the support of diversified printing methods, all need to be based on the premise of digitization. For this part of the work of packaging and printing, in order to obtain excellent operation quality and results, it is necessary to strengthen the understanding of printing color Color, positioning, quality, drying and surface finishing and other benchmarks for accurate and scientific control, and through digital technology, we can use the computer as a medium to grasp and adjust the relevant content, better enhance its automation and intelligence, and constantly improve the digital degree of the operation process.

1.3 Digitization of packaging and printing process

Packaging and printing forming processing is also a very important link in the process of this work. Its core mainly focuses on the slitting, die cutting, indentation, folding and pasting of printing products. The integration of digital technology in this link is mainly reflected in the following two aspects.

1.3.1 With the help of data link, realize the transmission of various types of actual processing data, ensure that the molding processing equipment can successfully receive the information and make corresponding adjustments and changes, improve the accuracy of parameters and processing accuracy;

1.3.2 With the help of printing production system, the data needed in the process of printing, surface finishing and forming processing can be reasonably matched, so as to ensure that the production line can always maintain a reasonable data matching state, even in the face of offline state, the position and efficiency deviation can be avoided as far as possible [2].

1.3.3 Digitization of packaging and printing quality evaluation and production management process

Packaging and printing quality evaluation and production management process is also the main embodiment of the application of digital technology. It can realize the detection and evaluation of packaging and printing quality, production management and the final effect through digitization, which can better save human resources, greatly reduce the work intensity and workload of personnel, and with the help of digital information, it can also effectively help enterprises realize the printing quality-based management The adjustment and optimization of production volume and production management mode, better fit the market demand, has always been in an invincible position in the development flood.

2. DIGITAL PACKAGING AND PRINTING TECHNOLOGY DEVELOPMENT TREND ANALYSIS

2.1 Digitization of packaging and printing process

Nowadays, China's packaging and printing industry has developed rapidly under the promotion of computer and science and technology. However, under the background of the times, more demands have been put forward for the packaging and printing industry. Among them, the digital development of the overall process of "centralized

production + distributed customization + intelligent service" attracts people's attention. In the face of this demand, we want to meet the needs of different regions In order to meet the needs of different fields, diversified enterprises and their different operation modes, it is necessary to ensure the establishment of digital process from packaging and printing product design to application service, so as to truly implement the production concept of "data in, product out", realize the optimization of enterprise value chain and business model, and better enhance enterprise value.

For the construction of this digital process, it also needs relevant personnel to combine with the trend and demand of social development, based on the large amount of digital printing process and color management, to realize the system construction that takes digitization as the cornerstone, and takes improving the intellectualization and adaptability of printing production management and color management as the goal, and under its guidance, to collect the market more comprehensively The real needs of users, improve the accuracy of production operations and the degree of processing qualification, and truly grasp the needs of consumers for materials and experience evaluation, fundamentally realize the optimization and upgrading of the overall process of packaging and printing, and constantly improve the economic level and core competitiveness of enterprises.

2.2 Intelligent packaging and printing manufacturing

At present, the packaging and printing industry is in an important stage of digital and intelligent development, and the emergence of artificial intelligence in the market has a great impact on the manufacturing pattern of the packaging and printing industry. With the support of communication and Internet, enterprises can realize the integration application of packaging and printing digital information data and Internet of things technology with the help of smart phone terminals, so as to promote the development of packaging and printing industry So that packaging and printing manufacturing can realize the integrated development with the Internet of things or e-commerce industry, and constantly enrich the related engine of enterprises [3].

With the development of intelligent packaging and printing manufacturing, it is necessary to realize the integration of digital printing technology and traditional printing technology through the application of digital integrated manufacturing mode, so as to optimize the overall information or function of packaging products,

realize the visualization information associated with the Internet of things through related special functions, and better promote the application of digital information service of packaging products And constantly expand new markets.

2.3 Functionalization and intellectualization of packaging and printing products

In the process of packaging and printing products, digital technology can further promote the transformation from "manufacturing" to "intelligent manufacturing". On the basis of ensuring the quality and efficiency of packaging and printing products, it can optimize and upgrade the service market, technical process, operation methods and sales methods, and create a more comprehensive operation mechanism with more applicable media and demand factors In addition, more diversified functional materials or digital information can be embedded into printed products through printing, so that users can obtain anti-counterfeiting information, product Internet of things related information and other content with the help of factors such as labels, two-dimensional codes, radio frequency identification, etc. based on this, users can also ensure the diversity of packaging products under the precise control of digitization Experience of functional requirements, such as delay color change, etc.

3. CONCLUSION

To sum up, under the background of the development of the times, digital related technologies have brought new challenges and development direction guidance for the packaging and printing industry. Industry personnel need to pay attention to the integration and application of new technologies, so as to realize the optimization and upgrading of the packaging and printing industry process based on user needs and enterprise development, and realize various operation links and diversified information with "digital" media It can promote the sustainable innovation and development of the industry.

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Finite Element Modeling and Mechanical Property Analysis of Spherical Hinge Bearing

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Abstract: In order to study the mechanical properties of the spherical hinge part of the swivel bridge bearing under load, a reasonable simplified model of each part of the swivel bearing and the upper and lower turntables is established by using the large-scale general finite element software ABAQUS. By analyzing the mechanical properties of each part of the spherical hinge under load, the following conclusions are obtained: the mechanical properties of the spherical hinge structure are good, which can meet the construction requirements.
Key words: Swivel bridge; Spherical hinge; Stress analysis; Finite element

1. INTRODUCTION

In order to reduce the impact of the new line construction on the operation of the existing line, the bridge swivel construction method is often used to cross the existing line. However, in the construction process of swivel bridge, it is inevitable to produce factors that affect the bearing capacity of the bridge. The spherical hinge of swivel bearing is the key structure in swivel construction, and its bearing capacity directly determines whether the swivel construction can be carried out smoothly.

Mo zengmo [1] analyzed and studied the contact stress of the ball hinge in the swivel construction of the bridge, and obtained that the calculation efficiency of the spring model is higher; Xiao Yusong [2] studied the design method of the swivel ball hinge of the extremely unbalanced bridge, and deduced the simplified calculation formula of the distance between the center hole wall of the upper ball hinge and the pin shaft, and the minimum elastic compression of the friction plate between the upper and lower ball hinges. Although scholars at home and abroad have done some research on the spherical hinge of swivel bearing, the analysis of its mechanical properties is still insufficient, so the analysis of the mechanical properties of swivel bearing is particularly important.

Based on the project of ningliang high-speed overpass over Beijing Kowloon Railway, in order to reduce the adverse effects of various loads on the swivel bearing of the bridge in the process of bridge construction and operation, the finite element simulation of the spherical hinge of the swivel bearing is carried out before the swivel construction, and the mechanical properties of the spherical hinge under different load states are analyzed to ensure the safe rotation of the spherical hinge, so as to ensure the safe and smooth construction of the swivel bridge [3] .

2. PROJECT OVERVIEW

The main bridge of ningliang section of Dongjiakou Liangshan Expressway Crossing Beijing Kowloon Railway and Beijing xiongshang high speed railway overpass adopts T-shaped rigid frame prestressed concrete box girder. The bridge is constructed by swivel method with swivel length of (70 + 70) M. after the cast-in-place construction on the east side of Beijing Kowloon Railway is completed, the bridge is rotated by 85.3 ° anticlockwise. The swivel structure is composed of swivel footwall, swivel support, upper turntable and rotary traction system. The swivel support adopts swivel support with bearing capacity of 300MN.

3. FINITE ELEMENT SIMULATION AND MECHANICAL PROPERTY ANALYSIS OF SPHERICAL HINGE

3.1 Establishment of finite element model
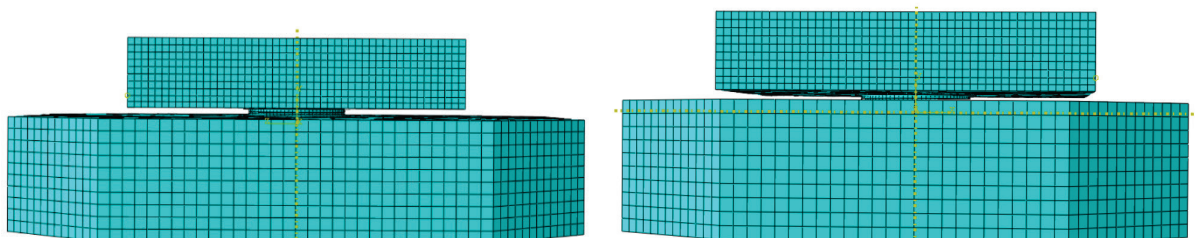
(a) Elevation

(b) Left view

Fig. 1 mesh generation of spherical hinge bearing

Spherical hinge bearing plays a key role in the process of bridge rotation. The mechanical properties of spherical hinge bearing are analyzed by using large-scale general finite element software ABAQUS to ensure its working performance in the process of bridge rotation [4]. Due to the focus on the spherical hinge bearing, the solid element modeling is adopted. In the model, the lower turntable and upper turntable of the spherical hinge are established. Considering the vertical load transfer of the bridge swivel structure to the spherical hinge, the local hanging wall concrete and footwall concrete are established, which are 1m upward from the hanging wall and 2m downward from the footwall. The material of spherical hinge bearing is Q345 steel, the elastic modulus is 210gpa, the Poisson's

ratio is 0.3, the ideal elastic-plastic constitutive relation is adopted, the upper spherical hinge and the lower spherical hinge are modeled according to the steel plastic model, and the surface-to-surface contact element is used to simulate the contact surface of spherical hinge; in order to improve the accuracy and efficiency of analysis, the 16 node high-order hexahedron element is used as a whole; the hanging wall concrete and the hanging wall, the hanging wall concrete and the lower wall concrete The results show that the binding contact is used in the contact parts of the hanging wall and footwall; the penalty function is used to define the contact in the tangential direction of the hanging wall and footwall, and the friction coefficient is 0.05; in order to prevent the penetration between the hanging wall and footwall in the calculation process, the hard contact is used to define the contact behavior in the normal behavior; the boundary condition of the bottom of the footwall concrete is defined as complete consolidation. The whole structure is divided into 80854 units [5], as shown in Figure 1.

3.2 Mechanical property analysis

According to the design scheme of swivel structure, the total weight of swivel structure is 220000kn, and the external load is applied to the center of upper surface of hanging wall concrete in the form of surface load. Through calculation and analysis, the Mises stress distribution of ball hinge contact surface is shown in Figure 2.
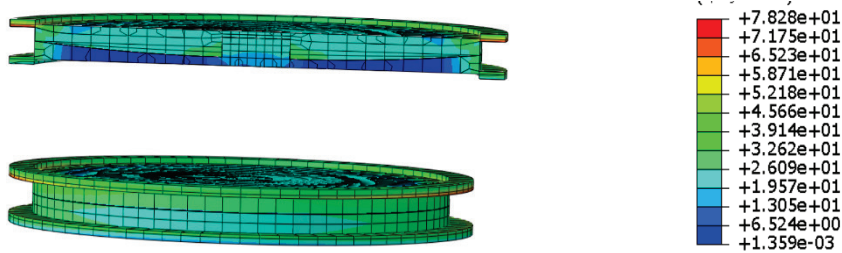

Fig. 2 stress nephogram of spherical hinge bearing

It can be seen from Figure 2 that under the design load, the analysis shows that: the middle part of the concrete at the top of the spherical hinge hanging plate is the compressive stress, which is 2.60mpa, and the distribution law of the compressive stress increases from the middle to both sides, increasing to 3.99mpa; the concrete outside the top area of the spherical hinge hanging plate produces a little tensile stress, with the peak value of 3.08mpa. Comprehensive analysis shows that the upper turntable will not crack under the axial load of 22000 tons.

The normal compressive stress of the spherical hinge contact surface under axial load is analyzed The results show that the compressive stress in the center of the hanging plate of the ball hinge is 20.49 MPa, and the distribution law of the compressive stress is that the compressive stress in the center increases to 26.59 MPa towards the edge of the ball hinge; the compressive stress in the center of the footplate of the ball hinge is 15.18 MPa, and the distribution law of the compressive stress is that the compressive stress in the center increases to 32.21 MPa towards the edge of the ball hinge; the maximum Mises stress is 32.21 MPa, which is less than the bending strength of the material Strength of clothing. The results show that: under the vertical load of 22000 tons, the strength of the spherical hinge meets the structural design requirements.

4. CONCLUSION

4.1 Under the design load, the mechanical property of the spherical hinge is good, which can meet the construction requirements.

4.2 Under the design load, the structural strength meets the requirements of relevant specifications, and has a certain safety reserve, which can ensure the safety and reliability of bridge swivel construction.

4.3 Under the design load, the stress distribution of the upper and lower turntables of the ball hinge increases from the middle to both sides, and the maximum stress does not exceed the strength value of the material, which can ensure the safety of the rotation process.

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A Study of College Students' Views on Love and Marriage and Parental Rearing Patterns

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Abstract: With the development of China's economy and the improvement of people's social level, China's education level has been comprehensively improved in the new period, and the number of college students has been significantly improved. According to the results of psychological survey, college students' Outlook on life, world outlook and the formation of values have an important impact. Therefore, this paper studies the concept of love and marriage and parental rearing patterns of college students, hoping to accurately analyze the current situation and influencing factors of students' love and marriage concept, so as to summarize the corresponding development law.
Keywords: College Students' view of marriage and love; Parental rearing style; College students

1. INTRODUCTION

University is an important stage of human survival and development, and the concept of marriage and love is the key to ensure the development of human life. However, according to the psychological survey results, college students' views on marriage and love are closely related to their parents' rearing patterns. Therefore, it is necessary to study the relationship between College Students' views on marriage and parental rearing patterns, and find out the hidden development rules, so as to provide effective suggestions for relevant departments to carry out relevant work [1-3].

2. COLLEGE STUDENTS' VIEWS ON MARRIAGE AND LOVE AND THE BASIC CONCEPTS OF PARENTAL REARING PATTERNS

Love and marriage is the most basic social phenomenon, which can be divided into two words: marriage and love. The concept of marriage and love is the embodiment of life values in marriage and love, and it is also the basic view of the individual for the relationship between the sexes. The subjective feelings of human beings for marriage culture have an impact on the behavior of human love and marriage, and affect the individual value orientation. It is of great significance to the growth and future development of students, and is also the key factor affecting students' future happiness No. In recent years, psychological experts have been studying the factors that affect college students' view of marriage and love, and found that family factor is one of the important factors affecting the individual's view of marriage and love. College students are high-quality and high-level talents and the backbone of social development. Therefore, it is necessary to explore the concept of love and marriage of college students, and to help schools take the correct way to educate college students, and predict the possible bad marriage, so as to ensure the development of college students.

Family upbringing is an educational activity within the family, with the family as the unit, the parent-child relationship as the core, and the purpose of cultivating social needs. The so-called parenting style refers to the educational methods and methods used by parents in the process of educating their children. Generally speaking, the parental education mode is stable and will not change easily. It integrates the attitude, behavior and non-verbal expression of parents. In addition, in essence, parenting is a variable in the parent-child relationship, which regulates the parent-child relationship and has an important impact on the formation of students' three outlooks.

According to the concept analysis, parenting style is an important influencing factor of students' three outlooks. College Students' view of marriage and love is the concentrated embodiment of values in marriage and love. Therefore, the formation of College Students' love and marriage concept is closely related to the parenting relationship of their parents. Therefore, it is necessary to study the relationship between college students and their parents. So as to innovate the current education mode, promote the overall development of college students, ensure the actual effect of educational activities, and ensure the actual effect of university education.

3. THE RESEARCH PROCESS OF COLLEGE STUDENTS' VIEWS ON LOVE AND MARRIAGE AND PARENTAL REARING PATTERNS

3.1 Research object and research method

In order to investigate college students' views on marriage and love, stratified sampling method should be adopted to adjust the difference. A questionnaire should be made for college students, and the relevant contents of College Students' views on love and marriage and parental rearing style should be included in the questionnaire. The survey results should be processed by using the data platform, so as to get more accurate results.

3.2 Findings and analysis

First of all, according to the data obtained from the survey results, we can find that the marriage value factor of female students is significantly lower than that of male students, while the score of male students in role factor comparison is higher. In addition, the major of students is also an important factor to determine the concept of love and marriage. Liberal arts students, medical students, engineering students and art students got significant scores in the loyalty factor of marriage. In addition, the influence of College Students' age difference on their views on marriage is not high,

Secondly, according to the results of the questionnaire

survey, we can find the differences of students' family rearing patterns. First of all, on the factor of mother's refusal and denial, gender factor is more effective. In addition, the only child and the non only child still have big problems in the way of child rearing.

4. THE ACTUAL RESULTS OF THE RESEARCH ON COLLEGE STUDENTS' VIEWS ON MARRIAGE AND LOVE AND PARENTAL REARING PATTERNS

According to the survey results, college students' views on love and marriage will be affected by gender factors. In the aspects of love motivation, marriage autonomy and marriage values, the scores of female students are lower than that of male students, while the scores of female students are higher than that of students in aspects of marriage tendency and marriage role. Therefore, the analysis of the data shows that in the university stage, boys have more advantages than girls in terms of love motivation, marriage autonomy and marriage values. The reason for this phenomenon is likely to be the influence of different division of labor between men and women under the current social background. Under this social background, male students have a stronger sense of career, while female students pay more attention to life under the influence of traditional factors. In addition, college students are relatively young, and boys are likely to improve themselves in order to undertake family responsibilities in the rising period of life, so as to ensure that they can undertake higher social and family responsibilities.

In addition, there are still significant differences between men and women in parenting styles. According to the survey results, boys are significantly higher than boys in severe parental punishment, parents' excessive interference, parents' refusal to deny, over protection and current preference. The result of this phenomenon may be the influence of traditional thinking. The differences between men and women make girls more dependent on their parents and have more communication with their parents. Parents are more comfortable and satisfied with girls. In the parent-child relationship, parents tend to be more concerned about boys. Therefore, in the process of education, the negative sex education behavior of girls is significantly less than that of boys.

In addition, according to the survey results, there is a positive correlation between College Students' views on marriage and parental rearing styles. Parents and college students have more emotional communication, which makes college students form a more positive view of love and marriage. It is of great significance for the students to have a happy marriage life and their all-round development. On the contrary, if the family environment is not warm, college students' love motivation is not high. In addition, under the condition of mother's preference, college students will have a strong attachment to their mother, which will reduce the demand for love. Parents' warmth and father's preference will have a positive effect on College Students' own views on marriage. In addition, parents' warm feelings will make students more reasonable when making love choices. If there are defects in the family environment, students will be in love with their parents Love choice will be more extreme, unable to harvest their own happy marriage.

College Students' views on love and marriage are negatively correlated with their parents' severe punishment, refusal to deny and over protection. Thus, it can be seen that healthy family environment and parent-child relationship are the premise to ensure students' healthy marriage concept. Parents need to give students enough warm support and emotional expression in the process of education, so that students can grow up in the warm growth process, which is conducive to the future development of students.

5. CONCLUSION

College students are an important factor in economic development and the mainstay of future social development. The cultivation of College Students' Three Outlooks is the key factor to ensure the long-term stability and healthy development of our society. College Students' view of marriage and love is the concentrated embodiment of their values, so it is necessary to analyze the influencing factors of College Students' marriage outlook. A person's character and the cultivation of three outlooks are closely related to their parents' education. Therefore, the research on the relationship between College Students' views on marriage and parental rearing patterns shows that there is a positive correlation between College Students' views on marriage and parental rearing, and help relevant departments to formulate reasonable education methods.

