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CONTENTS

On Optimizing the Progressive Rate Structure of Personal Income Tax in China

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Abstract: The progressive rate structure is composed of rate gap, tax rates and rate bracket. Using ARP and MRP to analyze the shortcomings of the current progressive tax rate, and infers the following enlightenment. Firstly, there are more rate brackets of progressive rate structure, which should be simplified further. Secondly, the lowest marginal tax rate is lower and the highest marginal tax rate is higher, resulting in a higher progressive level. The progressive level should be gradually lowered. Thirdly, China's rate brackets for low and middle-income groups are more intensive. The span of the rate brackets for low and middle-income groups should be expanded properly while that for high income groups should be shrunk accordingly.
Keywords: Personal Income Tax; Rate Structure; Rate Gap; Rate Bracket

1.INTRODUCTION

Personal income tax is imposed on all kinds of individuals income, which derived from 1799 in the UK, and it has become commonly levied by more and more countries in the world. As one of the major direct taxes, personal income tax is progressive and fair so that it become the main tool for countries in the world to adjust the income distribution gap and stabilize the social economy. Moreover, the tax rate is the core element of the tax system, whether its design is reasonable or not will directly affect the severity of the tax burden, thus affecting the realization of the function of fairness. Therefore, the research on the optimization of the tax structure of the individual income tax has attracted the attention of both Chinese and foreign scholars.

The research on the optimization of individual income tax rate structure originated from the optimal tax system theory. The main concern of the optimal income tax theory lies in the progressive tax rate. Their research methods are mainly to introduce fiscal and taxation policies within the endogenous economic growth framework and set the goal of maximizing welfare as to derive the optimal income tax rate. For the first time, Edgeworth (1897) deduced the optimal tax system for maximizing social welfare by using the social welfare function that is, implementing a progressive tax rate with multiple grades and high tax rates. This view has a great impact on the design of personal income tax rates for future generations. It was not until the 1970s that Mirrlees (1971) argued that high tax rate would dampen labor motivation, and further improved the optimal progressive income tax theory with the aid of the game theory tool in his "An Exploration in the Theory of Optimum Income Taxation". If the upper limit on the number of income distribution is known, the marginal tax rate of the highest income groups needs to be zero, the marginal tax rate of low-income groups can be appropriately reduced, and the marginal tax rate of middle-income level can be correspondingly increased, that is, the optimal income tax rate and income should be inverted "U" type relationship. Based on the lognormal distribution, Kanbur and Tuolnala (1994) concluded that an unequal income would change the optimal tax rate. Farhi (2012) investigated the optimal income tax under the premise that the government lacks commitment, and found that when the capital value is small, the optimal capital marginal tax rate is negative, on the contrary, it is positive.

On the other hand, as one of the criteria for measuring the fairness of tax system, the progressive level has become one of the common tools to analyze the optimal tax system. Pigou (1929) firstly proposed the use of Average Rate Progression and Marginal Rate Progression to measure progressiveness. Musgrave and Thin (1948) test the progressiveness of the tax rate by comparing pre-tax and post-tax distributions. Furthermore, some foreign scholars conducted an empirical analysis of the progressive situation of their personal income tax. Scott and Triest (1993) examined the effect of changes in the federal tax system on the state's progressiveness, arguing that the measure of reducing marginal tax rates further increases the progressiveness of the individual income tax in each state.

In China, personal income tax system has only been introduced for more than 30 years. The study on personal income tax has only focused on the analysis of the progressive level in China and the discussion of the tax rate structure by using the progressive measurement mode advocated by western scholars.

Shen Yu-ping and Wu Lin (2007) pointed out the value orientation of personal income tax, studied the problems existing in the level 9 excess progressive tax rate under classified personal income tax system mode, and further discussed the design of the marginal tax rate, the bracket and the gap. Liu Yi, Hu Zu-quan, and Hu Xiao-dan (2010) think that level 9

excess progressive tax rate is too dense in the middle and low-income sectors. China should expand the tax rate gap between middle-low income groups, gradually close to the Olivine income distribution pattern. Deng Zi-ji and Li Yong-gang (2010) applied Stern model to estimate the best tax rate and proposed that the tax brackets should be reduced and the highest marginal tax rate should be adjusted appropriately. Wan Ying (2011) calculated the progressive level of personal income tax in China by using the 1997-2008 official statistics of urban residents' income and concluded that the progressive level has basically exceeded that of most developed countries, but the average tax rate is too low to hinder Personal income tax to play its role in adjusting the income distribution gap. He Dai-xin (2011) started with the reform of the taxation system and proposed an initial reform plan of the comprehensive taxation system, and designed classified tax rates and comprehensive tax rates. In the tax reform background, Yang Bin (2017) proposes that tax on annual income be paid, and family-based tax rates should be applied 10% -45% over level 5 progressive tax rates. Tax on non-periodic income shall be subject to a flat rate 10%.

In China, personal income tax will gradually shift from the classification mode to a combination of classified and comprehensive mode. Based on this background, this paper points out the main problems existing in the progressive tax system, and then redesign tax rate that adapts to the new tax mode and verifies its progressiveness.

2. THE PROBLEMS OF CHINA'S EXISTING PROGRESSIVE TAX RATE SYSTEM

There are many indicators to measure the progressive-ness of the tax rate structure. This article mainly draws on the Average Rate Progression (ARP) and Marginal Rate Progression(MRP) proposed by Pigou (1928). Average tax rate Progressive refers to the ratio of the change in the average tax rate to the change in income. Progressiveness of the average tax rate is expressed as:

$$ARP = (AR_1 - AR_0)/(Y_1 - Y_0) \quad (1)$$

Where Y is the taxable income amount, Y_1 is the reporting income, Y_0 is the base income; AR_1 is the average tax rate when the income is Y_1, and AR_0 is the average tax rate when the income is Y_0. Therefore, if the average tax rate progressiveness is positive, then the wage income tax is progressive, and the larger the value, the higher the progressive level. If it is negative, it is regressive; if zero, then the proportional tax.

The progressive tax marginal tax rate refers to the ratio of the change of the marginal tax rate to the change of income. The expression is:

$$MRP = (MR_1 - MR_0)/(Y_1 - Y_0) \quad (2)$$

Where MR_0 is the marginal tax rate corresponding to income Y_0, and MR_1 is the marginal tax rate corresponding to income Y_1. If MRP is positive, it is a progressive tax, that is, the taxable income increases, and the corresponding MR also increases. This shows that the increase of tax burden caused by the increase of per unit taxable income of high-income groups is larger than the corresponding increase of tax burden of middle-low income groups. If MRP is negative, then the tax regressive. If MRP is 0, then the proportional tax.

Table 1.The existing level 7 progressive tax rate of personal income tax in China

Bracket	Taxable income amount	Rate	Quick deduction
1	0-1500	3%	0
2	1500-4500	10%	105
3	4500-9000	20%	555
4	9000-35000	25%	1005
5	35000-55000	30%	2755
6	55000-80000	35%	5505
7	80000above	45%	13505

According to Eq.(1) and Eq.(2), this paper analyzes the above tax rate by simulating income data. Results shown in Figure1:

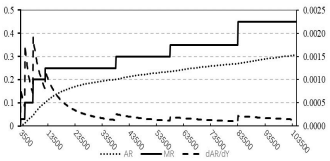

Figure 1 Simulation result

Through the simulation analysis, we find the average tax rate, marginal tax rate and average tax rate progressive curve of personal income tax under each income situation. To sum up, the current tax rate table has many problems in the following aspects:

Firstly, too many brackets in the progressive rate scale. Tax bracket is a range of incomes taxed at a given rate. The basic idea is that you are not taxed on the funds until you withdraw, at which point you are taxed at the rate of your income tax bracket. In the theoretical sense, the more brackets help to achieve the fair goal. However, from the reality of national income in China, most working-class people only apply to tax levels ranging from 3% to 20%. Even considering individual differences, taxpayers who earns above 80,000 yuan a month applying to 45% tax rate are even more rare. In addition, too many brackets lead to a big jump in the tax rates that it is applicable to low and middle-income groups, making it extremely hate paying taxes. This will undoubtedly increase the difficulty of tax collection and the taxation costs. Moreover, this is contrary to simplify the tax system and improve efficiency in China reform.

Secondly, narrow gap between brackets. The tax rate gap is the distance between different brackets when imposing tax according to different bracket. The gap is one of the factors which affect the progressiveness

of personal income tax. The large gap can make a small difference of tax burden of people with incomes adjacent to each other, while the difference is large. However, there is a lack of unified logic rules for the existing tax rates in China at the demarcation point setting, especially for the low-income groups. At present, the monthly income of the middle-class people is basically between 5100-10000 yuan and the applicable tax rate is between 20% -25%. From an individual point of view, the proportion of tax revenue in the total income is too high. That is, working-class taxpayers who easily enter the taxpayer group can easily pay taxes from a low tax rate to a higher tax rate, which violates the principle of quantity and affordability.

Thirdly, Low starting income for the top marginal tax rate. In China, it is hard to change the phenomenon that kinds of income are low monetization and book-keeping in a short period. However, personal income tax can only be imposed on money earners. Under such circumstances, if the tax rate is too high, taxpayers may feel sacrificed too much, prompting them to choose whether the revenue is invisible or to require the net tax revenue in the contract. Therefore, it is difficult in achieving the aim that regulating high income with high tax rates. In addition, high-income earners can also reduce their real marginal tax rates by avoiding tax hurdles and entering the higher tax rates. In addition, at present, only a few countries have the highest top marginal tax rate over China, which is not conducive to attracting top international talents to work in China or even to the loss of local talents.

3. A DESIGN OF TAX RATES OF A CLASSIFIED AND COMPREHENSIVE PERSONAL INCOME TAX SYSTEM

According to the official website of the State Ad-ministration of Taxation, the specific reform plan should establish a comprehensive taxation model based on the taxation of all sources of taxpayers. In accordance with the nature of taxation policies, part of taxable items implemented proportional tax rate withholding at source, the remaining items implemented progressive tax rate over the year-end summary.

(1) The initial program of levying mode reform

Based on fully drawing on the experience in OECD countries, combining with the current conditions of tax collection and tax environment, considering the objective of reform at this stage and the general concept of future improvement, this section has designed a comprehensive and classified mode, including,

Firstly, distinguish between labor income and capital gains, current income and contingent income. According to the role of labor and capital gains in personal income, the tax items can be divided into labor income and capital gains. On this basis, the current income and accidental income can be distinguished according to the frequency of occurrence. Specifically, income from wages and salaries, labor remuneration, writing remuneration, self-employment, contracting and property leasing are classified as comprehensive tax items are measured annually. Dividends and interest, property transfer income, writing income, incidental income and other income are classified as taxable items. The biggest advantage of this arrangement lies in the fact that on the one hand it achieves a smooth connection with the current tax arrangement by tax items and on the other hand it introduces the usual method of tax collection and payment management.

Secondly, tax system design: tax structure and expense deduction. The expense deduction standard is an important basis for determining the tax base. Under the existing tax mode, there is an insufficient understanding in the overall personal income, which led directly to be controversial of the current expense deduction. Income from property leasing, contracting and leasing of enterprises and production of individual industrial households, which their costs can be deducted. Allowances for salaries, remuneration for labor services and allowances for writing are deducted on invoice. Income from property transfer could deduct the original value of the property, the remaining items are generally not deducted. Moreover, in the classified and comprehensive personal income tax mode, it is learned from below table that at present, although the resources of income of residents in China are diverse. income from comprehensive items accounted for more than 70%. Based on the experience, this paper thinks that the standard of 60,000 yuan can be deducted for the part of the comprehensive income, and the part of the classify-cation will not be deducted. Because there is lack of sufficient experience information, with reference to Wan Ying (2014), all revenues are combined, and the related costs are deducted. Then she established a unified level 5 progressive tax rate. Based on the previous studies, this paper re-optimizes the above-mentioned tax rate table, and designs a progressive tax rate table for the part of labor income under the classification and comprehensive tax model as shown in the table:

Table 2. The composition of per capita disposable income of Urban Households

Items \ Period	2016	2015	2014	2013
Per-capita DPI	100.00%	100.00%	100.00%	100.00%
Per-capita DPI of Salary	56.48%	56.72%	56.63%	56.86%
Per-capita DPI of Business	17.71%	18.01%	18.51%	18.76%
Per-capita DPI of Belongings	7.93%	7.92%	7.87%	7.77%
Per-capita DPI of Transferring	17.88%	17.35%	16.99%	16.61%

Table 3. Tax rate table for the papt of labor income on annual

Brackets	Taxable income amount	Rate	Quick deduction
1	0-37500	5%	0
2	37500 -112500	10%	1875
3	112500 -225000	20%	13125
4	225000 -525000	30%	35625
5	525000	40%	88125

(2) Examination of Tax System under Classification and Comprehensive Collection

Under new mode, this article incorporates the similar income to apply to the redesigned level 5 progressive tax rates. This will not only reduce the incidence of tax evasion, but also reduce the chance of "dividing the tax base." In the meantime, the progressive tax rate table for labor shown in Table2 follows the principle of "simplifying the tax system and lowering the tax rate." The following will be from the average rate and the average rate progression to highlight the advantages of new tax rate table.

From the perspective of the average tax rate, as shown in Figure 2, AR1 represents the simulated average tax rate of the existing level 7 tax rate, and AR2 represents the simulated average tax rate of the level 5 tax rate under classified and comprehensive personal income tax system. From the simulation results, when the income from labor is 668000 yuan, the average tax rate for the same amount of income calculated under the level 5 progressive tax rate is less than that of level 7 progressive tax rates. In other words, after the reform, low-class and middle-class people will have a lower tax burden than the existing tax system, but the tax burden on higher-income people will gradually increase.

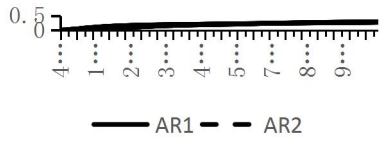

Figure 2 the AR under different mode

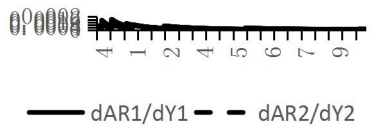

Figure 3 the ARP under different mode

From the perspective of the average rate progression, although it is found from Figure 2 that the intersection occurs only when it reaches 668,000 yuan, the income level is relatively high-income at present. However, as shown in Figure 3, it is also not difficult to find that within the [0,180000], compared with that existing tax system, tax progressivity has been significantly improved. In addition, the tax progression of the high-income groups has greatly improved.

Through the comparison of this section, the advantages of the level 5 progressive tax structure under classified and comprehensive personal income tax system are as follows: Firstly, the tax burden will be lower for the middle-and-lower-income earners based on labor. Second, the marginal tax rate for those high-paying taxpayers relying on labor and high human capital will be reduced, thus not only reducing their motivation for tax evasion but also reducing the substitution effect caused by the high marginal rate.

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The Application of PEEK Composite in Dentition Defect

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Abstract: The PEEK composites have excellent mechanical properties and biological activity .These excellent characteristics of medical PEEK has become a kind of implanted materials have attracted much attention since the beginning of this century. Foreign countries have successfully applied PEEK medical materials in plastic surgery, hard tissue injury, spinal implant and heart valves and other medical fields, achieved good clinical effect. With the development of this kind of material, all PEEK oral composite materials have been successfully developed and applied in prosthodontics, department of oral and maxillofacial surgery and planting fields. This article makes a summary on the application of PEEK as biomedical materials in stomatology.
Keywords: Polyetheretherketone; Composite materials; Biological activity

1. INTRODUCTION

PEEK is an organic polymer compound that is polymerized from two ether bonds, one carbonyl group and three benzene ring structures [1].The melting point of peek is 334 ℃ .Its excellent high temperature resistance makes it can be used for a long time in an environment with a temperature of 200 ℃ and has no obvious influence on the self properties. In addition, PEEK can also tolerate any chemical reagents other than concentrated sulfuric acid, and the chemical properties are very stable [2].Compared with the commonly used prosthetic materials, peek has excellent mechanical properties and can meet the needs of different restorations. The elastic modulus of PEEK composites is similar to that of cortical bone, and satisfactory results have been obtained when used as orthopedic implants and oral implants, reducing the stress shielding effect brought by implants and benefiting the implants far Period of survival [3,4]. Furthermore, Morrison et al. [5] tested the cytotoxicity of PEEK and epoxy resin to fibroblasts and osteoblasts in vitro. The results showed that PEEK and its composites had biological safety. Based on the above excellent properties, and with the development of modification technology, the mechanical properties and biocompatibility of peek were improved, which provided the conditions for its application in craniofacial defects. The application of PEEK in craniomaxillofacial defect was reviewed.

2. APPLICATION OF PEEK IN THE FIELD OF ORAL IMPLANT

Dental implants have improved the quality of life in many patients with missing dental implants. In the 1960s , Branemark et al. [6]suggested that the choice of material for implants in the oral cavity was pure titanium , although this was based on a substantial basis , but a series of problems would arise with pure titanium implants: The patients of titanium allergy; elastic modulus of titanium implant and the surrounding bone has a certain gradient difference, may cause peri implant bone resorption; the lack of transmission caused by the appearance of titanium, the problem; more and more patients without metal implant materials. As a substitute of titanium, PEEK elastic modulus is 3.6GPa, and the bone similarity; its elastic modulus by adding carbon fiber was increased to 18GPa, similar to cortical bone [6].Therefore, peek can be used as a thermoplastic polymer to replace metal implants in the field of stomatology.

For the wide application of PEEK implants, the in vivo and out - of - vivo experiments were also active. Some scholars implanted PEEK, titanium and zirconia implants into the mandible of the dogs, respectively, showing that the bone - binding ratio of the PEEK implants was almost no difference compared with the titanium and zirconia implants [7]. In addition, Nieminen et al. implanted the injection-molded PEEK plate into the subcutaneous tissue of the back of 12 sheep, and carried out a three-year follow-up experiment to investigate the recovery of 12 sheep after operation. All the wounds healed and there was no infection [8]. Three - dimensional finite element analysis performed by Sarot et al. showed no difference in stress distribution around PEEK and titanium implants [6]. Therefore, PEEK can be used as a substitute for titanium in dental implants. Some scholars formed titanium / peek composites by die-casting, and then removed titanium wire to prepare porous peek, its pores can provide a channel for the growth of bone cells and the propagation of body fluids. The elastic modulus of porous PEEK is 3.0 ~ 5.5 GPA, which is higher than the lowest value of cortical bone elastic modulus range. This porous PEEK is expected to be the choice of hard tissue implant material [9].

PEEK can also be used as an implant healing abutment [10], Koutouzis found that there was no significant difference in bone resorption and soft tissue inflammation between PEEK and titanium implants by randomized controlled trials [11]. Moreover, the attachment of oral microbes to PEEK

implants is basically the same as that of titanium, zirconia, plexiglass and other materials [10]. Santing [12] through the comparison and fracture strength of titanium abutment abutment PEEK temporary crown, in addition to the PEEK for less than before the breaking strength of the base station in the right maxillary incisor temporary crown reported anterior teeth chewing average pressure is about 206N, there is no difference between the crown fracture strength of two kinds of materials. Therefore, PEEK can instead of making titanium implant abutment.

3.FIXED BRIDGE REPAIR

PEEK has good biocompatibility and color appearance of natural teeth, and PEEK modified by colored porcelain can give stable natural white sheen according to the need of restorations, which provides conditions for its application in restoration [13]. Stawarczyk et al. [13] found that the average fracture strength of the three-element fixed bridge prosthesis fabricated by CAD/CAM was 1383N. At the beginning of deformation, the pressure is about 1200 N, which far exceeds the bite force of anterior tooth region prosthesis and posterior tooth area reported by Behr et al [14].PEEK produced by CAD/CAM and polymethyl methacrylate fixed denture has better mechanical properties than traditional denture. Peek is another kind of material that can be used as CAD/CAM prosthesis [15,16].Three-unit PEEK fixed dentures made by CAD/CAM have higher fracture strength than PEEK dentures made by compression of particles or balls [17].The fracture strength of PEEK fixed denture made by CAD/CAM is higher than that of lithium disilicate glass ceramic (950Nu, Al 851N)[18], Zirconia (981-1331N)[19].In addition, PEEK is more precise, low density, light weight, comfortable for patients, soft texture, shock absorbent to bite, and will not release harmful metal and monomer. Prevent gum allergy.

4. ACTIVE REHABILITATION ASPECTS

A total of 48 patients with edentulous jaws were treated with PEEK active prosthetic stents in three oral schools in Romania. The recovery was recorded every three months and followed up for three years. The results showed that PEEK active prosthesis had many advantages. Therefore, peek denture provided a new shortcut for patients with edentulous jaw [20].

5. OUTLOOK

The biological properties of PEEK were greatly enhanced after surface coating. With the progress of materials science, it is possible to improve its biological properties through a variety of ways to make it more widely used in Craniofacial defect.

6. ACKNOWLEDGMENT

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Research on the Separation of Spindle Dynamic Motion Error of Machine Tool

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Abstract: The dynamic spindle radial error is one of a most significant factor in evaluating machine tool performance. To improve the accuracy of the dynamic spindle radial error measurement, this paper presented some development of the three point method. The floating sample frequency data acquisition method is used to ensure the number of the harmonic components under different spindle speeds to be the same. So that, the error separation accuracy would not decrease with the increase of the spindle speeds. In order to avoid the effect of the white noise mixed in the measured data, the spindle profile was sampled at discrete time intervals for ten revolution speeds. After that, the ensemble averaging method was used to eliminate the white noise. An experiment system is set up to measure the dynamic spindle radial with the proposed method. The pure dynamic spindle radial error, roundness error and eccentric error under different spindle speed are obtained, and the results verity that the presented method can improve the accuracy of the spindle radial error measurement.
Keywords: radial error; error separation; three point method

1. INTRODUCTION

The dynamic spindle radial error is one of a most significant factor in evaluating machine tool performance. When measuring the tolerance of a machine spindle, the spindle radial error is usually mixed with roundness error and eccentric error. To date, many of investigations on the separation of the spindle roundness error and radial error have been done [1-6], and the three point method is the most widely method used in radial error separation [7-10]. However, there are still some problems. The past work often used fix sample frequency to connect the spindle profile under different spindle speeds, which means the number of the harmonic components would reduce with the increase of the spindle speed, and the separation accuracy is decreased. The reference [7] has proved that the noise mixed in the measured data would finally add on the radial error, however, it did not propose a method to eliminate the noise.

Considering the shortages all above, some development methods to improve the error separation accuracy of the three point method are proposed. With the floating frequency sampling strategy, the number of measured data under different spindle speed is the same which ensure the number of the harmonic components the same. So that, the error separation accuracy would not decrease with the increase of the spindle speeds. The ensemble averaging method is used for eliminating the white noise mixed in the measured data. An experiment system is set up to measure the dynamic spindle radial with the proposed method. In the experiment, capacitor sensors are used for measuring the spindle shape geometry, a PXI data acquisition card is used to connect the outputs of the capacitor sensor in float sample frequency, the noise in the measured data is eliminated by the ensemble averaging method, and after that the pure spindle radial error, roundness error and eccentric error are obtained with three point method. The results have verified the method prospection.

2. MEASUREMENT PRINCIPLE

Figure 1 illustrates the principle of roundness error or radial error measurement by the three point method. Three displacement sensors are placed around spindle by a set angle, and face toward the circumference of the test spindle. The angle between sensor1 and sensor2 is α, and the angle between sensor1 and sensor3 is β.

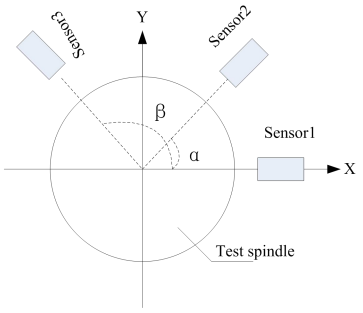


Figure 1 Schematic of three-point method

When the spindle rotates around its axis counter clockwise, the outputs of these three sensors can be given as follow

$$\begin{cases} M_1(\theta) = V(\theta) + \delta_X(\theta) \\ M_2(\theta) = V(\theta+\alpha) + \delta_X(\theta)\cos\alpha + \delta_Y(\theta)\sin\alpha \\ M_3(\theta) = V(\theta+\beta) + \delta_X(\theta)\cos\beta + \delta_Y(\theta)\sin\beta \end{cases} \quad (1)$$

Where, θ is the rotation angle of the test spindle, $M_i(\theta)$ is the outputs of the sensors, $\sigma_X(\theta)$ and $\sigma_Y(\theta)$

denote the x and y components of the radial error respectively, and can be described as:

$$\begin{cases}\sigma_X(\theta)=\sigma(\theta)\cos(\theta)\\ \sigma_Y(\theta)=\sigma(\theta)\sin(\theta)\end{cases} \tag{2}$$

$V(\theta)$, $V(\theta+\alpha)$ and $V(\theta+\beta)$ are the spindle shape geometry measured from the centre of each sensor, and can be represented in a form of Fourier series as

$$\begin{cases}V(\theta)=A_{01}+\sum_{k=1}^{\infty}(A_k\cos k\theta+B_k\sin k\theta)\\ V(\theta+\alpha)=A_{02}+\sum_{k=1}^{\infty}[A_k\cos k(\theta+\alpha)+B_k\sin k(\theta+\alpha)]\\ V(\theta+\beta)=A_{03}+\sum_{k=1}^{\infty}[A_k\cos k(\theta+\beta)+B_k\sin k(\theta+\beta)]\end{cases} \tag{3}$$

Where A_{0k} denotes the average displacement between the sensor and the spindle shape. The magnitude of the first harmonic component coefficient A1 and B1 denote the eccentric error initial coordinate in the measurement coordinate system.

Let i represent the discrete time samples of measured data obtained at the corresponding samples time, N is the total number of the sample data after one circle of the spindle rotate.

Let $p_1=\alpha N/2\pi$ and $p_2=\beta/2\pi$ are integer, and the discretization of Eq.(3) can be given by

$$\begin{cases}V(i)=A_{01}+\sum_{k=1}^{\infty}(A_k\cos 2\pi ki/N+B_k\sin 2\pi ki/N)\\ V(i+p_1)=A_{02}+\sum_{k=1}^{\infty}[A_k\cos 2\pi k(i+p_1)/N+B_k\sin 2\pi k(i+p_1)/N]\\ V(i+p_2)=A_{03}+\sum_{k=1}^{\infty}[A_k\cos 2\pi k(i+p_2)/N+B_k\sin 2\pi k(i+p_2)/N]\end{cases} \tag{4}$$

Where, A_{0k} can be compute by

$$A_{0k}=\sum_{i=1}^{N}M_k(i)/N \tag{5}$$

The roundness error is the combination of the remain harmonic components and can be express as

$$r(i)=\sum_{k=2}^{\infty}(A_k\cos 2\pi ki/N+B_k\sin 2\pi ki/N) \tag{6}$$

Let

$$\begin{cases}S1(i)=r(i)+\delta_X(i)\\ S2(i)=r(i+p_1)+\delta_X(i)\cos(2\pi p_1/N)+\delta_Y(o)\sin(2\pi p_1/N)\\ S3(i)=r(i+p_2)+\delta_X(i)\cos(2\pi p_2/N)+\delta_Y(o)\sin(2\pi p_2/N)\end{cases} \tag{7}$$

By multiplying arbitrary constants c0, c1 and c2 to S1, S2 and S3 respectively, the sum is written as

$$S(i)=c_0S1(i)+c_1S2(i)+c_2S3(i) \quad)$$

Substitute (7) into (8) and it becomes

$$\begin{aligned}S(i)=&c_0r(i)+c_1r(i+p_1)+c_2r(i+p_2)\\ &+[c_0+c_1\cos(2\pi p_1/N)+c_2\cos(2\pi p_2/N)]\sigma_X(i)\\ &+[c_1\sin(2\pi p_1/N)+c_2\sin(2\pi p_2/N)]\sigma_Y(i)\end{aligned} \tag{9}$$

The roundness error can be calculated by adjusting the parameters (c0, c1, c2) to satisfy Eq. (10)

$$\begin{cases}c_0+c_1\cos(2\pi p_1/N)+c_2\cos(2\pi p_2/N)=0\\ c_1\sin(2\pi p_1/N)+c_2\sin(2\pi p_2/N)=0\end{cases} \tag{10}$$

Let c_0=1 and substitute into Eq. (6), the c_1 and c_2 can be calculated as

$$\begin{cases}c_1=\dfrac{-\sin(2\pi p_2/N)}{\sin[2\pi(p_2-p_1)/N]}\\ c_2=\dfrac{\sin(2\pi p_1/N)}{\sin[2\pi(p_2-p_1)/N]}\end{cases} \tag{11}$$

Substitute Eq.(11) into (8) and it becomes

$$S(i)=r(i)+c_1r(i+p_1)+c_2r(i+p_2) \tag{12}$$

After Fourier transform, Eq.(12) can be express as

$$S(n)=R(n)G(n) \tag{13}$$

Where $G(n)$ is the weight function of the three-point method, given by

$$G(n)=1+c_1e^{j2\pi np_1/N}+c_2e^{j2\pi np_2/N} \tag{14}$$

The roundness error can be calculated as fallow

$$r(i)=F^{-1}[S(n)/G(n)] \tag{15}$$

The discrete from of Eq.(2) is given by

$$\begin{cases}\sigma_X(i)=\sigma(i)\cos(2\pi i/N)\\ \sigma_Y(i)=\sigma(i)\sin(2\pi i/N)\end{cases} \tag{16}$$

Define d_k (k=1,2,3)represent combination of roundness error, eccentric error and radial error, which can be calculated as

$$d_k=M_k-A_{0k} \tag{17}$$

Substitute Eq. (16) into (17), and it becomes

$$d_1-r(i)=A_1\cos 2\pi i/N+B_1\sin 2\pi i/N+\sigma(i)\cos(2\pi i/N) \tag{18}$$

$$\begin{aligned}d_2-r(i+p_1)=&A_1\cos 2\pi(i+p_1)/N+B_1\sin 2\pi(i+p_1)/N+\\ &+\sigma(i)\cos(2\pi i/N)\cos(2\pi p_1/N)+\sigma(i)\sin(2\pi i/N)\sin(2\pi p_1/N)\end{aligned} \tag{19}$$

According the trigonometric function characteristic

$$\begin{cases}\sin[2\pi(i+p_1)/N]=\cos(2\pi i/N)\sin(2\pi p_1/N)+\sin(2\pi i/N)\cos(2\pi p_1/N)\\ \cos[2\pi(i+p_1)/N]=\cos(2\pi i/N)\cos(2\pi p_1/N)-\sin(2\pi i/N)\sin(2\pi p_1/N)\end{cases} \tag{20}$$

Substitute Eq. (18) and Eq.(20) into (19), and it becomes

$$\begin{aligned}&-A_1\sin(2\pi i/N)+B_1\cos(2\pi i/N)+\sigma(i)\cos(2\pi i/N)\\ &=\{[d_1(i)-r(i+p_1)]-[d_0(i)-r(i)]\cos(2\pi p_1/N)\}/\sin(2\pi p_1/N)\end{aligned} \tag{21}$$

Let

$$g_1(i)=d_1-r(i) \tag{22}$$

$$g_2(i)=\{[d_1(i)-r(i+p_1)]-[d_0(i)-r(i)]\cos(2\pi p_1/N)\}/\sin(2\pi p_1/N) \tag{23}$$

By solution of Eq.(22) and Eq.(23), the initial coordinate of eccentric error can be given by

$$A_1=\frac{2}{N}\{[g_1(i)\sin(2\pi i/N)-g_2(i)\cos(2\pi i/N)]\sin(4\pi i/N)\} \tag{24}$$

$$B_1=-\frac{2}{N}\{[g_1(i)\sin(2\pi i/N)-g_2(i)\cos(2\pi i/N)]\cos(4\pi i/N)\} \tag{25}$$

The pure rotation error of spindle is given by

$$\begin{aligned}\sigma(i)=&g_1(i)\sin(2\pi i/N)-g_2(i)\cos(2\pi i/N)\\ &-A_1\sin(4\pi i/N)-B_1\cos(4\pi i/N)\end{aligned} \tag{26}$$

3. MEASURE SYSTEM STEUP AND DATA ACQUAIR

Figure 2 shows the experimental of the setup is used to measure the spindle's radial errors and roundness error. Three capacitive sensors are placed around the spindle using a probe holder. The angle between

sensor1 and sensor2 is 90°, and the angle between sensor1 and sensor3 is 157°.