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Deep Learning Based Surveillance Video Anomaly Detection Technology Analysis

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Abstract: China is among the countries with the highest penetration rate of surveillance cameras in the world, yet has a fairly low usage rate of surveillance video data. It is of great practical significance to realize the automation of surveillance video analysis and anomaly detection. Collecting surveillance data is convenient while data labelling is of overwhelming workload, which is not fit for traditional supervised deep learning methods. However, self-supervised learning could make the most of internal semantic information of data to automatically create labels which are subsequently fed to supervised learning method, on this basis, contrastive based self-supervised learning methodology is emerged recently. We find contrastive learning method, through contrasting mutual information of positive video consecutive frames with that of negative frames, could preferably apply to surveillance video data to address anomalies. Through the automation of surveillance video analysis and anomaly detection, we aim to increase the usage rate of surveillance data and to relieve human from manual video analysis, in order to make practical use of anomaly detection of surveillance video.
Keywords: Deep Learning; Surveillance Video; Anomaly Detection

1. INTRODUCTION

In the Computer Vision area, the early thrived image processing technology has become relatively mature after decades' research and practice, it has largely been adopted in real applications. Especially after the thriving of Deep Neural Network, the capability of image processing technology has been significantly improved with the deepening of neural network and the increase of data.

With the development of deep learning in image processing, as well as the increase of data and computing capability, the Computer Vision community moves research interests to video analysis and begins to solve problems like action recognition, video classification, video prediction, anomaly detection, target tracking, etc. Through various technologies, the Computer Vision community has achieved remarkable achievement. Firstly, we apply image processing technology to video processing, video is processed frame by frame and then results are fused together [1]. However, single frame of video does not carry temporal information, e.g., consecutive action information, the academia usually adopts Recurrent Neural Network (RNN) for better processing performance [2]. On the other side, since RNN, especially Long Short-Term Memory Networks (LSTM), is hard to train and of low efficiency, the community gradually abandons these technologies.

As research goes deeper into video analysis area, end-to-end general video processing models emerged. From 3D Convolutional Model, which includes C3D[3], I3D[4], etc., to two-stream models[5], the academia handles video analysis with higher proficiency. In the meantime, lots of prosperous research topics emerges in the community, such as: action recognition, video classification, target tracking, anomaly detection, incident detection, temporal localization.

Lately, the research focus has been spread to each subdivision and breakthrough is rare, the theoretical research is said to enter a bottleneck. However, real application favored researches as surveillance video anomaly detection draw more and more attention due to the following two facts. The surveillance cameras deployed all over the world reached a new high number, and continues increasing at a relatively high rate. Report from IHS[6] points out that after 2021, there will be more than one billion (770 million at the current) surveillance cameras around the globe with a yearly growth of 30%, among which over 50% cameras will be deployed in China where over 350 million cameras are enabled, every four persons have a camera which makes China the country with the highest penetration rate of surveillance camera in the world and the country with the most potential to master surveillance video analysis technologies. However, as billions of video data generates continuously, a large portion of these data is abandoned without any processing, there is a huge room for improvement according to the data usage rate. Moreover, the "father" of deep learning Geoffrey Hinton, top scientist Feifei Li, author of Keras François Chollet and many more suggests that research of deep learning has gone into bottleneck but the research which applies deep learning technology to solve realistic problems will be booming. Currently, deep learning largely replies on back propagation theory and thrives due to explosively increased data storage capacity and computing capability, but theoretical research does get consecutive progress.

Overall, it is of great practical significance to realize the automation of surveillance video analysis and anomaly detection. And due to the diversity of video scenes and the variety of anomaly, anomaly detection has always been one of the most challenging tasks in surveillance video analysis.

2. ANOMALY DETECTION

According to Hawkins's definition [7], anomaly is an observation that differs largely from the others in a way that people suspect it is originated by a different

mechanism.

Anomaly detection research has been carried on for a very long period in real world, and lots of practical application were implemented, such as junk mail detection, anti-fraud. Along the research path, there are quite a lot methods of anomaly detection, traditional machine learning methods includes: statistics (e.g., Gaussian Distribution), distance-based method (e.g., KNN), density-based method (e.g., LOF), model-based method (e.g., SVM), dimension reduction method (e.g., PCA), and etc.

Traditional machine learning methods breed many thoughts for current anomaly detection research, we also combine traditional methods and deep learning methods to train new model. These traditional methods have close performance in low-dimension data because of their core assumption that anomaly is the minority that differs from the majority. In such context, traditional methods usually face the curse of dimensionality, i.e., common similarity measures (e.g., Euclidean distance) often lose efficiency in high dimension data, so traditional anomaly detection methods could not be applied to video data directly. However, the recent thriving deep learning based anomaly detection method has achieved better performance than traditional methods, we usually adopt deep anomaly detection (DAD) methods nowadays.

3. VIDEO ANOMALY DETECTION

As described in [8], video anomaly detection means finding abnormal patterns or movements in data, and these abnormal patterns and contents are defined as infrequent or rare event.

According to label information, DAD method is usually categorized as three types: supervised DAD, semi-supervised DAD, and unsupervised DAD. Supervised DAD needs to collect anomalies in reality and create a large dataset for supervised training, although supervised DAD gets better performance than semi-supervised and unsupervised DAD, it is extremely costly to collect anomaly data. Semi-supervised DAD does not require precisely labeled data to train model which finds the boundary of normal data, any data exceeds this boundary is deemed anomaly. With only dataset of one class, semi-supervised DAD achieves remarkable performance, but it might not be able to learn representation of anomaly samples which causes over fitting, and it might have false alarms as well. Unsupervised DAD is implemented based on Autoencoder (AE) mainly. Although it does not require data labeling, it consumes significant time and computing power for representation learning. Besides, unsupervised DAD is sensitive to noise such that it is hard to achieve accuracy of supervised DAD.

Currently, the main deep neural networks for DAD are reconstruction model and predictive model. Reconstructive model focuses on appearance representation learning, vectors are stacked in channel dimension even if input is multiple frames, temporal information is reflected in channel sequence. The latent representation actually presents the fusion of multiple frames which includes only weakened temporal information. Aim at this problem, predictive model uses RNN to entrust latent representation vector temporal state

of frame from before and after. Beside these two models, other DAD method utilizes audio, multiple sample learning, Gaussian distribution, and so on to achieve considerable result.

4. CONTRASTIVE LEARNING

No matter using reconstructive model or predictive model, they rely on pixel-level loss optimization, but this simple encode-decode or encode-predict model still has a lot of problems. Pixel-level loss based optimization model usually assume that each pixel is independent which decreases the modeling capability of spatial correlation and complexity. Excessive attention on pixel-level details will easily cause important semantic information being ignored and be sensitive to noise, which makes model vulnerable to false alarms. We hope the representation learned is not only of fewer dimensions, but also of more semantic information, such that model can use pretext to help downstream task. All the requirements mentioned above can be met by contrastive learning which utilize pretext to learn semantic latent representation from video data and then apply to anomaly detection.

At the current, self-supervised based method is killing in deep learning tasks with the powerful contrastive learning. Although contrastive learning is not a new methodology, it achieved great success in computer vision tasks. Data Efficient CPC model achieved better accuracy in ImagNet dataset than supervised AlexNet, MoCo model also passed supervised models by transferring contrastive learning result to other downstream tasks. As shown in figure 1, contrastive based self-supervised learning method learns representation by contrasting positive and negative samples in latent space.
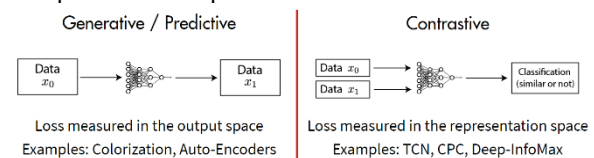

Figure 1. A comparison of two types of self-supervised learning

The idea of contrastive learning is to learn an encoder function f that satisfies the following equation:

$$score(f(x), f(x+)) \gg score(f(x), f(x-)) \qquad (1)$$

where x+ stands for positive sample, x- stands for negative sample, and score() represents similarity function. In order to optimize encoder function, we normally adopt the famous InfoNCE loss.

Nowadays, video analysis researches using contrastive learning have shown promising outcome, by contrastive based self-supervised learning, we can obtain representation data with rich semantic information and high structural feature while throwing away low-level details, for downstream video anomaly detection task.

In particular, when handling anomaly detection of surveillance video, we follow the following procedures:

4.1 Video data collection

We utilize mainstream video anomaly dataset, such as: UCSD dataset, CUHK Avenue dataset, UCF-Crime dataset, Traffic dataset, and so on. It is relatively easy to collect surveillance data of our interest.

4.2 Frame pre-processing

We consider different pre-processing technics, such as: grey processing, cropping, shifting, angle changing, sub-sampling, etc. This needs to be chosen carefully according to dataset.

4.3 Positive/negative sampling strategy

With a batch of video frames as input, we choose N pre-processed frame samples, in which there are one positive sample and N-1 negative samples. There should be hard negative, and negatives can be drawn from the same training batch.

4.4 Pretext of contrastive learning

Using contrastive learning, we optimize the InfoNCE of surveillance video data and get latent representation of video frame. In this process, we obtain a well-trained encoder function f.

4.5 Anomaly Detection and its criteria

For some video input sequence, if there exists consecutive model outputs of relatively low score, it indicates the probability of these input frames come from normal video data distribution is low, thus can be judged as anomaly. The best threshold of anomaly should be derived from practice.

5. CONCLUSIONS

In this paper, we described the background of video processing technology and introduced the necessity of researching anomaly detection in surveillance video data. Traditional anomaly detection methods are described to compare with deep learning based methods, which includes supervised based, semi-supervised based and unsupervised based methods. Among unsupervised based methods, contrastive learning is merged with promising performance and excellent prospect in anomaly detection.

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Security Protection of Archives Management Under the Background of Internet

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Abstract: The continuous development of information technology accelerates the arrival of the Internet era, and also promotes the production development of various industries to produce great changes. Among them, the archives management also follows the trend of the social era, and carries out the information construction of archives management, which greatly improves the quality and efficiency of Archives management. However, the popularity of Internet technology has also brought a threat to the security of archives. Once there is a network virus or malicious attack by hackers, the security of archives will be affected. Therefore, the relevant archives management departments should do a good job in the safety protection of archives management and improve the safety of archives.
Key words: Internet background; Archives management; Security protection

1. INTRODUCTION

Under the current internet background, the application of information technology has become more and more extensive, and the network has been widely used all over the country. With the development and application of network technology, the working mode of archives management has changed to some extent. The traditional paper file has been transformed into digital archives, which makes the efficiency of archives management work improved. But at the same time, the network will also have a certain impact on the file security. Therefore, the relevant management departments should attach great importance to the security of digital archives, and adopt various ways to improve the effectiveness of file security protection.

2. PROBLEMS IN FILE MANAGEMENT SECURITY PROTECTION UNDER THE INTERNET BACKGROUND

2.1 Lack of attention to safety protection

In the background of the Internet era, archives management is gradually informatization, and network security protection has become an important work in the current file management. However, in terms of actual situation, the relevant archives management departments do not attach importance to the security protection work, and the specific performance has the following reasons. First, the relevant archives management departments lack comprehensive understanding of the content and importance of the safety protection of archives management, and therefore, they do not pay enough attention to the work, and also believe that archives management is not the center of work, and does not need to spend a lot of manpower, material resources and materials to maintain it. This idea not only affects the effective development of archives management, but also has a bad impact on the safety protection of archives, which makes it difficult to carry out the work smoothly; secondly, the archives management mechanism is not perfect. In terms of the actual file management, the system of archives management does not include the security protection mechanism. Therefore, when implementing the file management work, the safety protection work can not get scientific guidance, and the ideological neglect will lead to the relevant file managers completely neglect the security protection of the archives. Once the Internet has virus, or the file management system, the safety protection work of the archives is ignored completely. Once the Internet has virus, or the file management system, the safety protection work will not be given scientific guidance. In addition, the ideological neglect will lead to the neglect of the safety protection of the The information management system is attacked by hackers, and it will not be able to be effectively applied, which will affect the integrity and security of files [1].

2.2 The safety protection measures are not perfect

With the continuous development of the social era, the storage mode of archives has also undergone great changes, and the information-based archives management mode is gradually popularized. When carrying out the archives management, we should also do a good job in the safety protection of archives to avoid the damage of archives materials and affect their own use value. Although most of the file management departments are aware of the importance of file security protection, there are still some problems in the specific security protection work, such as fireworks in the archives, untimely inspection of relevant electrical equipment, and house damage. All these will have a negative impact on the security and integrity of archives. In addition, the location of some units' archives is relatively remote, and the environment is relatively simple, and the doors and windows are relatively old. In this case, there will be a lot of security risks in the archives management work.

3. EFFECTIVE MEASURES OF FILE MANAGEMENT SECURITY PROTECTION UNDER THE BACKGROUND OF INTERNET

3.1 Establish a sound file management security protection system

If the relevant units want to carry out effective file management, improve the security of file management and ensure the integrity of file data, they need to have a comprehensive understanding of the specific content and importance of the security protection work of file management, so as to improve the attention of the internal leaders and relevant management personnel to the security protection work, so as to provide reference for the security

protection of files The effective implementation of the work laid a good foundation. In addition, the archives management department should also establish a sound safety protection system, and bring it into the archives management mechanism system, so that it can scientifically guide the safety protection work of archives management, so as to improve the standardization and orderliness of archives safety protection work [2].

Based on this, the relevant units can set up a special file security protection group, which is required to carry out strict inspection on file management on a regular basis, and seriously investigate the potential safety hazards in the file management area, especially pay attention to the inspection of the file management system, which needs to assign professional technical personnel to carry out system maintenance, so as to improve the security of the whole file management. At the same time, we should also implement the accountability mechanism. Once there is a security problem in the file management, we should investigate the responsibility of the relevant person in charge, so as to improve the work efficiency of the safety protection personnel. In addition, the relevant units can also develop a standardized work process for the security protection of archives, clarify the scope and area of security protection, determine the key protection location, and strictly require the staff to carry out security protection for archives management according to the corresponding process, so as to improve the effectiveness of security protection.

3.2 Reasonably improve the safety protection measures of file management

In the context of the current Internet, if the relevant archives management departments want to carry out effective security protection work, it is necessary to make scientific improvement and reasonable improvement on the traditional working methods, so as to make it more suitable for the archives security protection work in the information age, and further play the actual effectiveness of the archives security protection work. In the improvement of the traditional way of security protection, the relevant file management departments should keep pace with the times, effectively apply information technology, and effectively construct the file management security protection system by using the corresponding scientific and technological tools. For example, the relevant units can employ professional and technical personnel, establish a firewall in the computer, and strengthen the security of the file information management system It can also install high-quality security management software to protect the file information management system [3].

In addition, in the management of digital archives, managers should do a good job of backup, so as to avoid problems in the management system, resulting in damage to the archives. Backup can reduce the loss of archives and ensure the integrity of archives. In addition, if the relevant archives management departments want to eliminate some security risks from the root, they should regularly check the data and information content in electronic archives, so as to improve the security of long-term storage of electronic archives. And the relevant units should also implement a reasonable digital archives management mode. For the departments that can independently complete the archives management work, they can keep the relevant archives of their own departments independently. For departments that can't keep archives independently, they can keep relevant archives of their own departments with external assistance.

4. CONCLUSION

In the network environment, it is very necessary to strengthen the security protection of archives. The effective development of security protection can avoid the leakage or damage of archives and ensure the integrity and security of archives. Therefore, the relevant archives management departments should recognize the importance of security protection work, and pay attention to it, at the same time, adopt a scientific way to realize the effective security protection of digital archives.

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Research on The Training Mechanism and Model of Artificial Intelligence Teachers in Primary and Secondary Schools -- Taking Zhoukou As an Example

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Abstract: With the continuous development of educational artificial intelligence technology, with the application of artificial intelligence in primary and secondary school classroom teaching, primary and secondary school teachers' classroom management is facing great challenges. We need to pay attention to the training mode of primary and secondary school teachers and improve teachers' classroom management ability. Combined with the development of educational artificial intelligence technology, this paper puts forward the characteristics of classroom management in the era of artificial intelligence, and analyzes the new requirements for primary and secondary school teachers' teaching ability. In order to understand the current situation of the teaching ability of primary and secondary school teachers, a questionnaire survey was conducted on the classroom teaching ability of primary and secondary school teachers in Zhoukou City. Research shows that artificial intelligence puts forward new requirements for teachers' classroom management ability. There are many problems in Teachers' teaching ability. The main reasons are the constraints of traditional classroom teaching ideas, internal reasons, and external reasons such as the conflict of talent training objectives. In order to improve teachers' teaching ability, this paper studies the training mode of primary and secondary school teachers based on artificial intelligence teaching.
Key words: Primary and secondary school teachers; Artificial intelligence education; Training mode

1. INTRODUCTION

The requirements of artificial intelligence for basic education lead to the reform of teacher education, which is manifested in the external upgrading of technology and the internal operation is the creation of ideas. Modern human beings must face the era of technology. The current technology development has entered the era of artificial intelligence, gradually changing people's original living habits. In the field of education, artificial intelligence implantation presents new changes in the content and mode. Educational changes need teachers to make adjustments. The key to teachers' changes lies in the reform of teacher education mechanism mode. The era of artificial intelligence has an impact on Teacher Education from the aspects of promoting the upgrading of teaching aid technology and triggering the renewal of talent concept training. The current teacher education is lack of foresight because of its conservative impact on the occurrence of artificial intelligence, teacher education has not done a good job to deal with the challenges of artificial intelligence, and the national cause of teacher training and education for primary and secondary school teachers needs investment in all aspects, such as people, property, etc. Teachers' training should focus on the change of training objectives. Under the orientation of training primary and secondary school teachers to adapt to the era of artificial intelligence, teachers' training objectives should adhere to innovative ideas, adhere to the basic orientation of ability, promote primary and secondary school teachers to master the basic technology of artificial intelligence, and cultivate students' morality in the era of artificial intelligence [1-2].

2. ARTIFICIAL INTELLIGENCE TEACHING IN PRIMARY AND SECONDARY SCHOOLS PUTS FORWARD NEW REQUIREMENTS FOR TEACHERS' ABILITY

According to the white paper of artificial intelligence standardization, artificial intelligence is a method and technology that uses digital computer machines to simulate human intelligence, acquire knowledge and obtain the best results. The key technologies include machine learning, natural language processing, computer vision, etc. According to whether artificial intelligence has autonomous consciousness, it can be divided into strong and weak artificial intelligence, and weak artificial intelligence is mostly used in the field of education. In 2019, the State Council issued a document on China's education modernization, proposing to build an intelligent teaching service platform as a whole and accelerate the reform of talent training mode. Promoting the development of artificial intelligence technology and classroom teaching has brought impact on the traditional classroom teaching management and put forward new requirements for the teaching ability of primary and secondary school teachers.

With the development of artificial intelligence technology, human society has entered the era of artificial intelligence. Under the technology of educational artificial intelligence, the mode of education has changed. Classroom is the basic organization form of school teaching, which plays the educational function of imparting knowledge. In the era of artificial intelligence, intelligent information editing and presentation technology is added to the classroom to make

the classroom become an intelligent learning space. Fully considering the needs of teachers and students, the teaching management ability of teachers in intelligent classroom has changed. In the era of artificial intelligence, classroom management has the characteristics of scientificity, openness and human nature. Classroom management ability is an important dimension of teachers' professional ability, which plays an important role in Teachers' professional development. Teachers with good classroom management ability can improve students' participation and ensure the realization of classroom teaching objectives. The classroom teaching of artificial intelligence technology changes the classroom management, and challenges the professional ability of teachers. In the era of artificial intelligence, intelligent teaching equipment puts forward new requirements for teachers' teaching management ability. Only by innovating the teacher training mode and improving the teacher's teaching management ability can we meet the requirements of AI classroom teaching.

3. THE LACK OF TEACHING ABILITY OF PRIMARY AND SECONDARY SCHOOL TEACHERS IN AI CLASSROOM TEACHING

At present, artificial intelligence technology is closely linked with education. The Ministry of education vigorously promotes the construction of smart campus. At present, many primary and secondary schools introduce artificial intelligence technology into classroom teaching, which promotes the development of classroom teaching management and poses a huge challenge to teachers' teaching ability. In order to understand the teaching ability of teachers in the era of artificial intelligence, this paper investigates the classroom teaching situation of primary and secondary school teachers in Zhoukou City, and analyzes the countermeasures to improve teachers' teaching ability and adapt to the era of artificial intelligence education from the perspective of teacher training mode.

Through the investigation and analysis, this paper summarizes the problems existing in the ability development of primary and secondary school teachers after artificial intelligence technology enters the classroom teaching. The investigation finds that in the artificial intelligence classroom teaching, the ability problems of primary and secondary school teachers are manifested as unbalanced development, backward classroom management concept, insufficient self reflection depth, and lack of ideological guidance for students. This paper analyzes the reasons for teachers' insufficient teaching ability, including the internal factors such as the shackles of traditional classroom management concepts, the reduction of teachers' self-development needs, and the external factors such as the conflict of talent training objectives, and the imperfect construction of intelligent classroom management system. With the introduction of artificial intelligence into classroom teaching, school education authorities carry out a variety of teacher training activities. However, the survey found that there are some problems in teacher training activities, such as single training mode, lack of pertinence in training

content, and unsatisfactory training effect. Lack of relevant training to improve teachers' classroom management ability, teachers' participation enthusiasm is not high. The teacher training mode and mechanism are backward, which can not meet the requirements of artificial intelligence teaching classroom for teachers' teaching ability.

4. INNOVATION OF TRAINING MODE OF PRIMARY AND SECONDARY SCHOOL TEACHERS UNDER ARTIFICIAL INTELLIGENCE EDUCATION

Innovating the training mode of primary and secondary school teachers is the key link to promote the professional development of teachers. The training mode is the core of the quality of teacher education and training. The training goal is the basis for the inspection and evaluation of teacher education, and the value of teacher education can be judged. The teacher training mode should be diversified. Artificial intelligence has put forward new requirements for the teacher training mode in primary and secondary schools. The traditional teacher training mode ignores the response to social change, attaches importance to the adaptability of the training mode, and ignores the foresight of the training mode. The teacher training mode matching with the era of artificial intelligence is the innovation and optimization of the teacher education and training mode in view of the deficiency of the teacher education and training mode in our country.

Under the classroom teaching of artificial intelligence, the training mode of primary and secondary school teachers should deal with the relationship between the inheritance and innovation of training objectives, adhere to the training orientation of teachers' ethics first and lifelong learning. It is necessary to accurately grasp the school running conditions of relevant teachers' majors, deeply analyze the advantages and disadvantages of the existing professional training mode, innovate the teacher training mode, promote the reform of the teacher education training mode, and fully reflect the changes of the internal and external environment of teacher education when choosing the training mode. The talent training of teacher education should be based on promoting the development of human society and from the perspective of social development The height of the exhibition closely follows the new trend of social development, such as information technology, to ensure that the teacher training mechanism reflects the unity of adaptability and foresight. Teachers' ethics first and lifelong learning are the requirements of teachers' professional standards for teachers' professional development. The idea of ability first in the era of artificial intelligence is very applicable. In the era of artificial intelligence, classroom teaching in primary and secondary schools reduces the interaction time between teachers and students, requires teachers to guide students to form correct values with good moral style, and requires teachers to make efficient use of teaching resources to complete teaching tasks.

In the classroom AI teaching of primary and secondary schools, to cultivate teachers' teaching ability, we should improve teachers' training mechanism from two aspects: self-improvement of teachers' classroom management

ability and external promotion. Teachers are required to guide practice with the concept of competence based classroom management, set up research-based learning objectives, explore the behavior structure of classroom management, change the mode of classroom management, and enhance classroom interaction. It is necessary to improve educational AI technology, strengthen the research and development of core technology, simplify AI operation procedures, build teacher growth community, and strengthen cognitive education of human-computer interaction classroom management. With the development of educational artificial intelligence technology, China's teacher education should keep up with the development of the times. The reform of teacher training includes the reform of normal student education and front-line teacher training. In the era of artificial intelligence, it is necessary to accelerate the reform of the training mode of primary and secondary school teachers. We should enrich the diversity of pre service training institutions for primary and secondary school teachers, and constantly increase the participation rate of comprehensive universities. We should encourage the establishment of professional training institutions, make educational practice run through the process of pre service training, and promote the development of professional ability in practice.

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The Study and Application of Artistic Insight

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Abstract: Everyone has heard this idiom, which means to grasp the changes, trends, or laws of one thing, and by analogy to understand the changes, trends, or laws of the same kind.
Keywords: Insightful; Thinking

1. THE BACKGROUND OF THE TOPIC

Art is a blooming flower, make people displaced; Is the drift of snow, people will never forget; Is the boundless sea, make people relaxed and happy; Is a bright lighthouse, so that people have the direction; Is a beautiful song of praise, intoxicating people. Whether in history or in modern times, art and aesthetics are often inseparable and complement each other. "Artistic Insight" is created by the author from a philosophical point of view, through his own keen insight and careful philosophical thinking, using the current philosophical theory: objective idealism values. His aesthetic thought is based on "the same philosophy", which expounds that beauty and philosophy are two absolute symbols and embodiments [1-4].

2. PSYCHOLOGICAL INSIGHT

Human beings have developed a set of highly developed functions to recognize and understand other people's psychological states, namely psychological insight. Theory of mind and empathy are closely related to this topic. To this day, psychological insight is still the core of our ability to adapt to social life.

Insight is not observation! Observation is the ability to see a human act. And through his actions, to see into his heart, is insight. Generally speaking, insight is to see through the appearance to the essence; Insight, in Freudian terms, is the transformation of the unconscious into consciousness. In this sense, insight is "open mind", is to learn to use psychological principles and perspectives to summarize human behavior. The simplest is to observe words and observe colors.

Many people think that insight is an amazing skill, like when Holmes first meets Watson and sees that he's just come back from Afghanistan, it's the eye of fire. There is a question on Zhihu about insight, and the answer with the most thumb ups is very interesting. There is not much verbal explanation, but there is a kind of awareness, a way of training insight through deliberate practice. The Secret of Insight by Gary Klein shows us that insight is not a flash of insight, but a whole new way of thinking. Let's learn its secrets.

Everyone has heard the idiom "to learn by analogy the changes, trends or laws of one thing, and by analogy the changes, trends or laws of other things of the same kind." Our normal lives are very regular and easy to solidify, but what can we do to train our insight by analogy? It must be to break out of your comfort zone and expand your life and social circle to broaden your horizons. Different environment will bring us fresh ideas and life experience, enrich our life, make our heart stronger, observe the logic behind things, also can have profound thinking. Just like yesterday when I went to paint oil painting, for the first time, I listened to the teacher's introduction. First of all, there were pictures of different difficulty levels, such as entry level, elementary level, intermediate level and advanced level. The purpose is to undertake the choice according to your actual situation, such actual operation rises won't have too big discrepancy, and the final result relative individual character can have a sense of achievement more, also can arouse interest, be willing to patronize again. This is definitely what the business wants to see. When I first drew it, I was careful not to make any mistakes. Choose the color of the pen color is also quite exquisite, this blue is used in several colors. What is the meaning of the painting, this is all the thinking behind it, how do you want to frame it and present it as a beautiful painting. Life is full of learning. Behind every subtle action there is a potential logic and reason. Many problems are similar, we just need to see the experience, see more, think more. Integrate new information with what you already know to find new problems.

3. SIMPLE TRAINING INSIGHT

3.1. Quiet sight -- clear at a glance

Find something in your room or outside, such as a watch, a fountain pen, a desk lamp, a chair or a plant, about 60 centimeters away, look straight ahead, blink naturally, and focus your attention on this object. Silently count 60 ~ 90 times, that is, 1 ~ 15 minutes. At the same time, you should observe carefully and attentively. Close your eyes and try to create a mental picture of the object. Describe it in as much detail as possible, preferably in words. Then look over it again and add to it if there are any mistakes.

As you practice, you gradually move on to more complex objects, observe features of things around you, and then close your eyes. Repeat a few times until you see every detail. You can observe the horizon, the color of clothes, the shape of plants, the posture and movement of people, the shape and color of clouds in the sky and so on. The point of observation is to keep changing your focus and to remember as many features as you can of the different parts of an entire object. At the end of each analysis exercise, close your eyes and observe with your mind's eyes in all aspects; then open your eyes and correct your mind's impression against the object; then close and open again until it is exactly the same. You can also focus on a shape or color in one environment and try to find it elsewhere around you.

suggest you look at the famous paintings after that. Must be the white description and the original object to be contrasted, and strive to do the description subtle, meticulous. When practicing with famous paintings, one

should stimulate one's feelings through image thinking, generate interest from feeling, and increase interest from interest to mood. This improves not only observation and attention, but also memory and creativity. Because in the process of creating your new mental image, you absorb and use a lot of clear visual information and store it in your brain.

3.2 Line View -- Look while walking

Walk at a moderate speed through your room, classroom, office, or around the room, quickly noticing as many objects as you can. Think back. Tell what you saw in as much detail as possible. Better yet, write it down.

In everyday life, eyes look like lightning. In the blink of an eye, that is, between 01 and 04 seconds, to look at the object in front of you, and then recall its type and location; Look at the license plate of the car speeding on the road, and then recall its letters and numbers; Look at a strange face and recall its features; Look at the trees and buildings along the road, and then recall the number of trees and floors. Look at the billboard and recall the pictures and words. The so-called "mind and eyes", this can not only effectively exercise the visual acuity, training vision and the brain in a moment of intense attention, but also can make you more intelligent from the inside out.

3.3 Throw look - the sky scattered flowers

Take 25 to 30 moderately sized colored balls, or blocks, or jumping pieces, one-third of which are red, yellow, white, or other colors. Mix them all together and put them in a bowl. Grab two handfuls quickly with both hands, then let them go and let them roll off the sofa, bed, table or floor at the same time. When they all fall, take a quick look at the objects that fall, then turn around and write down the number of each color from memory rather than guess. Check for correctness.

Repeat this exercise for 10 days and see your progress on day 10.

3.4 Speed of view - there is no leakage

Take 50 pieces of paper 7 cm square. Write a Chinese character or letter on each piece of paper. The writing should be clear and neat, with one side of the character facing down. Playing cards are also available. Take out 10 sheets, close your eyes so they face up, and spread them out as much as possible on the table. Now open your eyes and take a very short look at them. Then turn around and write down what you see from memory. Then repeat the exercise with another 10 pieces of paper. Do this three times a day for 10 days. Notice how much progress you make on day 10.

4. CONCLUSION

We use insight to try to solve all the points in the story lay out, remove all the constraints, pinpoint where the goal is; After finding the target, I should change my perspective and re-examine all the conditions. Not only in work and life, but also when I see a book, I can analyze the author's views and think more about the logic behind the problems. Find an opening. We use insight to grasp the core points of a problem and practice our ability to examine problems from multiple perspectives.

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Application of Artificial Intelligence in Computer Network Technology

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Abstract: With the improvement of China's economic strength and the enhancement of scientific and technological strength, computer technology has been developed rapidly and widely used. The application of artificial intelligence technology to computer network technology has obvious advantages, which can provide convenience for people's life and work, and improve people's quality of life. This article briefly introduces artificial intelligence, analyzes the application of artificial intelligence technology in computer network, hoping to provide reference for the development of related work.
Key words: Artificial intelligence; Computer network technology; Application

1. INTRODUCTION

Artificial intelligence technology is based on the development of network technology and computer technology. In the new era, artificial intelligence technology has a role that can not be ignored, can be more effective to solve the problems, so that the computer can better help people solve the problems in life. From a certain point of view, the application of artificial intelligence technology to computer network technology can ensure social stability.

2. ARTIFICIAL INTELLIGENCE

The first stage of artificial intelligence is the intelligent application of the machine, which can effectively improve people's living standards, make the tedious work more simple to carry out, shorten the time to work, improve the quality of work. However, with the continuous improvement of people's requirements for computers, the traditional mode of computer has been unable to meet people's practical needs. The application of artificial intelligence technology to computer network technology is the main direction of the development of the new era, which can enrich the original functions, automatically identify images, tables and so on. In order to enhance China's technical strength and economic strength, it is necessary to apply artificial intelligence technology to computer network technology to maximize its role and provide security for people's work and life [1-4].

3. CHARACTERISTICS OF ARTIFICIAL INTELLIGENCE TECHNOLOGY

Compared with human brain, AI technology can store more diverse knowledge and process information quickly. In the process of practical work, people can store limited knowledge in their brains, and problems may not be solved by the knowledge they have mastered. And for the application of artificial intelligence technology, it can be effectively solved. If there are some problems with high complexity, artificial intelligence technology can build a model to deal with it reasonably. The artificial intelligence technology and real life can be connected to improve the work effect. Moreover, AI technology can simulate human thinking and accumulate more knowledge in the process of continuous learning. In this process, if people encounter some problems that cannot be solved, they can collect and find by artificial intelligence technology. The answers provided by AI computer network technology are more accurate and professional, which can help people solve problems in a short time.

4. APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN COMPUTER NETWORK TECHNOLOGY

First, the use of artificial intelligence technology to carry out computer network security management. According to the investigation and analysis of relevant data, it can be found that hacker intrusion has become one of the main factors hindering the safe operation of the computer, which is likely to lead to the exposure of user information, resulting in security problems. When it is serious, it will even have an adverse impact on the user's property security. In this case, the staff need a reasonable application of artificial intelligence technology, network security management, which can more effectively show the advantages of artificial intelligence technology. It can also be understood that the use of computer reasoning mechanism to improve the database, which can be more effective to prevent hackers, and make the information in a safe state, improve the security of the computer network system. In this process, the relevant personnel should also apply the artificial intelligence technology scientifically, analyze the noise, and ensure that the artificial intelligence technology can effectively improve the work efficiency.

Second, artificial intelligence technology can be applied to computer network management system. Artificial intelligence technology is based on the development of computer technology. For the application of artificial intelligence technology, we can solve the problem according to the existing database, so that the system management work can be carried out more orderly. In addition, with the help of artificial intelligence technology to carry out network management and system evaluation, we can improve the professional level of work and reduce the workload of staff [3].

Third, artificial intelligence technology can be applied to data mining. In the new era, there are a large number of data of various types, and the complexity of these data is relatively high. In this context, the relevant personnel to carry out the work, the need for a reasonable application

of artificial intelligence technology, data mining. We can work from two perspectives. In the process of data mining, the relevant personnel need to implement the rules and regulations, and in the process of deep mining, they should also scientifically apply the facilities and equipment to ensure that the collected data is accurate. In the process of daily work, the relevant personnel should study how to invade the computer, so as to master more ways to invade the computer, and record the relevant data, so as to ensure that the relevant staff have enough ability to resist hackers, and make the relevant work more smoothly. To a certain extent, it can also ensure that the data mining work is in a safe state.

Fourth, artificial intelligence technology can be applied to computer management and evaluation. In the new era, the role of artificial intelligence in computer network management is more and more prominent. Artificial intelligence can not only be used for network security management, but also for database analysis, so as to improve the overall management ability. In order to fully reflect the advantages of artificial intelligence technology, we should first strengthen the research of artificial intelligence technology and record it. From the perspective of management, the computer network is in a state of constant change, and the dynamic code is not immutable. In this case, the application of artificial intelligence technology can simplify it and make the related work more smoothly.

Artificial intelligence plays an important role in the application of information system. Information system contains many experts' experience and opinions as well as some new research results. The improvement of this system can make the relevant views more concentrated. And it can solve similar problems through artificial intelligence system and evaluate them [4].

At present, most enterprises will use artificial intelligence technology for management. With the improvement of economic level, supervision and management with the help of artificial intelligence technology has become the inevitable development of the times, which can effectively enhance the degree of enterprise modernization and reduce the cost of investment.

5. CONCLUSION

According to the above analysis, with the improvement of China's economic strength, there is a large number of data information, but from a certain point of view, it increases the difficulty of computer network operation, and is likely to have some problems, leading to the work can not be carried out smoothly, which seriously hinders people's work and life. In this context, for the application of artificial intelligence technology, can be more effective to solve the problems, efficient for data processing. In addition, it can also ensure that the computer technology is in a safe state to a certain extent, and provide conditions for the further development of computer network technology.

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Research on Seismic Response of Multi-span Simply Supported Beam Bridge

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Abstract: Bridge is an important part of traffic construction engineering, and its seismic performance has an important impact on road safety and earthquake relief work. In recent years, many bridges have been damaged due to the earthquake, which directly caused the loss of human, material and financial resources, and also affected the post-earthquake relief work. The use of multi-span simply supported bridge is an innovative design by the relevant units considering the seismic factors of bridge displacement. Especially in the frozen soil area, the soil interaction is not very obvious. Improving the design of multi-span simply supported bridge can effectively deal with the traveling wave effect of seismic wave, and then guide and transfer the seismic wave sense, so as to reduce the impact of seismic effect of simply supported bridge. It is of great significance.

Key words: Simply supported beam bridge; Seismic response; Multi span; Model; Earthquake resistance

1. INTRODUCTION

The superstructure of multi-span simply supported beam bridge is composed of bearing beams simply supported on piers and abutments at both ends. The simply supported beam is a statically determinate structure, and the adjacent spans are stressed separately. Therefore, no matter how the other structures deform, each span of the beam bridge is not affected by the support displacement. Moreover, the multi span simply supported beam bridge is simple in structure, easy to create various forms and structures, and easy to manufacture and install, which is widely used in today's bridge construction. But the mid span bending moment of simply supported beam is a design link that designers should pay attention to, which will increase rapidly with the increase of span, resulting in excessive loss of economic resources in the actual construction process of bridge.