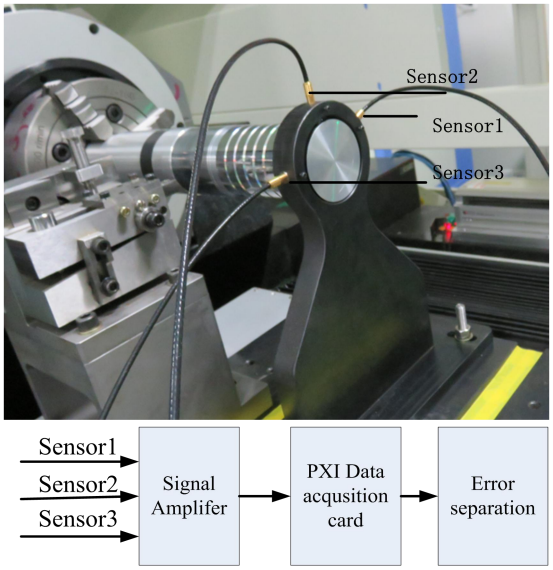


Figure 2 Experimental setup

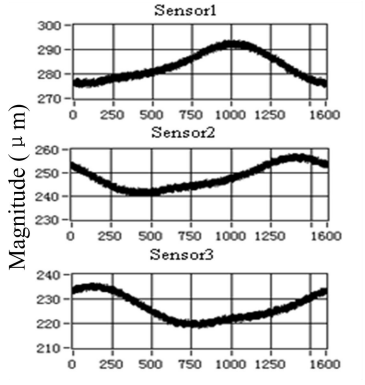
The spindle's surface is used as the reference surface. The outputs of the sensors are sampled by a PXI data acquisition card at discrete time intervals after passing a signal amplifier. To ensure the number of measured data under different spindle speed is the same under different spindle speech, the sampling frequency (f_s) must change with the spindle's rotational frequency (f_r), and given by

$$f_s = Nf_r \tag{27}$$

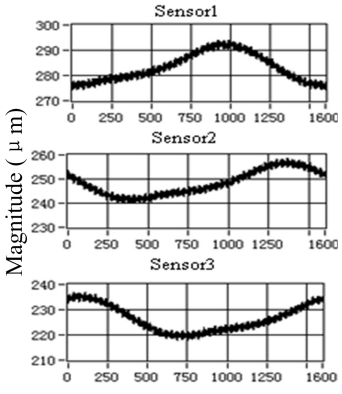
Where N donates the total number of the sample data in one revolution. In order to avoid the aliasing effects and obtain a high Precision error separate results, the N need to as big as possible, the maximum of N can be calculated as

$$N_{\max} = \frac{f_{s\max}}{f_{r\max}} \tag{28}$$

Where, f_{smax} is the biggest sample frequency of the PXI data acqusition card, and f_{rmax} is the biggest rotational frequency need to be measurement. In this paper, f_{smax}=8kHz and f_{rmax}=5Hz, so that, the maximum of N is 1600. Figure 3 shows measured data obtained undertake the spindle speed of 90r/min, 120r/min and 300r/min respectively.



(a)



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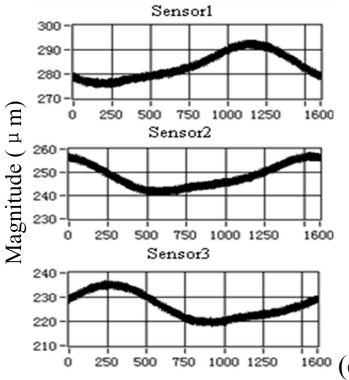


(c)

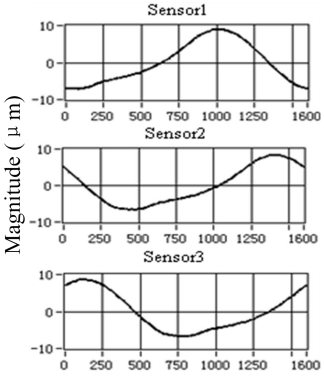
Figure 3 Measured datas obtained under diffferent spindle speed

(a) 90r/min, (b) 150r/min, (c) 300r/min

The deviation between zero level and measured data is indicated as the sensor offset in Fig.3. The sinusoidal pattern components is the contribution of the eccentric error. It also can be seen that the measured data comprises lots of white noise which may affect the error separate results. In this section, the ensemble averaging method is used to eliminate the white noise. The idea of the ensemble averaging method is: sampling the spindle profile receptive in continuous revolutions under the same spindle speed, and compute the average value point by point. Assuming the number of revolution is K, the result data after ensemble averaging method can be express by

$$\overline{M}_k(i) = \frac{M_k(i) + M_k(i+N) + M_k(i+2N) + \cdots M_k(i+KN)}{K} \tag{29}$$

Let K=10, the results after elimating the white noise and deviation are shown in Figure 4.



(a)

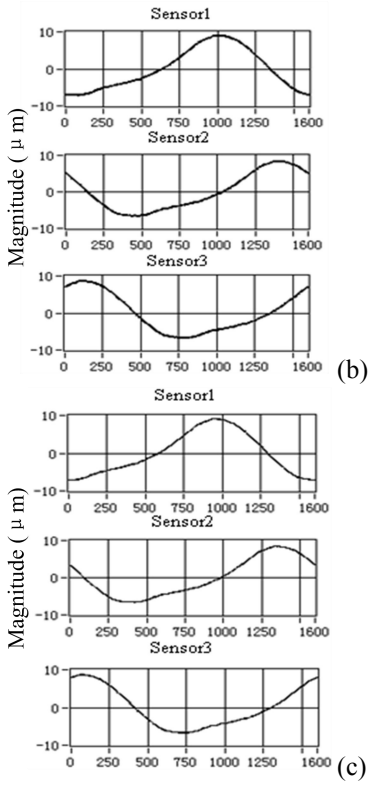


Figure 4 The results after elimating the white niose and deviation
(a) 90r/min, (b) 150r/min, (c) 300r/min

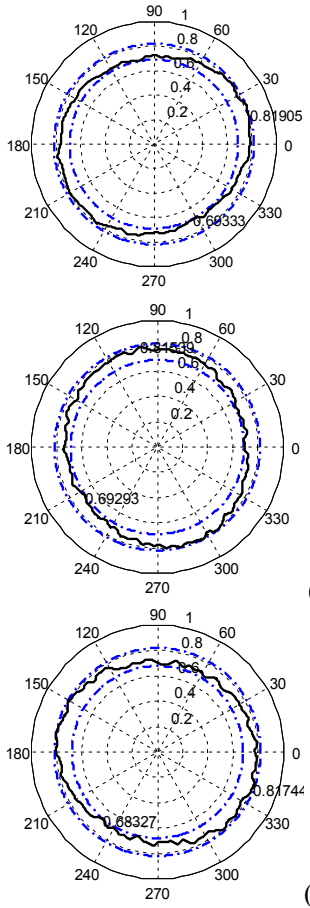


Figure 5 The polar plot of roundness errors

90r/min, (b) 150r/min, (c) 300r/min
It can be seen that all have similar shapes regardless under different spindle speed. The errors correspond different spindle speed have a phase discrepancy, that because the simple data are not ordered strictly in phase between different spindle speed.
The maximum of roundness errors is defined as the minus between its excircle radial and inscribed radial. The maximum of spindle roundness errors (E_{rmax}) at different spindle speed are shown in Tab.1. It can be seen that the maximum errors at different spindle speed are highly approaching. Table.1 also shows the magnitude of eccentric error (E_{cc}). at different spindle speed which are also highly approaching. All above verify that the measured results are creditable.
Table 1 Maximum of Ermax and Ecc

Spindle speed	E_{rmax}(μm)	E_{cc}(μm)
90r/min	0.12	7.11
150r/min	0.12	7.11
300r/min	0.13	7.12

The radial errors at several spindle are shown in Fig.6. It can be seen that the radial error is stochastic and have no relationship with the spindle speeds which according its characteristic.

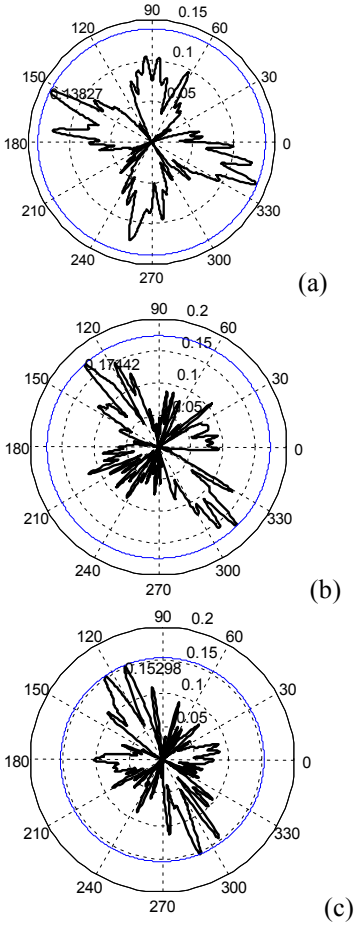


Figure 6 The polar plot of raduis error

(a) 90r/min, (b) 150r/min, (c) 300r/min

5. CONCLUSION

This paper presented some developments to improve the error separation accuracy of the three point method. With the floating frequency sampling strategy, the number of measured data under different spindle speed is the same which ensure the number of the harmonic components the same. So that, the error separation accuracy would not decrease with the increase of the spindle speed. In order to avoid the effect of the white noise mixed in the measured, the spindle profile was sampled at discrete time intervals for ten revolution speeds. After that, the ensemble averaging method was used to eliminate the white noise. To verify the proposed method, an experiment system is set up to measure the dynamic spindle radial. In the experiment, capacitor sensor is used for measuring the spindle shape geometry, a PXI card is used to connect the outputs of the capacitor sensor in float sample frequency, the noise mixed in the measured data is eliminated by the ensemble averaging method, and after that the pure spindle radial error, roundness error and eccentric error are obtained with three point method. The results have verified the proposed method which can improve the accuracy in measuring the dynamic spindle radial error.

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The Progress of Viral Vectors in the Treatment of Bone Defects by Using Bone Morphogenetic Protein 2

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Abstract: Bone morphogenetic protein (BMP) is the most important growth factor for bone formation and repair. Among them, BMP-2 is the protein that induces the strongest bone activity. Numerous studies have confirmed that BMP-2 can promote bone defect repair and fracture healing. The U.S. Food and Drug Administration (FDA) has approved the possibility of using BMP-2 for the treatment of tibial fractures and nonunion. With the development of molecular biology and cell biology, the application of transgenic technology in the treatment of bone destruction is becoming a hot spot in the world, and the choice of vector is very important for the transgenic technology in the treatment of bone defects. In this article, the research of viral vectors is reviewed.
Keywords: BMP-2; gene therapy; bone defect; viral vectors

1. INTRODUCTION

Bone loss induced by periodontitis, tooth extraction, cleft palate, surgical treatment is one of the most common clinical manifestations of stomatology. The current methods of repair of bone defects are mainly the following: bone or bone graft replacement, chemical drugs, distraction osteogenesis, stem cell tissue engineering and so on [1, 2]. Limited source, secondary injury, increased chances of infection and other reasons limit autologous bone's clinical application. Because the preparation and preservation of allogeneic bone are difficult, especially its own immunogenicity and various complications after transplantation, this has also seriously affected its clinical application. Application of chemical drugs achieve limited bone absorption inhibition, and oral or intravenous systemic administration resulting in the short time of effective treatment dose maintenance, so in order to manage this problem, it requiring frequent and large doses administration. However, long-term use of chemical drugs can cause damage to gastrointestinal tract, kidney and alveolar bone. There are ethical issues with the use of embryonic stem cells, and adult stem cells need to be obtained through surgery, because this procedure is costly and lack safety, so it has not been accepted by the society and the majority of patients [3]. BMP-2 is the most effective osteogenic growth factor in the field of bone defect repair [4]. However, the simple application of BMP protein has a short half-life, and need a large dosage, and most importantly, BMP protein has a difficult source. With advances in theory and experimental techniques of molecular biology and cell biology, the application of transgenic technology in the treatment of bone defects is becoming a hot topic in the world. Gene therapy is by introducing osteogenic genes into cells,unlike the explosive release of recombinant cytokines, so sustained expression and release of highly active osteogenic proteins can be achieved[5]. However, the transgenic technology needs the help of vector. Vectors are divided into viral vectors and non-viral vectors. Viral vectors are currently the main vectors for BMP-2 gene therapy, so this article describes the progress of viral vectors in the treatment of bone defects by using BMP-2.

2. TYPES OF VIRAL VECTORS

(1) Lentiviral vector

Lentiviral vector refer to a viral vector derived from human immunodeficiency virus-1 (HIV-1), it contains the whole genetic information needed to package, transfect, and stably integrate. Because of advantages of high transfection efficiency, sustainable expression of foreign genes, and high safety it's more and more used in the field of repair and regeneration of bone defects in recent years and achieved good results [6]. Guan et al. [7] investigated the effect of lentiviral-encoded BMP2 gene transduction on the osteogenic potential of USCs, The results showed that the transduction efficiencies were over 90%, and infectious USCs had high expression levels of the BMP2 gene and secreted BMP2 protein. Alkaline activity and mineral deposition staining demonstrated that infectious USCs differentiate into osteogenic lineages without the addition of osteogenic supplements. Infectious USCs also showed high expression of bone-related markers, including runt-related protein-2 (Runx2) and osteocalcin (OCN). Histological analysis indicated

that the infectious USCs induced robust new bone formation in nude mice. Lin et al.[8]use the lentiviral as the carrier, in this study two lentiviral gene constructs – (1) Lv-BMP/GFP, containing human BMP-2 and green fuorescent protein (GFP) gene (BMP group); or (2) Lv-GFP, containing GFP gene (GFP group) – were incorporated with human BMSCs, Real-time PCR showed dramatically increased expression of osteogenesis marker genes only in the BMP group, and implantation into SCID mice the micro-computed tomography imaging showed detectable mineralized areas only in the BMP group. In summary, lentiviral can be an effective vector for BMP-2 gene therapy.

(2)Adenovirus vector

The adenovirus (AD) is a non-enveloped linear double-stranded DNA virus with 57 serotypes. Among the currently known viral vectors, adenovirus vectors are the most effective gene delivery systems. Its capacity of loading gene can up to 37kb and have a wide host cells and most importantly its transfection efficiency is high in the short term [9]. Johannes et al. [10] successfully transfected BMP-2 gene into human mesenchymal stem cells (MSCs) via AD, experiments confirmed that the expression of BMP-2, OPN, OCN and Runx2 increased significantly. Menendez et al. [11] constructed the bone and cartilage defect model of the horse, then the Ad-BMP-2 system was injected directly into the defect zone, the experiments found that it can promote the formation of bone and cartilage, but the time is short, so it can't provide long-term osteochondral repair. Wang et al. [12] isolated and cultured rabbit BMSCs, transfected with Ad-GFP-hBMP-2 were used as experimental group and untransfected group as control group, the study found that the ALP activity was higher in the experimental group than the control group at each time point after transfection and the gene and protein expressions of BMP-2 were higher in the experimental group than the control group. Vivo experiments found that: the bone formation of experimental group was significantly apparent than the control group. Zhang et al. [13] designed a study: the hBMP-2 and hVEGF-165 double gene co-expression adenovirus vector transfected rabbit BMSCs,the results showed that BMP-2 gene was highly expressed in BMSCs after transfection, and alizarin red staining confirmed the formation of calcium nodules 21 days after osteogenic induction. From these studies it can be inferred that AD is an effective vector for BMP-2 gene therapy.

(3) Adeno-associated virus vector

Adenovirus-associated viruses (AAVs) are a group of single-stranded linear DNA-deficient viruses with a genomic DNA of less than 5KB, uncoated and have the appearance of bare 20-sided body particles. AAVs can't be replicated independently, replication and cytolytic infection can only occur in the presence of helper viruses (such as adenovirus, herpes simplex virus and vaccinia virus), otherwise only lysogenic latent infection can be established, and compared with Ad, AAV can reduce pathogenicity and lower antigenicity[14]. BMP-2 gene was implanted into human BMSCs with AAV as a vector and found that this method can significantly increase BMP-2 expression and ALP activity of BMSCs and by constructing animal models they reached the same conclusion [15].

3. OUTLOOK

Due to its high transfection efficiency, viral vector is currently the most widely used gene vector. But as a transformation of the virus, it is expensive and difficult to mass-produce. Most importantly, there are security risks and other issues, so many scholars gradually put attention to the non-viral vectors. It is firmly believed that with further research, vectors with better performance will play a better role in the field of gene therapy for bone repair so that gene therapy for bone defects can produce satisfactory results for both doctors and patients.

4. ACKNOWLEDGMENT

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A Review of VANET Routing Protocols

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Abstract: Vehicle ad hoc networks (VANET) which depend on special application scenarios are different from mobile adhoc networks (MANET). The existing routing protocols of MANET cannot be applied to VANET effectively. Many new routing protocols are presented for VANET. First summarize the features and applications of VANET, introduce location-based, topology-based and broadcast-based routing concepts, and focus on analyzing and summarizing the core ideas and features of recent routing protocols. Then, we make a comprehensive comparison of routing protocols from six aspects: application scenarios, preconditions, requirements of virtual devices, requirements of electronic maps, routing recovery strategies, and forwarding modes. Finally, the important features that ideal routing protocols possess are summarized, and open research issues and possible directions of future research related to VANET routing are proposed.
Keywords: Vehicle ad hoc networks; Routing protocols; Unicast Routing; Broadcast Routing; Robustness

1. INTRODUCTION

As more manufacturers of vehicles are equipping their vehicles with wireless communication devices, it is clear that the number of smart vehicles will be increasing dramatically in the near future [1]. Therefore, the future vehicles will certainly be able to communicate among themselves, which engender a new type of networks called Vehicular Ad hoc NETWORK (VANET). The emergence of VANET will play a major role in the enhancement of traffic management and make roads more safe and efficient than before [2].

Vehicular Ad hoc Network seems to be an ideal solution to avoid road problems and improve traffic environment. Vehicular Ad Hoc Network is a wireless network which connects vehicles to each other via equipping them with certain wireless and processing capabilities; it is a particular form of Mobile Ad Hoc Networks (MANETs) where nodes could be vehicles or Road Side Units (RSUs) [2]. Unlike other types of MANETs, Nodes movements in VANET are restricted by road topology and must obey road signs and traffic lights. VANETs enable exchanging and analyzing road and traffic information by sending and receiving it wirelessly among nodes. The main goals of VANET are to provide more road safety, improve traffic environment and enhance users' road experience [3-4].

This paper introduces the characteristics and applications of VANETs, summarizes the characteristics of the existing VANETs routing technology, and analyzes the future development of routing protocols.

2. CHARACTERISTICS OF VANET

Vehicular Ad Hoc Networks have mainly two types of communications: Vehicular to Vehicular communications (V2V), and Vehicular to Infrastructure communications (V2I - I2V), see Figure 1. In the first type, vehicles communicate directly with other vehicles by exchanging messages with each other. Whereas in the latter, the communications are done between vehicles and fixed infrastructures (i.e. RSUs). The communications could be either in a single hop or multi-hop manner, depending on the distance between the intended nodes. The RSUs also can communicate with each other to form Infrastructure to Infrastructure communications (I2I) [5-6]. These communications can be utilized to build efficient applications that enable safe and comfort transportation for passengers.

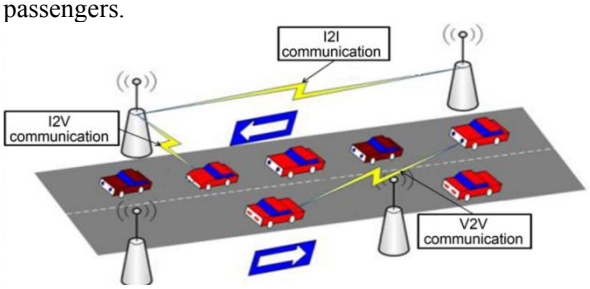

Figure 1 VANET communications

As earlier stated VANET is a sub of MANET, but it has its own distinguished characters such as:

High Mobility: Because vehicles move at high speed it is difficult to predict a node position and also it makes protection of nodes privacy hard.

Rapid Changing Network Topology: Due to the random speed of a node (vehicle), node position is difficult to ascertain and its position changes frequently, this causes the network topology to change frequently in VANET.

Unbounded Network Size: VANET network size is not limited to a particular region or locality, it can be implemented for a city or more, or even for countries. VANET is geographically limitless.

Frequent Exchange of Information: Information can be exchanged amongst vehicles and road side units (RSUs) die to the ad hoc nature of VANET. This makes the information exchange more frequent and updated.

Wireless Communication: The technology that VANET runs on is a wireless technology, therefore nodes are connected and information exchange are done via a wireless communication channel.
Time Critical: Time limits are set on each information packet that is been sent or received, this enables the delivery of information at the right time to avoid unwanted delays and decisions can be made accordingly by the corresponding node with action taken.
Sufficient Energy: The nodes have huge power source, because the vehicles run on their own battery. There's no limited power supply for the corresponding components to function properly. This causes demanding techniques to be used by VANET, such as RSA, ECDSA etc.
Better Physical Protection: Because VANET nodes are vehicles, it's more secured physically. This makes VANET nodes to be more difficult to compromise physically and also reduce physical attack on the infrastructure.

3. VANET APPLICATIONS

There are two categories of applications that is associated with the VANET; safety and user based applications.

3.1 Safety Related Applications

The safety related applications are used to increase safety on the road and also that of the road users, such applications are: collision avoidance, cooperative driving, and traffic optimization. Collision Avoidance: Some studies states that 60% of road accidents can be avoided if the drivers are warned 0.30 seconds before the collision occurs [7-9]. In the collision avoidance application, a signal or a nodes location is broadcasted to other nodes if an accident occurs so as to prevent other vehicles coming to get involved. Cooperative Driving: An uninterrupted/safe journey can be achieved via traffic related warning signals such as changing of lane, the speed limit, negotiating a bend or curve etc. drivers are practically responsible and involved in this application, because many accidents occurs because of the lack of cooperation between drivers [10-11] .Traffic Optimization: Vehicles acts as data collectors for the VANET. A signal like (JAM, ACCIDENT) etc. can be sent among the vehicles when there's a disruption on the road involving a vehicle or more so they can choose an alternative route to optimize the traffic and save time. For example, if there's a congestion on one lane the information can be transmitted or relayed to the vehicle on the opposite lane so it can be delivered faster to vehicles heading towards the congestion location. This gives enough time to for the vehicles approaching to choose an alternate route [12].

3.2 User Based Applications

Safety comes first in the usage of the road, afterwards other services can be included. Infotainment (Information and Entertainment) services is also provided by VANET, such as:
Peer-to-Peer Application: these applications can be utilized usefully to provide music, video, etc. sharing among the vehicles in the network.
Internet Connectivity: VANET provides the road users with internet connectivity.
Other Services: Geographical locations, payment services, etc. are provided by non-safety applications in VANET.

4. ROUTING IN VANET

In the past few years, routing in VANET have been researched widely [13-16]. However, due to the characteristics of VANET having a high active topology recurrent connectivity, the commonly used routing protocols that were implemented for MANET have been tested and evaluated for use in VANET environment [17]. Depending on the number of sending and receiving nodes involved, the routing in VANET can be classified into three types namely; Geocast/Broadcast, Multicast, and Unicast approaches.

4.1 Geocast/Broadcast

This protocol is very important in VANET. It is a typical location-based message propagation mechanism. The source node and the destination node use their locations to communicate. The forwarding path is selected according to the destination node location of the data packet and the location of the neighbor node. the review of various geocast/broadcast protocols on VANET was researched on, such as:

- Spatially Aware Packet Routing Algorithm (this protocol is able to predict holes in topology and conduct the geographical forwarding).
- SHDV (this protocol helps find the best path to forward a packet through).
- Interface Awake Routing Scheme (this enables the node with a multichannel radio interface and switches the channel based on the SIR evaluation).
- FROV (this selects the retransmission and spans further node to rebroadcast a message).
- Multi-hop Broadcast Protocol (this protocol segments the road and choose the vehicle that is far in a nonempty segment).

Other protocols such as; V-TERADE, UMB, AMB, MHVB, and MDDV have been proposed by other researchers [5-6].
The location-based message propagation mechanism does not require a network topology during message propagation, and is based only on the location information of neighbor nodes and target nodes. The advantages / disadvantages of such mechanisms are as follows.
(1) Advantages: High performance in high-speed mobile nodes. Can deal with the rapid movement of the vehicle; no need for the global route from the source node to the destination node, reducing the

processing overhead of the system; more suitable for the distributed environment of the node.
(2) Disadvantages: GPS is needed to provide location. Once GPS does not work properly, message propagation mechanism may be invalidated; road obstacles affect distance calculation; beacon package is required.

4.2 Multicast Protocol

Multicast is important among communication between group of vehicles in some vehicular situations such as; road blocks, high traffic density or congestion, accidents, road intersections, bad road surface condition etc. In [18], the multicast protocol was divided into two types, 1) topology based approaches such as ODMRP (this generates a source based multicast mesh and forwards it based on the group address), MAODV (this generates a group based multicast tree), and GHM (this generates group-based multicast meshes). 2) location-based approaches, such as PBM (which is based on positions of all 1-hop neighbors and also that of individual destinations), SPBM (this introduces hierarchal group membership management), LMB (this uses the multicast region as destination information for multicast packets), and RBM and IVG (which define a multicast scope for safety warning messages).

When designing the broadcast protocol, four parameters, ie, Reachability, Delay Delay, Overhead Overhead, and Collison, should be considered and they can be calculated according to equations (1) through (4), respectively.

N is the number of nodes in the network, L is the maximum transmission distance, and R is the number of broadcasts. Ri said the first round of broadcasting. Te and Ts respectively represent the moment when the source node broadcasts the packet in the i-th broadcast and the last node in the network receives the packet. Mi indicates the number of nodes for which packets were forwarded in broadcast i.

$$\mathrm{Re}achability = \sum_{i=1}^{R} \frac{K_i}{N} \frac{L}{R} \tag{1}$$

$$Delay = \sum_{i=1}^{R} \frac{t_e^{R_i} - t_s^{R_i}}{R} \tag{2}$$

$$Overhead = \sum_{i=1}^{R} \frac{M_i}{N} / R \tag{3}$$

$$Collision = \sum_{i=1}^{R} \frac{C_i}{M_i} / R \tag{4}$$

4.3 Unicast Protocol

The unicast communication protocol for VANET is in three ways:

- Greedy: in this protocol, nodes forward packets to the vehicle or nodes that are far off neighbor coming towards their destination, like (GYTAR).
- Opportunistic nodes use “carry-toward” technique, where this is done in order to resourcefully deliver the data to the corresponding destination, just like the topology-assist, geo-opportunistic routing etc.
- Trajectory Based: Nodes compute the paths that will possibly lead to the destination and deliver the data by relaying it to nodes that are along one of the computed paths, just like the trajectory-based data forwarding (TBD) [19-20].

5. CONCLUSIONS

In this paper, we introduced VANET, we found out the routing protocols used in VANET that enabled road users to communicate and receive messages appropriately, such as: Geocast / Broadcast, Multicast, and Unicast protocol. The routing protocols in VANET are robust to the rapid movement of vehicles, must have adaptive capabilities, and have low control overhead and scalability. Following the analysis of various types of routing protocols based on the forecast VANET routing protocol development.

Robustness. The preconditions of the existing routing protocols are too ideal. In the actual environment, it is difficult to achieve these conditions. In addition, some uncertainties within VANETs challenge the stability of routing protocols. Therefore, the robustness of routing protocols must be considered.

Safety. Existing routing protocols only pursue the routing performance without considering the security requirements of the routing protocols, including user data authorization, privacy protection, and communication security. Therefore, how to introduce security protection in routing protocols is an urgent issue to be solved.

Simulation platform unity. The existing VANET routing protocol experimental simulation platforms are different from each other, and they are not unified. Also, the road structure and vehicle movement model of some routing protocols are too simple, and the experimental simulation scenarios set up differ greatly from the actual scenarios. Therefore, further study of VANET routing protocol simulation platform.

In general, domestic and foreign researchers have proposed numerous VANET routing protocols for different scenarios of VANET. However, in the field of VANET routing protocols, there are still many problems to be solved.

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Research on the Pricing Efficiency of Internet-based Finance Concept Listed Corporations in China

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Abstract: Capital pricing efficiency is the core issue in the process of capital market development, which reflects the accuracy and comprehensiveness of the price of various securities traded on the capital market. Whether the pricing is reasonable will directly affect the resource allocation efficiency of stock market, and the pricing efficiency is also an important indicator to measure the degree of maturity of the market. Internet-based finance as the emerging financial model with a rapid development weaken the financial inter-mediation of the securities industry, reconstruct investment and financing pattern of the capital market, increased the competition. So it is significant to study the stock pricing efficiency of the internet-based finance concept listed corporation. This article selected 26 internet finance stocks in 2010-2014 which can reflect the development of China's internet finance in recent years and have a strong representation. Finally, based on the test results, this paper gives some suggestions on improving the pricing efficiency of internet-based finance concept listed corporation in China. Firstly, China should pay more attention to the pricing function of the capital market, and make the improving of the capital market pricing efficiency as the first principle in formulating and improving the relevant laws and regulations. Secondly, improve the regulatory system, to provide a stable environment for the effective operation of the capital market. Also, optimize the enterprises structure and improve the corporate governance mechanism, to achieve the true and effective information disclosure and improve the efficiency of security pricing through the improvement of business performance. Finally, pay attention to and improve the information disclosure system, as the perfect degree of information is a fundamental guarantee to improve the capital market pricing efficiency.

Key words: Pricing Efficiency; Internet-based Finance Concept; Listed Corporations

1. INTRODUCTION

Internet finance is a new emerging financial mode that integrates traditional financial industry and information technology. It is based on technology support such as network technology and mobile communication technology and the financial functions such as online payment, financing, information intermediary and other financial functions. The realization of Internet finance makes the financial industry more open, more convenient, more equal and more free. It has a great impact on the growth and breakthroughs of the financial industry. The study of the stock pricing efficiency of the Internet financial concept listed companies can help us understand the pricing efficiency of the capital market in the emerging financial model. This will promote the future development of the capital market, and show a good blueprint for the future capital market. Therefore, taking this as a breakthrough point, this paper studies the stock pricing efficiency of the Internet financial concept listed company, hoping to play a referential significance for the future financial structure change and the future development of financial market.

2. REVIEW OF LITERATURE

2.1 Review of the research on the definition of pricing efficiency

Wu Zhongqun (2002) returns to the original connotation of the efficiency of the capital market. From the effective market hypothesis (EMH), the concept of pricing efficiency is put forward and discussed. He thinks that the pricing efficiency refers to the stock price in the stock market, which reflects the accuracy and comprehensiveness of the related information, and expounds the relationship between the pricing efficiency and the effective market. Huang Xiaozhi (2014) thinks that the pricing efficiency is a concept reflecting the price of the capital market. She explains the pricing efficiency mainly from the perspective of fair value. It examines the impact of fair value information on pricing efficiency from three aspects: value relevance, risk relevance and accrual anomaly.

2.2 Review of the research on the Internet financial model

Xie Ping and Zou Chuanwei (2012) gave the concept of Internet Finance for the first time, and explained it from its internal meaning and external expansion. He pointed out that the rise of Internet finance is the subversion of Internet technology to the inherent financial form, and it is the third financial financing model. She Songtao (2015) deals with the pricing of Internet financial products, starting with the analysis

of the related factors of the products. It mainly includes the competition of previous financial products, the restriction of the development level of the Internet and the influence of government policies and regulations.

2.3 Review of the factors affecting the pricing efficiency

You Jiaxing, Zhang Junsheng and Jiang Wei (2006) analyzed the role of institution building for financial development from a dynamic perspective, and used the goodness of fit of regression models to study the synchronicity of stock price fluctuations. The study found that the improvement of the system could help to reduce the synchronicity of the volatility of the stock price, and to improve the company specific information contained in the stock price. Ceng Changhong (2005) summarized the related theories of the first public offering and pricing of the company's stock and the comparative analysis of the first issue pricing methods at home and abroad. This paper empirically analyses the pricing model and its influencing factors of the initial public offerings in China, and finds that the pricing of the issue is closely related to the value of the company, The empirical results also explain the irrational pricing of China's first issue to a certain extent, and put forward relevant policy suggestions.

3. STOCK MARKET PRICING THEORY AND INTERNET FINANCE THEORY

As the focus of various theories of capital market, stock pricing theory is a stock price decision theory and equilibrium theory under an uncertain state. The relevance of risk and income is the key research content, and new risk factors are constantly discovered. As the cornerstone of investment theory, stock market pricing theory has gradually shifted from traditional stock pricing theory to modern stock pricing theory, and has become the most active part of financial economics.

As the core part of capital market theory, stock pricing theory has gradually changed from traditional stock pricing theory to modern stock pricing theory, and has become the most active part in financial economics. The emphasis of the traditional stock pricing theory is the function of value discovery. When examining the determinants of stock prices, the point of view is generally based on the perspective of the enterprise, focusing on the analysis of the price behavior and change trend of a single stock; The modern pricing theory usually takes market investors as the starting point, brings the reality of market investment into more consideration, and focuses on the study of portfolio investment. Internet finance is a new financial mode that integrates traditional financial industry and Internet technology. It is based on Internet technology, mobile communication technology and other technology supportAt the same time, the financial functions such as online payment, financing, information intermediary and other financial functions are more advantageous. The implementation of Internet finance makes the financial industry more open, more convenient, more equal and more free, which has a huge impact on the development and breakthroughs of the financial industry.

This article gives a definition of pricing efficiency, that is, to reveal the accuracy and comprehensiveness of the information concerned for the stock prices of all kinds of transactions in the stock market,the higher the degree of disclosure, the higher the pricing efficiency. And from the information disclosure system, government intervention, the market macro structure, the market main structure of the four aspects of the impact of the pricing efficiency.

4. ANALYSIS OF THE FACTORS AFFECTING THE PRICING EFFICIENCY OF THE STOCK MARKET

Information and pricing efficiency: Among the factors affecting the efficiency of stock pricing, the perfection of information plays a decisive role.在 In economic theory, the more competition is, the higher the price of the market is. Therefore, when the market is in a state of complete competition, its pricing efficiency is the highest, and when the market is kept in equilibrium, it will reach the Pareto optimal state. The key factor of affecting the efficiency of the market pricing lies in the information effectiveness of the market price, that is, the accuracy and comprehensiveness of the information that is revealed by the market price. Therefore, only when information reaches a certain degree of perfection, can the effectiveness of the market be realized, so that the pricing efficiency can be affected, that is, the more perfect market information, the more conducive to the formation of pricing efficiency.

4.1 Market participants' rationality and pricing efficiency

In the real market transactions, even the market participants with the rational pursuit of motivation, but if the information is not perfect and their knowledge is not up to the requirements of the market, will lead to rational behavior can’t be realized. Because there are still many participants in stock market who are less knowledge-based in information and less rational in knowledge, so the stock market still has a considerable degree of irrationality. Although information is not perfect, traders can’t be completely rational, but at least we can learn knowledge through continuous learning, so that we can get closer and closer to reason.

4.2 Market competition and pricing efficiency

In a fully competitive market, each trader is a price recipient, and its trading activities have no effect on the change in the equilibrium price. At this point, the market price reflects the value of the stock completely, so as a rational trader, the market participants will not conceal the real information they own. In the incomplete competitive market, the

activity of the trader can affect the equilibrium price. At this time, the information content contained in the equilibrium price is reduced, and the participants in the market will hide their own information in order to get the excess profits, and they will have a game between them. At this point, the equilibrium price will be disturbed and the pricing efficiency of the stock market will decrease. Therefore, the competitiveness of the market is beneficial to the promotion of the pricing efficiency of the capital market.

5. EMPIRICAL STUDY ON THE PRICING EFFICIENCY OF THE INTERNET FINANCIAL LISTED COMPANIES

In this paper, we take advantage of the non-systematic risk of 26 internet financial stocks in 2010-2014 years, and further study the pricing efficiency of stock. That is, by analyzing the explanatory power of non-system risk factors for non-system risk, we will investigate the change of pricing efficiency according to its change. The selected indexes include: the size of the company, the concentration of equity, the institutional investors, the activity of stock, the performance of the company, the structure of the company's equity and the level of the dividend of the company.

In this paper, we take the non-system risk as the dependent variable and take the index selected as the independent variable, and establish the following model as follows:

$$NRISK = \beta_0 + \beta_1 SIZE + \beta_2 CSHARE + \beta_3 BSHARE + \beta_4 ISHARE + \beta_5 TURN + \beta_6 EPS + \beta_7 ROE + \beta_8 TTM + \beta_9 DR + \beta_{10} DIVID + \beta_{11} BS + \beta_{12} DATE + \beta_{13} BPS + \beta_{14} INDUST + \varepsilon_{i,t}$$

According to the regression model, we get the adjusted, thus the pricing efficiency of the stock is obtained. Empirical test results and analysis, through the establishment of panel data, the multiple regression test is carried out by Eviews8.0, and the results are obtained.

Table 1 The results of selected indexes(2013-2014)

Particular year		2013		2014	
Variable name	Variable symbol	coefficient	T value	coefficient	T value
C	C	1370.374	0.830	-432.582	-0.442
company size	SIZE	-8.28E-10	-0.509	-2.09E-09*	-1.828
Top ten shareholders' shareholding	CSHARE	0.699	1.713	-0.225	-0.857
The proportion of the first largest shareholder of the listed company	BSHARE	-0.225	-0.947	-0.469 *	-2.052
Shareholding ratio of institutional investors	ISHARE	0.331	1.426	0.116	0.721
Turnover rate	TURN	0.013	1.603	0.008	1.296
Earnings per share	EPS	2.717	0.121	-76.541**	-2.778
Net asset yield	ROE	-0.327	-0.641	1.818**	2.483
Operating rate of return	TTM	-0.217	-1.111	-0.036**	-2.371
Asset liability ratio	DR	-0.186	-1.018	0.042	0.456
Pre-tax cash dividend per share	DIVID	-8.081	-0.437	-83.066**	-2.905
Share bonus	BS	9.769	0.694	36.478	1.561
Proportion of restricted stock	TSHARE	0.555*	1.899	-0.010	-0.061
Date of company listing	DATE	-0.002	-0.794	0.001	0.528
net asset value per share	BPS	-7.793**	-3.090	5.439*	2.082
industry	INDUST	0.505	0.861	1.641**	2.761
Sample number	N	26		26	
adjusted R^2	adjusted R^2	0.5260		0.4364	

This paper uses the same empirical method to study the pricing efficiency of the 50 components of Shanghai stock market. The results of the regression analysis are as follows:

Table 2 The regression results of the pricing efficiency of the Shanghai 50 constituent stocks (2010-2014)

Particular year	2010	2011	2012	2013	2014
adjusted R^2	0.1837	0.2590	0.2300	0.4961	0.3224

From the results of the regression analysis of 26 internet financial concepts, the pricing efficiency it showed a decreasing trend year by year. This shows that the company's unique information about listed companies is playing a more and more important role in stock pricing. At the same time, compared with the pricing efficiency of the 50 parts of Shanghai Stock Exchange, the pricing efficiency of the Internet financial concept stock is generally high.

The factors that affect the results of the regression analysis can be found that not all the independent variables have a significant impact on the pricing efficiency of the Internet financial concept stock, and the same independent variable does not affect it every year, that is, the factors that affect the pricing efficiency of the Internet financial concept stock each year are different. we can see that company size, ownership concentration, stock activity, company performance, corporate capital structure, corporate dividends and restricted stock ratio all have significant impact on the pricing efficiency of Internet financial stocks.

6. CORRESPONDING SUGGESTIONS

6.1 Paying attention to the pricing function of the capital market

To do that, we need to change the attitude of the government, relocate the function of the capital market, change its role in the capital market, and reposition for its own functions, and decentralize the power to the market. In terms of regulation, we need to set up an effective market supervision system so as to improve the efficiency of capital market pricing as the starting point and ultimate goal to formulate a series of rules. In the construction of the legal system, we should strengthen the construction of the legal system of the market, improve the market trading system, and ensure the transparency of the full information disclosure and transaction procedures.

6.2 Perfecting the supervision system of Internet Finance

In view of the pricing efficiency of the Internet financial concept listed companies, it is found that the systemic risk is still high. Therefore, China's capital market can't rely entirely on the government, and the government should not interfere with it, but to some extent, it can't do without government intervention, especially in regulation. Market regulation is an important part of government decision makers in formulating relevant laws, regulations and practices. Especially when our legal mechanism is not perfect, we should pay more attention to the role of market supervision. Strengthening market supervision can improve market information transparency, and help the market to be open and fair, so as to protect the interests of market investors and improve the efficiency of capital market pricing.

6.3 Optimizing the governance mechanism of Internet Financial Enterprises

On the one hand, we should give full play to the effectiveness of the constraint mechanism. In the internal governance of the enterprises, the government should reduce the intervention, and also have the right to the enterprises, so as to strengthen the legal supervision over the violation of laws and regulations; On the other hand, we should set up a set of incentive mechanism suitable for the company's own development, stimulate the enthusiasm and creativity of the company, so that every employee can enjoy the achievement of the company's performance. When the company's performance is raised, it is possible for the company to disclose information more truthfully, more fully and actively, which is very necessary for improving the pricing efficiency of the capital market.

6.4 Perfecting the information disclosure system

The principle of accounting conservatism should be rationally used, accounting information should be fully disclosed, and the principle of conservatism and information disclosure system should be effectively combined. 上 Accounting information disclosed by city companies is an important channel for market investors to understand their operation and company performance, and is also the fundamental basis for investors to predict future earnings. Therefore, the accuracy of accounting information will directly affect investors' decision making, which will further affect the equilibrium price of the stock market, thus affecting the pricing efficiency of the capital market.

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Comparison Research on Equity Financing Efficiency of the Listed Companies between China and UK

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Abstract: Britain is the world's first country to complete the industrial revolution, and the issuance of shares of listed companies also has a long history, the British stock market is the world's most international stock market, which provides reference experience to the development of listed companies in China. Therefore, this paper use the Data Envelopment Analysis to evaluate the equity financing efficiency of listed companies in China and UK, and draws a conclusion that the effective ratio of equity financing efficiency of Chinese listed companies is lower than the effective proportion of the UK. Meanwhile, the paper finds that the effective value with range of 0.7-1 of the listed companies in China is significantly lower than that of the United Kingdom, with the results of the robustness of the test were tested. According to the British listed companies and the stock market development experience, as well as the comparative study results of equity financing efficiency, proposing relevant recommendations in order to improve the efficiency of equity financing of listed companies in China.
Key words: Listed Companies; Equity Financing Efficiency; Data Envelopment Analysis

1. INTRODUCTION

Following the "Shanghai-Hong Kong Stock Connect", Tu Guangshao, executive vice mayor of Shanghai, said at a news conference in Shanghai on December 29, 2015 that Shanghai will prepare to build a strategic emerging board to study and launch the "Shanghai-London Communications" to deepen its cooperation with the United Kingdom Economic cooperation. As we all know, Britain's stock market is mature, and it is the most international stock market in the world. It can provide the needed funds for our country while accumulating experience under the capital system of Britain to help the development of China's stock market. Under the proposal of "Shanghai-London Stock Communications", it can drive our country's innovation, improve the structure of investment and financing of listed companies and promote the interconnection of stock markets in China. Therefore, this economic situation has laid a foundation for studying the efficiency of equity financing in China and the United Kingdom basis. Based on the two stock exchanges in Shanghai of China and London of the United Kingdom, this paper comparatively studies the equity financing efficiency of listed companies in China and the United Kingdom, and can learn from the reference of British stock market and listed companies. In order to improve the efficiency of equity financing in China, Put forward feasible suggestions to speed up the stock market and the development of listed companies.

2. REVIEW OF LITERATURE

The financing efficiency is a hot topic in the academic field of stock market, and a considerable amount of scholars have given their own findings based on the in-depth and continuous research. A domestic scholar named Bai Qin-xian (1987) has firstly thought that the population effect should be considered as a crucial factor in comparing the financial systems between different countries. Meanwhile, he also has provided the concepts of population effect and individual effect. Then, Wang Yong-qi (2007) has defined the financing efficiency in financial market as the difficulty and scale to raise capital from financial market. Zhang Jin-qing (2008) has considered that in the process of financing, the more net earnings and lower cost, the higher the financing efficiency is. After that, based on the microscopic point, Yang Xiao-bo (2012) has claimed that, on the basis of various management structures, an enterprise's financing efficiency is the capability of bringing the highest profit with the lowest cost and risk. Hu Chao (2014) has thought that in Brazil, Russia, India, China and South Africa, the stock market financing efficiency is the level that capital gathered from market can make influence on the whole economy and the profit earned from stock market. Moreover, researchers from overseas have given their results either. Richard.G.Lipoy (1996) has defined the financing efficiency in the perspective of the capital allocation, and pointed out that the process of financing should conform to the Pareto Optimality. Pual.A.Sumueolson (1999) has given his point that the financing efficiency represents the capital allocation efficiency, which can be able to provide the greatest possibility for enterprises to financing under the condition of established resources and technology in the economy. The researches mentioned above laid a theoretical foundation for the further study of the stock market financing efficiency.

For emerging markets, how to evaluate financing efficiency is continuously becoming the central focus of academic researches. Due to the point of Xu Ke-da (2003), we should evaluate the stock market financing efficiency by comparing the trading efficiency and the allocation efficiency. Zhang Jin-qing (2008) has used three capabilities of financing, including the ability to meet the demand of huge capital scale with relatively low cost, the ability to bolster the business investment, and the ability to guide the fund to the companies with high economic benefit, to evaluate the market financing efficiency. In the perspective of listed companies, Chen Xian-jin (2010) and Yang Xiao-bo (2012) have used different indicators, such as the Tobin Q which represents the ratio between firms' stock value and replacement cost, the return on equity, the increase rate of business revenue and the earnings per share, to measure the financing efficiency. In addition to this, Yang Xiao-bo (2012) has used DEA model to evaluate the listed company equity financing efficiency in China and India. Moreover, Hu Chao (2014) has used the total amount of raised capital and the market return to reflect the whole BRICS stock markets financing result. Thomas (2005) has divided financing efficiency into two parts, the capital allocation efficiency and the dynamic capital usage efficiency. The relationship between them should be followed by companies in the process of financing and capital usage. Guoping Lin (2008) has estimated the effectiveness of the China's stock market by introducing the ratio between the share price and the dividend discounted, the Tobin Q and the ratio between the market capitalization and the GDP growth as indexes. It can be seen that the measuring standard of financing efficiency in share market should be concentrated on the result of financing and the profit brought by financing.

Generally, we define the stock market financing efficiency as the influence made by financing on the profit of the whole stock market, and the improvement of stock market and national economy. Furthermore, if the result is remarkable, we will say that the financing efficiency is significant. Otherwise, the financing efficiency is non-significant. In this paper, we use the financing efficiency index to measure the result of financing.

3. DEA Empirical Model and Data Description

The data envelopment analysis (DEA) is a linear programming method, which is based on the productivity frontier theory made by Farrell in 1957. Then, the theory was developed by Chamesetal (1978), and he used it to evaluate the efficiency of the public sector and non-profit sectors. In 1985, the DEA model was firstly used by Sheman and Gold to evaluate the security company efficiency.

The DEA model is a method that measures the relative efficiency of decision making units (DMU) with the same input, output and nature. In the point of the production effectiveness, the DEA model is a very ideal and valid method to estimate the very DUM which contents multi-input and multi-output indexes and is simultaneously effective in technique and scale. Owing to the hypothesis of returns to scale, DEA model can be separated into two parts: CCR model and BBC model. CCR model, firstly discussed by Chames, Cooper and Rhode in 1978, is used under the condition of constant returns to scale (CRS). Whereas, BBC model is used under the condition of variable returns to scale(VRS). These two models are all used by us to evaluate the financing efficiency of China-UK stock market.Generally, If the empirical test based on the DEA model is effect, it will be proved that financing has a positive effect on the economy. Besides, if the result of the DEA test is close to 1, it will be proved that the stock market financing efficiency is valid.

In this paper, we choose the input variables include: equity concentration, net equity financing, debt ratio, the output variables selected include: return on net assets, revenue growth year on year, asset turnover. This paper selects 2010-2015 as the study period, using the data of 257 listed companies in China's listed companies in Shanghai and Shenzhen 300 constituent companies and 61 listed companies in FTSE 100 constituent companies in the UK as the sample data for the study. Study on the Efficiency of Equity Financing between Chinese and UK Listed Companies. Data from the wind database, the World Bank statistics, and the data of some UK listed companies through the London Stock Exchange Finishing get.

4. EMPIRICAL ANALYSIS ON THE EQUITY FINANCING EFFICIENCY BETWEEN CHINA AND UK

4.1 Equity Financing Efficiency of Chinese Listed Companies

The DEA model is used to test the data of Chinese listed companies, and the DEA efficiency of Chinese listed companies' equity financing efficiency is obtained. The results of the empirical results are summarized in table1 and table2.

Table 1. The Overall Situation of Equity Financing Efficiency of Chinese Listed Companies

Chinese Listed Companies	TE		PTE		SE	
	Quantity	proportion	Quantity	proportion	Quantity	proportion
Effective	11	4.3%	23	8.9%	11	4.3%
non-effective	246	95.7%	234	91.1%	246	95.7%
total	257	100%	257	100%	257	100%

Table 2. Proportion Distribution of Equity Financing Efficiency of Chinese Listed Companies

Chinese Listed Companies	0-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1	1
TE	77.4%	7.4%	5.1%	2.3%	2.3%	1.2%	4.3%
PTE	65.0%	9.3%	7.0%	4.7%	2.7%	2.3%	8.9%
SE	21.8%	10.1%	7.4%	10.9%	14.0%	31.1%	4.3%

Tips: TE represents Technical Efficiency. SE represents Scale Efficiency, PTE represents Pure Technical Efficiency

As can be seen from Table 1, in the CCR model, the equity financing efficiency of 11 listed companies in 257 listed companies in China is DEA-efficient but only accounts for 4.3% of these 257 listed companies. Inputs and outputs are exactly matched, there is no input redundancy and output deficiencies, and can be the smallest amount of input to get the maximum output, to achieve the listed company's DEA effective. 23 companies, or 8.9% of the sample companies, reached a pure DEA efficiency of 1 in the BCC model. Scale efficiency is the ratio of technical efficiency to pure technical efficiency, so it is the same as that of technical efficiency, and 4.3% is also efficient for economies of scale.

Table 2 also compares the various stages of the equity financing efficiency of listed companies in China. It can be seen that the efficiency of equity financing obtained in the CCR model is 10.1% higher than 0.7, and only 5.5% higher than 0.9 However, the value of equity financing efficiency of listed companies is less than 0.5, accounting for 77.4% of the 257 listed companies. Under the BCC model, listed companies with efficiency values above 0.9 achieve a ratio of 11.2%, but the percentage with efficiency values below 0.5 is also high at 65.0%. Through the efficiency of equity financing of listed companies in China, it can be seen that listed companies have a relatively low proportion of firms that have efficient equity financing and non-DEA effective firms are not too efficient.

4.2 Equity Financing Efficiency of UK Listed Companies

The DEA model is used to test the data of UK listed companies, and the DEA efficiency of Chinese listed companies' equity financing efficiency is obtained. The results of the empirical results are summarized in table3 and table4.

Table 3. The Overall Situation of Equity Financing Efficiency of UK Listed Companies

Chinese Listed Companies	TE		PTE		SE	
	Quantity	proportion	Quantity	proportion	Quantity	proportion
Effective	15	25%	24	39.3%	15	25%
non-effective	46	75%	37	60.7%	46	75%
total	61	100%	61	100%	61	100%

Table 4. Proportion Distribution of Equity Financing Efficiency of UK Listed Companies

Chinese Listed Companies	0-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1	1
TE	37.7%	8.2%	9.8%	4.9%	1.6%	14.8%	25.0%
PTE	1.6%	4.9%	8.2%	19.7%	16.4%	11.5%	39.3%
SE	23.0%	9.8%	9.8%	9.8%	3.3%	21.3%	25.0%

Tips: TE represents Technical Efficiency. SE represents Scale Efficiency, PTE represents Pure Technical Efficiency

From Table 3, it can be concluded that among 61 UK companies, the equity financing efficiency of 15 listed companies in the CCR model is DEA-effective, accounting for 25% of the 61 listed companies. The DEA efficiency value of equity financing efficiency of these 25% of the enterprises is 1, the technical efficiency is effective for DEA, and the enterprise financing is effectively utilized. Among the 61 listed companies, 24 enterprises, or 39.3% of the enterprises, achieved a purely technical efficiency value of 1 in the BCC model, achieving the DEA effectiveness. As with technology efficiency, scale efficiency is also 25% of firms that are DEA-effective on equity financing efficiency. From the perspective of equity financing efficiency of UK listed companies as a whole, the effective ratio of equity financing efficiency DEA is not too high and close to 40%, but it is also slightly higher than the effective proportion of DEA equity financing efficiency of Chinese listed companies.

Table 4 also lists the distribution about DEA efficiency of equity financing efficiency of UK listed companies in different stages. According to the comparative analysis in Table 4, it can be seen that in the CCR model, the DEA efficiency of the equity financing efficiency is close to half of the enterprises with the value of 0.7 or more, and the companies of more than 0.9 account for 40% of the 61 listed companies. Under the BCC model, the DEA efficiency of the company's equity financing efficiency is higher, reaching 50% when the DEA efficiency value is greater than 0.9, and the ratio of the DEA efficiency value of the equity financing

efficiency greater than 0.7 is as high as 87%. It can be seen from the DEA efficiency value of the equity financing efficiency of UK listed companies that UK listed companies have higher equity financing efficiency, so the capital utilization of UK listed companies is more reasonable and effective.

4.3 Comparison of Equity Financing Efficiency between China and UK Listed Companies

After more than 100 years of development, the UK stock market has very mature rules and regulations and a sound capital market system. The stock market is a representative stock market in the world. Therefore, the equity financing efficiency of UK listed companies is relatively high. However, the stock market in China was short established in 20 years and relatively backward.

The research shows that the technical efficiency and pure technical efficiency of equity financing in UK listed companies are generally higher than that of Chinese listed companies. The technical efficiency of Chinese listed companies in equity financing efficiency have a larger distribution in the range of 0-0.6, with less distribution in the higher efficiency and only 4.3% effective in the efficiency of equity financing of listed companies. However, listed companies in the UK, although their technical efficiency values also account for a relatively large range of 0-0.6, but are lower than 40% of Chinese listed companies, and the proportion of listed companies in the 0.9-1 interval is far greater than that of China. meanwhile, The proportion of DEA effective is also higher than that of Chinese listed companies. Therefore, the equity financing efficiency of listed companies in the UK is lower than that of Chinese listed companies in the area of low efficiency, and the proportion of companies that are valid in DEA is higher than that of Chinese listed companies.

5. SUGGESTIONS TO IMPROVE THE EFFICIENCY OF EQUITY FINANCING IN CHINESE LISTED COMPANIES

Based on the above empirical analysis of the equity financing efficiency of listed companies in China and the UK, the equity financing of Chinese listed companies is inefficient, with the problems of redundant input and insufficient output. To improve the efficiency of equity financing of listed companies, the most fundamental is to improve and adjust from the level of the company itself.

5.1 Reduce Ownership Concentration

First of all, according to the different characteristics of listed companies in different industries and regions, as well as the unique features of Chinese stock market. Differentiation of listed companies in the management and governance. Adjust the ownership concentration of its companies and control the proportion of major shareholders within a certain range to avoid the phenomenon of "single domination", so that the relatively decentralized ownership concentration is conducive to raising the efficiency of equity financing.