2. BRIEF ANALYSIS OF MULTI SPAN SIMPLY SUPPORTED BEAM BRIDGE

Simply supported beam bridge is mainly composed of a bearing beam at both ends, which supports the beam on movable support and hinged support respectively. It is the earliest and most widely used bridge form in beam bridge. Because of its simple and strong structure, it is not affected by foundation deformation and frozen soil layer, so it is often used in seismic bridge design. The simple supported beam bridge can be divided into integral simple supported beam bridge and fabricated simple supported beam bridge. The integral simple supported beam bridge has large transverse stiffness and good stability, and is generally used for in-situ pouring. The fabricated simply supported beam bridge is a T-shaped section beam, which has the advantages of simple manufacture, and the reinforcement can be made into a rigid steel skeleton, so it is often used as the main beam support of beam bridge. However, the main defect of the two kinds of simply supported beam bridges is that the seismic force is weak. If they are built on super-high piers and abutments, supplemented by external force, it will increase the safety risk. Moreover, when the internal force of the simply supported beam bridge exceeds its own bearing capacity, the span capacity of the simply supported beam can not continue to expand. In other words, when the beam body exceeds a certain sliding range, it will automatically fall from the support, which leads to the safety risk of falling beam. [1]

3. MODEL ANALYSIS OF MULTI SPAN SIMPLY SUPPORTED BEAM BRIDGE

3.1 Nonlinear model

When the multi span simply supported bridge encounters strong earthquake, the pier may have plastic deformation, which consumes the seismic energy input into the structure and changes the seismic response characteristics. For example, in the dynamic structure analysis of simply supported beam bridge, designers usually use Clough model with weak stiffness. Firstly, the model tests the pier dynamics. Through the analysis of the positive and negative yield strength and deformation degree, it can be found that the low cycle repeated load curve in the railway pier model obviously presents pinch phenomenon, which indicates that the energy dissipation effect of the beam is poor. It is not enough to maintain the seismic response of large external force. [2]

3.2 Collision model between track and beam

The longitudinal vibration of road track and simply supported beam bridge is closely related. For some ballasted beam bridges, the interaction between track and beam bridge can be analyzed through the longitudinal displacement diagram of ballast bed. The strength of longitudinal resistance per linear meter is the actual indication of limiting the positive and negative vibration of track and beam bridge. Designers usually use the commonly used ideal elastic-plastic mechanical model for analysis, by adjusting the maximum resistance of the track bed, the type of track bed, section size and sleeper type and other conditions, and then study the resistance internal relationship of the longitudinal displacement of the beam. The whole research process is a simulation experiment for the later collision between beams. The designer thinks that the elastic beam with increased strength will cause uncontrollable collision and friction to the track, so the three fold line elastic collision is usually used to simulate the collision between the track and the beam body, and the

data of initial clearance, secondary clearance and tertiary clearance are analyzed respectively, so as to repeatedly verify the stiffness parameters of the beam body under strong earthquake action, and ensure the firmness of the beam body under external force collision. [3]

3.3 Equivalent foundation spring model

In the study of seismic response analysis of beam bridge, designers usually use the equivalent foundation spring to replace the substructure of beam bridge according to the inertia effect, which can simplify the treatment of pile interaction. Based on the existing theoretical research results, it is necessary to simulate the artificial boundary, set an appropriate scattered wave model on the model boundary, and understand the artificial boundary penetration principle by observing the reflection of the scattered wave, so as to obtain the spring stiffness coefficient of the three-dimensional model and solve the equivalent foundation spring coefficient of beam bridge group pile foundation level. At the same time, the designer should also design the pile finite element model, create three-dimensional finite element analysis model according to different soil melting depth, and then carry out element simulation according to the changes of site soil and pile bearing platform, so that the separation and sliding of pile foundation and soil need not be considered, and only Drucker-Prager material is used to directly determine the parameters.

4. SEISMIC RESPONSE MEASURES OF MULTI SPAN SIMPLY SUPPORTED BEAM BRIDGE

4.1 Reinforced concrete pier

Due to the weak seismic force of multi span simply supported beam bridge, it is necessary to strengthen the concrete pier sleeve in the seismic response measures to ensure that the plastic hinge of the pier can rotate flexibly. The concrete has the characteristics of thermal expansion and cold contraction. Once it meets the changing external environment, it will produce deformation, which greatly limits the flexibility of the pier. As a result, when the external force exceeds the bearing strength of the pier, it will produce cracks and increase the hidden danger of seismic safety. Therefore, in seismic reinforcement, the method of adding concrete pier sleeve can be adopted, that is, a layer of reinforced concrete is strengthened around the pier column to increase its basic ability of bending, fracture and deformation resistance. In general, designers usually use the close stirrup method for cylindrical or elliptical piers, pour a layer of stirrups around the piers, and then drill holes in the pier body and connect them with steel bars. In this way, the pier stiffness can be increased to 20%, so as to improve the seismic resistance of concrete piers on the whole beam bridge. [4]

4.2 Reinforcement of abutment limit bearing

Bearing is an important part of the structure connecting the upper and lower parts of the beam bridge, and its horizontal stiffness stability has a great impact on the seismic response of the beam bridge structure. In general, the fixed bearing with vertical bearing capacity of 4, 000 KN is used in the bridge, but it is not easy to adjust and cannot be flexibly switched in case of high-strength external force. Therefore, designers usually do not use fixed bearings, but choose ordinary rubber bearings and lead rubber bearings. Ordinary rubber bearings can extend the natural vibration period of beam bridges, and will automatically avoid when encountering earthquake, so as to reduce the damage degree of earthquake to beam bridges and increase the seismic performance of beam bridges. Lead rubber bearings have been used for a long time in building construction and beam bridges, and the damping effect is very good. Its core principle is that when the earthquake period is generated, it will automatically transfer the natural vibration period of its own structure, reduce the displacement of the superstructure of the beam bridge, and increase the seismic resistance strength of the beam structure, so as to adjust the seismic force influence of the beam bridge pier. Therefore, the two methods can effectively protect the stability of the beam and reduce the loss of the beam.

4.3 Adding the link of bridge seismic performance evaluation

After the design of the beam bridge is completed, the seismic performance evaluation of the beam bridge is usually strengthened to determine the good degree of the seismic performance of the beam bridge again, so as to ensure the stability of the seismic capacity of the multi span simply supported beam bridge. Generally speaking, the designer will first create the nonlinear dynamic analysis model of the example beam bridge, and compare with the dynamic analysis model before the design, and compare the spatial elastic beam element model, the longitudinal model at both ends of the beam, the movable support model, the pier connection model one by one, to find out the difference data before and after the design, and then carry out the dynamic time history analysis on these groups of difference data. The seismic performance of the beam bridge before and after reinforcement design is evaluated. Then, the seismic response degree of the main components of the beam bridge should be simulated and tested, and the pier, movable bearing, fixed bearing, abutment and other links should be reinforced again with limit cables, which can minimize the average peak value of the deformation of the beam bridge and improve the overall seismic performance of the beam bridge. In short, for this kind of non seismic design of multi span simply supported beam bridge, it is necessary to analyze the ductility and flexibility data of each link of the beam bridge through nonlinear curve response, so as to find out the seismic reinforcement points and reduce the risk of beam falling. [5]

5. CONCLUSION

To sum up, there will be a variety of unforeseen problems in the design and construction of multi span simply supported beam bridge. For the inspection of seismic force, designers need to pay attention to the details of each link in the design of beam bridge, carry out multi-party technical exploration and simulation experiments in the specific operation design, and then summarize and analyze the factors affecting the seismic response of simply supported beam bridge. Through comparison and multi-party verification, the stability and durability of seismic performance of simply supported beam bridge in

frozen soil can be enhanced. At the same time, it also needs the relevant departments to strictly control the quality of construction equipment and materials, and strengthen the comprehensive skills of construction technicians, so as to ensure the normalization and process of the seismic performance of simply supported beam bridge, and ensure the long-term stability of its seismic force.

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Research on The Innovative Design and Application Strategy of Rural Public Facilities in Beautiful Countryside

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Abstract: For a long time, three problems that involving agriculture, rural spaces and farmers in countryside are fundamental issues related to the national economy and people's livelihood. For the moment, the imbalance between urban and rural development has been becoming more increasingly apparent as the current construction of beautiful village has not yet fully matched with the development of the city along with the acceleration of urbanization in China. Rural public facilities space, as a part in villages and towns, is important for villagers' activities and an indispensable part of the rural public space network system. Whether its fully equipment can cover all villagers, meet their actual production and life needs, inherit and unify the rural culture, truly close to their life, and meet the daily activities demand is one of the issues that farmers are most concerned in the current environment of new rural construction in our country, and also a key point that must be resolved in order to achieve rural revitalization.
Keywords: Beautiful countryside; Public building; Rural construction

1. ENVIRONMENTAL FACILITIES ARE HUGE CHALLENGES IN RURAL REVITALIZATION

The rural revitalization strategy which first proposed in work report of the 19th National Congress of the Communist Party of China, is another major strategic national policy and decision-making deployment issue after building new and beautiful village at national level. It's not only an important tool to solve the three problems, but also a solution to win the battle against poverty. At present, the deeper problems such as the development of rural industry and the level of rural public service are the key that restricting the village construction and revitalization. So the construction of new and beautiful village has solved the problems of infrastructure construction and rural living environment such as in further developing rural society, solving the problem of public service, strengthening the construction of public facilities, and narrowing the gap between urban and rural, it lays a good foundation [1-4].

Based on the urgent need of the construction of new socialist countryside, the research on the configuration and design of rural public facilities is particularly important, and systematic research on the allocation and design method of rural public facilities is the theoretical basis for the practice of new rural socialist construction, and is also an important prerequisite for the real improvement of rural environmental quality.

2. THE ARTISTIC EXPRESSION AND INFLUENCING FACTORS OF PUBLIC FACILITIES SPACE

The design of public facilities has been divided into single facility design and system planning design from the perspective of industrial product design, because it has many types, and there are different classification methods according to different perspectives. The first design refers to a single product, which is the foundation and core part in it, and the second refers to the overall facility design coordinated with environment and services of the site through the system planning and design of individual facility products.

As the basic attribute of public service facility is to serve the public and in order to truly design for people, its construction and design should be based on people and also consider the characteristics and needs of different groups especially for socially disadvantaged groups, such as the elderly, children, patients, the disabled, pregnant women etc. Because of their different physical needs and emotional appeals in themselves, it should be fully taken into account in the design to combine their physical and mental characteristics with design. At the meantime, environmental factors also need to be carefully considered when it comes to the design of public facilities, otherwise it will directly affect the service life and use effect of the scenic facilities. In addition, due to the different history and culture, geographical location and economic level of each region, the living and working habits of the residents will be different, so the design of environmental facilities should also consider the regional cultural characteristics of the local space. It is not difficult to find that rural public service facilities are exactly the important carrier of regional culture, which can show the image and style of the countryside in different places.

3. INNOVATIVE DESIGN AND SPACE CREATION OF PUBLIC FACILITIES IN BEAUTIFUL COUNTRYSIDE

Public facilities and buildings can not only integrate with the rural natural environment to form a good village landscape, but also effectively promote the sustainable and healthy development of the rural economy and society, improve the level of rural public services, and comprehensively accelerate the promotion of rural revitalization.

3.1 Focus on agriculture and achieve integrated development

Rural resources such as natural and agricultural has been integrated to expand their characteristic, highlight the

local characteristics of rural culture, break the monotony production function of the traditional agricultural development model, diversified development, promote agricultural development in the living function and ecological protection function, develop agricultural value of "multiplier effect", facilitate the transformation and upgrading, achieve rural continuous integration development based on agricultural development.

3.2 Developing a complex and intensive public service system as an attraction

Rural infrastructure has been constantly improved to optimize and improve the quality of public services, promote the quality of rural ecological environment and residential buildings, meet the psychological and physiological needs of tourists, emphasize the complex functions of rural life and ecology, extend the agricultural industrial chain and enhance the additional value of agricultural industry and pay attention to the transformation from a single function of sightseeing tourism to a complex function of sightseeing tourism, agricultural experience, and rural residential science education.

3.3 Construction of agricultural and industrial systems

Guided by market demand, we optimized the structure of the agricultural industry, build a modern agriculture and industrial system, and vigorously develop efficient circular agriculture and creative agricultural experience to realize the marginal effect of "1+1>2", improve agricultural added value and accelerate agricultural transformation to improve income. For example, the basic agricultural conditions and the background of natural ecology in various regions was made full use by agriculture and tourism, to expand the experience function of characteristic agricultural tourism and provide a place for urban people to experience and comprehend the nature. Vigorously develop three-dimensional agriculture and derive forest bacteria, forest medicine, forest fruit, forest birds and other undergrowth economy. Combining with the development of tourism to promote the development of tourism facilities. Using the "Internet +" to achieve the full-time tourism services. Agriculture and folk culture education was adopted to improve tourists' understanding of farming culture, to feel unique farming civilization and experience the authenticity of the countryside through farming experience. It can be displayed through agriculture, popular science education, agricultural research and other forms. Therefore, integration of resources, innovative ways should be based on agriculture and coordinated with the construction of infrastructure and public facilities to gradually establish the modern agricultural industry system lying on updated agriculture and to finally drive the agricultural transformation.

3.4 Enhance the participation enthusiasm and management ability of local farmers

The aboriginal should be actively mobilized to participate in development, so that villagers can receive professional knowledge education, improve the aboriginal tourism service awareness, and continuously strengthen urban tourists' in-depth perception of rural tourism. Stable economic development in rural spaces would be ensured

through the organic integration of regional characteristics and rural tourism. Meantime A development system of "center and farmer households would be actively built through the public facility center, unified management, unified service, and unified publicity of all production factors in the region. And avoiding government and foreign investment as capital parties should directly intervene to ensure the dominant status of villagers and increase employment opportunities for villagers.

3.5 Construction of rural resident community

With rural space environment as the base, the rural tourism as the guide, we would promote the transformation and upgrading of industries, and optimize the improve rural living environment, improve the public infrastructure which was lacking development and promote the value of land, we have set up the community functions and environment appropriately, the public service level effectively, thus can satisfy peoples' homeless feeling of new urbanization production and living space.

3.5.1 Modern agricultural production space

As a main body of modern agricultural production space, modern agricultural production would form a closed science and technology industry chain loop that is production, system, exhibition and sales of organic integration along with modern facilities of agriculture, ecological organic recycling agriculture and high-tech agriculture as important components, such as centering on modern agricultural production to promote the creative industry, farming experience and to display sales.

3.5.2 Characteristic rural landscape space

The characteristic rural landscape space mainly covers two categories: natural landscape and man-made landscape. Which is the core attraction of introducing human capital and enhancing the value of land, forming a multi-category, multi-themed sightseeing space, and an important basic environment for practicing ecological priority and sticking to green and sustainable development.

3.5.3 Health tourism and leisure gathering space

The leisure gathering space is a concentrated distribution with comprehensive functions, meeting the spiritual and material needs of the service objects. The overall planning of the region takes tourism as a guide, closely integrating with health and wellness, and coordinating a variety of health and leisure tourism products and elements . Through the planning and construction of various public facilities related to leisure and tourism, it provides space for leisure activities for all kinds of people, enhances the additional value of village, enriches the tourist experience, and stimulates the inner vitality of the village.

3.5.4 Rural residential development space

The rural residential development space is the core for the steady advancement of new urbanization. It is also a relatively concentrated residential area for rural indigenous residents, tourists and new villagers, and is the main functional area for urban-rural cultural exchanges.

3.6 Relying on regional advantages to expand experiential economy

The experiential economy is the extension of the service industry. Relying on the advantages of resource

endowment, a diversified industrial space and system structure, shape production, life, and ecological scenarios with regional characteristics was constructed. The diversified creation of experience space can not only take advantage of natural landscapes such as mountains, water, forests and fields, but also rely on cultural advantages such as regional culture, customs and feelings, as well as special services such as traditional Chinese medicine therapy, beauty and beauty, yoga and fitness. According to the region, the advantages and characteristics of the company was expanded to form the creation of multiple life experience spaces such as forest picking, creative farming experience, hand-crafted workshops, ancient architecture research, leisure and health care, etc. And these different industries can penetrate each other to form derivative diversified industrial development. These spaces not only can carry the connotation and educational function of agricultural culture, but also restore the authenticity of regional life while promoting the development of regional industry integration and the interactive experience of urban and rural residents.

4. EXPLORATION AND CONSTRUCTION STRATEGY OF BEAUTIFUL COUNTRYSIDE MODEL

4.1 Integrating rural land resources and realizing the diversified and integrated development of regional economy

Tourism resources are unique, but they have been scattered and segregated by inefficient agricultural production for a long time, since ecological resources have been excessively consumed, and economic output has continued to decline. Therefore, it is necessary to constantly weigh the relationship between various elements, to effectively reduce the pressure on land resources from development and construction, to actively adapt to the growth of the natural law, to coordinate the continuous improvement of public infrastructure, to intensively optimize the industrial space structure, and focus on protection for appropriate development and maintenance. The natural and ecological features of the landscape are beautiful, the ecosystem chain is improved, and the multi-integrated development of characteristic tourism industry, cultural industry, leisure and health care will be constructed. By guiding the integration of multiple industries and gathering multiple cultures, the development of regional economic integration can be realized.

4.2 Respecting the objective status quo of the field and rationally constructing the industrial system

In terms of overall planning and positioning, it should be rooted in local areas, taken measures according to local conditions, figured out regional differences objectively, shown unique regional characteristics and farming culture, and paid attention to the corresponding relationship between various functional plates and the integration and symbiosis of functions, so as to form an organic complex with overall coordination and intensive functions. In terms of spatial layout, we should scientifically examine, optimize and coordinate the functions of production and life, and pay attention to the orderly combination and mutual integration of all parties. As a basic industry, agriculture should retain the original agricultural land to the greatest extent, rationally use existing farmland and base site, and appropriately reserve space for later space upgrade.

5. RESULTS AND DISCUSSION

By highlighting efficient and focusing on agriculture, a window was created for all people to start a business, tie the interests of all people on an industrial chain to form a comprehensive service space with a comprehensive scale, intensively integrate production factors, and improve the efficiency of factor matching. By highlighting features, the development of traditional agriculture was promoted through leisure tourism, agricultural experience and facility construction to increase the commercialization of agricultural characteristic industries.

It is worth noting that public facilities products are different from ordinary products, and their service targets are not a type of "people" with the same goal, but usually people in the system. This is destined to be different from other products and systems, whether it is a single product or the entire system with more complex inclusiveness and versatility. The research and implementation of the design should be taken into account the particularity of its products and system services, and more in-depth and specific discussions will be conducted in the later research.

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Network Security Risk Monitoring Method of Smart Campus Based on Internet of Things

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Abstract: With the continuous improvement of China's information level, the intelligent campus system based on the Internet of things has also begun to get more application and attention. Good network protection can ensure the security of system data. This paper will discuss how to improve the monitoring system in combination with the development overview and characteristics of smart campus. Regular maintenance of equipment, strengthening security awareness, strengthening security management and other network monitoring methods can provide more reference for the application of smart campus system.
Keywords: Internet of things; Smart campus; Network security; Risk monitoring

1.INTRODUCTION

Smart campus can be seen as an effective combination of education industry and information technology industry. Internet, big data, cloud computing and Internet of things are used as carriers to promote an intelligent, multi-functional, data-based and networked integrated service mode of education and scientific research. The earliest concept of smart campus appeared in the construction proposal of Zhejiang University in the 12th Five Year Plan of 2010. In June 2018, the state officially released the relevant documents of the overall framework of smart campus.