Second, the regulatory agencies of listed companies formulate corresponding measures to strictly control the maximum cap of shareholding concentration of listed companies, so that the concentration of ownership is strictly controlled by law and policy within a certain range, reducing the phenomenon of "one single dominant". And formulate appropriate disciplinary measures to reduce the ownership concentration of listed companies.

Thirdly, according to the actual situation of listed companies, multi-shareholding measures can be adopted. When the listed company first raised its shares or issued new shares, it should adhere to the concept of multiple shareholders and allow the company to manage and control each other under the control of multiple shareholders Supervision and management, avoiding major shareholders for their own interests, to make the company does not conducive to the rational management of the decision-making. In order to improve the company's operating efficiency, thereby enhancing the company's equity financing efficiency.

5.2 Optimize the Financing Structure

Chinese listed companies should learn from the financing structure of listed companies in the UK, reduce their reliance on equity financing, and increase their bonds and internal financing. And then play the financial leverage of bond financing, making the company's financial resources to get higher operating results. At the same time, Chinese listed companies should strengthen the main business of the Company, improve the ability of innovation and competition, enhance the utilization efficiency of funds of listed companies and improve the efficiency of equity financing of Chinese listed companies.

5.3 Adjust the Total Equity Financing

Chinese listed companies should properly adjust the total equity financing of listed companies, do not blindly financial, making the company redundant funds, without reasonable and effective use.Meanwhile, Do not be afraid of financial redundancy and reduce the financial capital makes the lack of funds, The company should be based on the overall size and management operations of their own, To blend with the company's matching funds. While adjusting the net total equity financing of listed companies, it will also improve the efficiency of capital utilization management, reduce the costs of operation and management, and improve the efficiency of production so that the input and output will be matched and the output will be reduced.

5.4 Increase the Proportion of Institutional Investment

Listed companies should provide institutional investors a certain amount of investment convenience, is conducive to institutional investors to invest in the company. Listed companies can get the funds from

institutional investors, which can disperse the management risks of listed companies and avoid excessive personal investment. At the same time, institutional investors, as the main body of supervision and management companies, can inspect and manage the management and operation of the company, Operating funds under the supervision of multiple identities of shareholders. Thereby improving the company's capital utilization efficiency and operational performance, enhance the company's equity financing efficiency.

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Empirical Analysis on the influencing factors of Maize Yield in Liaoning Province

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Abstract:Maize has the characteristics of wide adaptability, strong resistance, short growth period and great potential and so on. It is one of the main grain crops in Liaoning Province and occupies an important position in agricultural production. The change of meteorological conditions has a great impact on the yield of maize, and therefore, four quantitative factors--maize planting area, air temperature, rainfall and sunshine hours are selected as independent variables to establish a model. According to the data of total maize yield, planting area of maize in Liaoning Province, 4-10 month average rainfall, temperature and sunshine hours from 1999 to 2015, using linear regression analysis, the relationship between the total yield of maize, sown area and climate factors in Liaoning Province was empirically analyzed.
Keywords:total maize yield, rainfall, sunshine hours, empirical analysis

1. INTRODUCTION

(1) Research background and significance

Maize has always been a major food crop in China, as well as the main feed source of animals and an important industrial raw material for mankind, which is a crucial renewable energy crop. In 2011, the planting area of maize has surpassed that of rice and became the largest crop variety in China. According to the different purposes of maize, the consumption of maize can be divided into feed, utility, industry, seed consumption and other consumption, of which maize accounts for the largest proportion of feed consumption, accounting for about 70% of the total maize demand in China. At the same time, the consumption of domestic maize industry is growing rapidly while the consumption of feed is increasing steadily. At present, China's maize processing is switching from using starch, alcohol, feed mainly primary processing to deep processing and biochemical processing with lysine, denaturated starch, chemical alcohols as the main products of the transformation, and
its products have been widely used in the field of food, medical, automotive, textile, electronics, especially in the fuel ethanol industry, which is developing rapidly, and its demand for maize showed a significant growth trend. With the increase of maize demand, former farmers selling food difficult began to change into a maize business to buy food difficult. China has always been a big exporter of maize, but the record import volume in 2010 changed the situation of our country's net export of maize for a long time. This situation has attracted the attention of the Chinese people, who realize increasing the yield of maize is imminent, and the increase of maize yield improve the enthusiasm of farmers for growing maize to make further biological energy, which laid a foundation for the sustainable development of the energy. Thus, it is particularly important to increase the yield of maize and to maintain the self-sufficiency rate of maize. The northern provinces of Liaoning, Jilin, Heilongjiang, Mongolia, Shanxi, Hebei, Shandong and Henan provinces have produced more than 70% of the country's maize, especially in the northeast, the annual sown area of maize is 900-1000 million hectares. The output of normal maize is about 5000-6000 tons, which is accounting for about 40% of the total output of maize in China and it is the largest grain producer of maize in China. Therefore, the empirical analysis on the influencing factors of maize production in Liaoning Province is quite typical. In the process of maize cultivation in Liaoning Province, it is significant to improve the production of maize, and maize in the production process, the main factors that cause the total yield of maize in Liaoning province is due to the fluctuation of meteorological factors, meteorological factors and influence of a large number of maize during the growth period of the amount of rainfall and sunshine duration. Accordingly, it is of great importance and significance to study the effect of climate change on the total yield of maize.

(2) Literature Review

Domestic scholars have studied how climate change affects the total yield of maize in different regions of China from different perspectives.

Sun Xue (2015) carried out the study by using the literature analysis method, regression analysis and path analysis, synthesized the relationship between the meteorological yield of Maize in Benxi and the accumulated temperature in Benxi area. After studying the results, she found that the precipitation meteorological yield of maize and maize growth period is much less positively related phenomena. The regression equation analysis and path analysis

showed that the effect of rainfall on maize yield was significantly greater than that of Maize in Benxi area. The rainfall in the Benxi region of Liaoning plays a significant role in promoting the meteorological production of Maize in the region, while the accumulated temperature has a negative effect.

Wang Heling (2017) analyzes the influence of climate change on the characteristics of agricultural climate resources and the potential cultivation pattern of major grain crops in Gansu province based on the data of meteorological observation data and regionalization of 80 ground meteorological observation stations in Gansu province from 1961 to 2014, and puts forward some countermeasures to adapt the agriculture structure and cultivation pattern to adapt to climate change.

Xu Lingli (2016), taking Gushi County maize as the breakthrough point of study, the general period, ripening universal period and interval days of Gushi County were taken as the research breakthrough points. From the meteorological data of 1990 to 2014, she extracted and calculated the sunshine duration, sowing to maturity, and accumulated temperature, and based on the analysis of light, temperature and water during this period, combined with data on the growth period of maize in the same period, an analysis was conducted to evaluate the factors affecting the yield of maize in Gushi County.

Meng Fanchao (2017) thinks the concentration of carbon dioxide and climatic factors such as precipitation, air temperature is the key factor affecting the growth and development of crops, and different climate factors influence on crops is not independent, by studying the effects of different climate factor interactions, contribute to the real response to climate change and understanding of crop crop ecosystem. The effects of temperature increase, atmospheric CO2 concentration and precipitation change on crop growth, photosynthetic physiology and yield were studied in recent years.

Li Yu (2015) selected four treatments of long-term monitoring points of Guizhou yellow soil from 2010 to 2012 and studied the effects of different fertilization treatments and rainfall on the agronomic characters and yield of maize in combination with the different rainfall during the three years of crop growth. The results showed that the number of grains per spike was significantly correlated with rainfall, and the correlation between plant height and fertilization was the highest. The yield of maize was affected by the interaction between rainfall and fertilization, and the effect of increasing yield is obvious.

2. Theoretical analysis

(1) . Theoretical analysis of influencing factors

(1.1) . Planting area

The total yield of maize is positively correlated with the planting area of maize, that is, the total yield of maize increases with the increase of maize planting area, and decreases with the decrease of maize planting area.

(1.2) . Meteorological factors

(1.2.1)Temperature

Maize is thermophilic crops, and to respond to changes in temperature is bigger, at the same time in the process of growth of the temperature of the different requirements. During the whole process of growth, if the temperature is too high or too low, it is not conducive to the growth of maize, which can lead to lower production of maize. The relevant studies have shown that the appropriate temperature remains about twenty-six to thirty degrees in the whole period of maize growth. In the jointing period, the average temperature, the highest temperature and the lowest temperature can all affect the yield of maize.

(1.2.2) Rainfall

The need for moisture of maize is relatively high, and in different growth period, water demand for maize is different, its main characteristic is the demand in the seedling period of cold resistant performance is good, need less water, not much water need during milk stage, and only need relatively large water in jointing period. During the jointing period, it is the most important period in the process of maize growth, because the rainy season has not yet arrived, the temperature is higher and the demand for rainfall is greater. In the milk ripening period, excessive precipitation can easily produce water, while too much rain affects photosynthesis in plants.

(1.2.3)Sunshine hours

In the process of plant growth, photosynthesis is particularly needed, and maize is one of them. If maize is not mature, the degree of sunlight exposure does not have much effect on the yield of maize. Generally, the daily sunshine hours in maize planting area are 9 hours to 10 hours, which can meet the demand of maize growth, but in the later period of maize growth until the mature stage the demand for sunshine is the most, and the time of exposure to sunlight plays a key role on the yield of maize.

(1.3). Fertilizing amount

The statistics of the United Nations Food and agriculture organization show that the contribution of chemical fertilizer to increasing production is 40%-60%. According to the World Fertilizer Conference of 1978, 30% of the grain output increase in developing countries came from the application of fertilizers and about 50% of the increase in cereal crops was due to the application of fertilizers. In the process of growth and development of maize, it is necessary to constantly absorb various nutrients from the soil and synthesize the organic substances that supply their own growth and development. In the whole growth period, the nutrients that the maize absorbs most are N, P, K, S and so on, and the nutrients absorbed in the life of the maize are the most in N, followed by K, and less P. Since most of the elements in the soil can meet the needs of maize

growth, three kinds of fertilizers are fertilized mainly by applying N, P and K in maize production. The absorption of N, P and K in Maize during the whole growing season is basically a trend of "less—more—less". That is, seedling growth is slow, plants are small, nutrients are few, growth is fast and nutrients are absorbed from jointing to flowering stage, and growth slows down and nutrients are absorbed at later growth stage.

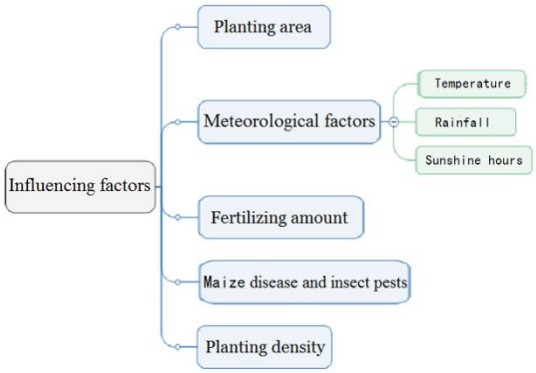
(1.4). Maize disease and insect pests

Meteorological conditions are the key factors to determine the occurrence of disease and insect pests. Maize Curvularia Leaf Spot, Maize Size Spot, Maize Kernel Black Powder and Maize Borer will damage maize and affect maize yield under certain temperature and humidity. In the stage of tasseling of maize, when encountering bad climatic conditions, such as temperature 20~25℃, relative humidity 90%, Maize Size Spot disease and Maize Curvularia Leaf Spot disease are easy to happen. Maize powdery mildew can occur in all stages of maize growth, but the obvious performance at heading stage and the greater impact on the damage.

(1.5). Planting density

The planting density of different varieties and sloping maize is different because of the influence of variety characteristics of maize variety and slope direction. According to the growth of maize plants, maize can be divided into tight, semi tight and flat. Tight type maize permeable and strong light, requiring high levels of fertilizer and planting density, survival seedlings 4000/667 square meters. Semi tightened maize is more dense than flattened maize, semi compact type maize planting density is 3300~3500 square meters plant/667. Flat type maize planting density is 3000 plants /667 square meters. Maize planting slope is divided into sunny and back to the north, to the sunny shady slope is better than the back light ventilation, so the slope density can be larger in sunny slope than the back slope.

(2) . Mindmanager diagram



Mindmanager diagram

(3) . Comparative analysis

After the empirical analysis, the goodness of fit of the model is 0.85. Although the result is close to 1, the goodness of fit should be higher for data collected from time series, and there is a certain gap between the actual result and expected value. The reason should be in addition to the planting area, the climate factors of maize have great influence on the total maize production, there are many factors affecting maize production, factors such as fertilization, pest and plant density, especially the effect of Fertilization on yield of maize. To sum up, the results of the empirical analysis did not reach the expected value, because there are other factors that affect maize production.

3. Empirical analysis of the influencing factors

(1). Data collection and variable settings

There are many factors that influence the yield of maize, taking into account the availability and quantification of data, and four quantifiable factors, such as maize planting area, temperature, rainfall, and sunshine time, can be used to establish a model for independent variables. According to Liaoning Statistical Yearbook of Liaoning Bureau of Statistics, the data of the total output of maize, maize planting area, average rainfall, temperature and sunshine duration in Liaoning Province in April-October from 1999 to 2015 were calculated and sorted out. After determining the study variables, it was found that the temperature and the sunshine time were also used as variables to generate multiple co-linear, so the temperature variables were excluded. The final variable is set as follows:

TABLE I. VARIABLE SETTINGS

Variable	Implication	Unit
Y	Total maize yield	Ten thousand tons
X1	Planting area	Hectares
X2	Rainfall	Millimeter
X3	Sunshine hours	Hours

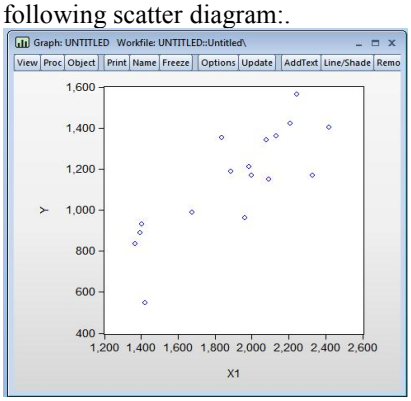
TABLE II. DATA ON INFLUENCING FACTORS OF MAIZE PRODUCTION IN LIAONING PROVINCE FOR 1999-2015 YEARS

Time	Total maize yield	Planting area	Rainfall	Sunshine hours
1999	988.27	1677.84	457.19	1660.66
2000	547.9	1422.5	432.6	1688.25
2001	833.7	1366.3	837.32	1688.25
2002	889.4	1395.1	484.88	1648.66
2003	930.5	1401.4	624.59	1521.05
2004	1352.1	1835.9	617.01	1562.88
2005	1340.3	2076.7	722.02	1438.89
2006	1211.5	1983.1	550.29	1463.44
2007	1167.8	1998.6	538.67	1567.09
2008	1189	1884.9	598.83	1473.86
2009	963.1	1964.1	500.61	1632.25
2010	1150.5	2093	860.52	1412.01
2011	1360.3	2134.6	585.79	1557.43
2012	1423.5	2206.7	786.54	1591.59

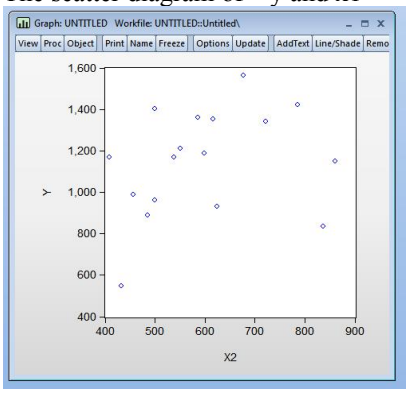
2013	1563.2	2245.6	676.94	1583.17
2014	1170.5	2330.1	408.19	1616.05
2015	1403.5	2416.8	500.12	1662.48

(2) Model building

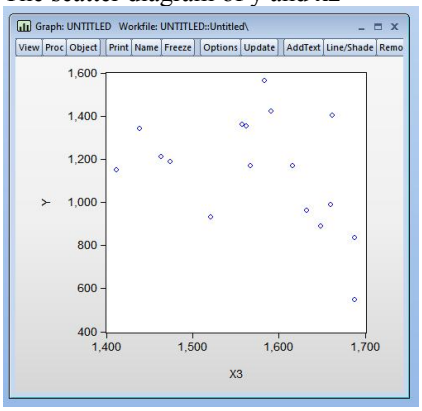
Input commands (X1, Y), (X2, Y) and (X3 Y) get the following scatter diagram:.



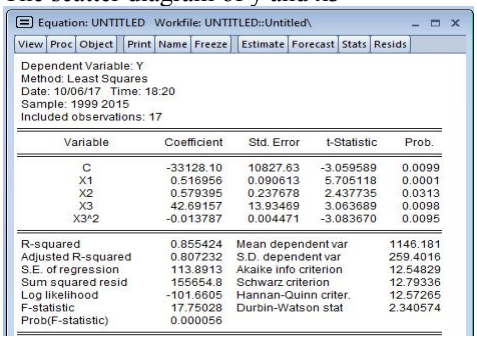
The scatter diagram of y and x1



The scatter diagram of y and x2



The scatter diagram of y and x3

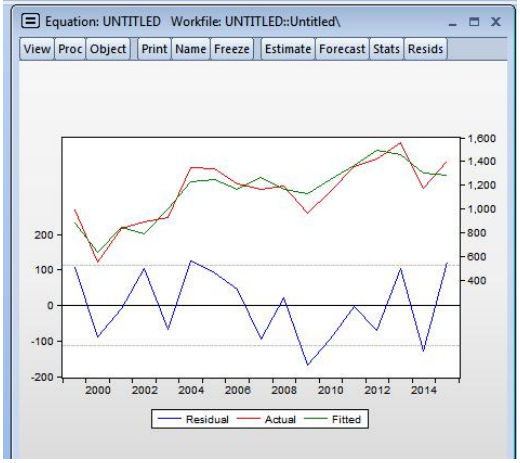


The relationship between y , x1,x2,and x3

The estimated result is:

$$Y = -33128.0977 + 0.51696 * X1 + 0.5794 * X2 + 42.6916 * X3 - 0.0138 * X3^2 \quad (1)$$

Then make a true and fitted values and residuals chart:



The true and fitted values and residuals chart

(3). Hypothesis test

1. Economic significance test

There is a positive correlation between the total maize yield and the maize planting area in Liaoning province. When the rainfall and sunshine hours remain unchanged, the planting area increases by 1 units, and the total yield of maize increases by 0.52 units. The total yield of maize is positively correlated with rainfall. When the planting area and sunshine hours remain unchanged, the rainfall will increase by 1 units, and the total output of maize will increase by 0.58 units. When the sown area and rainfall remained constant, the sunshine hours and total maize yield showed a parabolic trend.

(4). Goodness of fit test

By R^2 =0.8554, which is close to 1, indicating the good goodness of fit.

(5). F test

For H0: β1=β2=β3=0, given a significant level of α=0.05, the critical value F0.05(3,13)=3.59 of the degree of freedom of 3 and 13 is found in the F distribution table. Due to F=17.75028 > 3.411, we should reject the original hypothesis H0, which shows that the regression equation is significant, that is, the planting area (X1), rainfall (X2) and sunshine hours (X3) have a significant impact on the total yield of Maize (Y) in Liaoning province.

(6). T test

Respectively for H0: βi=0 (i=1,2,3),H1: βi≠0 (i=1, 2, 3), a given level of significance of α=0.05, generally considered the corresponding statistics were (7).705118, 2.437735, 3.063689, | t1 | and | t2 |, | t3 | > t0.025 (13) = 2.1604, t1, t2, t3, all through the test of significance, namely planting area (X1), rainfall (X2), sunshine time (X3) of maize production in Liaoning province (Y) has a significant effect.

4. COUNTERMEASURE

(1). Implement a more strict policy on cultivated

land protection

Cultivated land is the root of grain production,and only by maintaining the area of cultivated land can the harvest of maize be guaranteed. The continuous improvement of the urbanization rate leads to a series of problems about the area of cultivated land and the circulation of land. Consequently, the government should formulate a strict policy of cultivated land protection in order to control the reduction of cultivated land in the process of urbanization. Only the planting area is guaranteed, so that the production of the maize can be guaranteed.

(2). Actively take water storage measures and develop drip irrigation techniques

Different meteorological factors will cause different degrees of impact on maize yield, and therefore, it is very important to study the influence of meteorological factors on Maize Yield in Liaoning province. In Liaoning province, rainfall has been the important meteorological factors influencing maize production in our region, through the analysis of the impact of rainfall on the total output of maize in Liaoning Province, its data achieved significant related conditions, the influence of rainfall for maize production and growth period has a positive correlation. The results show that the increase of rainfall can lead to the increase of maize yield, and the maize is warm and humid and the water requirement is larger. In April and May, it is the maize planting stage, and rainfall has great influence on yield, this period of rainfall can effectively improve soil moisture, so that the maize can be seeded well. July is the stage from jointing to tassel, which is the critical period of water requirement for maize and the water requirement for high yield is bigger than before. In July, it is summer, and there is much rainfall, however, we should pay attention to the fact that excessive rainfall will lead to a reduction in production. The rainfall in Liaoning province is less than the province in the south of China. In the future, the adaptation strategies of maize production in Liaoning Province in response to climate change are to build, manage and use the rural water conservancy infrastructure in the main producing areas of maize. Hence combined with this experimental research, in order to ensure the actual increase of Maize Yield in the future maize production process, Liaoning province should actively take measures of water storage, develop drip irrigation planting technology, and properly increase irrigation for maize.

(3). Increase sunlight and enhance photosynthesis

The number of sunshine is also an important meteorological factor affecting maize production in Liaoning province. The number of sunshine hours affects the photosynthesis of maize. The influence of sunshine duration on the total yield of maize showed a positive correlation in the growth period, and the increase of sunshine number would lead to the increase of maize yield. Maize is a short day crop, with the shortening of the sunshine, the growth process is accelerated, the amount of nutrient growth is reduced, and the economic yield is reduced. In addition, the increase of light is beneficial to the enhancement of photosynthesis of maize and the improvement of physiological metabolic function of maize plants. In the mature stage of maize, sunshine hours should be guaranteed to increase maize production through photosynthesis so as to increase the economic benefits of maize.

5. SHORTCOMINGS

In addition to the planting area and climatic factors of maize, there are many factors influencing the yield of maize, such as fertilizer, insect pest and planting density. These factors will also have a certain impact on the total yield of maize. In the future research, we should also consider the effect of other factors on maize yield, so as to provide a scientific basis for maize production in Liaoning province.

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The Application of PEEK Composite in Craniomaxillofacial Defects

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Abstract: The PEEK composites have excellent mechanical properties and biological activity. These excellent characteristics of medical PEEK has become a kind of implanted materials have attracted much attention since the beginning of this century. Foreign countries have successfully applied PEEK medical materials in plastic surgery, hard tissue injury, spinal implant and heart valves and other medical fields, achieved good clinical effect. With the development of this kind of material, all PEEK oral composite materials have been successfully developed and applied in prosthodontics, department of oral and maxillofacial surgery and planting fields. This article makes a summary on the application of PEEK as biomedical materials in stomatology.
Keywords: Polyetheretherketone, Composite materials, Biological activity

1. INTRODUCTION

As a member of the polyetherketone family, PEEK is a special thermoplastic polymer with high strength, stiffness, corrosion resistance, good mechanical properties and biocompatibility[1],has been approved by the us food and drug administration (FDA) for use as intervertebral fusion device. Compared with metal materials, its elastic modulus is closer to human cortical bone, which can effectively reduce the bone resorption and bone atrophy caused by the stress shielding effect[2,3]. PEEK is a kind of special thermoplastic engineering plastic which has the characteristics of high temperature resistant long-term use temperature as high as 250℃, so once called super heat resistant special engineering plastics[4]. PEEK is a new type of organic polymer compound, which has the advantages of semi-transmission of radiation and elastic modulus between bone spongy and bone dense, and has been widely used in the fields of injury, spine, joint and plastic surgery[5]. Below, the application of PEEK composite in craniomaxillofacial defects is described.

2. APPLICATION OF PEEK IN ORAL AND MAXILLOFACIAL SURGERY

Maxillary defects caused by trauma, infection and tumor reduce the quality of life of patients, and the repair of maxillary defects and the improvement of patients' quality of life are problems that need to be solved urgently in oral and maxillofacial surgery. Bone defect repair device and orthopedic device, especially titanium alloy, have been widely used in clinical practice. With the increasing use of metal fixators in clinic, the defect of lack of visual field, stress occlusion and electrolytic reaction caused by the lack of ray transmission caused bone resorption. The long-term clinical effect of bone defect repair is poor. The research and development of non-metallic materials fixation devices has become a hot topic. Some scholars established a rabbit mandibular monolayer bone defect model. The carbon fiber reinforced PEEK material was directly implanted into the rabbit mandibular bone defect. The mechanical properties and biocompatibility of the materials in the complex environment of mandible were observed. There were no secondary fractures, loosening and shedding of implant materials in all experimental rabbits after operation. Compared with autogenous bone grafting, the biocompatibility of the carbon fiber reinforced PEEK is not obviously different. As the observation time is prolonged, the immune reaction is getting weaker and weaker, indicating that the carbon fiber reinforced PEEK has good biocompatibility and is expected to be an alternative material for repairing the new bone defect[6,7].

Maxillofacial and cranial anatomical structures are complex, and the repair of forehead and orbital wall needs good function and excellent aesthetic effect. Biomaterials such as titanium mesh and methyl isobutenate are not suitable for orbital reconstruction[8]. At the same time, the rib or ilium graft is difficult to shape when the orbital frontal temporal defect is reconstructed, and bone resorption is also caused. In recent years, PEEK has been used as a new material to repair the maxillofacial region and the cranial portion[9,10], the maturity of CAD/CAM technology makes it possible. The first clinical application of PEEK in craniofacial reconstruction is reported by Scolozzi[11] in 2007. The researchers described a computerized orbital reconstruction designed to implant specific patients. 2

years later, Kim and other people[10] reported 4 patients who were implanted with PEEK for weight loss. The investigator followed the procedure for 16 to 20 months after surgery, and the patient had no complications such as infection, extrusion, dislocation, etc., and had good post-operative aesthetics and functional effects. Goodson et al.[10] described a clinical case using two PEEK implants to reconstruct the orbital wall, the orbital floor, and the flat cheekbone complex. In 2014, PEEK implants were used to perform optimal reconstruction after resection of large orbital and frontal lesions by Jalbert et al.[12]. They concluded that extensive resection could be done in the orbital area, with aesthetic and functional effects, while reducing the time of surgery and avoiding the occurrence of complications in the affected area. According to another report of bone defect of craniofacial tumor surgery to predict the resection range caused by the rapid pre PEEK implant surgery according to the preoperative design of precise resection of the tumor using the navigation system, the pre formed good PEEK implants implanted to repair craniofacial bone defect, immediate access to excellent configuration PEEK, and pre implant does not exist to have adverse effects on postoperative radiotherapy[13].

3. THE USE OF PEEK AS A PROTHESIS

Peek can also replace the traditional repair materials for the production of prostheses. The traditional prosthesis is acrylic resin, cobalt-chromium alloy or titanium production, compared to traditional material prostheses, application of CAD/CAM technology in the production of pseudo PEEK Composite compatibility and mechanical processing has better fracture resistance and friction in the biological, also has the advantage, and it is more portable[14]. The super-anhydrite standard model of mandibular dental defect that has completed the preparation of the base teeth was scanned in 3D, and the digital model was obtained. The complete removable partial denture data was designed by the combination of dental CAD software and reverse engineering software. The result shows that the complete structure of removable partial dentures can be designed by using digital technology, and the integrated removable partial dentures can be made by using PEEK materials. The denture can be put in place successfully on the superanhydrite model with good adaptability, no obvious warping in stability and it can meet clinical requirements[15].

4. OUTLOOK

Although many excellent PEEK biological composites have been prepared in the present research, they are still far from being widely used in clinic. With the rapid development of CAD/CAM digital processing and 3D printing technology and the breakthrough of biological key technologies, PEEK biological composite material with more excellent biocompatibility is expected to be prepared through comprehensive application of multiple modification technologies in the near future, and will be widely used in the field of medical implantation to benefit a large number of patients.

5. ACKNOWLEDGMENT

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Empirical Study on Disclosure of Environmental Information in Iron and Steel Industry- Based on Listed Company Panel Data

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Abstract: Based on the existing environmental protection mechanism, this paper conducts empirical research on 2012-2016 annual reports, explanatory notes and environmental responsibility reports of 115 Steel Listed Companies in A shares, and reveals the related factors that affect the disclosure of environmental accounting information in the steel industry. The research results seek to provide suggestions for the improvement of the organizational form of enterprises and the path selection of environmental.
Keywords: environmental protection mechanism; management innovation; environment information disclosure; path selection

1. INTRODUCTION

Environmental issues have become one of the focus of attention. A series of environmental protection policies were promulgated, can the green economy play its positive role and promote enterprises to choose high-reliability forms of environmental information disclosure? In this paper, these issues are the research focus of attention, and we will expand the discussion.

2. CORRELATION EFFECT HYPOTHESIS

2.1 Environmental protection mechanism plays a role in environmental information disclosure hypothesis

Due to the environmental events in the management of the enterprise, it is the typical external "market failure". The government starts from two aspects, one relies on strengthening the regulation construction and the regulation mechanism, directly acts on the enterprise behavior, the second relies on the macroeconomic mechanism to use the tax, the subsidy means to guide the enterprise development trend. Based on analysis, make assumptions:

H1: Environmental protection mechanism can improve the level of environmental information disclosure.

2.2 Enterprise management plays a role in environmental information disclosure hypothesis

2.2.1 Holding Type.

Make assumptions

H2a: State-owned holding focused more on complying with the law and disclosing environmental accounting information truthfully.

2.2.2 Organizational Management.

Make assumptions

H2b: The participation of independent directors in decision-making can promote the disclosure of corporate environmental information.

H2c: The separation of powers, and the containment of each other more effectively against "bounded rationality", promoting the disclosure of information.

2.2.3 The scale of the supervisor.

Make assumptions:

H2d: Enterprise management, below hypothesis are put forward:

2.2.4 Executives factors.

Make assumptions:H2e： The higher the degree of corporate executive education, the more conducive to environmental information disclosure.

H2f: The shorter the seniority of the senior executives, the more conducive to the disclosure of corporate environmental information.

3. RESEARCH DESIGN

3.1Analyze methods

"Content analysis" is based on the whole, and the indicators are classified and scored for analysis.

3.2 Study sample selection

The study is based on selected Shanghai and Shenzhen 2012-2016 a total of 115 steel listed companies annual reports, notes and their environmental responsibilities As a data sample, in order to meet the going-concern assumption of the enterprise, the data only selects the data of listed companies that have been operating for at least five years. Excluding the IPO and its enterprises, the data of 86 listed companies with a total of 1,015 data sets are collected.

3.3 Variable setting

Taking enterprise organizational structure, profitability and financial leverage as control variables, this paper describes the enterprise environmental information disclosure by combining the factors of enterprise scale, profitability and financial leverage.

3.4 Model setting

Under the assumption 1, the model is designed as follows:

$$EID = \alpha + \beta_1 \text{EPM} + \beta_2 CS + \beta_3 \text{ROA} + \beta_4 \text{FL}$$

This model verify the impact of the environmental protection mechanism on environmental information disclosure in the iron and steel enterprises to determine whether the environmental protection mechanism has impacts. and it can also verify the impact of the scale, profitability and financial leverage of enterprises on the level of disclosure of environmental information.

The model hypothesis of the effect of enterprise management on environmental information disclosure on environmental protection mechanism:

$$EID = \alpha + \beta_1 \text{EPM} + \beta_2 \text{EPM} * X_i + \beta_3 \text{CS} + \beta_4 \text{ROA} + \beta_5 \text{FL}$$

Definition of I Represents the type of holding, the size of independent directors, the independence of authority, the size of supervisors, the academic qualifications of senior executives and the length of their term of office. Under the environmental protection mechanism, this model is used to test the impact of enterprise management on environmental information disclosure.

4. EMPIRICAL TEST AND ANALYSIS

4.1 Impact of Environmental Protection Mechanism and Enterprise Management on Environmental Information Disclosure

From Panel A1 to Panel E1, the environmental protection mechanism plays a significant positive correlation of 1% with respect to corporate environmental information disclosure, and the degree is relatively obvious. At the same time, with the help of Model 1, the overall Panel E1 fitting effect is better. Therefore, when the relative estimation standards of CS, ROA and FL are 1%, 5% and 10%, it is more significant, which shows that the impact of these three factors on the reliability of corporate environmental information disclosure is significantly positive.

variable	Panel A1 EID	Panel B1 EID	Panel C1 EID	Panel D1 EID	Panel E1 EID
constant	5.006*** (18.198)	10.18*** (47.002)	-183.2*** (-18.005)	9.73*** (40.796)	-107.76*** (-10.151)
EID	8.6507*** (24.398)				6.9321*** (18.1869)
FL		0.0367*** (0.241)			0.254*** (1.912)
CS			8.906*** (19.012)		5.309*** (10.609)
ROA				11.79*** (3.396)	6.487*** (2.094)
Total sample size	1015	1015	1015	1015	1015
Adj R2	0.5568	0.4781	0.5364	0.4573	0.6014

Figure 1 Impact of Environmental Protection Mechanism and Enterprise Management on Environmental Information Disclosure

Note: ***, **, * means that the level of 1%, 5%, 10% significant. Brackets for the t value.

4.3 The Impact of Enterprise Organizational Structure on Environmental Information Disclosure

As shown in the Figure (1), on the basis of the environmental protection mechanism acting on the information disclosure of the enterprise, the regression analysis on the disclosure of environmental information on the organizational structure of the enterprise is carried out and passed. In the Panel A2 EID as a dependent variable, EPM effect on the EID in the 1% level of the test results show that the environmental protection mechanism in the enterprise EID played a positive role; TOH role in the EID at 1% level test more effective, further it shows that the type of state-controlled shares helps to play an active role in the role of EID, which shows that state-owned shares can better fulfill corporate social responsibility and verify H2a assumption is reasonable. Through Panel B2 analysis, EPM effect on EID is obvious at 1% level test. At the same time, EID * IDR is significantly positive at 10% level, indicating that the proportion of independent directors is positively correlated with EID disclosure reliability, and the hypothesis of H2b is reasonable. Through Panel C2 analysis, the effect of EPM on EID was obvious at 1% level test, but the effect of EID * IA fitting was not obvious, indicating that the independence of authority from EID was less effective, that is: independence of authority and authority did not effectively promote the reliability of EID Enhance. H2c failed the test. In Panel D2, the effect of EPM on EID at 1% level was obvious, but EID * BSS did not fit well, indicating that the size of supervisor did not promote the reliability of EID. H2d failed to pass the test. At the same time H2e, H2d did not pass the test. In Panel E2, the effect of EPM on EID was obvious at 1% level test, but EID * EMR was not significant. This also shows that business management qualification does not

contribute to the enhancement of enterprise EID reliability, and H2e fails the test. The illustration of Panel F2 shows that EID * EYS is effective at the 1% level test. It also shows that the longer the senior management positions of a company, the more likely it is to have a high confidence EID disclosure. The conclusion is the opposite of the hypothetical H2f.

variable	Panel A2 EID	Panel B2 EID	Panel C2 EID	Panel D2 EID	Panel E2 EID	Panel F2 EID
constant	-105.946*** (-10.076)	-105.621*** (-10.076)	-107.18*** (-22.653)	-107.789***	-104.65*** (-9.08)	-106.08*** (-10.041)
EID	5.437*** (9.216)	5.249*** (4.568)	6.139*** (7.46)	6.982*** (18.316)	4.196*** (3.968)	6.816*** (17.683)
EID*TOH	2.381*** (3.462)					
EID*IDR		0.552* (1.864)				
EID*IA			0.928 (1.076)			
EID*BSS				0.126 (0.523)		
EID*EMR					2.784 (1.463)	
EID* EYS						10.824*** (4.976)
FL	0.251* (1.894)	0.243* (1.856)	0.248* (1.883)	0.249* (1.896)	0.310* (2.278)	0.247* (1.851)
CS	5.203* (10.504)	5.182*** (10.503)	5.201*** (10.510)	5.203*** (10.487)	6.762*** (9.346)	4.930*** (9.941)
ROA	6.736** (2.316)	6.362** (1.863)	6.486** (-10.09)	6.385** (2.089)	10.396** (2.556)	5.752* (1.887)
Total sample size	1015	1015	1015	1015	1015	1015
Adj R2	0.593	0.595	0.5916	0.592	0.597	0.596

Figure 2 Results of Regression Analysis on the Impact of Enterprise Management on EID

Note: ***, **, * means that the level of 1%, 5%, 10% significant. Brackets for the t value.

5. CONCLUSION

Based on the current normative system, this paper interprets the significant relationship between environmental protection mechanism and corporate environmental information disclosure. Draw the following conclusions: 1.State-controlled enterprises are more conducive to enterprises to follow the environmental protection mechanism and fulfill their social responsibilities. 2. In the organizational structure of an enterprise, the proportion of independent directors and their supervisors also have a greater impact on the disclosure of corporate environmental information.

In summary, China should pay attention to the innovation of the environmental protection system and the strengthening of the internal management of enterprises. Only when the two are developed together can we truly promote the disclosure of corporate environmental information.

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Numerical Extension Method Based on Hyper-chaos for Solving Planar Mechanism Synthesis

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Abstract: The problem about mechanism synthesis and approximate synthesis can be converted to nonlinear equations in order to find solutions, but it is very difficult to find all solutions because of the strong coupling of the nonlinear equations. Newton iterative method as an important technique to one dimension and multi-dimension is more sensitive to the initial value and has only a solution obtained. According to the problems of only one solution and sometimes no convergence during solving the nonlinear equations in Newton method and quasi-Newton method and based on numerical extension method, numerical extension method based on hyper-chaos for solving mechanism synthesis was proposed. This method uses the hyper-chaotic system to produce the initial point of the numerical extension method, and takes advantage of the characteristics of the chaotic sequence and the numerical extension method to find all the real solutions. The numerical example shows that the new method has some characteristics such as running in the initial value range, fast convergence and all real solution that be found out, and proves the correctness and validity. It provides a new approach to mechanism design.
Keywords: Chaotic motion; Newton iterative method; hyper-chaos system; Crank-slider mechanism; Mechanism synthesis

1. INTRODUCTION

There are many solutions in the problem about mechanism synthesis. How to obtain all size programs to meet the requirements of a given movement of the mechanism and how to prefer to these programs are important theoretical significance and practical significance. Generally, the mathematical model of mechanism synthesis is a large complex non-linear polynomial system. How to solve this system has been a research problem in the field of mechanism. Newton iterative method has second-order convergence and high performance, but this method is extremely sensitive to initial value. If the initial value selected is improper, the result is not easy to convergence more difficult and all solutions are more difficult to get. This problem has not been fully resolved until now, so it has been the research focus of many scholars [1, 2]. Sometimes this phenomenon that Newton iterative method with improper initial value is not easy to convergence is considered to be the arithmetic singularity or inevitable singularity. In fact, the reason of numerical instability is that NR method is a nonlinear discrete dynamical system where the chaos and fractal phenomena will be generated in the sensitive area. In the field of mechanism design, the chaos phenomena is considered to be incomprehensible to be at a loss what to do, or is regarded as random imagination to be ignore. The rapid development of chaos theory is one of the major achievements in the last century [3]. The international academic community generally considered that non-linear mathematics, nonlinear natural science, social science and their technological development are the mainstream in the 21st century, while chaos is the basic pattern of almost all sports phenomenon in nature. Chaos is called as a phenomenon seemingly irregular and similar to a random in a deterministic system. Chaos has many basic characteristics such as boundedness, ergodicity, intrinsic randomness, scaling, universality, fractal dimension, the positive Lyapunov exponent and unlimited broadband power spectrum sub-dimensional power spectrum. Lyapunov exponent is one of effective methods depicting the chaos specific property of nonlinear system. If one of Lyapunov exponents is positive, the system is chaotic, and if a system has two or more positive Lyapunov exponents, the system is hyper-chaotic. The more the number of the positive Lyapunov exponents, the higher the degree of instability in the system [4, 5]. The most essential characteristics of chaotic behavior is extreme sensitivity to initial conditions of the nonlinear system, and, the methods chaos-based just about make use of this behavior. It is important theoretical and practical significance that the chaotic and hyper-chaotic systems are used to calculate kinematics.

The chaos method can calculate all the real solutions within the scope of the real number, and it has high computational efficiency because of not seeking plural results. The method described in Ref. [6] considers that the points of Julia centralization in Newton iteration method will appear in the neighborhood where the Jacobian matrix of the equations is equal to zero. And this method is quite complex to solve the matrix. Chaotic sequence method is a new one, in which the initial point of

Newton iteration is generated using the chaotic and hyper-chaotic system and all the real solutions on the mechanism synthesis can be effectively solved [5-10]. When the solutions are not convergence using Newton method or quasi-Newton one, the mathematical programming method can be adopted [11, 12].

In this paper, based on the combination of hyper-chaos system and numerical extension method, numerical extension method based on hyper-chaos for solving mechanism synthesis and approximate synthesis was proposed. This method uses the hyper-chaotic system to produce the initial point of the numerical extension method, and takes advantage of the characteristics of the chaotic sequence and the numerical extension method to find all the real solutions. The numerical example in crank-slider mechanism shows that the new method has some characteristics such as running in the initial value range, fast convergence and all real solution that be found out, and proves the correctness and validity.It provides a new approach to mechanism design.

2. HÉNON HYPER-CHAOTIC SYSTEM

Lyapunov exponent is one of effective methods depicting the chaos specific property of nonlinear system, and the number of Lyapunov exponents is the same as the dimension n of the state space of the system. If one of Lyapunov exponents is positive, the system is chaotic. And if a system has two or more positive Lyapunov exponents, the system is hyper-chaotic. The more the number of the positive Lyapunov exponents, the higher the degree of instability in the system [4-5]. In general, if the systematic state variable number is more (for high dimension system, e.g. the discrete system, n>2), it probably appears the unsteady level is higher.

A general Hénon mapping was designed as follows [13].

$$\begin{Bmatrix} x_{1,k+1} \\ x_{i,k+1} \end{Bmatrix} = \begin{Bmatrix} a - x_{n_1-1,k}^2 - bx_{n_1,k} \\ x_{i-1,k} \end{Bmatrix} \tag{1}$$

where, $i = 2,3,\cdots,n_1$ expresses the dimension of the system, k is the discrete time, and a and b are adjustable parameters. When i=2, the above mapping is called as famous Hénon mapping. When fixed parameters a=1.76, b=0.1 and the dimensions vary from 2 to 10, after computing, it was found that with increasing n_1, the simple relation of the number n of the positive Lyapunov exponents with the system dimension n_1 is $n = n_1 - 1$ in Ref. [13], namely, when a system dimension is larger of two, the system is hyper-chaotic. For n>10, we also have done simulating study and also obtained the same result.

For example, $n_1 = 5$, we compiled program Matlab with time series method for solving Lyapunov exponents, and we obtained four positive Lyapunov exponents. When $n_1 = 13$, the simulating result is that the system has 12 positive Lyapunov exponents as shown in Figure 1.

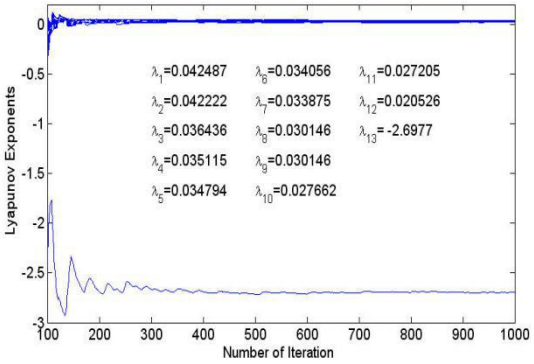

Figure 1 Lyapunov exponent of Henon maps with $n_1 = 13$

3. NUMERICAL EXTENSION METHOD

The nonlinear equations are set as:

$$\mathbf{F}(\mathbf{x}) = 0 \tag{2}$$

where,

$\mathbf{F}(\mathbf{x}) = [f_1(\mathbf{x}), f_2(\mathbf{x}), \cdots, f_n(\mathbf{x})]^{\mathrm{T}}, \mathbf{x} = [x_1, x_2, \cdots, x_n]^{\mathrm{T}}, \mathbf{x} \in \mathbf{R}^n$

In order to solve Eqs. (2), a parameter s is introduced, and Eqs. (2) are embedded in the parametric equations as $\mathbf{B}(\mathbf{x}, s) = 0$ to $\mathbf{B}(\mathbf{x}, 0) = \mathbf{F}(\mathbf{x}) - \mathbf{F}(\mathbf{x}^0)$ when $s = 0$ and $\mathbf{B}(\mathbf{x}, 1) = \mathbf{F}(\mathbf{x})$ when $s = 1$. There are a variety of forms in constructing parametric equations where one is as:

$$\mathbf{B}(\mathbf{x}, s) = \mathbf{F}(\mathbf{x}) + (s-1)\mathbf{F}(\mathbf{x}^0), s \in [0,1] \tag{3}$$

where, $\mathbf{x}^0$ is given. Supposed that there is a continuous solution $\mathbf{x} = \mathbf{x}(s)$ in $\mathbf{B}(\mathbf{x}, s) = 0$ for $s \in [0,1]$, the solutions of $\mathbf{F}(\mathbf{x}) = \mathbf{B}(\mathbf{x}, 1)$ are its two endpoints $\mathbf{x}^0 = \mathbf{x}(0)$ and $\mathbf{x}(1) = \mathbf{x}^1$ [14].

For $\mathbf{F}(\mathbf{x}) = 0$, the following iterative form can be established [15]:

$$\begin{cases} \mathbf{x}^{k+1} = \mathbf{x}^k - (\mathbf{F}'(\mathbf{x}))^k [\mathbf{F}(\mathbf{x}^k) - (1 - \frac{k}{N})\mathbf{F}(\mathbf{x}^0)] \ (k = 0,1,\cdots,N-1) \\ \mathbf{x}^{k+1} = \mathbf{x}^k - (\mathbf{F}'(\mathbf{x}))^k \mathbf{F}(\mathbf{x}^k) \ (k = N, N+1, \cdots) \end{cases} \tag{4}$$

Based on the above iterative form, *mulNumYT.m* is written in Matlab.

4. NUMERICAL EXTENSION METHOD BASED ON HYPER-CHAOS FOR SOLVING NONLINEAR EQUATIONS

Using the numerical extension method based on hyper-chaos, all solutions of nonlinear equations can be obtained. The calculation steps are as follows:

Step 1 Constructing the chaos set $x_0(i, j)$

according to Eq. (1), $i = 1,2,\cdots,n$ where n is the number of variables and is also the number of the positive Lyapunov exponents of Hyper-chaotic Hénon system, and $j = 1,2,\cdots,N$ where N is the length of chaos sets.

Step 2 Supposing that the variable interval of $x(i)$ is $[a(i),b(i)]$, the chaos set is mapped to the variable interval to generate the j th initial value of $x(i)$, that is, $x(i,j)$.

Step 3 $x(i,j)$ regarded as the initial value of the numerical extension method, Eq. (2) has been iterated j times, then all the solutions $\mathbf{x}^*$ are obtained.

5. Numerical example

The function synthesis in planar crank-slider mechanism is to design a crank-slider mechanism to make the slider displacement and the crank rotation angle meet a given function relationship. In Fig. 2, ϕ_{1j} is the relative angle when the crank turns from the first position to the j th position and s_{1j} is the relative displacement of the slider. The calculation steps solving the function synthesis are: first of all, determining the coordinates of A_1 and B_1 (A_{1x}, A_{1y}, B_{1x}, B_{1y}), and then, calculating the displacement of the slider (that is, B_1) s_{1j} when the crank OA_1 turns the angle ϕ_{1j}.

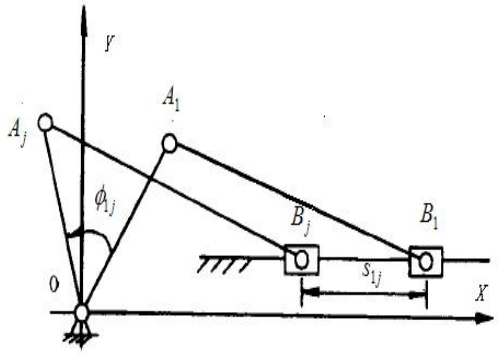

Figure 2 Planar crank-slide mechanism diagram

When the mechanism moves from the first position to the jth position, the coordinates of A_j and B_j can be obtained according to the following equations:

$$\begin{cases} A_{jx} = \cos\phi_{1j} A_{1x} - \sin\phi_{1j} A_{1y} \\ A_{1y} = \sin\phi_{1j} A_{1x} + \cos\phi_{1j} A_{1Y} \end{cases} \quad j = 2,3,\cdots,n \tag{5}$$

$$\begin{cases} B_{jx} = B_{1x} + s_{1j} \\ B_{jy} = B_{1y} \end{cases} \quad j = 2,3,\cdots,n \tag{6}$$

During the movement of the mechanism, the length of the link A_1B_1 is always the constant, so there is the following equation.

$$(C\phi_{1j}A_{1x} - S\phi_{1j}A_{1y} - B_{1x} - s_{1j})^2 + (S\phi_{1j}A_{1x} + C\phi_{1j}A_{1y} - B_{1y})^2 - (A_{1x} - B_{1x})^2 + (A_{1y} - B_{1y})^2 = 0 \tag{7}$$

where, C and S indicate cos and sin respectively.

Assumed $x_1 = A_{1x}$, $x_2 = A_{1y}$, $x_3 = B_{1x}$ and $x_4 = B_{1y}$, the integrated polynomial equation can be found after arranging.

$$\begin{aligned} f_{j-1}(\mathrm{x}) = {} & (-C\phi_{1j})X_1X_3 - S\phi_{1j}X_1X_4 - B_{1x}S\phi_{1j}X_2X_3 + (1 - C\phi_{1j})X_2X_4 - C\phi_{1j}s_{1j}X_1 \\ & + S\phi_{1j}s_{1j}X_2 + s_{1j}X_3 + s_{1j}^2 / 2 \end{aligned} \tag{8}$$

where, $j = 2,3,4,5$

Because Eq. (8) contains four design variables and $n-1$ equations, the biggest accurate number of the function synthesis in the crank-slider mechanism is 5.

Known the mechanism parameters: $\phi_{1j} = 70^\circ, 140^\circ, 210^\circ, 280^\circ$, and the corresponding displacements of the slider $s_{1j} = -20, -30, -10, 10$, all sizes of the mechanism can be found.By using the proposed method, run 2.53s to solve the results as Table 1.

Table 1. Results of the synthesis in planar crank-slider mechanism

No.	x(1)	x(2)	x(3)	x(4)
1	6.0897	9.0603	9.5236	-0.6218
2	-3.7800	12.5987	66.4764	65.0659
3	15.0628	5.8433	-42.2560	37.5875

6. CONCLUSIONS

Based on the combination of hyper-chaos system and numerical extension method, numerical extension method based on hyper-chaos for solving mechanism synthesis and approximate synthesis was proposed. This method uses the hyper-chaotic system to produce the initial point of the numerical extension method, and takes advantage of the characteristics of the chaotic sequence and the numerical extension method to find all the real solutions. The numerical example in crank-slider mechanism shows that the new method has some characteristics such as running in the initial value range, fast convergence and all real solutions that be found out, and proves the

correctness and validity. It provides a new method for mechanism synthesis and approximate synthesis and other strongly nonlinear equations.

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Debates On the Relationship Between Morality and Law

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Abstract: The relationship between morality and law has always been a core issue explored in the field of western modern jurisprudence. Whether morality and law have essential connection or not, the school of the natural law believes that morality and law have substantial connection. The natural law is essentially a moral law. Rationality is the basis of natural law, and that the law of reason is the law of nature. The school of positivism emphasizes that the foundation of legislation should be the personal and community interest, caring for the actual experience of life, advocating the separation of law and morality and denying the necessary connection between law and morality.

The controversy over the evil law and the good law between the natural law and positive law lasted for centuries. In a sense, the result of repeated controversies between the two schools of thought is not that each of them has strengthened its extremes in its own theory, but rather the development and deepening of certain consensus between the two schools, starts gradually moving closer to each other on the common ideas and values basis. This is a noteworthy, perhaps also deserved development trend.

Key words: Morality; Law; Natural law; Positive law; Trend

Morality is the sum of a special code of conduct that regulates the relationship between people. It is based on the evaluation of good and evil, and is mainly maintained and made to play a role through social public opinion, traditional customs and inner beliefs. Law as a special social norms is formulated or recognized by the state and relies on national coercive force to ensure the implementation. It is the basic rule that a country and society carry out social management, maintain social order and regulate people's life. But also it is the universal norms that must be followed for a common life of people in a society and a country during a certain historical period, which have the functions of prediction, coercion, punishment and deterrence, and have multiple functions such as political rule, social management and cultural transmission. Both morality and law have the function of regulating people's behavior and maintaining social order, and have the function of restraining members of society. However, the inherent requirements and manifestations of the restraining effect of the two are different, and the actors have different consequences after violating the two kinds of norms.

The relationship between morality and law has always been a core issue explored in the field of western modern jurisprudence. It is also focus problem debating and opposing each other for a long time by the two major schools having huge influence in the history of the development of western legal philosophy-- the natural law school and the positivist law school. In terms of the basic ideas of the two major theoretical factions, the theory of natural law is based on the dualism of metaphysics of real law and natural law, advocating that objective moral truth can be found through natural reason and that moral truth should be the criterion for evaluating the effectiveness of real law, that is, ethical real law is "real law."

1. Point of View of Natural Law

The main point of the school of natural law is that law is essentially an objective regular pattern based on objective regular pattern. Everything is governed by the regular pattern, which is the rule and order in which the universe, nature, and human society exist and are maintained, and is a unified order that exists and is established prior to nature and human society. The rule and order is the law of nature. The law of nature is also called "reason." The natural law is essentially a moral law. It is the basis of law and justice. It is not only the principle basis for making law, but also the value standard for evaluating law.

The origin of natural law dates back to ancient Greece. Plato, the ancient Greek philosopher, believed that law is the command and crystallization of reason and the embodiment of all morality. Aristotle considered law as the embodiment of reason and justice. Thomas Aquinas believed that law belongs to the virtue of reason. Later, natural law, as a more explicit concept and object of academic construction, began with the Stoics.

The Stoics believed that the universe is a whole unity, and there exists a universal law governing and maintaining everything. Human and human beings are part of the universe and subject to this universal law. The universal law is " the Natural law ", that is," rational. " Reason is the universal law governing human society and the highest standard of human behavior. Under the rational control, all people can live together in an equal, harmonious and natural way. Natural law is rational. It is a criterion for judging good and evil and right and wrong and the foundation

of law and justice.Krishna, the chief representative of the Stoics, revealed the ideological thrust of the law of nature of the Stoic: "The main goodness is living in a manner that is submissive to nature, which means obeying one's own nature and obeying universal nature. Do not do the things commonly prohibited by the common law of mankind. The common law is identical with the correct rationality of popularizing all things. "The Stoics first proposed the basic propositions that nature is rationality and the natural law is the foundation of law and justice, equating reason with nature, integrating reason with law and justice, and introducing the natural law into the field of social politics from the realm of nature.

Later, the ancient Rome politician Jurist Cicero gave a systematic demonstration of the relationship between nature, reason, justice and law. Cicero argued: "Man and God have the same virtue, and any other kind of creature does not have it. This virtue is nothing but the nature achieving perfection and going into the highest realm." "The true law is the correct rule, which is consistent with nature, applies to all people, and is stable and long-lasting. An eternal and immutable law will apply to all peoples, and will be applicable to all ages. "Nature gives rationality. Reason comes from nature. Law is the product of rational development. Reason is the basis of law and justice, and law is the right reason.

At the time of the theory of classical natural law in modern times, no matter Enlightenment thinkers such as Clausius, Prudhoefe, Hobbes, Spinoza, Locke, Montesquieu, Rousseau, they started from the need of opposing feudal rule and religious theology and establishing a new capitalist order, and held high the banner of "freedom", "equality", "natural law" and "natural rights". The natural law had become an important ideological weapon in the struggle of the emerging bourgeoisie to overthrow the feudal oppression.

Classical natural jurists generally believed that natural law is the source of human law and has the highest authority. Natural law is discovered and recognized through human reason. Human rationality is the basis and foundation for the emergence and existence of the state and the law. Before the emergence of the state, mankind was living in a natural state under the control of natural law. Later, People entered into contracts, established the state, and enacted laws under the rational demands. The natural law theory of this period broadened the scope of application of natural law, emphasizing the rational basis of natural law, with the rational features such as rationalism, individualism, decentralization and social contract.

With the establishment of a new world order after World War II, new conflicts continued to emerge in society and required judgment on new phenomena and values. At the same time, people were not only rethinking the trauma of war, but also realized that the irrationality of positive law blindly pursues legal forms, which eliminates all moral and spiritual considerations, there are disputes over the handling of many post-war cases and the application of law under wartime conditions. However, the moral principles of rationality, equality and justice, which are consistently emphasized by natural law, are full of humanitarian spirit and arouse people's attention again.

In this context, new natural law rose and was represented by Fuller, Rawls, Dworkin. Fuller believed that the real law can’t be separated from morality, and the law is not only a tool and means, but also should be used as a guide, and this purpose is the morality of the law. Fuller divided the law into external morality and internal morality. External morality refers to the substantive goals of equality, fairness and justice that the law pursues and achieves. Inner moral means that the law must also be premised on a series of legal principles.

Another new natural law scientist, Dworkin, in his masterpiece Serious View of Rights, pointed out that right is a "moral claim" for protection and can be both legal and moral or political right, and moral or political right, is also a natural right. He stressed that if the government does not take the rights seriously, then it can’t take the law seriously. The government must protect individual rights and everyone has an inalienable moral right. When the court is handling the case, the decision on the protection of individual rights should be based on generally accepted moral principles. Dworkin also pointed out that the rules, principles, policies and other elements constitute the law. In particular, he emphasized the status of principles, many of which are the requirements of justice and fairness and are moral principles.

These thoughts and viewpoints of the school of natural law have always occupied an important historical position in the history of western legal philosophy. From the perspective of these typical natural jurists, although they have different understandings of the laws of reason, they regard rationality as the basis of natural law, and that the law of reason is the law of nature. The real law originates from the natural law. The moral rationality is the ultimate source of legal legitimacy. The law has a dependency on morality.However, when law gradually develops into an independent discipline, the theory that law is attached to morality shows its flaws, and that law is moral, equivalent to morality, the law is the vassal of morality and losing its own independent character and the supremacy of authority, gives the impression that the development of law is not independent at all.In addition, this theory has also begun to be questioned and criticized in various fields. If the law's legitimacy comes from the moral rationality, on the one hand, it will make people mistakenly believe that the laws promulgated and implemented today are all in conformity with moral

and just laws, so that people will lose their confidence in criticizing the existing laws and blindly support the existing legal order, and thus the effectiveness of morality as a weapon of law criticism will be undermined, and that will be not conducive to the development and improvement of the legal system itself. On the other hand, that will also make people refuse to obey and abide by existing laws that are unethical, resulting in chaos in the social order and even anarchy.