2.AN OVERVIEW OF SMART CAMPUS DEVELOPMENT BASED ON THE INTERNET OF THINGS

Since the emergence of computer information technology, it provides a lot of convenient services for human life, but also affects the way of people's life and production. According to the latest data forecast reality of IDC data center, by 2021, there will be 31 billion internet devices working together in the world at the same time. People will experience the ubiquitous network service in life and learning. Smart campus integrates information technology and education industry to realize the integrated service of teaching, scientific research, life and management. At the same time, it can also analyze the learning environment and dispatch existing resources. Smart campus emphasizes the application principle of "people-oriented". Its characteristics are reflected in the following aspects: firstly, it can realize the real-time sharing of network information, and can enjoy high-speed and high-quality network services both inside and outside the school. Secondly, the resource data in the smart campus system can be highly integrated to complete the specified data mining and analysis operations according to the needs of users, and provide intelligent services. Whether teachers, students, or managers can complete the required behavior operation and management control in the system. Finally, smart campus can assist the cultivation of innovative talents. Under the background of the new era, the society needs innovative talents, and the education field pays more attention to the cultivation of students' innovative ability. The open, shared and socialized characteristics of smart classroom can promote the realization of educational objectives.

3. NETWORK SECURITY RISK MONITORING METHOD OF SMART CAMPUS

3.1. Improve the monitoring system

In the campus network related work, we should follow the management principle of "prevention first", do a good job in data detection for common network security problems, and improve the monitoring and early warning system. The university network room contains the environment system of the computer room, including: temperature and humidity, air conditioning, flooding, power equipment, power distribution switch, UPS, access control, infrared, vibration damage, fire monitoring, monitoring of important network and system equipment, etc. The intelligent terminal is deployed by the Internet of things technology, and the monitoring equipment installed in the above areas and the special network room is centrally managed. Once the abnormal situation is found, the alarm device is started, and the monitoring terminal is deployed on the application server. If necessary, the operation behavior and data recording of CPU can be monitored. Big data technology is used to mine and analyze the monitoring information to control abnormal operation behavior in time.

3.2. Regular maintenance of equipment

Many colleges and universities did not pay special attention to the construction of information management system in the early stage, so the selection of equipment and the overall structure of the system network are relatively simple, and the technical operation is low, which also leads to great loopholes in network security, leaving opportunities for criminals. In addition, in terms of staffing, many operators do not have sufficient professional ability and knowledge reserve, lack of network security management experience, risk protection awareness is not in place, can not timely update the current network system, these problems are not solved, it is likely to cause information leakage in the system, and even bring security crisis to the campus network. Therefore, when maintaining the network security of smart campus, we need to do a good job of equipment maintenance and update. At present, the equipment used in smart campus is mainly divided into software and hardware. Technicians

should monitor the running status of software and hardware in real time. Managers should also optimize the structure of the whole campus network from the network access level to ensure that the equipment and instruments are in good condition. For example: you can choose the only static IP in the office area or teaching area to avoid network failure caused by changing IP address in the future. In addition, operators should regularly pay attention to the official website of the software and hardware equipment used, learn about the update situation and download the upgrade patch package, so as to avoid illegal elements from attacking network vulnerabilities. The firewall can also be installed on the system to avoid malicious access, record the external network access records, judge whether there is high-risk behavior, and do a good job in risk control. Once the dangerous operation is found, it is necessary to organize the visit immediately and conduct targeted investigation. Timely check and kill viruses, develop good operating habits, and ensure the safe and smooth operation of smart campus network.

3.3. Strengthen safety awareness

Because smart campus is an integrated service system, network security is related to educational administration management, scientific research knowledge, personnel files, personal information, financial data, logistics management and other work. Therefore, users and managers should strengthen their own data security awareness. At present, China has issued a series of laws and regulations on network security, such as network security law, Internet application information service management regulations, etc. Both teachers and students or administrators should strictly abide by the laws and regulations when using the campus network, develop the habit of assessing security risks and protect their privacy. In addition, it is necessary to do a good job in school publicity. For example: in the use of network platform communication, important personal information and account password should not be communicated by chat. When using the public network, it is necessary to clear the browsing traces in time; do not download the e-mails or links sent by unidentified phishing websites, so as to avoid the leakage of personal information or the damage of personal accounts.

2.4. Strengthen security management

Because the construction of smart campus network security system needs to involve technology, personnel, management, equipment, regulations and other fields of engineering, so in the process of network operation, we should adhere to the management principles of partition isolation and unified protection. The portal layer, data layer, communication layer and IOT layer are encrypted to protect the terminal, and the management effect is enhanced by means of perception gateway and security isolation to reduce data risk. Dynamic prediction of network risk factors, such as: can increase the number of perception equipment, system operation will be uploaded to the computer terminal in the form of data signal, convenient for technical personnel to handle uniformly. Moreover, the sensing system can also collect the data generated in the operation of routers, firewalls, switches and IPS, and can also support the collection of security information such as security logs, traffic probes, baseline scanning, network logs, etc. according to these security data, we can understand system vulnerabilities and user visiting behaviors. The data is transmitted to the analysis platform. When there are anomalies, it is convenient to use data mining technology to find out the potential security risks and send out early warning signals to improve the security of network operation.

3.CONCLUSION

To sum up, the era of big data has come. The intelligent campus system based on the Internet of things has brought a lot of help to teaching and school affairs, but the data network security problem has gradually attracted more and more attention. In order to ensure the security of data application, technical personnel should not only check the lines, equipment, machine rooms and power equipment, but also timely update the ports of identity authentication and data backup, so as to avoid the expansion of network security risks.

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On the Innovation Strategy of Higher Vocational Physical Education Under the Guidance of Vocational Education

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Abstract: For higher vocational colleges, because it is the place to cultivate "professional" talents, vocational education guidance is inevitable in teaching activities, so as to improve students' Vocational Competitiveness and make students' ability development more in line with work needs. But for the physical education work, due to the lack of attention of higher vocational colleges, there are many deficiencies in the process of carrying out educational activities. The most important thing is that there is no "localization" treatment in higher vocational colleges, blindly learning from the physical education curriculum of ordinary high school, without highlighting the guidance of vocational education, which can not provide effective help for students' career development. In this article, we will focus on the reform of physical education in Higher Vocational Colleges under the guidance of vocational education, and put forward some feasible optimization and innovation strategies on the basis of fully considering the professional needs and the development of students.
Key words: Vocational education; Higher vocational colleges; Physical education

1. INTRODUCTION

In the current environment of education reform in our country, more attention should be paid to the improvement of students' basic ability, which requires that the knowledge system of various disciplines can bring real help to students' growth, and that various disciplines can have more abundant educational value. For physical education in higher vocational colleges, on the one hand, due to the late start of China's higher vocational colleges, all aspects of the system has not been built and improved; on the other hand, because higher vocational colleges focus on the teaching of vocational skills, there is a certain degree of contempt for Physical Education, so that the physical education system in higher vocational colleges has not entered a mature stage, can not provide guidance for students in the future Career development provides more help. Therefore, it is necessary to reconstruct the physical education system of Higher Vocational Colleges Based on the guidance of vocational education, so as to bring students better physical education teaching experience and make students get greater growth in the process of physical education.

2. ENDOW PHYSICAL EDUCATION WITH GREATER EDUCATIONAL VALUE

For a long time, due to the influence of people's inherent impression of physical education, most social groups simply think that physical education is a simple physical exercise behavior, which can only enhance the physical quality of students, but not help students in a wider range. In fact, this is a very wrong idea, in the long evolution of sports activities, sports activities have been given greater educational value.

2.1 Improve students' competitive consciousness and cooperation ability through physical education

With the advent of a new era, due to the further maturity of the social system, the role that individuals can play is more limited, the era of fighting alone is gradually away, and win-win cooperation has become the mainstream of social development. In order to achieve career success, it is necessary to cooperate with others. At the same time, in today's increasingly saturated economic market, people often need to face more fierce competition Competition, only those who have a good sense of competition can go further on the road of development. It can be seen that the sense of competition and the ability of cooperation are of great importance to the future career development of students. However, in the higher vocational education system, too much attention is paid to the teaching of vocational skills, and the cultivation of students' vocational ability is ignored to a certain extent, which can be well made up in physical education activities. In sports, there are many projects that need students to compete and cooperate, such as football, basketball, etc. it not only needs the unity and cooperation between teammates, but also needs to compete with opponents, which can effectively improve students' sense of competition and cooperation ability. Teachers should focus on cultivating students' professional ability and comprehensive quality in physical education, not just sports skills The mastery of physical fitness and the enhancement of physical fitness [1].

2.2 Enhance students' psychological quality and pressure resistance through physical education

In modern society, the pace of life is accelerating and the pressure of life is increasing, especially when the students just graduated, they not only have to face the trouble of looking for a job, but also need to resist the confusion on the road of life, which requires the students to have a very strong psychological quality and anti pressure ability to resist the ups and downs of society. Although the courses of mental health have been set up in higher vocational colleges, and the teachers of various subjects will also give psychological guidance to the students after class, it is always only implemented in words, which has little impact on the students' psychology. And sports activities not only have the effect of physical exercise, but also can

make students have a certain degree of pleasure, so that students' inner pressure can be relieved, which is helpful to eliminate students' psychological crux, and is beneficial to students' mental health. And the sports activities have win and lose, the victory can effectively improve the students' self-confidence, the failure can significantly improve the students' ability to resist setbacks, the key lies in the teachers in sports activities how to carry out psychological guidance [2].

3. TEACHERS' QUALITY IS THE CORE GUARANTEE OF TEACHING ACTIVITIES, AND THE CONSTRUCTION OF TEACHERS' TEAM SHOULD BE STRENGTHENED

Although in the current quality education reform, more respect for students' teaching dominant position, the role of teachers in teaching activities has been weakened to a certain extent. However, this does not mean that teachers are no longer important in teaching activities. Teachers are still very important "guides" in teaching activities, which can help students to embark on the correct development path and avoid students from learning "detours" to the greatest extent. Therefore, a teacher with excellent teaching ability can often provide greater help for the growth of students, and promote the maximum improvement of students' ability in the shortest time. However, in the physical education system of higher vocational colleges, due to the lack of attention of the top management of higher vocational colleges, physical education directly leads to the lack of strict selection in the recruitment of physical education teachers, leading to a mixed team of physical education teachers. Although there are excellent teachers, a large part of them are just making up for the number and do not have the support of physical education The ability of dynamic development [3].

Therefore, if higher vocational colleges want to do a good job in physical education teaching, they must first do a good job in the team building of physical education teachers, recruit more excellent high-quality teaching talents, so as to give students the most scientific guidance. And, at this time is in the key period of physical education reform, more need the support and help of high-quality physical education teachers, can be keen to find the shortcomings of the traditional physical education mode, and targeted to take various measures to make up, make physical education work more fit with the education needs of Higher Vocational colleges. In addition, excellent talents are scarce resources, which can not be recruited in a short time. It is also necessary to "retrain" the original physical education teachers to effectively improve the teaching ability of the original physical education teachers, and the original teachers have rich teaching experience. After the teaching ability is further improved, they can carry out all kinds of work more efficiently [4].

4. CONCLUSION

Generally speaking, the reform of physical education in higher vocational colleges is imperative, which is not only the core need of the concept of quality education, but also the inevitable requirement of students' professional ability growth. In today's era, due to the enrollment expansion of major educational institutions, the number of excellent graduates for the society increases year after year. However, the speed of economic development is limited, which can not keep up with the trend of education enrollment expansion. As a result, the supply exceeds demand in the talent market, and the talent involution is serious. If vocational college students want to occupy an advantage in the market competition, they will inevitably put forward more stringent requirements for teaching activities, and promote the further vocational education orientation of educational activities, so as to promote the improvement and breakthrough of students' professional ability.

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Analysis of Personal Data Information Protection Under Big Data Technology

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Abstract: With the rapid development of big data technology, the scope, breadth and value of big data application are more and more recognized by the society. At the same time, the society's awareness of protecting personal data information is also increasingly strong. At present, the scope and degree of big data application is still unsatisfactory, among which the most critical problem is the protection of personal data information. Therefore, how to continuously strengthen and protect the security of citizens' personal data information in today's increasingly wide application of big data technology will be one of the practical problems that must be effectively solved in the process of further wide application of big data technology.
Key words: Big data technology; Personal data information protection

1. INTRODUCTION

The protection of personal data information is related to the vital interests of the public. In the era of big data, although people enjoy all kinds of convenience brought by big data technology all the time, they also bear the risk that personal data information may leak at any time [1-4]. Therefore, it is very necessary to strengthen the protection of personal data and information, which is related to the legitimate rights and interests of individuals and enterprises, and even related to national security. Therefore, how to effectively protect the security of personal data and information, who will supervise those illegal acts of stealing personal information, these issues are worthy of in-depth thinking and exploration.

2. RISKS FACED BY PERSONAL DATA INFORMATION UNDER THE BACKGROUND OF BIG DATA TECHNOLOGY

The rapid development and popularization of big data technology brings more convenient experience for the public, but also brings the risk of personal data leakage. According to a survey report released by China Consumer Association, as of March 2020, China has more than 900 million Internet users, more than 4 million Internet websites, more than 3 million apps and more than 3 million personal data Data information protection has become one of the most realistic interest issues that the general public is most concerned about [2]. According to the relevant statistical data, the phenomenon of excessive collection of personal data information of Ono individual households by e-commerce, social software and other platforms has become one of the new hot issues of current user complaints. 82.5% of consumers said that they have suffered from the leakage of relevant personal data information, such as receiving relevant sales calls, SMS harassment, spam and so on According to relevant experts, a simple app security requires users to open more than 20 permissions, and they have almost mastered all the user's mobile phone information and privacy. At the same time, compared with the traditional user's personal information such as personal name, occupation, and communication record, the protection of new generation of personal biological information such as face and fingerprint is also important. In September 2019, A face changing software was interviewed by the Ministry of industry and information technology because it was suspected of illegally collecting users' personal face information. Compared with traditional personal information such as users' occupation and communication records, biological information has the characteristics of uniqueness and irreplaceability. Once there is a risk of leakage, it may cause social crisis. Therefore, the protection of personal data information under the background of big data technology is also in recent years It has become one of the focuses of social concern and one of the key proposals of the CPPCC National Committee.

3. RESEARCH ON PERSONAL DATA INFORMATION PROTECTION MECHANISM UNDER THE BACKGROUND OF BIG DATA TECHNOLOGY

The protection of personal data information involves a wide range of subjects and has a wide range of interests. It needs relevant government departments, legislative bodies, individuals and other relevant subjects to form a joint force from their respective perspectives to jointly improve and protect the security of personal data information. Specifically, we should focus on the following aspects

3.1 Speeding up the pace of legislation

Law is one of the important tools to protect personal data information security in the context of big data technology [3]. From the current situation of China's laws and regulations on the protection of personal data information, the relevant laws and regulations are relatively scattered and unsystematic, and the difficulty of implementation in practice is relatively high. At the same time, the protection scope of personal data information, punishment mechanism and other related issues need to be further studied and clarified. Therefore, the legislative department should issue relevant laws and regulations under the current big data technology background as soon as possible In order to solve the long-standing difficulties and pain points in the process of personal data information protection as soon as possible, we should work hard to provide a strong legal basis for personal data information protection under the background of big data technology.

3.2 Standardizing enterprise behavior

Enterprises are one of the main protection subjects of users' personal data information. In order to effectively protect the security of personal data information, it is necessary to speed up the standardization and clarification of the boundaries of enterprises using personal data information. Government departments should strictly supervise the process of enterprises using personal data information in strict accordance with relevant laws and regulations, such as the collection, storage and use of personal sensitive information On the other hand, it is necessary to further strengthen the dynamic supervision and accountability of the use of personal data information by relevant enterprises. The most important thing is to further clarify the security protection obligations and responsibilities of the users of personal data information, and clearly require enterprises to collect and share personal data information with their own enterprises in the process of using personal data information Products, services and other information related to user experience can not be used for statistics and analysis of users' personal habits, highlighting the combination of enterprise supervision and self-discipline, actively guiding enterprises to strengthen industry self-discipline, and actively protecting citizens' personal data privacy.

3.3 Strengthen information protection

In addition to further strengthening the legislation of personal data information and standardizing enterprise behavior, we must also strengthen the protection of relevant information that has been obtained in this process, which is the key and top priority to effectively prevent the risk of personal data information leakage [4]. In other words, the holder of personal data information is required to strengthen the evaluation and analysis of relevant personal data information on the premise of ensuring information security. For all kinds of massive information that has been collected, one is to pay attention to protection, and encrypt the encrypted information in time, so as to ensure that people with access rights can access it, The second is to ensure that it can not be shared at will, and the purpose and purpose of using data and information security should be clear. For example, for personal data information obtained through various "health codes" during the epidemic prevention and control period, these information can only be used for epidemic prevention and control work, work resumption and other related work. The third is to strictly do a good job in the relevant data deletion and destruction work, for in a specific period of time For example, the existence period of personal data information obtained during the epidemic prevention and control period should be set in time, and those personal data information without reservation value and research value should be destroyed regularly, so as to effectively reduce the risk of data information leakage.

4. CONCLUSION

In short, the rapid development of big data technology not only brings convenience to the public, but also brings a certain risk of data information leakage. Personal data information protection, on the one hand, is to protect the legitimate rights and interests of citizens, the more important purpose is to maintain social stability and protect national security. Government departments, judicial departments and relevant enterprises should constantly improve their booths, strengthen the protection of citizens' personal data information from the overall point of view, and strive to achieve the benign integration of personal information protection and big data application.

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Design of Mobile Terminal Measurement System Based on Android Platform

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Abstract: In order to solve the problems of single function and complex measurement operation of traditional measurement system, this paper takes Android platform application as an example to build a mobile terminal measurement system with perfect function and strong practicability. First of all, scientific division of system function modules; this, in strict accordance with the system development requirements, complete the scientific design of the system database, and constantly optimize and improve the system function, in order to achieve the purpose of improving the system performance, so as to bring good user experience.
Key words: Android platform; Mobile terminal measurement system; Design

1. INTRODUCTION

In recent years, with the continuous improvement of the level of science and technology in China, Android platform development means continue to emerge, and seize the opportunity in the mobile application market. This development method is widely used in the design and implementation of mobile terminal measurement system with the characteristics of self height accuracy and strong flexibility. It not only effectively improves the calculation and processing ability of the system, but also has powerful information sharing function, which plays an important role in further improving the stability, reliability and security of the system. Therefore, under the application background of Android platform, how to design and apply mobile terminal measurement system scientifically is a problem that technical personnel must think about and solve.

2. SYSTEM FUNCTION MODULE DIVISION

Field measurement mainly includes independent point measurement, area measurement, distance measurement, linear object measurement and other aspects [1]. Therefore, under the application background of Android platform, the main function modules of mobile terminal measurement system are divided into the following contents.

2.1 Independent point measurement

Through the use of this system, we can use one by one positioning method to realize the accurate and scientific measurement of the relative position information coordinates of independent points. The location information of independent point mainly includes the following kinds, which are the name of the feature, the name of the layer, the location serial number and so on.

2.2 Dynamic positioning survey of ground objects

In the process of line state measurement, in order to ensure the authenticity and accuracy of the measurement results, the system mainly adopts the boundary measurement method. According to the distance between different positioning, the mobile device is used to collect and sort out the positioning related information data automatically. At the same time, the start point, corner point, end point and other positions are considered comprehensively Based on the point related parameters, the accurate collection and collation of the position information of special points are completed by using the method of positioning acquisition, which lays a solid foundation for the effective development of the later measurement work. When the user clicks the "pause positioning" button, the positioning process will end immediately. At the same time, it is necessary to input the relevant attributes of the ground objects into the system comprehensively and accurately, and create good conditions for the later scientific construction and design of the system database.

2.3 Display and update of measurement results

When the final measurement results are safely and effectively stored in the system database, the system can quickly and accurately search and view the location information of interest according to certain search conditions by using the mobile terminal measurement system. At this time, the mobile terminal measurement system will automatically use the list form to present these information data comprehensively and effectively in front of users In order to improve the user experience.

2.4 Feature length/area measurement

In order to further improve the authenticity and accuracy of the length measurement results, the system mainly uses the map projection method to set the position of the ground object as the coordinate system. On this basis, it uses the relevant principles and knowledge of length measurement to accurately measure the length and area of the ground object, and presents the final measurement results in the form of a list in front of the user, so as to improve the practicability of the system, For the later better popularization and promotion of mobile terminal measurement system has a positive impact.

3. SYSTEM DATABASE DESIGN

In the specific design of the system, MySQL database integrated by Android platform is mainly used. This type of system database is a lightweight relational database, which has the characteristics of low memory occupation and high efficiency in data processing. According to the design requirements of the system, the following three data tables are designed by using MySQL database [2], which are layer list information table as shown in Table 1, surface feature information input table as shown in Table 2 and survey point list information table as shown in Table 3.

Table 1 layer list information table

Field name	Field description	Data type	Null requirement
layer_id	Layer ID	Int	NOTNULL
layer_name	Layer name	Varchar	NOTNULL
layer_type	Layer style	Varchar	NOTNULL
create_at	Creation time	Varchar	NOTNULL
create_at	Revision time	Int	NOTNULL

Table 2 figure information input table

Field name	Field description	Data type	Null requirement
object_id	Figure ID	Int	NOTNULL
object_name	Name of feature	Varchar	NOTNULL
layer_name	Layer	Varchar	NOTNULL
length	Length	Int	NOTNULL
area_measure	The measure of area	Int	NOTNULL

Table 3 measurement point list information table

Field name	Field	Data type	Null
	description		requirement
point_id	Point ID	Int	NOTNULL
point_name	Roll call	Varchar	NOTNULL
point_no	Point number	Varchar	NOTNULL
jd	Longitude	Int	NOTNULL
wd	Latitude	Int	NOTNULL
object_name	Features	Varchar	NOTNULL

4. DETAILED DESIGN OF THE SYSTEM

The program module diagram of mobile terminal measurement system is shown in Figure 1. From the figure, it can be seen that the system mainly includes the following functional modules: main function module, dynamic positioning function module, feature information input function module, independent point positioning function module, data storage function module, area/length measurement function module, graphic display function module and data viewing function module And update function modules.
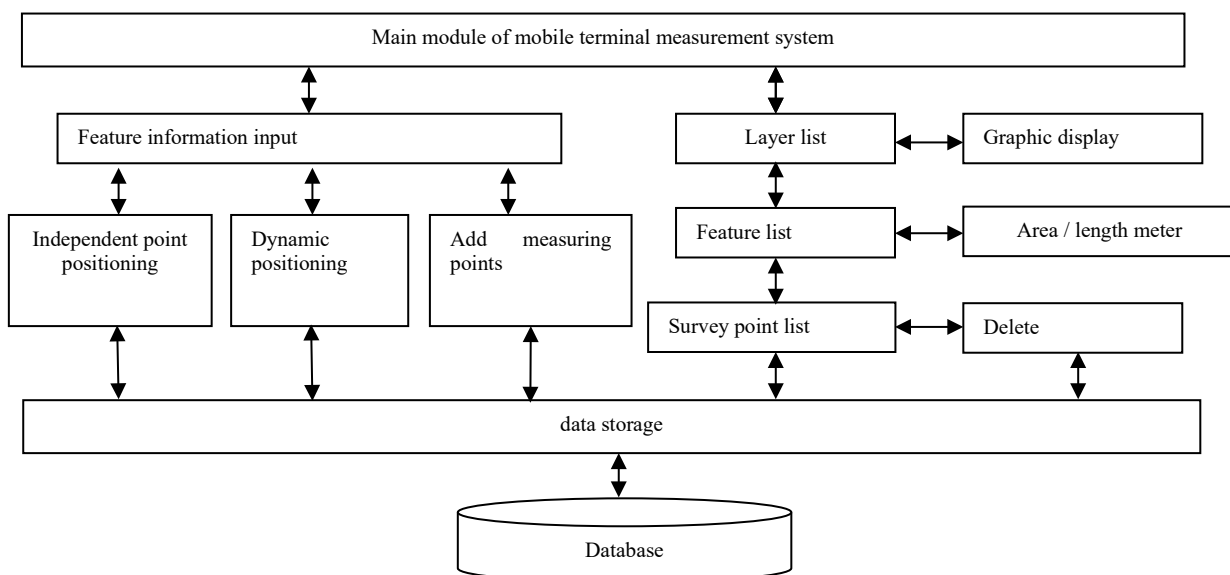

Figure 1 program module diagram of mobile terminal measurement system

4.1 System main function module

As the entrance of the mobile terminal measurement system, the main function module of the system is mainly used to display the program interface, add, delete and query the data table, and view and call the relevant help information. In the specific design, the function module is mainly designed and developed by creating the welcome class [3]. Therefore, in order to ensure the scientificity and rationality of the design of the function module, Technicians should pay attention to the comprehensive use of classes and objects, and strictly follow the relevant standards and requirements of interface design to ensure that the interface involved is simple and friendly, and bring users good experience while meeting the aesthetic experience of users.

4.2 Feature information input function module

In the specific application of feature information input function module, it is mainly responsible for the accurate input and statistics of feature related attribute information. At the same time, it establishes an effective connection with independent store positioning function module, increasing measurement point function module and

dynamic positioning function module, which provides a strong guarantee for intelligent control of these function modules [4]. This function module is designed and implemented by creating inputobject class.

4.3 Data storage function module

The data storage function module is mainly used for the management of positioning related information data. At the same time, it is also responsible for the creation and application of the storage system, so as to realize the storage of positioning related information data, and provide the corresponding access interface for the access data of other function modules. In the specific design of this function module, we mainly use the method of creating datastor2age class to design and develop.

4.4 Independent point positioning function module

In the specific application of the independent point positioning function module, mainly according to the positioning point related information data, through the use of GPS absolute positioning method, it can extract the positioning point longitude [5], latitude and other related location information. On this basis, it can store the positioning data reliably and safely in the system database,

which is convenient for users to view and call. In the specific design of the function module, the stlocate class is mainly used to design and develop.

4.5 Dynamic positioning function module

The dynamic positioning function module is mainly used for accurate measurement of parcel boundary and precise positioning and measurement of special positions. Users can use this function module to display the longitude and latitude of the measurement points with the help of the system screen according to their own measurement needs, so as to complete the accurate and standardized operation of positioning [6]. When the GPS device automatically moves to the user's preset position, the system will automatically calculate, obtain and store the longitude, latitude and other related parameters of the location, and match and correspond the final stored location information with the ground features. On this basis, the relevant information of the feature is stored in the system database safely and reliably. In the specific design, the dynamic positioning function module is designed and developed by creating dylocate class.

4.6 Data view function module

In the specific application of the data view function module, the system database is mainly used to quickly find the layer name, feature name and other related information, and the final query results are presented in the form of a sequential list in front of the user, for the user to consult and call, so as to improve the user experience [7]. In the specific design, the data view function module is mainly designed and developed by creating listpoint class.

4.7 Graphic display function module

The graphic display function module is mainly used to view the display mode of the ground objects and the information data related to the geographical location. In the specific design, the function module is mainly designed and developed by creating the showmap class.

4.8 Area/length measurement function module

As the core function module of the mobile terminal measurement system, the area/length measurement function module is mainly used for the accurate view of the position length and area, which provides an important basis and reference for the scientific measurement of the distance between various regions. In the specific design of this function module, it is mainly designed and developed by creating Listobject class.

4.9 Data update function module

In the specific design of this function module, we mainly use the method of creating datastor2age class to design and develop.

In the specific application, the data update function module is mainly responsible for the statistics and update of the addition, deletion and modification of the data related to the ground features, so that users can view the latest location information of the ground features in time. In the specific design, the function module is mainly designed and developed by creating addpoint class.

5. SYSTEM APPLICATION

In order to better verify the effectiveness and reliability of the mobile terminal measurement system, the system is applied to the measurement of lawn area and perimeter in a university. Firstly, select a lawn area to be measured, and then use the system to measure and calculate the length, area, positioning accuracy and other related parameters of the lawn area. The application results show that: the mobile terminal measurement system has a good performance It has very high effectiveness and reliability, greatly improves the accuracy and efficiency of lawn related parameter measurement, and provides important basis and reference for better planning and management of efficient lawn in the later stage.

6. CONCLUSION

To sum up, under the application background of Android platform, great breakthroughs and innovations have been made in the design and application of mobile terminal measurement system. The system is not only powerful, versatile and has good user experience, but also has achieved remarkable application effects in the fields of distance measurement and area measurement. Therefore, it is favored and loved by the majority of users. In order to facilitate the maintenance and upgrade of the later system, the relevant software developers need to make persistent efforts to expand more applicable functions with more elegant codes, so as to provide a strong guarantee for promoting the healthy and sustainable development of mobile terminal measurement system and improving its application value and prospect.

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Talk about the Design of the Opening Remarks for the Math Class

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Abstract: An experienced teacher always attaches great importance to the design of opening remarks in class. A good opening can serve as a link between the preceding and the following, enlighten students' thinking, and stimulate their interest, which can play a brick to attract jade and get twice the result with half the effort. This paper abstracts and designs some novel and desirable opening remarks of mathematical class to communicate with peers.
Key words: Mathematics; Opening remarks; Teaching

1. START WITH TEACHING AIDS

Teaching aids give people a sense of reality with their characteristics of visualization, which help to inspire students' ability of thinking. It is a basic method for people to understand things by abstracting theory according to the visual objects. When teachers show physical teaching aids, students are often driven by curiosity and immediately attracted by the material aids, looking forward to the beginning of the new curriculum. When explaining the basic knowledge of "circle", the teacher can prepare a rope with one end tying a ball, hold the other end and let the rope and ball revolve around the hand. Then let students observe the movement route of the ball, and then guide the students to summarize the definition of "circle" by themselves. When talking about logarithms, the teacher can take a piece of white paper and fold it in half again and again, and ask the students to imitate and imagine how high it would be if they folded it 50 times. The students may say it is high, but they will never imagine that it can be higher than the moon. At this point, the teacher asks questions and tells the students that the height can be easily calculated with the basic knowledge of logarithms [1-3].

2. START WITH PROBLEMS IN PRODUCTION, LIFE AND OTHER DISCIPLINES

Although mathematics is abstract, it originates from the real world and is more applied in practice. Starting with the problems in life and production that students are familiar with can not only make students deeply feel the close connection between mathematics and the real world, but also effectively stimulate students' interest in learning. When teaching "ellipse", the teacher can introduce the questions in the textbook by the launching and running track of China's man-made satellite. When explaining the concept of derivative, students are first guided to recall the method of calculating the average velocity in physics, and then teachers put forward the problem of how to solve the instantaneous velocity of object motion.

3. START WITH QUESTIONS

It is often said that doubting is the beginning of learning. "He who reads without doubt must be taught with suspicion." To mobilize the enthusiasm of students to learn, it is necessary to create doubts using what they have learned, which is called the process of urging students to think positively through questions. When teaching limit of function, teachers can come up with some questions like "Do you remember the formula for the area of a circle?" "Will you prove it?" and other similar questions.These can inspire students to think deeply, and then teachers introduce the concept of limit, calculation method and other knowledge.

Start with doubting, and pay attention to the difficulty of questions, which can make students in a state of temporary confusion. This is the situation of "the heart seeks to clear but does not get, the mouth wants to speak but cannot", so as to stimulate the students to follow the teacher's train of thought to think about problems with doubt and good guidance.

4. START WITH REVIEW OLD KNOWLEDGE

It is a basic fact of psychology that things associated with a person's existing knowledge are more likely to attract attention and stimulate imagination. Mathematics has a strong systematicness and coherence. Starting from reviewing old knowledge, students can not only consolidate what they have learned, but also stimulate their desire to acquire new knowledge, so that they can master new knowledge more easily. Of course, there is a lot of old knowledge, the teacher must carefully choose the review content, in order to have twice the teaching effect with half the effort. When explaining the relationship between trigonometric functions of the same angle, the teacher can review the definition of trigonometric functions first. In this way, teachers can make students learn new knowledge naturally without much talk.

5. START WITH DESCRIBING THE PURPOSE AND SIGNIFICANCE OF THE LEARNING CONTENT

Explaining the purpose and significance of the learning content will often make the students clear about the learning direction, understand the importance of the learning content, generate cognitive needs, and improve the autonomy of learning. It is not necessary for teachers to explain every aspect, students need to learn just as long as one or two points. For example, before teaching calculus, a teacher could briefly describe how Newton and Leibniz created calculus based on the needs of applications, what extensive application calculus has in physics, chemistry, biology, economics and social life, and how important it is to learn calculus well for their future study, work, life and so on. If teachers combine with examples or exercises, students can fully realize what a good tool calculus is for solving practical problems.

6. START WITH A STORY OR ALLUSION

Teachers' vivid stories are often quick to catch students'

attention and are often very effective in introducing new lessons. The selection of stories must be based on the teaching content. The Newton-Leibniz formula can be taught by telling the story of Newton and Leibniz who created calculus respectively. When teaching arithmetic sequence to find the formula of the sum of the first N terms, teachers can firstly tell the story about the ingenious solution to solve "1+2+3+4+... +100" used by German mathematician Gauss in elementary school. Such stories would certainly make a math class interesting.

7. START WITH AN ANALYSIS OF ERRORS IN THE ASSIGNMENTS

It is inevitable that students will make mistakes in their homework. If teachers grasp typical mistakes to comment, students can learn lessons from mistakes and then deepen their understanding of knowledge. Learning the correct way to solve problems, students will not feel insipid in learning, and so it is easier for teachers to explain new knowledge.

8. START WITH AN INTERESTING MATH PROBLEM

Interesting math problems tend to focus students' attention and stimulate their interest in study. When teaching geometric sequence, the teacher may firstly give the students such an interesting question, "The king of ancient India wanted to reward the inventor of chess. He asked the inventor what he wanted. The inventor who was playing against the king said, please put grains of rice on the 64 squares of the chess board in this way 1, 2, 2^2, 2^3, 2^4, …. That is all I want. The king readily consented. Please use the mathematics to calculate whether the king can satisfy this requirement." Students will feel very curious after hearing such an interesting question. They want to try and are eager to get the answer, but lamenting their inability. At this time, the teacher can turn to the topic to learn the geometric sequence. Then the problem will be readily solved. With such an interesting question, students will concentrate on the class, and the class effect will naturally be very ideal.

Obviously, there are many ways of opening remarks. Various methods can also be used with combination. The opening is short, but it is an integral part of the whole class, which has an obvious effect on opening a brick to attract jade. The opening remarks should be based on textbooks as much as possible, which requires the language should be accurate, vivid and natural. No sensationalism is allowed, otherwise it will be self-defeating and fail to achieve the expected effect. Therefore, teachers must study the teaching material thoroughly and use the skill of educational psychology. They should design the opening remarks skillfully according to the teaching content, requirements and students' psychological characteristics, so as to fully mobilize the students' learning enthusiasm.

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Research On 3D Printing Application of Chinese Clothing Accessories Design Based on Virtual Simulation Technology

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Abstract: This paper studies the application of 3D printing in Chinese clothing accessories from the perspective of virtual simulation technology. This paper analyzes the advantages of the current 3D printing technology and the specific application in Chinese clothing varieties, such as the application of clothing materials and clothing styles. This paper promotes the development of China's clothing industry, hoping to have a certain reference value for relevant staff.
Keywords: Virtual simulation technology; Chinese clothing accessories; 3D printing

1.INTRODUCTION

In recent years, China's clothing industry is in the stage of rapid development, the export volume is also increasing, and the development of 3D printing technology, further promote the development of the clothing industry, it can not only more quickly realize the production of clothing. At the same time, it can save raw materials and avoid waste, which is helpful for designers to carry out fashion design work more efficiently. Therefore, we must pay attention to the research of 3D printing technology, so that the clothing industry will develop towards a more efficient and personalized direction, and promote the economic development of our country[1-2].

2. ANALYSIS OF THE IMPORTANCE OF 3D PRINTING TECHNOLOGY BASED ON VIRTUAL SIMULATION TECHNOLOGY IN CHINESE CLOTHING ACCESSORIES

1.1 It is conducive to the development of clothing industry in the direction of environmental protection

The international community has clearly put forward that the clothing industry must adhere to the basic principle of ecological and environmental protection in the process of development. Therefore, designers in the design process, must follow the relevant management regulations, to ensure that clothing has good environmental performance. Usually, traditional Chinese clothing often uses some anti-static, or some materials containing softener, which can not ensure the safety of clothing materials. At the same time, it will damage the natural environment, and 3D printing technology can make up for this defect. The application of 3D printing technology in the processing of Chinese clothing accessories can realize the automation of processing links. The staff only need to assemble the garment printing work after it is finished, which not only reduces the cost of human resources. At the same time, it can also reduce the pollution to the environment and make the clothing industry develop towards more efficient and environmental protection.

1.2 Helps to enhance the styling ability of clothing design

In recent years, people's living standards are constantly improving, and the requirements for the quality and shape of clothing accessories are also increasing. Personalized clothing is more and more popular. Although most of the Chinese fashion designers at this stage have good design concepts, due to the limitations of production technology, these design concepts can not be produced. The introduction of 3D printing technology into the clothing industry can improve this phenomenon. This is due to the strong accuracy of 3D printing technology, which is conducive to the realization of garment modeling, thus showing the designer's concept and promoting the further development of the industry.

3. ANALYSIS OF THE SPECIFIC APPLICATION OF 3D PRINTING TECHNOLOGY IN CHINESE APPAREL UNDER VIRTUAL SIMULATION TECHNOLOGY

3.1 Application analysis in Chinese apparel materials

In the design process of traditional Chinese clothing accessories, designers usually use some materials such as cotton, hemp and chemical fiber. Although some derivative materials will be used, most of them are closely related to the above-mentioned materials, which have a certain impact on the designer's design work. However, when 3D printing technology is introduced into Chinese clothing accessories, the main printing material is plastic, which is hard, which is quite different from traditional clothing materials. For example, from the actual wearing situation of customers, it can be seen that Chinese clothing under 3D printing technology is more similar to a structure that can directly act on the surface of clothing. In the specific design process, the requirement for details is increased, which is usually to show the designer's design concept, rather than for the use of clothing. However, this situation changed in 2015. Based on 3D printing technology, technicians invented the corresponding derivative technology, that is, users can use the 3D printing technology to print the clothing style by using a new material, as long as the clothing design software is used, so that the clothing can be more in line with the actual production situation. According to the investigation and research, liquid materials are widely used in Chinese clothing accessories, which improves the utilization rate of 3D printing technology in Chinese clothing accessories.