2. Point of View of Positive Law

Since the beginning of the 19th century, with the gradual rise of positive law the thought of natural law declined at one time. In the first half of the 19th century, Britain and France successively completed the industrial revolution. Other Western European countries also carried out the bourgeois revolution and established the bourgeois regime. Natural law, an important weapon used by the bourgeoisie to overthrow the feudal landlord class, now targeted the bourgeoisie itself. The bourgeoisie urgently needed to create a new theory to replace the theory of natural law and safeguard its own power and dominance. In addition, the incompleteness of the bourgeois revolution had left behind some old and outdated legal systems, and the struggle among the various factions within the bourgeoisie had made the bourgeois laws disorderly and contradictory, resulting in difficulties and confusion of the application of legal alternatives.

It is under such conditions that positive law sought to liberate the law from the doctrine of natural law, and turned the research on “the supposed problem” of the natural law, that is, what law should be, that the law should be based on the moral principle of justice or rationality to the "real issue" for the study of law, that is, the existing law that exists in reality, emphasizing that the foundation of legislation should be the personal and community interest, caring for the actual experience of life, according to logical reasoning to determine the applicable law, advocating the separation of law and morality and denying the necessary connection between law and morality.

Bentham, the utilitarian, strongly opposed classical natural law, arguing that natural law is an exaggerated nonsense, a form of fiction, a speculation, a purely logical illusion, and "nonsense in high fever." He also strongly advocated the separation of the actual law from the due law, that is, the separation of law and morality. He held that the purpose of legislation is to safeguard the interests of citizens and ensure the survival, safety, equality and affluence of citizens rather than to defend the abstract justice called by the natural law.

Austin, the founder of the school of analytical positive law, inherited and developed Bentham's thinking. He didn’t deny that the development of law is deeply influenced by morality. He also admitted that many norms originate from morality, but he insisted that morality and law do not exist necessary links and must not introduce moral elements in determining the nature of the law. In the book "The Scope of Jurisprudence," he proposed the famous "Evil Laws are Laws," that is, "jurisprudence studies the law of real or strict title, regardless of whether it is good or bad." " The existence of law is one thing, its advantages and disadvantages are another matter." That is, a statute that is promulgated in an appropriate manner is also valid even if it is morally evil.

Kelsen, the pure legal representative, proceeded from positivism and held that "the concept of law has no moral meaning." As a scientific issue, legal issues are social and technical issues. They should adopt a completely scientific attitudes and methods to purely discuss and analyze the actual law from the structure, that is, the real law formulated by the state, rather than explaining psychologically or economically its conditions or evaluating its purpose morally or politically, excluding all moral and spiritual considerations, and there is no connection between law and morality.

After World War II, Hart as the representative of the new analytical law inherited the basic point of view of positive law, strictly distinguished between "actual law" and "due law", focused on the logic analysis of the real law without making the relevant value judgments. However, at the same time, on the issue of law and morality, Hart proposed a new proposition of "the natural law of minimum content", acknowledged “the existence of the unquestionable connection between law and morality” and moved closer to the natural law. Nevertheless, Hart still believed that the connection between law and morality in fact is not inevitable, and there is no logical and conceptual connection between law and morality.

The emergence of positive law is a profound change in the history of western legal philosophy in modern times, which has led to the relentless criticism and strong challenge to natural law philosophy and its principles of justice, which lasted for more than ten centuries. Positive law advocates the applicability of the law, which has positive significance to maintain the legal independent character, improve the technical and operational nature of the law. But its flaws are obvious.Positive law denies the essential link between law and morality. The view of “evil law are also law” is bound to weaken the moral foundation of law, especially in today's complex society. And the law that there is no ethical factor that only allows people to include the list of "evil laws", which leads people not to obey and comply with it. If so, such a law is ineffectual. Furthermore, the making of a law requires moral penetration and maintenance. When the law can’t even guarantee the moral principles, even if it violates the mainstream moral feelings, such laws can’t be implemented practically any more. They can only stay in writing and can’t stand the test

of reality.

3. The Fusion Trend of Natural Law and Positive Law

The controversy over the evil law and the good law between natural law and positive law lasted for centuries. In a sense, the result of repeated controversies between the two schools of thought is not that each of them has strengthened its extremes in its own theory, but rather the development and deepening of certain consensus between the two schools, starts gradually moving closer to each other on the common ideas and values basis. This is a noteworthy, perhaps also deserved development trend.

This trend of getting closer together makes people understand that in the current era of diversified values and social compatibility, the development of law, even if it is an independent discipline, still covers morality and has the necessary moral rationality. Positivism jurists acknowledge the existence of principles and values behind the rules of law. In fact, positive law has gone through such processes from Austin, Kelsen to Hart and then to Radbruch. Obviously, it is a process moving closer to natural law over the relationship between morality and law. Positivists admit that in the process of the application of the law of positive reality, some moral principles or standards need to be given guidance. Only in this way can the real law be better applied, implemented in social life or legal practice. Similarly, the nature law jurists are increasingly considering the political aspects of law. Since moral standards or principles contain the moral obligation to uphold the legal order, it is inevitable that the natural law considers the political factor, which reflects the interaction and fusion of natural law and positive law.

The disagreements on the major issues between contemporary western natural law theory and positive law have been weakened more and more and consensus has been reached on many issues. Some jurists' theories are in between, making it hard to distinguish them from being positive law or natural law. "Typical" naturalistic theorists and positivists have been hard-pressed to find in contemporary jurisprudence. Of course, we can’t say that these issues are irrelevant to the controversy between classical natural law theory and positive law. Many legal problems in reality still involve the relationship between law and morality. However, this turn shows at least that the integration of natural law and positive law is a fact and trend that we can’t ignore.

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Evaluation Model of Flexibility in Reconfigurable Manufacturing System

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Abstrct: Appling the method of stochastic dynamic programming, flexibility of reconfigurable manufacturing system stochastic dynamic programming quantitative evaluation model is build in a manufacturing cycle, to calculate the optimal revenue of reconfigurable manufacturing system and rigid manufacturing system. Finally, using the difference method to determine the flexibility degree of the manufacturing system, so as to provide reference for the system expected investment.
Keywords: reconfigurable manufacturing system; flexibility; dynamic programming; evaluation

INTRODUCTION

Under the background of today's global economic integration, manufacturing enterprises are faced with multiple pressures to improve product quality, reduce product cost and respond promptly to market demand. In this severe situation, it is of great significance for enterprises to improve the flexibility of the manufacturing system to promote the competitive advantage. Under this background, Reconfigurable Manufacturing System (RMS) emerges as the times require. It takes account of the advantages of rigid manufacturing system and flexible manufacturing system, and is the best manufacturing system to meet the mass customization requirements. The reconfigurable manufacturing system has high flexibility. It is a reconfigurable modern manufacturing system, and it can respond to customer needs in a rapid way with low resource cost.

The existing evaluation index system mostly refers to the evaluation of the overall flexibility of the enterprise, or the evaluation of the flexible manufacturing system, but it lacks the flexibility evaluation of the reconfigurable manufacturing system. Based on the theory of operational research, this paper studies the operation process of reconfigurable manufacturing system in manufacturing enterprises, and establishes a flexible evaluation model that matches with the manufacturing process.

1 A REVIEW OF RELATED REASEARCH

The reconfigurable manufacturing system was initially introduced by Koren [1], as an intermediate production concept in between traditional dedicated manufacturing lines and flexible manufacturing systems.

Sheng Bohao[2] believes that RMS is a such manufacturing system that able to change according to market demand, through the reconfiguration, reuse and update the system configuration or the subsystem, realize the system short development cycle, low cost and high reconstruction quality and investment benefit, can quickly adjust the variable manufacturing process, production capacity and production function. Zhao Zhongmin [3] thinks that the reconfigurable manufacturing system is to respond to the sudden change of market or uncertain demand, and quickly adjust the production capacity and production function of a part group, in order to rapidly change the system structure and software components.

In the research of manufacturing flexible measurement methods, Yao [4] proposed a measurement model based on entropy theory for working path flexibility. Barad and Sipper[5] believe that the flexibility of the manufacturing system can be estimated by the time required by the system to adapt to the changes. Yang Jingmei [6] reviews the measurement standards and measurement methods of flexible measurement.

2 CONSTRUCTION OF FLEXIBILITY OF QUANTITATIVE EVALUATION MODEL IN RMS

The characteristics of reconfigurable manufacturing system change with time, making quantitative evaluation of system more difficult. Therefore, we must establish a dynamic stochastic model that can show its connotation. Because there are many uncertainties affecting factors, this paper mainly discusses the uncertainty caused by the change of demand. By using the method of stochastic dynamic programming, to establishing a quantitative evaluation model for RMS flexibility in a manufacturing cycle.

Hypothetical conditions for quantitative evaluation of system flexibility:

(1) Suppose that the production cycle is the time from the completion of the last batch of jobs to the completion time of the next batch, and the two kinds of workpieces are different.

(2) Suppose that there is no mechanical failure in the whole manufacturing process.

The stochastic dynamic programming model for evaluating the flexibility of RMS is as follows:

(1) Determination stage: the enterprise is going to process the T stages;

(2) The setting of state variables and decision variables:

At the end of the t phase, the processing work in

phase t is finished and the processing work in phase t +1 is started. At the end of phase t, the output of a known customer demand for i is $d_i(t)$, that is, $N_i(t) = d_i(t)$; It is assumed that the output of the j workpiece is $x_j(t)$, the results can be obtained:

The state variables $s_t = (x_i(t), d_i(t))$, a set of states that can be reached $S_t = \{x_j(t), d_t(t)\}$, $i, j = 1, 2, ..., n$, $x_j(t) = 1, 2, \ldots, M_j$, $d_i(t) = 1, 2, \ldots, D_j$.

At the end of phase t, it is necessary to make decisions on the production of phase t +1, allowing the collection to be as follows:

$D_t(S_t) = \{x_i(t+1)\}$, $i = 1, 2, ..., n$, $x_i = 1, 2, \ldots, D_j$.

If decision variables $U_t(S_t) = x_i(t+1)$, the decision made is that production of the i workpieces in the $t+1$ stage is $x_i(t+1)$.

Here, M_i is the upper limit of the output of the various workpieces at each stage, and M_i takes the integer; D_i is the upper limit of the requirement of the various workpieces at each stage, and D_i takes the integer, and $D_i \le M_i$; $x_i(t)$ is the output of the i workpiece; $d_j(t)$ is the customer's demand for the j workpiece; $N_j(t)$ is the customer's demand for the j workpiece at the end of phase t, $N_j(t) = 1, 2, \ldots, D_i$, $d_i(t) \in [1, D_i]$, $d_i(t)$ takes the integer, $i = 1, 2, ..., n$.

(3) decision-making process

Due to the assumption that the initial state of the model is given, the inverse method is chosen to obtain the results:

$$F(0, x_i(0), d_j(0)) = \max_{\substack{i=1,\ldots,n \\ x_i(1)=1,\ldots,M_i}} \{EF(1, x_i(1), d_j(1))\};$$

F is the optimal benefit value of the manufacturing system at the whole processing stage.

By using the stochastic dynamic programming model built above, we can get the optimal value F_r of RMS in the whole processing stage when the external conditions such as demand are constantly changing. At the same time, the rigid optimal profit value F_d of the manufacturing system can be calculated, that is, the optimal profit value of the system under the assumption that the demand and other external conditions are constant. Finally, the difference ΔF of the two can be defined as the flexible value of the RMS:

$\Delta F = F_r - F_d$

3 CONCLUSION

This paper applies the method of stochastic dynamic programming, constructed the evaluation model to evaluate the flexibility of the reconfigurable manufacturing system. To calculate the optimal profit value of reconfigurable manufacturing system and rigid manufacturing system, finally, using the difference method to determine the flexible degree of reconfigurable manufacturing system. The next research focus on the comparison and optimization of flexible value, that is to determine the optimal flexibility value range.

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Simulation Research of Conducted Emission on Motor Controller

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Abstract: Conducted emission testing is an essential part of electromagnetic compatibility (EMC) testing. It is focus on the emission in the low frequency band of the product or device. Conducted emission included conducted emission voltage method (CEV) and conducted emission current method (CEI), this paper just take CEI account. CEI test needs the tested harness to keep through the current probe, the current probe can get the interference current, and transmit it to receiver by coaxial cable, the receiver changes interference current to electromagnetic energy, and display it on the screen. According to an actual project, this paper shows the results of the theoretical analysis, simulation analysis by Saber, and the finally verification in the certificated laboratory. The fact shows the simulation can not only display the result of the theoretical analysis directly, but also forecast the debug test results, it provides a reference method for EMC debug in the future.
Keywords: EMC, CEI,Simulation

1. PROBLEM DESCRIPTION

CEI test set up of motor controller was shown in Fig.1.According to the standard of OEM, all the wiring harness need to be done, every harness of power (KL30, KL15) and GND also need to be test separately.The result of KL15 (Pin42) was the worst.The test values of average (AVG) and quasi-peakare over the limit on 1 MHz

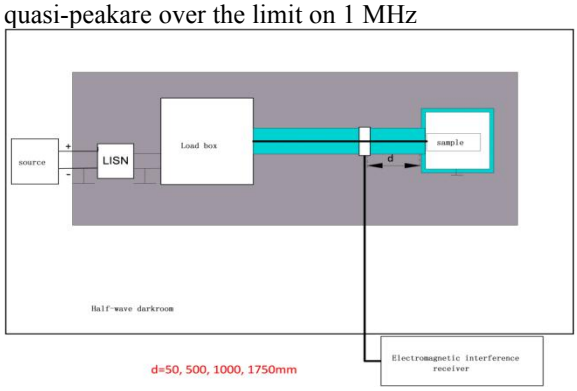

Figure 1.CEI test set up

2. ANALYSIS OF PROBLEMS

KL15 is directly connected the LISN, and LISN has a filter function, so the interference is not come from the power supply. If the interference is not from the external power supply, is it from the internal circuit? The internal circuit of the controller is shown in Fig.2.

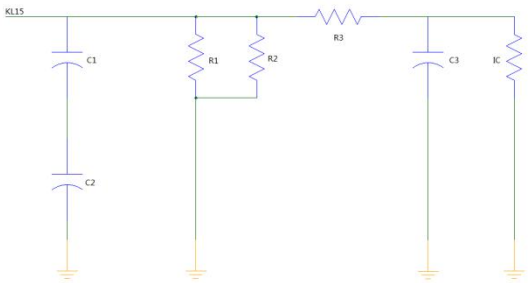

Figure 2 KL15 schematic diagram

There is no obvious radiation source in the circuit. A 10Kohm resistance is between the chip and the connector. So the interference on the wiring harness should not come from the chip. Where does the interference come from? This is the motor controller, so the interference may come from the PCB. How can the interference on the ground line reach the power line such as KL15? The absolute insulation of the power line and the ground wire is for DC. It can be conductive to a certain frequency or even high frequency signal (the absolute value of the signal is small, and it doesn't affect the insulation performance).[1]Based on Fig.2, it is easy to find. The most possible path of interferencebetween the KL15 and ground is C1 and C2, the values of both C1 and C2 are 22nF. If the analysis is right, changed the ESD capacitance, the interference of KL15 should be changed, in order to verify it, this paper makes a simulation analysis of the circuit.

3. SIMULATION MODELING

Reference to the actual circuit,the simulation circuit is shown in Fig.3.In order to simplify the model, a white noise source is used directly on the ground to replace the disturbance on the ground caused by the unstable condition of the motor .There are three reasons for this:

1) The test system's motor is in an unstable condition and it is difficult to express its interference signal with a fixed noise source.

2) The white noise source is equivalent to the addition of noise in all frequency bands, so that we can easily see which frequency bands have EMC problems.

3) The frequency of ground interference is uncertain, but the interference is detected and two factors must be met at the same time, one factor is the interference of the frequency band on the ground,another factor is

that the filter is bad in this frequency band

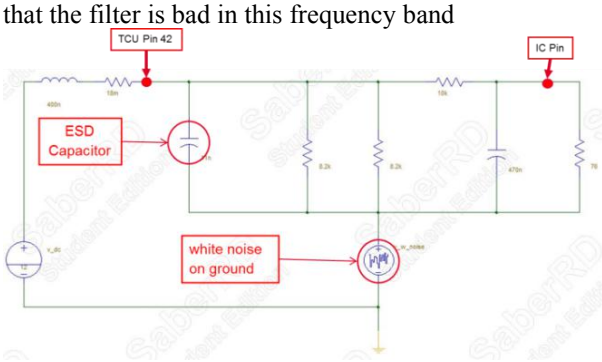

Figure 3Simulation circuit

After building simulation model, the circuit is simulated in the frequency range of 100kHz-1GHz, and the results are shown in Fig.4.

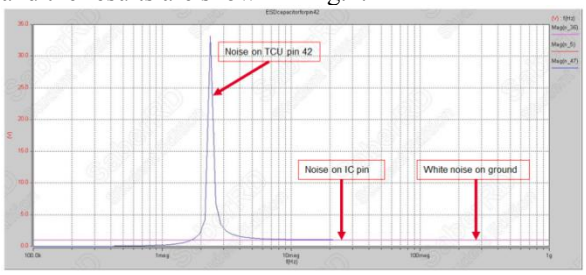

Figure 4 Pre-improved results

In Fig.4, the interference intensity at 2MHz is obviously stronger than other frequency range. This indicates that the circuit has transmitted the ground interference to the port at this frequency band, which is consistent with the fact that the 500kHz-1.8MHz conduction radiation is stronger than the actual test.

According to the previous theoretical analysis, the port on the interference may be from the ground, the reason is the instability of multiple motors, resulting in ground potential instability, that there is the ground above the interference, part of the interference by adding the port impedance and lower ESD capacitance spread to the KL15 traces and is transmitted through the port to the harness, measured by the current probe, causing the CEI to exceed its limit.Obviously, it is difficult to improve the EMC of the system from the interference source (the model of the motor and its operating conditions are specified by the customer). In order to reduce the interference on the wiring harness, it is necessary to solve the problem of the interference path. Interference between the 500kHz and 1.8MHz can pass through the capacitor, apparently due to the larger capacitance of the 22nF capacitor and the lower impedance in the low frequency range (as shown in Fig.5), even considering two capacitors in series, the impedance is not enough to change the magnitude of the impedance of the band.[2] The initial conclusion is that the pF capacitor should be able to block the conducted interference in this frequency band from 500kHz to 1.8MHz. The common 2pF capacitor is selected here for verification. The impedance curve of the 2pF capacitor is shown in Fig.6, where it can be seen that the impedance increases by two orders of magnitude in the 500kHz-1.8MHz band. If the true interference propagates through this path, the theoretical conducted interference will vary significantly. In order to unify the change of impedance into the change of conducted interference,the ESD capacitances of C1 and C2 is changed to 2pF. The simulation result is shown in Fig.7.

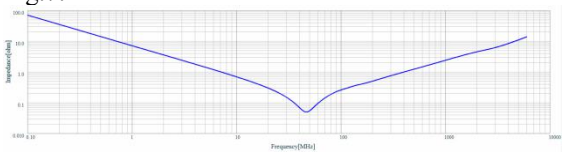

Figure 5 22nF capacitor impedance curve

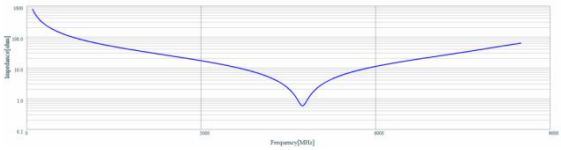

Figure 6 2pF capacitor impedance curve

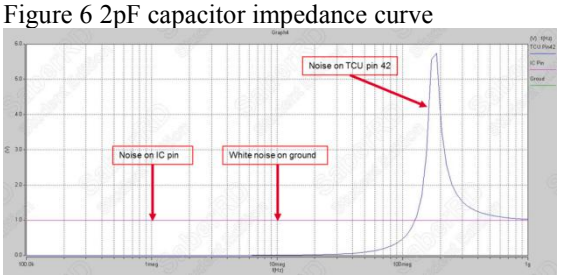

Figure 7 ESD capacitance to 2pF simulation results

Fig.7 shows that there is almost no interference in the frequency band of 500kHz-1.8MHz. Although there is some interference in the high frequency, the intensity is much lower than the original interference strength. The simulation result well supports the previous theoretical analysis. Through theoretical analysis and simulation verification, the conclusion is, changing the ESD capacitance to 2pF can effectively reduce the interference in the frequency band of 500kHz-1.8MHz. However, in actual projects, it is impossible to use such a small capacitor because the port circuit needs a capacitor to prevent the destruction of ESD. This kind of capacitor can not withstand the ESD test of several thousand volts, so it need to search for other component to replace this electric capacity with two conditions at the same time:

1)Small capacitance (pF level).

2)Can withstand a certain level of ESD (the project requires 8KV).

Based on the above conditions, the conclusion got from the analysis is that the most suitable component is TVS. As shown in Fig. 8, the junction capacitance of TVS is 13pF. Simulation circuit is shown in Figure 3,C1 and C2 are be changed to TVS,the simulation result is shown in Fig.9.

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse stand-off voltage					
	PESD1LIN (15 V)		-	-	15	V
	PESD1LIN (24 V)		-	-	24	V
I_{RM}	reverse leakage current					
	PESD1LIN (15 V)	V_{RWM} = 15 V	-	< 1	50	nA
	PESD1LIN (24 V)	V_{RWM} = 24 V	-	< 1	50	nA
$V_{(BR)}$	breakdown voltage	I_R = 5 mA				
	PESD1LIN (15 V)		17.1	18.9	20.3	V
	PESD1LIN (24 V)		25.4	27.8	30.3	V
C_d	diode capacitance	V_R = 0 V; f = 1 MHz	-	13	17	pF
$V_{(CL)R}$	clamping voltage	[1]				
	PESD1LIN (15 V)	I_{PP} = 1 A	-	-	25	V
		I_{PP} = 5 A	-	-	44	V
	PESD1LIN (24 V)	I_{PP} = 1 A	-	-	40	V
		I_{PP} = 3 A	-	-	70	V
r_{dif}	differential resistance					
	PESD1LIN (15 V)	I_R = 1 mA	-	-	225	Ω
	PESD1LIN (24 V)	I_R = 1 mA	-	-	300	Ω

Figure 8 TVS tube (PESD1LIN) parameter table

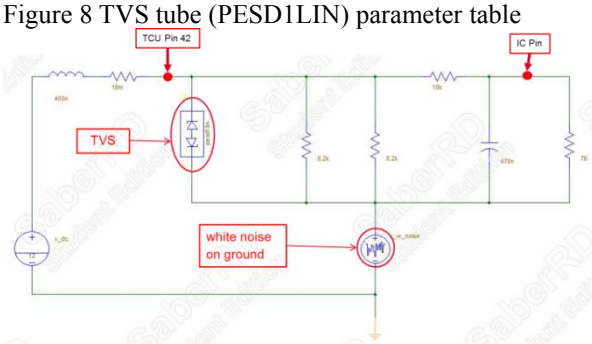

Figure 9 ESD capacitor to TVS tube simulation circuit

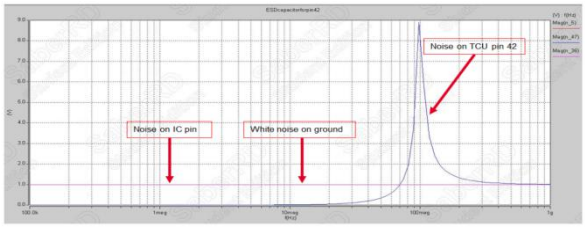

Figure10ESD capacitor to TVS tube simulation results

The simulation result of changing the ESD capacitor to TVS is similar to the simulation result of changing the ESD capacitance to 2pF. There is no obvious interference in the frequency band of 500kHz-1.8MHz ,onlysmall interference in the high frequency band. As shown in Fig.11.Becausethe measurement results of high frequency band interference are far below the limit value,the effect of interference on high frequency is not too big.

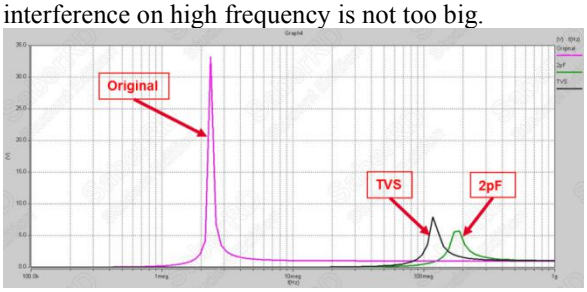

Figure 11 Simulation results of three configurations

4. TEST VERIFICATION

Theoretical analysis and simulation results show that changing the ESD capacitance of the port to 2pF or TVS will solve the problembetween the 500kHz and 1.8MHz,the following are tested to verify. There are three samples prepared for thetest(Normal sample, ESD capacitanceschanged to 2pF and ESD capacitanceschanged to TVS).The test results are shown in Fig.12 to 14.

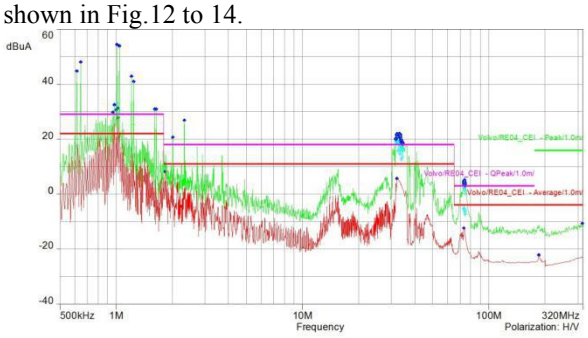

Figure12 CEI test results of normal sample

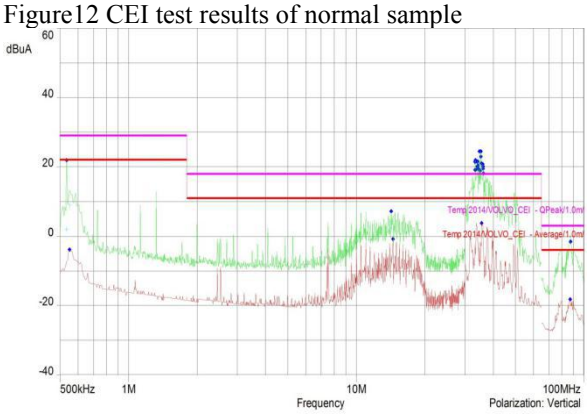

Figure13 CEI test result with 2pF ESD capacitances

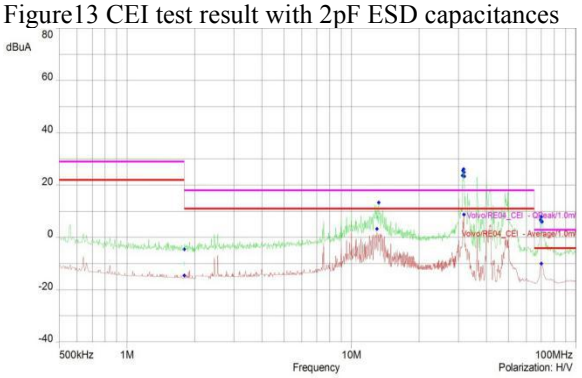

Figure 14 CEI test result of TVS

It can be found from the test results above, either pF levelcapacitances or TVS can effectively reduce the interference rang form 500kHz to 1.8MHz.Although the measured value in the high frequency band isincreased, it also meet the requirement of standard.The measurement results coincide with the simulation conclusions.

5. CONCLUSION

Low frequency conducted interference test is the lowest pass test in automotive electronic products, when the conditions can not be changed and the basic design of the printed circuit board isfixed,it is very difficult to decreaseconducted interference of low-frequency.

In this paper, through the analysis of the circuit, the propagation path of the interference is determined, then it is verified by simulation that the original design has strong interference at low frequency. A solution to reduce the low frequency interference is

proposed. Simulation and test show that the proposed solution can effectively reduce the interference of low frequency band. However, decreasedthe value of capacitance may affect the ESD performance of the product. Considering the low frequency conduction performance and the ESD performance of the product, the bigger value of the original circuit capacitance is replaced by TVS.After the simulation analysis and the final experimental verification, the solution can effectively reduce the low-frequency conducted interference.In this paper,simulation is used to solve the problem of low-frequency conducted interference, The simulation has a good effect on the verification theory and the guidance of the modification.

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The Importance of Regional Activity in Kindergarten

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Abstract:The regional activity provides the children with development by means of exhibiting a variety of objects that facilitate their recognition ability and triggering their sentiment,personality,sociability and other traits.Operating and playing with the materials within each regions enable the children to extend their active study ability.The setting of regional activity is designed in the aims of satisfying their needs in exploration,communication,cognition and corporation to realize their curiosity for knowledge.Hence,positive and efficient regional activity plays a tremendously crucial role in the growth of the children.
Keywords:Kindergarten;Regional activity;Children

INTRODUCTION

Regional activity in kindergarten is profoundly favoured by the children for it resorts to different kinds of materials that thoroughly meet kids' multiple needs in games,recreation,studying and interaction with each other.When engaging in this type of both mentally and physically palatable environment,children can manage to indulge themselves into exploring,discovering and thus mastering sundry techniques.Regional activity in kindergarten not only manifests the idea of"Kindergarten educational guidance outline",but also depicts the humanism spirit and the human oriented ideology in preschool education .Additionally,it also shows full respect to the education concept of "child-focused".