3.2 Color application analysis in Chinese clothing

products
3D printing technology and Chinese style clothing accessories design work is mutually promoting relationship. Applying 3D printing technology in the fashion design link can create more design channels for designers. On the contrary, the manufacturing and popularity of Chinese style clothing accessories can further promote the development and innovation of 3D printing technology. Generally speaking, color is the key link in clothing design, which directly affects the overall emotion and style of clothing accessories. Under 3D printing technology, color is the core content. How to use color more flexibly has been the main research work of relevant staff. In recent years, with the continuous development of this technology, color problems have also found corresponding solutions. Currently, the hydrological transfer method, the powder method of laying plastic and fusion of clothing and the ink jet method of pixels are widely used in Chinese clothing color. The hydrological diversion method mainly refers to that the staff can print the color on transparent film materials first, then put them in the printed film materials, and put some adhesive in the water, so that the color can be attached to the surface of the object. However, there are some defects in this way, that is, the accuracy of color is not high and the application is less. In addition, if the laying extrusion method and powder are combined, the staff must timely change the color of clothing to achieve printing. Therefore, this way requires higher professional quality of staff, and the color flexibility of the clothing printing is insufficient, and the color performance is not strong, which can not display the designer's design concept well. In a word, in the process of using 3D printing technology, designers can choose the corresponding color printing technology in combination with their own design intention and actual situation to ensure the design quality of clothing.

3.3 Analysis of the application of clothing styles in Chinese clothing products
The application of 3D printing technology in the printing of Chinese style clothing accessories can fully reflect its advantages. This is because the advantage of 3D printing technology is that it can be organically combined with computer technology, which is helpful for designers to adjust and modify clothing styles, and significantly improve the work efficiency of staff. In addition, 3D printing technology can also enable designers to meet the needs of customers to achieve personalized customization of Chinese clothing accessories. This is because under the support of this technology, the designers of Chinese style clothing accessories do not need to spend more time on a piece of clothing, they only need to display their own design concept on the computer, and then choose the clothing materials they need. Finally, the use of 3D printer can produce the corresponding clothing, not only conducive to improving the quality and efficiency of work, but also can provide more personalized clothing for clothing customers. In short, 3D printing technology provides more convenience for the work of fashion designers.

4.CONCLUSION
In a word, the application of 3D printing technology in the design of Chinese clothing accessories can not only make copies with complex changes. At the same time, it can also ensure the comfort of clothing, organically integrate the function and personality of clothing, and ensure that the fabric and structure of clothing are in a state of balance. Therefore, the relevant staff should pay attention to the research of 3D printing technology, improve its utilization in Chinese clothing accessories, and improve the overall development level of China's clothing industry.

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Natural Gas Development Technology and Development Trend in Ordos Basin

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Abstract: Ordos Basin has been an important area for oil and gas exploration and development in China for a long time. The continuous development of exploration technology has further promoted the development and application of natural gas in Ordos Basin, and made new progress in natural gas exploration and development. Taking Longdong area of Ordos Basin as an example, this paper discusses the natural gas development technology, further analyzes the natural gas development potential of Ordos Basin, and prospects its development trend.
Key words: Erdos; Basin; Natural gas; Development technology

1. INTRODUCTION

Ordos Basin is one of the earliest basins to explore natural gas in China. Surrounded by mountains and Cenozoic faults, it has a very broad area of $25 \times 104 km2$. It has very rich natural gas reserves, especially in the Yishan slope. The upper and lower Paleozoic strata in the basin are gas bearing strata. There are many oil-bearing basins around the basin, and Jingbian gas field has been explored in the lower Paleozoic. According to the statistics, the conventional natural gas resources in Ordos Basin have reached $10.7 \times 1012 m3$. Since the discovery of Jingbian gas field, Yulin, Sugeli and other large gas fields have been successively discovered. At present, it has become the first large gas field of more than $1 \times 1012 m3$ in China. In the development of natural gas in China, Ordos Basin is an important storage and supply place, which plays an important role in the application of natural gas in China. Based on the research of natural gas development technology in Ordos Basin, this paper analyzes the corresponding natural gas development potential and development trend.

2. NATURAL GAS DEVELOPMENT TECHNOLOGY IN LONGDONG AREA OF ORDOS BASIN

2.1 Well location

Longdong area is located in the southwest of Ordos Basin. Natural gas development began in 2013. Changqing Oilfield Company carried out natural gas exploration and development. In this area, there are many gullies, the terrain is uneven, and the maximum drop is 300m. Relatively speaking, the reservoir is single, and the ground condition is complex, so it is difficult to select the well site. After synthesizing all kinds of situations, the well layout mode selected in this area is determined as combination mode, so as to minimize the floor area of well site layout. This well layout mode is also very convenient for implementation and management in later application. In the current engineering settings in this area, the completed well sites include 3 cluster well groups and 5 cluster well groups, specifically 1V + 2D, 1V + 2H and 1V + 4D. See Figure 1 for details.
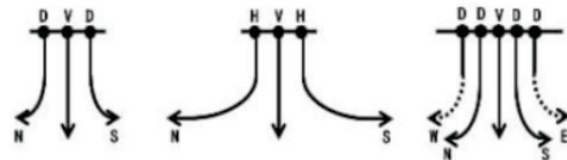

Fig. 1 combination of different well types

2.1.1 Geological conditions

In the study of sand body distribution in Longdong area, it is found that it tends to be near north-south direction or northwest southeast direction. In this case, the well distribution direction is north-south direction. In the selection of well layout mode, compared with the vertical/directional wells, the single well production of horizontal mirror is significantly higher, which can be increased to 3-5 times, and can also promote the horizontal development of single sand body; the main purpose of setting vertical wells is to make clear the sand body development thickness and horizon in the longitudinal view, that is, the pilot hole in the whole project. During the process of natural gas exploration and development, the adjustment of horizontal wells needs to be guided Through directional well, the development width of sand body can be explored and analyzed. Combined with the relevant exploration, we can have a clear understanding of the local river plane development and sand body trend, and achieve a comprehensive understanding of the local geological conditions.

2.1.2 Saving land use area

The scale of standard single well in Longdong area is $100m \times 70m$, and the area is $7000 m2$. In the cluster well distribution setting, the inlet distance is 10 m, the length of one additional well increases by 10 m, the width will not change, and the total area will increase by 700 m2. Compared with the land area occupied by two single well sites, the land area occupied can be reduced by $6300 m2$. In this regional setting, if the number of cluster wells is assumed to be n, the specific area saving is $(n-1) \times 6300 m2$. The number of cluster wells currently set is 5.

2.2 Development technology

It is found that the buried depth of natural gas reservoir in Longdong area is 3600m-4400ma. Compared with Sulige gas field, this gas field not only has larger buried depth and bottom pressure of reservoir, but also has higher formation temperature, which leads to more complex drilling technology in development and requires more cost. In the development of natural gas in Longdong area, with

the optimization of wellbore structure and BHA, the application of cementing tools in horizontal section and the adjustment of drilling fluid system, the ROP is significantly improved, which not only reduces the drilling cost, but also significantly shortens the drilling cycle.

2.2.1 Wellbore structure

In the design of vertical well bore structure, at the beginning, according to the relevant requirements, the selected well bore structure is the second opening structure, which is 346mm bit × 273mm technical casing + 241.3mm bit × 177.8mm. However, in the practical application of this structure, due to the large depth of the target layer in the area, a lot of energy needs to be invested in the construction process of the open hole section, and the period is relatively long. At the same time, there are serious loess layer leakage and Zhiluo layer collapse, which further extends the drilling period. In order to meet the actual needs, it is necessary to optimize and adjust the wellbore structure of vertical wells, and the adjustment result is determined as the second opening structure, specifically: 444.5mm bit × 339.7mm surface casing + 215.9mm bit × 139.7mm. The technical casing is used to seal the Luohe formation and Zhiluo formation, which can effectively prevent the collapse of Zhiluo Formation and the leakage of Luohe formation.

In the design of horizontal wellbore structure, the third spud wellbore structure is selected, which is 346mm bit × 273mm surface casing + (241.3mm bit + 215.9mm bit) × 177.8mm technical casing + 152.4mm bit × 114.3mm casing. This structure mode provides convenience for casing cementing and completion technology.

2.2.2 BHA mode

In natural gas development, it is also necessary to optimize the design of BHA. In the construction of vertical well section, if little attention is paid, deviation prevention and straightening are easy to occur, and deviation correction treatment is needed. Further increase the construction time, maximize the deviation correction time, and significantly reduce the problem of large sliding module due to the unreasonable BHA. At the same time, it also helps to reduce the serious pressure support of drilling tools and drilling cost Slow and other related problems can significantly improve the ROP in the drilling process.

2.2.3 Drilling fluid system

In the development of natural gas in this region, the drilling fluid selection is potassium based polysulfonate drilling fluid system at the beginning. However, after comparing the drilling parameters in the application, in order to better meet the actual demand, it is transformed into soilless low density and high viscosity drilling fluid. The latter has more application advantages. It has high-temperature rheology. If it is in a high-temperature environment, it will significantly improve the inhibition ability of drilling fluid, and the lubrication performance is also very significant. In the application process, it will not increase the thickness of mud cake formed, and it also has good toughness, which can further improve the stability of wellbore, and then it can effectively prevent wellbore collapse when drilling in long mudstone section in

horizontal section The collapse problem occurred.

2.2.4 Horizontal well completion technology

The structure of horizontal well is special. In practical application, the corresponding completion technology also has a direct impact on the corresponding transformation work. In the development process of horizontal well completion technology in Longdong area, a series of improvements have been made, from the initial open hole completion to the liner hanging completion, and then to the current casing completion stage. In this process, the important measures are: open hole packer staged fracturing, hydraulic pumping bridge plug fracturing and hydraulic jet fracturing. After implementing a series of improvements on completion technology, comparative analysis of drilling indexes in recent three years shows that the average drilling cycle of horizontal wells decreased significantly in 2017, by 24.9% compared with 2015, and by 29.1% compared with the half year of 2016; meanwhile, the average drilling cycle of vertical wells also decreased significantly, by 44.9% compared with 2017 and 2015, and by 25.5% compared with 2016.

3. DEVELOPMENT POTENTIAL OF NATURAL GAS IN ORDOS BASIN

The exploration and development of natural gas in Ordos Basin has good benefits, and remarkable achievements have been made in the development, which provides conditions for the future exploration and development of natural gas. Ordos Basin itself has good geological conditions for natural gas accumulation, and has a very rich Upper Paleozoic coal seam, which has a certain range of distribution, and also has a wide range in the analysis of the upper Paleozoic gas bearing range of the whole basin. In the study of hydrocarbon generation intensity in Ordos Basin, Chinese scholars found that the hydrocarbon generation intensity is usually above $20 \times 10^8 m^3/km^2$, and the proven natural gas reserve is $1.1 \times 10^4 km^2$, which shows that it has strong development potential and exploration value. In addition, according to the international standards (see Table 1 for details), it is found that the Ordos Basin has low exploration degree, and the density of exploration wells is only 0.2 wells/100km2. Combined with the results of resource evaluation, it can be seen that the natural gas reserves of Paleozoic in the basin can reach $10.7025 \times 10^{12} m^3$, but the proved reserves are only $1.3108 \times 10^{12} m^3$, which is only one tenth of the total reserves, so it still has great exploration value and development potential.

Table 1 international standards for natural gas exploration

Classification	Well density
Low exploration area	1 □/100km²
High exploration area	(1-10)□/100km²
Mature exploration area	>50 □/100km²

4. DEVELOPMENT TREND OF NATURAL GAS IN ORDOS BASIN

4.1 Strengthening geological exploration

At present, the exploration of Ordos Basin has entered the stage of complex gas reservoir exploration, so in the exploration engineering, we need to combine the characteristics of basin targets, adhere to the core objectives, and realize the effective implementation of the

new direction of exploration. First, innovative exploration ideas, in the exploration process, we should firmly establish innovative ideas, break through the input of traditional knowledge, so as to implement multi angle and multi thinking exploration for the natural gas geology of Ordos Basin, so as to fully excavate the natural gas potential of Ordos Basin; second, highlight the problem orientation, and effectively grasp the geological problems in the exploration process Exploration development direction. For tight sandstone gas reservoir, implement fine evaluation, summarize and analyze the enrichment law of natural gas; inject redevelopment areas and new fields in natural gas development; third, strengthen basic research, based on the application of oilfield informatization and digital platform, so as to strengthen research on some existing basic data, so as to deeply understand the geological conditions of natural gas storage and provide reference for exploration In the development of exploration work, we should pay attention to the combination of geology, logging and seismology, and combine with major national scientific research units, and actively promote the integrated development of production, learning, research and application, so as to enhance the overall scientific research and innovation ability.

4.2 Promote the integration of exploration and development and enhance the benefits of oil and gas fields

In the development of natural gas in Ordos Basin, it is necessary to pay attention to the overall exploration and evaluation for the local area, and also pay attention to the integrity in the development process. Only in this way can the development process be reduced. In the actual exploration and development, based on the overall goal, the work arrangement of exploration wells in the construction area and in the extended side should be implemented. The unified arrangement of expanding gas bearing area and opening exploration wells in the area by exploration is helpful to significantly reduce the exploration cost in this process, and can also realize the reexamination of 1000 wells, which can significantly improve the overall efficiency of exploration and development, and also help to enhance the economic efficiency of the whole oil and gas field.

4.3 Increase the application of new technologies to increase production and efficiency

In the development of natural gas in Ordos Basin, it is necessary to take increasing reserves and increasing benefits as the core development goal, increase the application of mature supporting technologies, and actively explore new technologies and new processes, so as to significantly enhance the development capacity of natural gas in Ordos Basin. In the aspect of earthquake, we need to strengthen the refinement of paleogeomorphology, and at the same time, we need to strengthen the "sweet spot" prediction technology of weathering crust reservoir. In this process, we focus on the analysis of dolomite reservoir gas bearing and fluid prediction technology, so as to achieve the accuracy and success rate of natural gas prediction. In the aspect of logging, we mainly focus on the prediction of Ordovician complex gas in Jingbian area

Around the water layer, realize the fine processing and interpretation of imaging measurement data, so as to significantly improve the accuracy of carbonate complex gas and water layer logging identification; in terms of technology, focus on the deep composite acid fracturing of strong carbonate rock, water-proof lock volume fracturing and other related technologies, so as to implement the transformation combined with the actual demand, and then significantly improve the single well production and improve the efficiency of drilling Natural gas development in Erdos bas

5. CONCLUSION

To sum up, Ordos Basin has good gas storage conditions, but the degree of natural gas exploration is relatively low at present, so it still has great exploration and development potential up to now. Therefore, in the future natural gas exploration of Ordos Basin, we can focus on the exploration and development of Paleozoic and Jingbian gas field, so as to effectively tap the natural gas reserves in this area and provide corresponding prospects for the development of natural gas in China. The development of natural gas in Ordos Basin is a systematic and complex project, so it is necessary to realize the comprehensive analysis of various factors in the exploration and development, so as to improve the accuracy of natural gas exploration and prediction in Ordos Basin, enhance the production of natural gas, and provide effective guarantee for the application of natural gas in China.

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Discussion on The Mixed Teaching Mode Based On "Rain Class" -- Taking the Teaching of Mechanical and Electrical Specialty as An Example

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Abstract: With the popularization and application of Internet technology, it provides sufficient power for the reform and development of education. At present, the application of Hybrid Teaching Mode in school teaching reform has become a new mode. In this regard, based on the "rain class", taking the mechanical and electrical professional courses as an example, this paper analyzes the hybrid teaching mode and its specific application, hoping to provide reference value for the actual teaching.
Key words: Rain classroom; Hybrid teaching mode; Mechanical and electrical professional courses

1. INTRODUCTION

The development of science and technology promotes the continuous development of human society, especially the emergence of intelligent terminal equipment and network, which has a great impact on people's life, study and work. At present, with the continuous promotion of education informatization, it is emphasized that colleges and universities need to make full use of information technology and innovate teaching mode in the actual teaching process, so as to provide students with an efficient information class and improve learning effectiveness. Therefore, based on the "rain classroom", the hybrid teaching mode is derived. This paper analyzes the practical application of the mechanical and electrical professional courses.

2. THE MIXED TEACHING MODE BASED ON "RAIN CLASS"

The essence of "rain classroom" is to make full use of wechat as an intelligent learning platform. "Rain class" is a kind of intelligent teaching app software based on the Internet platform. "Rain class" organically integrates PPT, MOOC, mobile phone, wechat and wechat, with the main purpose of building an "online" learning mode, increasing the interaction between teachers and students, and comprehensively improving the efficiency of classroom teaching. The most prominent feature of rain class is that it can track and record the students' learning situation in real time, and get the classroom report with the help of data collection [1].

The mixed teaching mode is a new teaching mode of online and offline mixed. Among them, "online" teaching is the main activity, while "offline" teaching is the further supplement and optimization of online learning, which is different from the traditional classroom. Through the integration of online and offline learning mode, the advantages of information-based teaching and traditional teaching can be brought into full play to the greatest extent, and students can improve their learning effect and deepen their deep understanding and mastery of knowledge.

3. DESIGN OF MIXED TEACHING MODE OF MECHANICAL AND ELECTRICAL COURSES UNDER "RAIN CLASS"

The following mainly takes the mechanical and electrical professional courses as an example, analyzes the mixed teaching mode of "rain class", mainly from the aspects of teaching environment, process and resources. Comprehensive integration of relevant teaching resources, through scientific and reasonable design, to promote the effective implementation of hybrid teaching mode [2].

3.1 Teaching environment

The realization of "rain classroom" is based on the Internet, which needs the network to be connected. Then, students use mobile terminal devices to connect to the school wireless network, and they can learn according to their own learning needs anytime and anywhere. Therefore, the usual network is a necessary condition, which requires schools to build the usual wireless network in combination with their own situation to provide guarantee for students' online learning. In addition, teachers and students need to each have a mobile phone. Through the correct guidance of classroom teachers, students can change their bad habits of being addicted to the Internet and entertainment, and learn to turn mobile phones into more valuable tools. Through the function of "rain classroom", we can build a good learning platform for students, cultivate students' interest in learning, improve students' autonomous learning, and gradually develop good learning habits.

3.2 Integration of teaching resources

"Rain classroom" is like a teaching toolbox full of wisdom, which has a variety of teaching tools. Teachers can flexibly choose the tools according to their own needs to improve their teaching effect, so as to form an organic whole before, during and after class and improve the effectiveness of Teaching [3].

3.3 Specific teaching process

3.3.1 Preview before class

First of all, teachers need to create courses in combination with mechanical and electrical teaching content. With the help of the functions of "start course" and "add course", they can form the two-dimensional code of corresponding

courses. Then let the students use their mobile phones to scan through wechat to identify the QR code of the course and enter the course.

Secondly, teachers need to publish courseware on the platform for students to learn. Teachers can use lesson preparation time to make preview ppt courseware and teaching video, in which the teaching video can be inserted into the online function of the school by making full use of the support of "rain classroom", integrating Tencent, Tudou, Youku and other online videos. In addition, it can also integrate knowledge structure map, pre class thinking questions and other contents, as long as the teaching resources related to the course are OK. For example, teachers can collect resources related to "mechanical design" and then push them to students' wechat. To a great extent, it has changed the way students acquire knowledge and learn. Students can learn anytime and anywhere without the limitation of time and space. Through preview before class, on the one hand, it can enrich students' learning resources, help students understand the knowledge content in advance, and stimulate students' interest through "mechanical design" related structure map, video, etc., so as to be more willing to participate in the actual teaching activities, which plays an important role in improving teachers' teaching efficiency and students' learning results.

Finally, teachers need to have a preliminary grasp of students' Preview through the preview data feedback of the platform. For example, teachers can clearly see students' video learning, exercise completion and other aspects through data statistics. In addition, students can use the function of "report teacher" to ask questions, and then teachers can help students solve problems in time, improve their learning effectiveness, and adjust and optimize classroom teaching programs according to this situation.

3.3.2 In depth discussion in class

3.3.2.1 Real time classroom. When students enter the online classroom through wechat scanning, teachers can see in time to effectively improve the students' class rate. Then, the teacher can present the PPT of the mechanical design part of the teaching content prepared in advance to the students' mobile phones synchronously in real time. Under the corresponding PPT, there are "don't understand" and "collect" buttons. If the teacher talks about something, the students can click the "don't understand" button to ask the teacher questions, while for key knowledge, the students can click "collect" for future

review Get ready. In addition, teachers can also test the students in real time through the test questions corresponding to the knowledge points, so as to effectively detect the students' mastery.

3.3.2.2 Interactive teaching. Online sending Barrage is a very prominent feature of rain class. Students can ask questions anonymously. For example, students can send barrage if they don't have a good grasp of the main points of mechanical design, so that teachers can focus on explanation and communicate with teachers in time.

3.3.3 Review and consolidation after class

In the "rain class", after class learning mainly uses the knowledge structure map of this section and after class exercises to further consolidate the knowledge learned in the classroom. At the same time, teachers can make data statistics to timely grasp the students' after class exercises, so as to accumulate questions and make preliminary preparation for the next class.

4. CONCLUSION

In short, the "rain classroom" hybrid teaching reform has greatly changed the previous teaching situation of mechanical and electrical specialty. The implementation of this hybrid teaching mode can improve students' class rate, stimulate students' interest, and help students master knowledge better. Through the analysis of the mixed teaching of mechanical and electrical specialty in this paper, we hope to provide reference for the teaching design of other majors, improve the teaching results and deepen the education reform.

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Finite Element Modeling and Mechanical Properties Analysis of New Traction Anchor Ear Plate

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Abstract: The traction system of swivel bridge includes new traction anchorage ear plate, traction steel strand and surrounding anchorage concrete. In order to study the service performance of the new ear plate in the traction system of swivel bridge, the mechanical performance of swivel bridge was studied based on the overpass of ningliang Expressway across Beijing Kowloon Railway. By establishing the finite element model, the stress of the traction system is calculated. The results show that the mechanical performance of the traction system is good, and the stress of each part does not exceed its strength design value, which can meet the construction requirements.
Key words: Swivel bridge; Traction system; Finite element; Ear plate

1. INTRODUCTION

At present, more and more swivel bridges are applied to the actual engineering construction process, but there are many problems to be solved in the process of Swivel Construction [1]. Among them, as an important facility of swivel construction, the traction system is easy to be damaged in the swivel process of some projects, so its performance directly affects the smooth construction of swivel bridge.

In the construction of swivel bridge, Jack is usually used to pull the steel strand embedded in the pier, and then to pull the bridge for swivel construction. However, due to the limited bonding performance between steel strand and pier, it is easy to separate steel strand and concrete in the process of swivel. Although there are some safety hazards in the construction process of traction system, there are few reports on the research of swivel bridge [2].

In order to make the swivel bridge in the swivel construction process can be fast, efficient and smooth, this paper relies on ningliang high-speed overpass project across Beijing Kowloon Railway, carries out the finite element modeling analysis on the ear plate part of the swivel bridge traction system, and ensures the service performance of the traction system by calculating the mechanical properties of the ear plate under the load [3].

2. PROJECT OVERVIEW

The main bridge of ningliang section of Dongjiakou Liangshan Expressway Overpass Beijing Kowloon Railway and Beijing xiongshang high speed railway overpass adopts T-shaped rigid frame prestressed concrete box girder. The road intersects the planned downline of Beijing xiongshang high speed railway at the mileage stake K105 + 001.8 with an intersection angle of 75.7 degrees. The bridge is constructed by swivel method with swivel length of (70 + 70) M. after the cast-in-place construction on the east side of Beijing Kowloon Railway is completed, the bridge is rotated by 85.3 ° anticlockwise. Two sets of zld300 hydraulic, synchronous and automatic continuous traction systems (the traction system is composed of continuous jack, hydraulic pump station and main control console) are selected for the bridge to form a horizontal rotation couple, which is anchored by pulling and wound on 27-15.2 steel strands on the circumference of the turntable with a diameter of 1300cm to make the rotation system rotate.

3. FINITE ELEMENT SIMULATION AND MECHANICAL PROPERTY ANALYSIS OF SPHERICAL HINGE

3.1 Establishment of finite element model

In order to study the influence of the new anchorage ear plate on the anchorage performance of steel strand and the internal stress distribution of concrete, a group of 40cm × 40cm × 40cm test specimens, including two groups of contrast specimens with and without ear plate, were specially designed to study the anchorage performance and stress distribution of steel strand The mechanical properties of the test specimen were analyzed by ABAQUS. In this test specimen, considering that the actual traction system is higher than the upper base plate of swivel support, in order to ensure smooth force transmission, the actual middle ear plate has a certain elevation angle, which can make the steel strand transition with a certain curvature in the height direction. In this experiment, the actual elevation angle of the ear plate is ignored, and the steel strand is reinforced in a straight line, which can more intuitively simulate the stress variation of the reinforcement and concrete. The new ear plate material is Q345 steel, the elastic modulus is 210gpa, the Poisson's ratio is 0.3, and the ideal elastic-plastic constitutive relationship is adopted; in order to improve the convergence effect of the analysis, the structure adopts the combination of 16 node high-order hexahedron element and 10 node quadratic tetrahedron element [5]; ear plate and hanging wall, ear plate and hanging wall concrete, ear plate and traction steel strand, steel strand and hanging wall concrete, upper wall concrete Binding contact is adopted between concrete and hanging wall, and fixed boundary condition is applied at the bottom of hanging wall. The whole structure is divided into 294434 units, as shown in Figure 1.

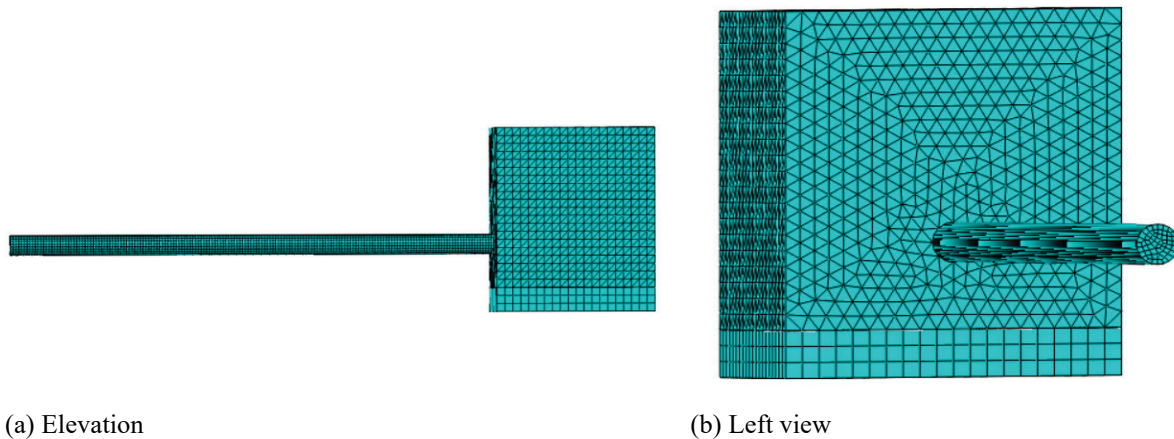(a) Elevation   (b) Left view

Fig. 1 mesh generation of new support structure

3.2 Mechanical property analysis

According to the design scheme of test specimen, the design load of traction force is 50 tons, and the design load is applied to the end of reinforcement in the form of concentrated force. Through calculation and analysis, the Mises stress distribution of the test specimen is shown in Figure 2.

scale

(a) Detail section of specimen without ear plate

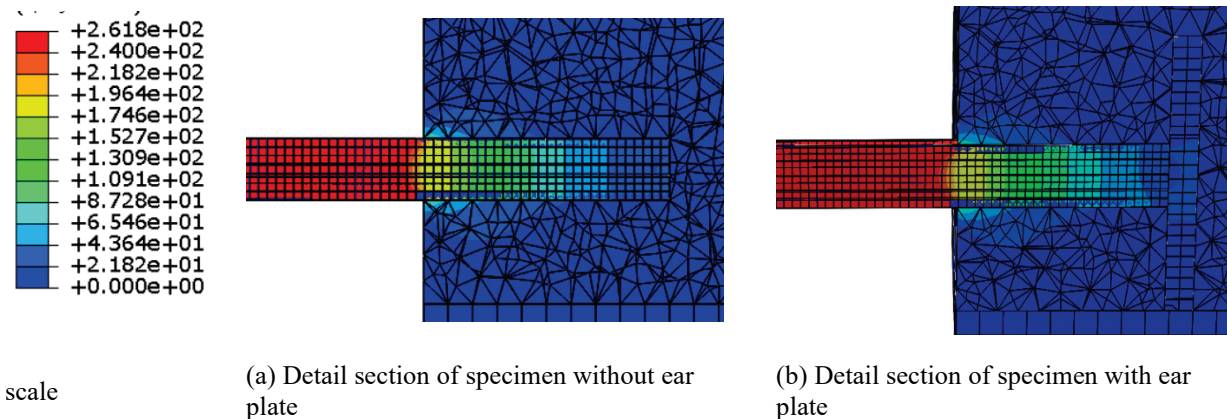(b) Detail section of specimen with ear plate

Fig. 2 stress nephogram of new support leg structure

It can be seen from Fig. 2 that under the design load, the stress of the reinforcement in the specimen without ear plate changes uniformly along the direction of the reinforcement, and the stress in the reinforcement begins to decrease from 264.8mpa when it contacts with the reinforcement and concrete, and decreases to 15 ~ 21MPa when it reaches the end of the reinforcement, the maximum Mises stress is 21.54mpa, and the concrete stress connected with the end of the reinforcement is 11 ~ 13Mpa The results show that the stress of the concrete around the reinforcement decreases uniformly around the longitudinal axis of the reinforcement; the stress variation of the reinforcement in the ear plate specimen is the same as that in the non ear plate specimen, but the decreasing law starts from 264.8mpa, and when it reaches the end of the reinforcement, the stress in the reinforcement decreases to 15 ~ 19mpa, and the maximum Mises stress is 19.25mpa, The stress of the ear plate connected with the end of the reinforcement is 15 ~ 22Mpa, and the maximum Mises stress is 22.66mpa. The stress on the ear plate decreases from the middle of the ear plate to the periphery of the ear plate, that is, from 15 ~ 22Mpa at the center to 5 ~ 6Mpa at the edge of the ear plate, and the concrete stress behind the ear plate is 7 ~ 9Mpa, which is evenly distributed and diffuses around.

4. CONCLUSION

4.1 The new ear plate can enhance the bond anchorage performance of traction system, reduce the anchorage length and improve the safety reserve of traction structure.

4.2 The stress of the concrete around the reinforcement presents the law of uniform decrease from the longitudinal axis of the reinforcement to the surrounding.

4.3 Under the design load, the strength of each part of the traction system can meet the requirements of relevant specifications, which can ensure the safety and reliability of bridge swivel construction.

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Influence of DC Bias on Transformer Vibration and Noise

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Abstract: With the development of social economy and the rapid increase of power consumption in daily life, large-scale long-distance DC transmission in China has become a solution to power demand, and bipolar unbalanced operation will make the transformer winding flow into DC, which will cause DC bias and aggravate vibration and noise. Based on this, this paper briefly describes the causes of transformer vibration and noise, and discusses the influence of DC bias on transformer vibration and noise.
Key words: DC bias; Transformer; Vibration; Noise

1. INTRODUCTION

DC bias leads to transformer failure and even damage, and the problem of transformer vibration is also caused by the magnetic bias. The frequency spectrum characteristics of transformer vibration and noise are studied by simulating the DC bias phenomenon of transformer, which provides reference for the future experimental design [1-2].

2. CAUSES OF TRANSFORMER VIBRATION NOISE

The vibration noise of transformer depends on the vibration of core and winding. The main sources of vibration noise of transformer body are three aspects. Firstly, the vibration caused by the magnetostriction of the core, in which the magnetostriction is the size change of the silicon steel sheet under the action of magnetic field. The size increases in the direction of the magnetic line, while the dimension in the vertical magnetic line decreases. Therefore, the frequency of magnetostriction is twice as high as that of excitation current, which produces different vibration. Secondly, the magnetic leakage field will be found between the laminations and joints of the transformer core, and the electromagnetic attraction will also cause the vibration of the core. Generally speaking, the frequency of such vibration is relatively small. Finally, the vibration caused by the leakage of magnetic field of the winding load current is much smaller than that caused by magnetostriction. However, the noise generated by the magnetic leakage of the load current is proportional to the secondary side of the load current. When the rated flux density of the transformer is less than 1.4T, the vibration of the winding is close to that caused by the magnetostriction of the core. In addition, the fan or cooling device outside the transformer will also generate vibration and noise, but it can be ignored compared with the body.

3. INFLUENCE OF DC BIAS ON TRANSFORMER VIBRATION AND NOISE

DC magnetic bias means that when there is DC flow into the transformer winding, the AC and DC magnetic fluxes in the iron core are superimposed, and the working point of the transformer changes accordingly. The magnetization curve is asymmetric, showing half wave saturation, resulting in a large number of high-order harmonics in the excitation current, becoming the form of peak wave, which leads to a series of hazards.

3.1 Electromagnetic field simulation analysis

In the transformer model, the voltage waveform and flux density of the primary side and secondary side without magnetic bias are measured, and the distribution of flux density under different magnetic bias configuration is analyzed.

The first is the distribution of flux density without DC bias. According to the model, the error between the current amplitude and the average value of three different phases in the secondary side of the transformer is 0.05%, 0.28% and 0.22%. Then the magnetic flux density at different times is taken every 0.005s in a cycle. The corresponding time of the positive and negative half cycle poles in one cycle is 0.005s and 0.0015s, and the distribution of the magnetic flux density is very close. By deriving the maximum and minimum values of the flux density at different times in the simulation model, we can know that the distribution of the flux density is the same and the maximum value of the flux density is the same.

In the simulation of flux density distribution with DC bias, one of the three phases is loaded with a DC voltage source of 30V, and the DC bias current is 1.2A, so the current waveform of the loaded voltage term changes. The test is still carried out with a period of 0.005s, and the maximum value of flux density at each time point is derived. It can be known that when DC bias occurs, the maximum value of flux density is greater than that without bias, and the distribution of flux density at each time point is not the same, and the maximum value of flux density is not the same. After that, the DC bias current was increased from 30V to 50V, i.e. 1.9a. It can be found that the magnetic flux density is far greater than the maximum value without magnetic bias, which proves that with the increase of DC magnetic bias, the distribution of magnetic flux density is gradually uneven, the maximum value of magnetic flux density begins to increase, the magnetostriction rate increases, and the vibration amplitude of transformer magnetostriction becomes stronger [1].

3.2 Simulation analysis of structural force field

The analysis of structural force field of transformer will mainly focus on core vibration and winding vibration. Firstly, the transformer core vibration is simulated, and the no-load condition is made in the open circuit of low-

voltage side. Then, the upper and lower yokes of the transformer model are fixed in the structural mechanics module to simulate the real transformer core. The vibration displacement and stress distribution of unbiased and biased cores were measured at 0.005s in one cycle. The maximum vibration displacement of the unbiased core is $7.51*10^{-9}$m, and the maximum stress is $1.77*10^4$n/m2. The maximum vibration displacement and stress of the iron core are $9.53*10^{-9}$m and $2.24*10^4$n/m2 respectively. It is proved that under the condition of DC bias, the vibration amplitude of the iron core is larger, and the maximum value of the vibration displacement of the iron core is in the same position with or without bias, which may be caused by the defect of the transformer model itself, which can not fully simulate the real situation, but has no effect on the simulation analysis of the structural force field.

When there is a short circuit in the transformer, the voltage in the circuit can be ignored. Under this condition, the winding vibration of the transformer can be simulated, the secondary side of the transformer can be short circuited, and the upper and lower ends of the transformer model can be fixed in the structural mechanics module to simulate the real situation of the transformer coil. Taking a period of 0.005 as an example, the maximum vibration displacement of the winding without bias is $3.26*10^{-7}$m, and the maximum stress is $4.33*10^5$N/m2. The maximum vibration displacement and stress of the winding are $4.16*10^{-7}$m and $5.08*10^5$N/m2 respectively. It can be proved that when the transformer is under DC bias, the vibration of the winding will become stronger and the stress will increase. However, the winding will be affected by gravity in the actual situation, and gradually move to the bottom of the transformer, so that the bottom is constrained by gravity, and its vibration may be larger than that in the simulation operation.

3.3 Sound field simulation analysis

The sound pressure level distribution of transformer core under normal condition is simulated respectively, and the sound pressure level distribution under the condition of no magnetic bias and magnetic bias is analyzed at 0.005s time of one cycle. It can be known that the maximum sound pressure level of transformer core is 63.72db when there is no magnetic bias, 66.81db when the DC magnetic bias is 1a, and 70.16db when the DC magnetic bias is 2A. It can be known that when the DC bias increases, the DC bias degree of the transformer core deepens, and the more intense the vibration is, the greater the noise caused by the vibration is.

The noise experiment of transformer can be used to verify the results of simulation analysis. According to the relevant regulations and standards, the transformer higher than 2.5m should have two contours, and the distance between the contours and the transformer is 2m, and the distance between the measuring points is 1m. Firstly, the noise analyzer is used to measure the background noise when the transformer is not powered on, which is usually 50-60db. If it exceeds this range, other places should be selected for measurement. After the no-load test of the transformer, the DC bias current is 0, the high-voltage side of the test transformer is open, in no-load operation, and the cooler is in operation. Then according to the standard to make the transformer operate normally under DC bias state, it can be obtained that the sound pressure level of each measurement point should be between 65-75db, and the background noise should also be improved, which proves that the difference between the actual measurement value and the simulation measurement value of 63.72db is not big. The simulation analysis of transformer is correct, and the main source of transformer noise is the transformer core, which verifies that the transformer noise will increase with the DC bias The results show that the bias current increases with the increase of bias current.

4. CONCLUSION

To sum up, after understanding the causes of transformer vibration and noise, combined with the transformer model test, after the electromagnetic field simulation analysis, structural force field simulation analysis and sound field simulation analysis, it is verified that DC bias will cause the increase of transformer vibration and noise, in which the vibration and noise of transformer core is more obvious, and with the increase of DC bias, the transformer vibration and noise will increase It is proved that DC bias has a certain influence on the vibration and noise of transformer.

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