1. The setting principle of regional activity in kindergarten

1.1 FOCUS ON ENJOYMENT

"To all,only love is the best teacher."is remarked by Albert Einstein.Indeed,physical and mental development of the children determines the limitation of how long they can attach attention on the class.Therefore,the tedious cramming education system may hamper their interest in studying.So one of the goals to set up regional activity for the preschool education is to enable the children to learn in recreation and experience joy from within.With that being said,enjoyment is the first and foremost principle to launch this kind of activity for it can trigger children's curiosity in various materials and hence boost their sensory cognition,cognitive skills and passion for grasping knowledge when they sense the joy of learning.

1.2 THE DIVERSITY OF ACTIVITY

The law of children's physical and mental development decides the limited time of them retaining interest in objects.In order to better enlarge their vision,the establishment of region activity in the kindergarten should follow the rule of diversity.Regional activity in kindergarten shares the same feature as the saying goes by Lu Xun, "Learning is like the bees gathering honey,sticking to one point only and then the harvest is limited."No matter how delicious the desert is,constant tasting may bore the people and repetition of sole type of activity may debase kids' interest,so for the purpose of continuously galvanizing their interesting and avoiding dull and repeated learning contents,diversity should be aimed to strive for when setting up the regional activity.

1.3 FOCUSING ON TEACHERS' GUIDANCE

The accountability that teachers undertake during the learning progress of the kids is not only restricted to inculcate them with knowledge but also guide them correctly.Initially,the children cannot clearly and purposefully discover various function of the materials.Owing to that,it's crucial for teachers to act as guides,leading the children fathom the the usage and function of the materials and subsequently attain divergent thinking mode and possess multiple utilization of the materials.

1.4 THE RATIONALITY OF REGIONAL ACTIVITY

In accordance to the law of children's physical and mental development,in terms of the kids age from three to six years old,the degree of difficulty of regional activity that they can handle with is limited.Consequently,as for deciding the difficulty of the regional activity,we should lay emphasis on whether it matches the law of their physical and mental development and then gradually boost up the difficulty throughout their growth from the primary grade to senior grade.By doing so,kids' recognition towards physical objects and theoretical knowledge is galvanized to develop in depth and width.

1.5 THE FLEXIBLE EVALUATION OF REGIONAL ACTIVITY

As Shakespeare once remarked "There are a thousand Hamlets in a thousand people's eyes."As a result,the disparities in the perspectives we adopt to view differentiate the outcomes. Chinese ancestors also put forward the idea"A reward wins over thousand times of critics for a child."Hence,when it comes to evaluate the varied outcome of the regional activity

that kids take part in,the evaluation criterion shouldn't be sole thus hindering their radiant thinking,but of a type which is elastic and flexible.

2. THE MEANINGFULNESS OF KINDERGARTEN REGIONAL ACTIVITY TO CHILDREN'S GROWTH

2.1 UPGRADING THE MANUAL ABILITY OF THE KIDS

The wisdom of the kids can be observed on their fingertips.Psychologists point out that humans' manual ability and thinking activity is inextricably linked that manual activity is the facade of the cerebral activity.The idiom "Clever in mind and skillful in hand"was put forward in our nation in ancient time.By operating different materials manually,children are capable of accumulating experience continuously and acquiring knowledge of those materials,thus extending their manual capability that enable their intelligence to be developed.By means of regional activity,kids can also form new cognition and understanding of the usage,function and feature of the materials or objects.Their manual work can highly fulfill their sense of achievement and this achievement will promote their manual ability unceasingly in reverse.

2.2 ENHANCING THE KIDS' LINGUISTIC AND COMMUNICATIVE ABILITY

The regional activity is the partial representation of the life scene in reality so it's characterized by sociality in some sense.For instance,under the circumstance of different role-plays that kids engage in the make believe corner,vivid linguistic communication and interpersonal reaction are needed to perfect and enrich the entire game.The most accessible parts for kids to play are the codes of conduct and linguistic forms of family members,adults around them and teachers.Role play enables kids to enrich their vocabularies and employ kinds of polite words and common words efficiently.Concurrently,under the effective guidance of the teachers,there are numerous channels provided for the kids,relating to the promotion covers from their linguistic ability,interpersonal communication to abundance in vocabularies,which are all conducive to the kids as to acquire reasonable linguistic and communicative abilities in joyous environment.

2.3 HELPING KIDS FORM TEAMWORK AND COLLABORATION AWARENESS

The realization of most regional activity lies in the corporation between the kids.Referring to the theory of child development remarked by Piaget,the preschoolers are not able to get rid of their "self-centeredness".It is by regional activities including group work in class,corporation in group and team work,etc.that the kids can come to realize the teamwork spirit and collaboration awareness.For example,when involved in the games of "cops and robbers",every kid wants to act as the cop,but there can only be two cops that kids need to discuss and seek for the efficient mean to solve the problem.Teachers can lead the kid to consider how to make it possible for every one of them participates in the game with delight,with possible means like role playing in turn or exchanging the roles.Therefore,children can acquaint the meanings of corporation,coordination and team thus establish the team and corporation awareness correspondingly.

2.4 CULTIVATING THE SOCIALITY OF THE CHILDREN

Different roles as doctors,barbers,chefs or parents that kids act in multiple regional activities help them sense the disparity in social division of labour and get to learn about the duties and natures of every kind of occupations.So children's range of movement is not only confined in the campus but also obtain certain amount of sociality.

3. EFFICIENT METHODS OF UPGRADING KINDERGARTEN REGIONAL ACTIVITY

The efficient measures of upgrading the regional activity in kindergarten is extremely vital to the development of the children.The construction of sound and efficient regional activity acts as the foundation and prerequisite for all the good development of the children. In this article,regional activity is considered to be improved in the following orientations.

3.1 FOCUSING ON THE HIERARCHY OF THE MATERIAL GIVING

The age,law of physical and mental development and individual development differences of the children should be attached attention to when capitalizing on the materials in the regional activity. Material giving is supposed to be developmentally appreciated and proceed in a progressive mode .In allusion to the "button up"activity in the living area,we should be able to provide sundry buttons for the children.Additionally,on the basis of varied levels of the kids,we should gradually give the materials according to the difficulty classification that covers three grades as easy,normal and hard to satisfy the desire for every kid in operating the materials.

3.2 FOCUSING ON THE EXPANSION OF REGIONAL ACTIVITY CONSTRUCTION

Setting up the regional activity should accentuate whether kids can be well enlightened from it and if their expansion of thoughts and ability promotion can be achieved.Consequently,the reservation of children's potential growth should be focused.When the growth of children's development is in placidity intermittently,then the possible expansion of the regional activity is guaranteed.

3.3 GOOD ORDER OF REGIONAL ACTIVITY

In regional activity,teachers need to lay emphasis not only on the guidance for children but the maintenance and construction of the regional activity order.The setting and maintenance of the regional activity order help the children learn about the importance of obeying the rules and hence preventing safety issues

that caused by the misuse and littering of the materials from happening,which in turns improving the safety of the activity.Good order of regional activity is also conducive to sound preservation of the regional activity environment.

4. CONCLUSION

From what has been mentioned above,regional activity in kindergarten is extremely important to the development of children,so the setting and perfection of it should be laid emphasis on sufficiently.Every child is the hope of our country and education is the steppingstone that enables children to acclimatize themselves to the social development in future.Resorting to the construction of regional activity,children are capable of joyfully mastering sundry life skill,social common sense,communicative ability and linguistic skill,etc.Those abilities will be progressively demonstrated in their study and life subsequently,which will determine sound foundation for the growth of their wholesome life.

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Analysis of Similarities and Differences Between the Zero Sequence Current Protection and Residual Current Protection

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Abstract: The basic working principle of the zero sequence current protection and residual current protection are discussed, and analyzes the two kinds of current protection scope, the sensitivity of different points, points out that it is an effective measure to prevent electric shock and electrical fire using the zero sequence current protection and residual current protection in low voltage distribution system; the sensitivity and reliability the protection of residual current protection is better than that of the zero sequence current protection.
Keywords: zero sequence current protection; residual current protection; grounding fault protection

1.INTRODUCTION

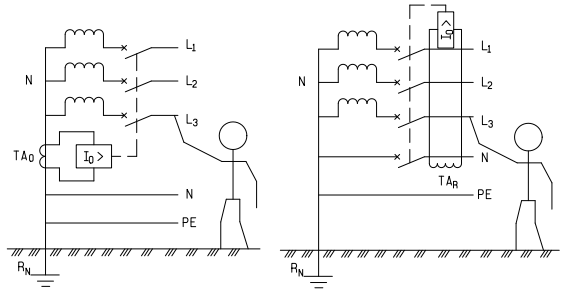
Ground fault protection should be set to prevent personal electric shock and electrical fire, indirect line damage and other accidents, to ensure the thermal stability of equipment and line. The standard of our country, the construction of electrical design are proposed to set the ground fault protection in low-voltage distribution line. In the national standard GB50054-95 "low voltage distribution design specification" (canceled) article 4.4.10 clearly pointed out by two methods of grounding fault protection, zero sequence current protection and residual current protection (also known as the RCD) [1]; the current GB50054-2011 voltage distribution "design code" article 5.2.13 pointed out that when the current protection devices cannot indirect contact protection appliances, should adopt the RCD; pointed out in article 6.4.1, distribution line insulation damage may occur when grounding fault and ground fault arc grounding may cause fire danger, should set the residual current monitoring or protective devices [2], cancel the description of the zero sequence current protection. The basic working principle of the two kinds of current protection is similar, but the use of range and installation requirements are different.

2.THE WORKING PRINCIPLE OF THE ZERO SEQUENCE CURRENT PROTECTION AND RESIDUAL CURRENT PROTECTION.

Zero-sequence current protection is done by installing a current transformer (CT) on each of the three-phase lines, or passing the three-phase conductors together through a zero-sequence CT, or by installing a zero-sequence CT on neutral N ,These CTs can detect the sum of the three-phase current vectors, which is zero sequence current I_0, $I_A + I_B + I_0 = 0$; when the three-phase load connected to the line is unbalanced, then $I_0 = I_N$; when the load is unbalanced (no harmonic current and does not consider the normal leakage current of the line and electrical equipment) , The zero-sequence current at this time is the imbalance current I_N; when a phase occurs a ground fault, it must generate a single-phase ground fault current I_d,then the zero-sequence current at this time$I_0 = I_N + I_d$, is a vector sum of three-phase unbalanced current and single-phase ground current.

The specific practices of residual current protection is measured in the three-phase guide line and neutral N are respectively provided with a C.T, or let the three-phase wire and N line together through a sequence of C.T, get the current vector of three phase conductors and the neutral line of N ,which is $I_A + I_B + I_C + I_N$.when single-phase grounding fault occurs, regardless of the three-phase load balance or not, this vector is zero and (strictly speaking for the normal leakage current circuit and equipment); when one phase grounding fault, the fault current through the metal component protection line PE and related company, that is $I_A + I_B + I_C + I_N = 0$, then the value is equal to the sum of the fault current I_d and normal leakage current[4].

The TN-S system uses the zero sequence current protection and residual current protection as shown in figure 1:



(a)Zero sequence current protection (b) residual current protection

Figure 1 the zero sequence current protection and residual current protection

Figure 1 (a) shows the zero sequence current protection, grounding transformer in transformer,

when a single-phase grounding device (line connected with the PE line) or single-phase short circuit fault (line connected with N line fault current transformer), TA $_0$ can measure large current, the the current can make the action of the electric current protection. But when the normal operation of current flowing through the TA $_0$ on one side of the imbalance current, as long as the overcurrent protection value setting in order to avoid the unbalanced current can not malfunction. Figure 1 (b) shows the residual current protection, TA $_R$ measured current $I_R = I_A + I_B + I_C + I_N$. During normal operation, I_R is zero, because of the back of all the unbalanced current from the neutral linel. When one phase ground fault occurs, the fault current willbe back to the transformer through the protection line PE and the metal component connected with the ground, then the sum of the three-phase current detected and the neutral phasor current is not zero,then the measured current TA $_R$ is the residual current. In addition, when single-phase short circuit phase line and the neutral line occurred when TA $_R$ in the induction current, the residual current protection cannot be used as phase short-circuit protection of neutral line.[5]

Seen from the above analysis, the basic principle of the zero sequence current protection and residual current protection are based on Kirchhoff's current law: any node into the current complex algebra in the circuit and is equal to zero, i.e. Sigma I=0, and are used as a sampling element zero sequence C.T. In line with the electrical equipment under normal circumstances, the vector of each phase current and zero (zero sequence current protection assume novalued unbalanced current), therefore, the two winding of zero sequence C.T has no output signal (when the zero sequence current protection from unbalanced current), then the tripping device wil not be drived. When a ground fault occurs, the vector of each phase current is not equal to zero, then the magnetic flux will be generated in the toroidal core of the C.T zero sequence of fault current ,the two secondary side induction voltage of zero sequence C.T drives the tripping device, switching power supply network, to achieve the purpose of grounding fault protection.

3.THE SIMILARITIES AND DIFFERENCES OF ZERO SEQUENCE CURRENT PROTECTION AND RESIDUAL CURRENT PROTECTION IN THE APPLICATION

3.1 Zero sequence current protection

Zero sequence current protection is generally suitable for use in TN grounding system. Since the loop impedance of the TN-S system Id includes the phase line impedance Z1, the PE line impedance ZPE and the contact impedance Zf, that is, ZS = Z1 + ZPE + Zf for single-phase grounding, and for the TN-C system, the Id loop impedance includes For TN-CS system, Id loop impedance includes phase impedance Z1, PEN line impedance ZPEN, PE line impedance ZPE and contact resistance Zf, that is, ZS = Z1 + ZPEN + ZPE + Zf, the resulting single-phase ground fault current Id = 220 / Z_S, significantly greater than the three-phase unbalanced current without fault.as long as the appropriate setting, the zero sequence current can be detected to cut off the fault circuit.

The IT system is generally used in high requirements for the reliability of power supply enterprises, can not immediately cut off the power supply circuit in single-phase grounding, just a failure of insulation monitoring signals, in order to maintain the power supply to continue for a period of time. When the single-phase grounding fault line, the whole system is zero sequence current flowing through the non fault line capacitance current and can detect the ground fault current with zero sequence current protection device which is used to monitor the relative to the first grounding fault[6].

TT grounding system often used in industry and agriculture, civil building lighting, power supply three-phase four wire distribution system in general, three-phase unbalanced current is larger, when single-phase grounding, I_d including phase loop impedance impedance Z_1, PE line impedance Z_{PE}, line impedance load the grounding resistance of R_A and the power supply side grounding resistance R_B, Z_f, the contact impedance Z_S,that is,$Z_S = Z_1 + Z_{PE} + R_A + R_B + Z_f$, ground fault current $I_d = 220/Z_S$. The $R_A + R_B$, $Z_1 + Z_{PE} + Z_f$, and $R_A + R_B$ numerical are generally larger, so the single-phase grounding fault current I_d is generally less than the unbalanced current, zero sequence current protection is difficult to detect the fault current, it is not applicable to TT grounding system.

Zero sequence current protection I_{set0} must be greater than the normal operation of three-phase flow through the PEN or N maximum conductor conductor unbalanced current, harmonic current, leakage current and normal, and in case of ground fault must act.zero sequence current protection I_{set0} should meet the following two requirements:

$I_{set0} \geq 2.0\ I_N$, $I_d \geq 1.3\ I_{set0}$

The above formula: I_N - zero current; I_d - single-phase earth fault current.

Zero sequence current distribution lines during normal operation of the value of I_N usually do not exceed 20% ~25% of the calculated current I_C , the setting value of the zero sequence current protection I_{set0} should be set for 50% ~60% of the circuit breaker long delay release current I_{set1}. Thus, the zero sequence current protection setting value I_{set0} is much smaller than the short time delay setting value I_{set2}, can meet the requirements of protection against indirect contact sensitivity to a certain extent [3].

3.2 Residual current protection

From the analysis of the residual current protection principle, protection of its current setting from grade mA to grade A, has very high sensitivity, so the

residual current protection device for TN, TT, IT grounding system can be applied.

Generally speaking, the more longer of the power supply line,the smaller of the end of single-phase grounding fault current.Petrochemical enterprises generally use phase short-circuit protection electric low voltage circuit breaker or fuse and single-phase grounding fault protection when single-phase grounding fault occurs at the end of the line, sensitivity and reliability of protection circuit is guaranteed. Electric phase short-circuit protection in TN system can fault within the time specified in the line is very short, but even so, TN still should set the residual current protection. First of all, in the design of each device is generally not one by one check (e.g. mobile socket on the electrical equipment etc.) at the single-phase grounding overcurrent protection meets the electric shock protection requirements, even if the check is not necessarily correct, because the leakage impedance is unknown. Secondly, overcurrent protection can not be used as additional protective measures of anti shock measures when the direct failure. In addition, when the PE line or PEN line breakage, overcurrent protection shell fault has no effect on. Therefore, in the TN system setting of residual current protection devices are of great importance to improve and complement the TN system capacity and fire protection against electric shock proof performance.

TN-S system, residual current protection for TN grounding system, but not for the protection of TN-C grounding system of trunk line feed. Because PE and N share a neutral line PEN line protection TN C grounding system, through the PEN during the normal operation of three-phase unbalanced current when single-phase grounding occurs when the ground fault current I_d from the PEN line through the residual current protection device can not detect is unbalanced the current or the fault current, the loss detection function of single-phase grounding fault. When used in the sub line and end line, if the TN-C grounding system, it should be according to the local TN-C-S or TT ground treatment. In order to avoid misoperation, the setting value of residual current protection circuit breaker I_{set4} should be 2.5~4 times the leakage current is greater than the sum of the normal operation of the line and equipment, but far less than the setting value of the zero sequence current protection, so the use of residual current protection is higher than the sensitivity of zero sequence current protection [3].

Compared with the national standard GB50054-1995 "low voltage distribution design specifications", in the current national standard GB50054-2011 added the residual current protection of electrical installation and selection operation regulations:

Article 3.1.11 in TN-S system, when the neutral conductor reliable ground potential is constantly away, should all live conductors cut off protection circuit; RCD rated residual non operating current should be larger than expected for leakage current in the load during normal operation; residual current action the type of electrical protection, the relevant provisions shall be determined according to the current national standard "RCD General requirements" GB/Z6829 according to the type of grounding fault.

Article 3.1.12 the RCD as indirect contact protection circuit of electric appliance, must be installed to protect the conductor.

Article 3.1.14 in the IT system, when using electrical protection of electrical device residual current protection, and constantly open circuit fault in the first, the rated residual non operating current value should not be less than the first current to ground fault through the fault circuit.

In addition, in the current national standard GB50054-2011 "low voltage distribution design specifications" in article 5.2.13, the distribution line used in the TN system over current protection devices as indirect contact protection appliances, its operating characteristic should meet the following requirements:

$Zs \cdot Ia \leq U_0$

The above formula: Z_S - impedance ground fault circuit (omega); U_0 - phase conductors of nominal voltage (V);

I_a is to ensure the protection of electrical circuit fault current cutting action within the specified time, the value that must ensure the protection of electrical equipment within the specified time, and should consider the protection of the sensitivity and reliability of electrical action.

When does not meet the requirements, should use the residual current protection device.

In the TT system, protection of electrical protection against indirect contact distribution lines should be used in electric or residual current protection over current protection devices.

In the IT system, When the exposed conductive parts are grounded together, when the second earth fault occurs, the fault circuit should be cut off in accordance with the TN system automatically cut off the power requirements, the distribution line should be over-current protection or residual current protection circuit to cut off the fault circuit; when the exposed conductive parts individually or in groups is grounded. When the second grounding fault occurs, cut off the fault circuit shall comply with the requirements of the TT system automatically cut off power supply.

4.CONCLUSION

From the sensitivity of protection and safety, the residual current protection is higher than zero sequence current protection, and zero sequence current protection can not be used as residual current protection in single-phase distribution lines. Since the protection current setting should avoid the

maximum imbalance current on the PEN, that is, when the single-phase ground fault current is less than the setting current, the zero-sequence current protection device refuses to move, which may cause personal electric shock and fire. From this point, the protection has canceled the zero sequence current protection in the IEC standard and the national standard in the low voltage distribution line ground fault. Whether the zero sequence current protection, or residual current protection, is one of the measures of grounding protection, and must also use combined with the potential link, can play a role in improving the anti shock.

5.KNOWLEDGEMENTS

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Research on Optimization Design of Spray Gun Trajectory

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Abstract: Glaze spraying process sprays glaze into the mist under compressed air with the glaze spray gun or glaze spray machine, so that the glaze adheres onto the clay body. As the uneven glaze will crack in the firing process, causing work piece scrapping, so the thickness of the sprayed glaze in the spraying process is required to be uniform as far as possible. In this paper, the research is carried out accordingly. In this paper, the relationship between atomization pressure P_1 , diaphragm pressure P_2 and spray distance his first used atomization, acquisition completed Bin β distribution model Medium [a, b, $Z_{\max}$, $\beta 1$, $\beta 2$]', and the spray gun spray gun in a single point of the model. After reviewing the relevant literature, this paper solves the thickness of continuous spray spray expression, and the definition of the thickness of the adjacent extreme difference is $F(d)$, When $F(d)$ is the smallest, the more suitable overlap spacing d=60.53mm is achieved. Finally, the use of MATLAB software simulation spray gun in the plane of the cumulative spray situation.
Keywords: ellipse double distribution mode, single point spray, path planning

1. INTRODUCTION

Glaze spraying process sprays glaze into the mist under compressed air with the glaze spray gun or glaze spray machine, so that the glaze adheres onto the clay body. It is a process easily realizing automation in the ceramic production process. Ruled surface is a representative special surface in large curvature surface. With the development of manufacturing industry, ruled surface has become one of the most widely used surface types in free form surfaces, Trajectory optimization of spray gun is of great significance.

According to the above materials, if the spraying direction of the spray gun always keeps unchanged, calculate the cumulative situation of spraying in the plane and find out the suitable overlap interval of the spray gun trajectory (P1 and P2 takes 0.2Mpa, and d takes 225mm).

2 PATH PLANNING OF PIANE SPRAYING

2.1Establishment of single point spraying modele

In actual air spraying[9,10], compressed air is usually arranged on both sides of the spray gun mouth, the mist cone is squashed into an elliptical cone, the region on the plane covered by the spray cone formed by the paint mist is an ellipse, with semi-major axis of a and semi-minor axis of b, as shown in Fig. 1.

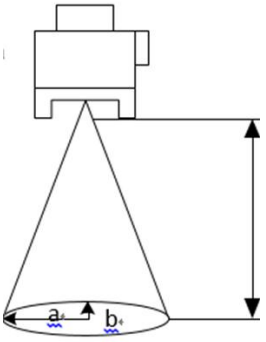

Fig 1 Schematic diagram of spraying

It meets elliptic double β distribution model in the elliptic distribution region:

$$Z_{单}(x,y)=Z_{\max}\left(1-\frac{x^2}{a^2}\right)^{\beta_1-1}\left[1-\frac{y^2}{b^2\left(1-\frac{x^2}{a^2}\right)}\right]^{\beta_2-1}$$

Where:

$$\begin{cases}-a\le x\le a\\-b\le y\le b\end{cases}$$

Atomization pressure P1, diaphragm pump pressure P2 and spray distance h are the main factors affecting the above parameters, and they have the relationship as follows:

$$\begin{bmatrix}129.8665 & -55.2435 & 1.7436 & -297.3908\\ 52.5130 & -5.7480 & 0.7394 & -128.6368\\ 59.7245 & 393.9655 & -0.1244 & 150.0184\\ -7.0125 & 34.5045 & 0.0284 & -9.5229\\ -4.6130 & 18.3620 & 0.0113 & -0.3924\end{bmatrix}\times\begin{bmatrix}p_1\\p_2\\h\\1\end{bmatrix}=\begin{bmatrix}a\\b\\Z_{\max}\\\beta_1\\\beta_2\end{bmatrix}$$

According to the subject information, P1= P2=0.2Mpa,h= 225mm,into the above matrix, to obtain:

$$\begin{bmatrix}a\\b\\Z_{\max}\\\beta_1\\\beta_2\end{bmatrix}=\begin{bmatrix}109.8438\\47.0812\\212.7664\\2.3655\\4.8999\end{bmatrix}$$

The elliptic double β distribution model is thus

obtained:

$$Z_{\text{理}}(x,y)=212.7664\times\left(1-\frac{x^2}{109.8438^2}\right)^{1.3655}\left[1-\frac{y^2}{47.0812^2\left(1-\frac{x^2}{109.8438^2}\right)}\right]^{3.8999}$$

2.2 One-way gun trajectory model

After checking the relevant literature, a generally planar spray path planning, as shown in Fig.2.

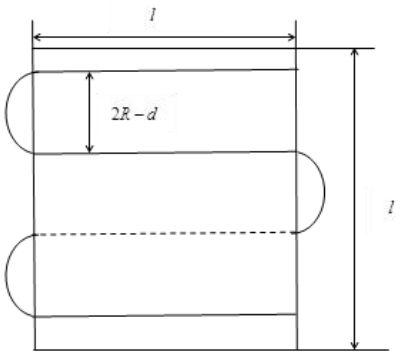

Fig.2 Path planning diagram

As the thickness in the region of the mist cone is large in the middle and thin on both sides during single-point spraying, so in order to ensure spray surface to be uniform, the mist cone will overlap in the adjacent paths in Fig. 3.

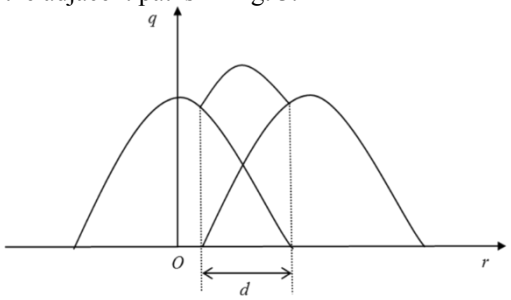

Figure 3 Continuous spraying overlap diagram

The long axis of the ellipse is the X axis and the short axis of the ellipse is the Y axis to establish the Cartesian coordinate system XY in Fig. 4.

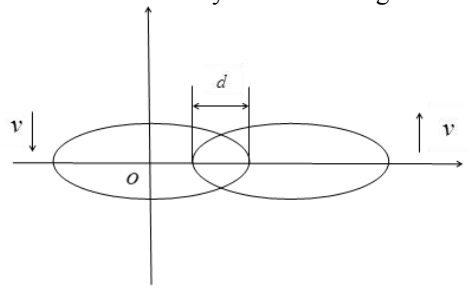

Figure 4 plane spray diagram

As shown in Fig. 4 on the plane, the direction of the arrow is the direction of the Lance movement, and D is the overlap interval.

2.3 The relationship between speed and paint thickness

Set the gun motion speed is V, then the s point thickness cumulative time t is：

$$t=2b\sqrt{1-\frac{x_s^2}{a^2}}/v$$

Thus, the S-point thickness of the gun is:

$$D_S(x,y)=\int_0^t\int_{-b\sqrt{1-x_S^2/a^2}}^{b\sqrt{1-x_S^2/a^2}}\left\{D_{\max}\left(1-\frac{x_S^2}{a^2}\right)^{\beta_x-1}\bullet\left[1-\frac{y^2}{b^2\left(1-\frac{x_S^2}{a^2}\right)}\right]^{\beta_x-1}\right\}dydt$$

which is:

$$D_S(x,y)=D_{\max}\left(1-\frac{x_S^2}{a^2}\right)^{\beta_x-1}\bullet\int_0^t\int_{-b\sqrt{1-x_s^2/a^2}}^{b\sqrt{1-x_s^2/a^2}}\left[1-\frac{y^2}{b^2\left(1-\frac{x_s^2}{a^2}\right)}\right]^{\beta_y-1}dydt$$

The formula Describes the distribution of the thickness of s at any point in the planar spray process of a single stroke. With the different XS value, the thickness distribution of s-point in X-axis satisfies the β-distribution of the thickness on the long axis of elliptical coating in spraying model. Because time t is the function of the velocity V of the gun, the thickness of the S-point is related to the velocity V of the lance, in addition to its position in the x direction. In the same position, with the increase of the gun moving speed V, the thickness accumulation time t will decrease, and the formula is known, the S-point thickness value also decreases. Conversely, the thickness value of the S-point will increase.

Spray gun spraying direction will always remain unchanged, so in the plane spray in the overlap between the size of D, may as well take the first round trip as an example, which is $x\in(0,2a-d)$ $y\in(0,\ a)$.

As shown in Fig. 3, the thickness function of the overlapped area is made up of two segmented thickness functions, then the first round-trip thickness function is:

The suitable overlap interval of the spray gun trajectory glaze thickness difference is less than 5%. This is a function of D ：

$$F(d)=\frac{\max\{D(x,y)\}-\min\{D(x,y)\}}{\max\{D(x,y)\}}$$

Thus the suitable overlap interval of the spray gun trajectory is：

d=60.53mm

3. CONCLUSION

The ellipse double distribution model can effectively reflect the thickness distribution of the paint film in the elliptical painting area. In the practical application, the work piece surface shape is diverse, the paper based on different planes, the establishment of different spray models, so that the results can be higher precision.

For the complex curved surface painting, the model is improved, the complex curved surface is divided into several small planes, the new model is established by using the idea of differential, and the mathematical

method is used to solve the model. The model uses MATLAB software to simulate the cumulative spray of the spray gun on the plane, which makes the result more accurate and convincing.

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Diagnostic Model of Sleep Disease Based On SVM

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Abstract: In this paper, we first adopt the spearman test to determine the correlation of indicators and eliminate the irrelevant data such as character. Then, the linear variables were controlled and the discrete indexes were considered. The correlation coefficients of the age, gender, intelligence and neuroticism of sleep quality were 0.0902, 0.8860, 0.1302 and 0.0582. Finally, through the classification of seven kinds of diseases, SVM model was established, and the accuracy of model was 89.53%.
Keywords: SVM model; Medicine Association; intelligence

1. INTRODUCTION

Since 2001, the World Sleep Medicine Association sets March 21 each year as World Sleep Day to remind people to pay attention to sleep. According to statistics, the rate of insomnia in Chinese adults is as high as 38.2%, adolescent insomnia is on the rise. Many factors that affect insomnia can generally be divided into objective and subjective factors.

Objective factors are environmental changes, bedtime tea or coffee, etc., and subjective factors are generally the stress of life, emotional loss, mental excitement and other mental factors. We investigated the quality of sleep and the indicators that affect sleep, analyzed the correlation of the indicators, and established the diagnostic model of sleep disorders through SVM model.

2. QUALITY OF SLEEP AND EACH INDICATOR CORRELATION ANALYSIS

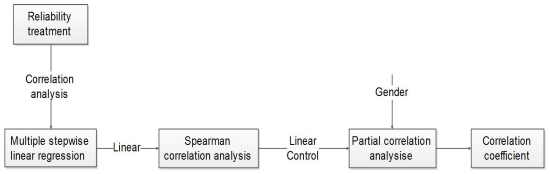

Figure 1 Degree of symptom analysis chart.

The normalization of the indicators given in the research, beginning with the reliability given, is based on the confidence of the person under test in performing the sleep quality test. When studying the correlation between each index and the quality of sleep, we should make full use of the impact of the reliability, so the credibility of the data processing and weighting to age and other factors beyond the uncontrollable factors, then deal with the index data correlation analysis. First, since the gender, indicators are discrete data, multiple linear step-by-step regression analysis of each indicator and sleep quality is carried out by using SPSS first, and the regression results obtained are shown in Tab 1:

Table 1.Stepwise linear regression analysis

Model	Sig.
Age	0.000
Age	0.000
Nervousness	0.000
Age	0.000
Nervousness	0.000
Character	0.000
Age	0.000
Nervousness	0.000
Character	0.000
Psychoticism	0.007

As can be seen from Table 1, Sig. Values of each index are less than 0.05, indicating that each index has a good linear correlation with sleep quality. On this basis, Spearman correlation analysis of age, stress, personality, psychotic index Spearman correlation analysis is also called naive correlation analysis, Spearman rank correlation coefficient is a non-parametric nature, that is, distribution statistics unrelated rank statistics, with To measure the strength of the relationship between the two variables. Let x and y be samples drawn from different population X and Y, that is, the observed values x1, x2...xn represent the corresponding values under each index, y1, y2 ...yn represent the corresponding Sleep quality data, if the xi of the respective sort, were rated xi and yi in the two samples in the rank. Can be seen, when X, Y is completely related, $\sum (R_i - S_i) = 0$ is remarked as $\sum d$, where di can be used to measure the degree of correlation between x and y. In order to accurately measure the correlation between x and y, use $\sum d_i^2$ max to get rid of $\sum d_i^2$, we can get a relative measurement index, that is, the strength of the link between the various indicators and sleep quality, see

Tab 2 Spearman correlation analysis results

	Age	Psychoticism	Tension	Character
Sleep quality	0.000	0.000	0.000	0.454

In the results of Spearman correlation analysis, there was a significant correlation when the result was Sig. <0.05.

The use of sample data to calculate partial correlation coefficients reflects the degree of net correlation between variables. When analyzing the net correlation between sleep quality and gender, after controlling the linear effect of the remaining variables, the partial correlation coefficient between the two is calculated as:

$$r = \frac{r_{12} - r_{13}r_{23}}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$$

Partial correlation analysis using SPSS results obtained Tab 3:

Tab 3.Partial correlation analysis results

Control Variables		Psychotic ism	Age	Nervousn ess
Sex Sleep Quality	Correlation	0.075	0.128	0.088
	Significance (2-tailed)	0.000	0.000	0.000
	df	6346	6346	6346

Analysis of Table 3 shows that partial correlation analyses of the Sig values were less than 0.05, indicating that the correlation between gender indicators and sleep quality is more obvious. Then, according to the definition of the correlation coefficient, formula is:

$$r = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2 \sum_{i=1}^{n}(Y_i - \bar{Y})}}$$

Using MATLAB to get the quality of sleep and the correlation matrix between the various indicators as follows:

Tab 4 Quality of sleep and the correlation matrix

	Age	Sex	Psychoticis m	Nervousne ss
Sleep quailt y	0.090 2	0.886 0	0.1302	-0.0582

3. DIAGONSTIC RESULTS AND SLEEP ANAYSIS MODEL

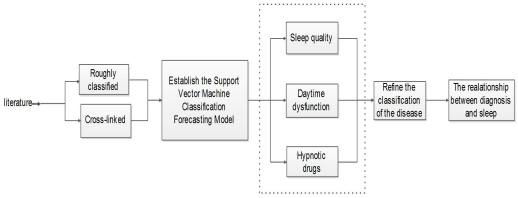

Figure 2.Diagnosis conclusion analysis chart.

Figure 2 for the establishment of SVM classification prediction model of the overall idea, from each node to explain the specific establishment of the model, the process is as follows.

3.1 Disease classification preparation based svm

According to a review of international criteria for the classification of sleep disorders like sleep disorders can be divided as

1) Organic diseases caused by sleep disorders, such as brain organic insomnia, somatic organic sleep disorders and other diseases;

2) 2 neurotic insomnia and psychosocial insomnia;

3) Mental illness caused by sleep disorders, such as mania, depression, schizophrenia and other diseases;

4) Sleep disorders caused by sleep disorders such as exogenous mainly seen in the shift and long-term nighttime workers, the other endogenous sleep disorders mainly seen in patients with dementia;

5) Drug sleep disorders;

6) Senile sleep disorders;

7) Unknown sleep disorders.

Secondly, using the SVM algorithm, according to the correlation between the various indicators, each specific disease is classified into seven categories divided according to the standard, and specific diseases included in each specific category of sleep diseases can be obtained. Among them, the steps of SVM classification are as follows:

Step 1: Let x1, x2, x3, x4, x5, x7 denote seven indicator variables respectively. The known sample is[(i = 1, 2, ..., n, where n = 6349), where $a_i \in R^{6349}$, $y_i = 0$ is sick and $y_i = 1$ is non-sick. First, classify it that is to find an optimal classification surface

(ωx)+b=0,and $x = [x_1,..., x_7]^T$

meet the following conditions:

$$\begin{cases}(\omega \cdot a_i) + b \geq 1, y_i = 0 \\ (\omega \cdot a_i) + b \leq 0, y_i = 1\end{cases}$$

So there is

$y_i[(\omega \cdot x) - b] \geq 1, i = 1,..., n$

The samples satisfying equation are support vectors.

Step 2: To make the total distance between the two categories to the largest, then

$$\max \frac{2}{\|\omega\|} \Rightarrow \min \frac{1}{2}\|\omega\|^2$$

So build SVM quadratic programming model is as follows:

$$\min \frac{1}{2}\|\omega\|^2$$

s.t. $y_i[(\omega \cdot x) - b] \geq 1, i = 1,..., n$.

Then find the best value of the corresponding, we can get the classification function:

$$g(x) = \text{sgn}[(\omega^* \cdot x) + b^*]$$

Step 3: Turn it into its dual problem:

Define generalized Lagrange function

$$L(\omega, \alpha) = \frac{1}{2}\|\omega\|^2 + \sum_{i=1}^{n} \alpha_i \{1 - y_i[(\omega, \alpha_i) + b]\}$$

In the formula, $\alpha=[\alpha_1,\ldots,\alpha_n]^T \in R^{n+}$

By KKT complementary conditions, through the partial derivative of ω, b derived

$$\frac{\partial L}{\partial \omega}=\omega-\sum_{i=1}^{n}\alpha_i y_i a_i=0,$$

$$\frac{\partial L}{\partial b}=\sum_{i=1}^{n}\alpha_i y_i=0,$$

$$\omega=\sum_{i=1}^{n}\alpha_i y_i a_i,\sum_{i=1}^{n}\alpha_i y_i=0,$$

We can get Brought into the original Lagrange function

$$L=\sum_{i=1}^{n}\alpha_i-\frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n}\alpha_j\alpha_i y_j y_i(a_i\cdot a_j)$$

Step 4: It can be transformed into the following model:

$$\max\sum_{i=1}^{n}\alpha_i-\frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n}\alpha_j\alpha_i y_j y_i(a_i\cdot a_j)$$

$$\begin{cases}\sum_{i=1}^{n}\alpha_i y_i=0\\ 0\le\alpha_i, i=1,2,\ldots n\end{cases}$$

.

$$\omega^*=\sum_{i=1}^{n}\alpha_i^* y_i a_i$$

Step 5: By KKT complementary conditions we can see:

$$\alpha_i^*\left\{1-y_i[(\omega^*,\alpha_i)+b^*]\right\}=0$$

$$g(x)=\mathrm{sgn}[\sum_{i=1}^{n}\alpha_i^* y_i(a_i\cdot x)+b^*]$$

Selected seven kinds of disease prevalence data, respectively, numbered 1 to 7, from the remaining 10% of the data, three groups of the most common diseases were randomly selected for each broad category of treatment and entered into the SVM model as test samples.

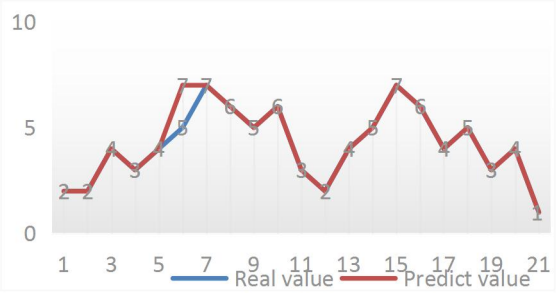

Figure 3. The test fitting image

Therefore, we can find that the actual value is almost consistent with the predicted value, which shows that the above model is more reasonable.

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The Research on Sleep Based on Grey Correlation Analysis and K-Means Cluster Analysis

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Abstract: the accelerating pace of modern life deprives people of their time for sleeping, which we can not turn blind eyes to. In this paper, the front-end data of sleep quality and the factor potentially affecting sleep is taken as processing object. In order to make it clear that the impact of several indicators have on the quality of sleep, the evaluation model based on Pearson correlation coefficient analysis method and Grey relational analysis method was proposed in the paper. Pearson correlation coefficient analysis method can get the linear relationship between the factor and sleep quality. The correlation degree can be attained with Grey relational analysis method. It strongly suggests that which potential factors affects the quality of sleep mostly. The evaluation model based on K-means clustering algorithm is discussed in this paper to obtain The cluster center of each index of 10 diseases served as the disease index of each disease.
Keywords: Grey relational analysis; Pearson correlation coefficient analysis method; K-means clustering algorithm

1. INTRODUCTION

According to the different index data, the relationship between the physical and chemical indexes of sleep quality and the sleep quality is analyzed. The size of the physical and chemical indexes affecting sleep quality is determined by the human body's own factors. The physical and chemical indexes are closely related to sleep quality. Because the number of physical and chemical indexes affecting sleep quality is too large and the treatment is more complicated, for some secondary physical and chemical indexes, the effects on sleep quality are relatively small. We will ignore the secondary physical and chemical indicators.

Therefore, this question is simplified as the relationship between sleep quality and physical and chemical indexes affecting sleep quality. Based on this, we can analyze the correlation of each index, and try to establish a multivariate regression model to collate and analyze these data. The effects of various physical and chemical indexes on sleep quality were obtained respectively after different people were affected by various factors. We correlated the physical and chemical data with each other and put in the formula of Pearson correlation coefficient as follows:

$$r = \frac{N\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{N\sum x_i^2 - (\sum x_i)^2}\sqrt{N\sum y_i^2 - (\sum y_i)^2}} \tag{1}$$

In this, x_i, y_i, respectively represent the i data in the first data group and the i data in the second data group.After comparing all sleep quality and physical and chemical indexes affecting sleep quality, a matrix of correlation coefficients is obtained.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{qj} \\ r_{21} & r_{22} & \cdots & r_{qj} \\ \cdots & \cdots & r_{ij} & \cdots \\ r_{p1} & r_{p2} & \cdots & r_{pq} \end{bmatrix} \tag{2}$$

The physical and chemical indexes of group I indicated the total number of physical and chemical indexes of sleep quality taken into consideration, and the total number of physical and chemical indexes of sleep quality that were taken into account was the total number of physical and chemical indexes of sleep quality.

After the correlation coefficient is obtained, the linear relationship between the fixed distance variables of each set of data is measured. Then the absolute value of the coefficient is taken to observe the magnitude of the value, which is classified as the range level. The range level of the coefficient is shown in the following table:

Table 1. The degree of correlation

codomain	degree of correlation
0.0-0.2	Very weak correlation or no correlation
0.2-0.4	weak correlation
0.4-0.6	Medium degree correlation
0.6-0.8	strong correlation
0.8-1.0	Extremely strong

correlation

If there is a strong correlation between the physical and chemical indexes of sleep quality and a certain physical and chemical index of sleep quality, the linear relation equation between them can be established by neglecting the other physical and chemical indexes. If a physical and chemical index of sleep quality has no physical and chemical indexes related to its very strong (strong or higher) among all the physical and chemical indexes affecting sleep quality, then select all the physical and chemical indexes related to its strong (moderate) degree. Establish a multivariate linear equation between several elements. If you do not select all the physicochemical indexes that are of moderate relevance to him, the default is that there is no significant correlation between the physical and chemical indexes affecting sleep quality and this index in wine Index. Through the study of the relationship between sleep quality and physical and chemical indexes of sleep quality, a comprehensive comparative analysis of the relationship between each index was obtained.

(1) association analysis

Selection of reference series

$$x_0 = \{x_0(k) \mid k = 1,2,..., n\} = (x_0(1), x_0(2),..., x_0(n)) \quad (3)$$

Where k represents the moment, assuming that there is a m-lattice comparison sequence.

$$x_i = \{x_i(k) \mid k = 1,2,...n\} = (x_i(1), x_i(2),...x_i(n)), i = 1,2,...m \quad (4)$$

Then said

$$\xi_i(k) = \frac{\min\limits_s \min\limits_t |x_0(t) - x_s(t)| + \rho \max\limits_s \max\limits_t |x_0(t) - x_s(t)|}{|x_0(k) - x_i(k)| + \rho \max\limits_s \max\limits_t |x_0(t) - x_s(t)|} \quad (5)$$

To compare a sequence of numbers x_i for reference sequence x_0 at k time correlation coefficient, among $\rho \in [0,1]$ is resolution coefficient. said the correlation coefficient defined by formula is an indicator of the degree of correlation between the comparison sequence and the reference sequence at a certain time. Since there is an association number at each time, the information appears to be too scattered to be easy to compare.

$$r_i = \frac{1}{n} \sum_{k=1}^{n} \xi_i(k) \quad (6)$$

is progression x_i for progression x_0 Correlation degree.

Generally speaking, different sequences in practical problems often have different dimensions, and when we calculate the correlation coefficient, Therefore, it is necessary to dimensionalize all kinds of data first. In addition, in order to be easy to compare, all sequences are required to have a common intersection. In order to solve the above two problems, we transform the given sequence.

definition :Point sequence $x = \{x_1, x_2, x_3 \ldots x_n\}$ is

$$y = \left(1, \frac{x_2}{x_1}, \frac{x_3}{x_1} \cdots \frac{x_n}{x_1},\right) \quad (7)$$

The initialization sequence for the original sequence of X.

So we can initialize the five columns in Annex 1. Note that for the first, third, and fourth columns, an increase in the value means an improvement in the level of movement as the score increases. When initializing a sequence x1 x3 and x4, take the following formula

$$y = \left(1, \frac{x_1}{x_n}, \frac{x_1}{x_n} \cdots \frac{x_1}{x_{\mathrm{n}}},\right) \quad (8)$$

It also requires an analysis of the relationship between symptoms and sleep. After preprocessing the data given by the topic, it will be found that the symptoms are numerous and complex, and that if direct regression analysis is carried out, there is a large amount of data. It's troublesome to deal with. A closer look at some of the symptoms shows similarities, so it can be grouped into a large group.

Cluster (Clustering) is to group data objects into multiple classes or clusters (Cluster), its goal is: high similarity between objects in the same cluster, and different objects are in different clusters. Therefore, in many applications, a cluster of data objects can be as a whole, so as to reduce the amount of computation or improve the calculation quality, of which K-meas is one of the most commonly used approach, it follows the principle:

Selecting k objects from n data objects as the initial clustering center;According to the mean value of each cluster object (center object), the distance between each object and the center object is calculated, and the corresponding objects are redivided according to the minimum distance. Recalculate the mean value of each (variable) cluster (central object);

Calculation of a standard measure function, when certain conditions are satisfied, such as when the function converges, the algorithm terminates; if the condition is not satisfied, it returns to step 2)

$$V = \sum_{i=1}^{k} \sum_{x_j \in s_i} (x_j - \mu_i)^2 \quad (9)$$

The formula for calculating the distance to the center object is shown in the figure

When using K-means method to analyze, we need to give the number of categories K and K objects as clustering centers.

2. SOLUATIONS

The linear relationship between physical and chemical indicators of sleep quality and physical and chemical indicators that affect the quality of sleep is extracted below. A sample of process samples is set up to further explain the relationship between factors influencing sleep quality and ideal indicators of sleep quality.

The relationship between the physical and chemical indexes of sleep quality and the physical and chemical indexes affecting sleep quality was analyzed, and all the physicochemical indexes which had the greatest correlation with the physical and chemical indexes of sleep quality were given. The correlation coefficient was shown in the following table

Table 2 correlation coefficient

indexes	correlation coefficient
Reliability	Reliability(0.169)
Psychoticism	Psychoticism(0.779)
Nervousness	Nervousness(0.833)
Character	Character(-0.313)

As the data in the table shows, Reliability correlation coefficient is 0.169,It's not good for sleep, but it has very little effect on sleep quality. It can therefore be excluded from the list of key indicators; The correlation coefficient of Psychoticism is 0.779,Extreme effects on sleep, Belong to strong correlation index; The correlation coefficient of Nervousness is 0.833, it has the biggest influence on sleep quality, belongs to the extremely strong index ranks, and has the biggest influence on the sleep quality. The correlation coefficient of Character was -0.313, which was beneficial to sleep quality, but the influence was small.

According to the requirements of the problem, we naturally select the correlation score of sleep quality as the reference series, and bring the initialized series of each series in annex 1 into the formulas of 3)and 4), and we can easily calculate the correlation degree of each series as follows(here is ρ=0.5).

Table 3 correlation calculation results

It is easy to see from Table 3 that the main factors affecting sleep quality scores are Psychoticism、Nervousness、Reliability、Character.

Based on the above data analysis, Reliability、Psychoticism、Nervousness is bad for sleep quality, Character is good for sleep quality; but Reliability, Character is a minimal correlation with sleep quality, so exclude these two indicators.

Table 3 Grey correlation degree

It is easy to see from Table 3 that the main factors affecting sleep quality scores are Psychoticism、Nervousness、Reliability、Character.

Based on the above data analysis, Reliability、Psychoticism、Nervousness is bad for sleep quality, Character is good for sleep quality; but Reliability, Character is a minimal correlation with sleep quality, so exclude these two indicators.

First of all, the data are described and analyzed as a whole (type of disease, mean value, standard deviation, etc.)

Because of the variety of symptoms,

Then calculate the number and percentage of people with each symptom, because there are more than 100 kinds of diseases, and the weight of the five diseases is 76% of the total weight, so the number of samples for these five diseases is much larger than the total number of other diseases. On the contrary, Although there are many other diseases, the weight of sample number is too small. If the relevant model is constructed, it will be affected by error, contingency and other factors, which lead to inaccurate results and have no practical significance. We can only consider the relationship between these five symptoms and sleep, and ignore other diseases. Put the data into the model and analyze it with SPSS.stops when the center point changes less than the minimum distance between the center of the initial category and the minimum distance between the center of the initial class

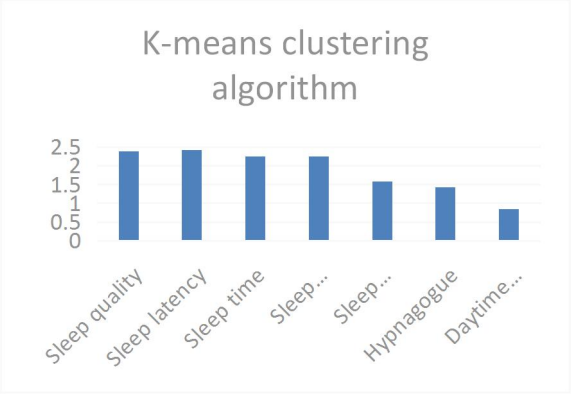

Figure 1 K-means clustering algorithm

As shown in the figure:

Take the disease of Sleep disorder as an example. Four factors, Sleep quality and sleep time, sleep efficiency, have a great effect on it, so if one patient has a higher level of these four elements than the others, the disease can be diagnosed as Sleep disorder. A few other diseases are similar to the disease.

CONCLUSIONS

The model seeks which factor affects sleep quality and the degree of the impact it causes from different angles. The model can be served as a tool to measure the relationship among objects, In terms of application performance, this model is worth popularizing.

Correlation	value
r_1	0.2376
r_2	0.8134
r_3	0.7156
r_4	0.1942

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Part of the Mammal Suppressor PDCD4 Research

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Abstract: Tumor-suppressor gene is also known as anti-cancer, under the condition of the activation has the role of inhibition of cell proliferation.When the mutations or deletion in the tumor suppressor gene, malignant cells will be infinite proliferation and lead to cancer formation.At present many kinds of tumor suppressor genes have been discovered, this paper studied some mammals PDCD4 (programmed cell death - 4) gene.To download from the NCBI including people, chimpanzees, gorillas and other 12 kinds of the nucleotide sequence of mammalian species were analyzed and got sequence homology;Use of bioinformatics tools MCScanX, Colinearscan analysis got collinearity sequence;Multiple sequence alignment with CLUSTALW software;Using phylogenetic analysis software MEGA7.0 constructed the phylogenetic tree of PDCD4 gene.Based on maximum likelihood (ML) and maximum simplicity method (MP) and the adjacent method (NJ) algorithm to construct phylogenetic tree and based on the same tree species fossil evidence, explain the evolution of the gene is associated with species differences occur together, is a relatively ancient genes.
Key words: PDCD4; Mammals; Phylogenetic analysis; tumor suppressor gene.

1.PREFACE

PDCD4 gene is 1995 Shibahara[5] in mice found genes related to cell apoptosis, is a tumor suppressor gene.Not only to important regulation of programmed cell death, but also by protein transcription and translation to inhibit the growth of tumor cells[2].In recent years, as people life rhythm is speeding up and the way of people's life has become increasingly diverse, abundant for a population with cancer, cancer is a serious threat to people's lives and health.Jansen AP etc. [6] were studied in colon, lung, glial cells, kidney, breast of 60 kinds of PDCD4 gene expression of tumor cells, according to the results in the molecular level, such as protein and mRNA, PDCD4 gene were low or even lack of expression, the PDCD4 transgenic mice found that not only the growth of skin papilloma inhibition by PDCD4 gene expression, and also reduce the incidence of skin cancer.Zhang, etc. [7] the findings of PDCD4 gene is not only involved in the hepatocellular carcinoma cell line Huh7 induction of apoptosis, but also found PDCD4 gene could through the TGF - beta 1 induced apoptosis in hepatocellular carcinoma cell line.Zhang Z , etc. [8] experimental study found by PDCD4 gene expression to increase colorectal cancer cell line can suppress tumor cells.The research showed that the occurrence of PDCD4 gene and tumor development have close relationship.

In this paper, the download from the NCBI including people, chimpanzees, gorillas and other 12 kinds of the nucleotide sequence of mammalian species were analyzed, and using bioinformatics tools such as blast +, MCScanX and Colinearscan to analyzed the nucleotide sequence homologous collinearity. Sequence alignment using CLUSTALX software, based on the maximum likelihood (ML), largest contracted (MP) and adjacent (NJ) algorithm, using phylogenetic analysis software MEGA software construct phylogenetic tree of PDCD4 gene.Phylogenetic analysis reflects all kinds of PDCD4 gene in the evolutionary relationships among the animals.Phylogenetic analysis of PDCD4 gene analysis aimed at the molecular level PDCD4 gene effects on tumor cells, and provide theoretical basis for the research of tumor gene therapy [2].

2.MATERIALS AND METHODS

2.1 THE DATA SOURCE

Mammals of the latest full genome sequence data from NCBI for download, including the whole genome DNA sequence of each species and gene sequence annotation file.Including mammals are shown in Tab.1.

Table 1.the species used in this study

English name	Latin name	logogram
Human	Homo_sapiens	hs
chimpanzee	Pan_troglodytes	pt
gorilla	Gorilla_gorilla	gg
Sumatran orangutan	Pongo_abelii	pa
White-cheeked gibbon	Nomascus_leucogenys	nl
macaque	Macaca_mulatta	mu
marmoset	Callithrix_jacchus	cj
baboon	Papio_anubis	pn
Wild boar	Sus_scrofa	ss
dog	Canis_lupus_familiaris	cl
rat	Rattus_norvegicus	rn
mouse	Mus_musculus	mm

2.2 DATA PROCESSING

Written in Perl language program, to deal with each species gene annotation file, determine each gene on

a chromosome, get the location of the file, each species to rename the CDS sequence of each species, make the name of each gene sequence is consistent with the gene ID, so that the analysis of the follow-up work.

2.3 DATA ANALYSIS

First of all, to Blast mammalian genome comparative analysis to get gene homology;Then, using the linear analysis tools MCScanX, Colinearscan looking for homologous collinear between genome DNA fragments, for collinear region between genome.Write a program, combining with the sequence similarity blast, genome location information and the collinearity among species of linear analysis software MCScanX information among species of lattice plotted on a graph.Fig. 1 shows the sumatran orangutan (pa) and people (hs) genome collinearity lattice figure.

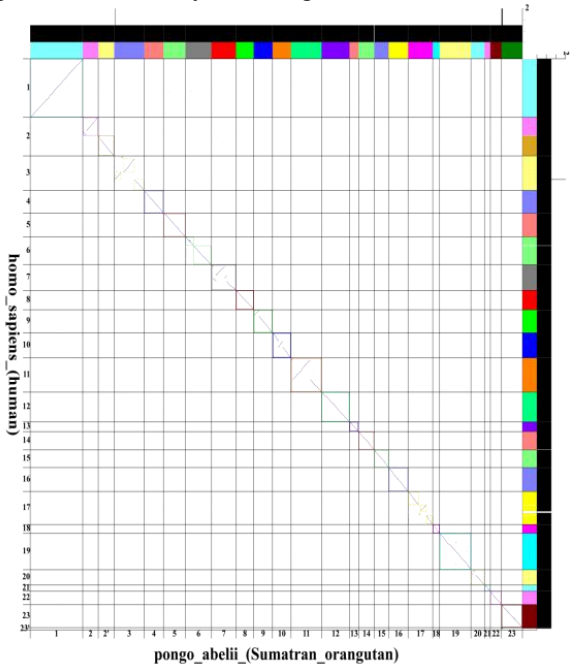

Figure 1 the sumatran orangutan (pa) and people (hs) genome linear lattice figure

2.4 CONSTRUCTON OF PHYLOGENETIC TREES

With CLUSTALX software to carry on the multiple sequence alignment, based on the maximum likelihood (ML), largest contracted method (MP) and the adjacent method (NJ) algorithm, using phylogenetic analysis software MEGA software build 12 kinds of mammals of PDCD4 gene phylogenetic tree, the result is shown in Fig. 2.The repeated sampling analysis (the Bootstrap test) 1000 times to test system confidence level of all branches of the tree.Three kinds of basic consistent method of topology.

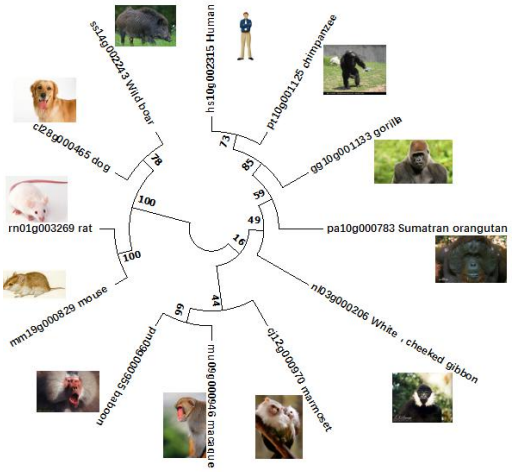

Figure 2 PDCD4 gene phylogenetic tree

3.THE RESULTS AND ANALYSIS

3.1 THE GENOME OF LINEAR ANALYSIS

Fig. 1 shows the sumatran orangutan (pa) and human (hs) genome collinearity lattice figure.Can get from figure

1,4,5,7,8,9,10,11,12,13,14,15,16,18,19,20,21,22,23

chromosomes and sumatran species of orangutans corresponding to the number of chromosomes one and only one block, manifests the corresponding good collinearity between chromosome;Human chromosome 2, 6 and 2, 6 chromosomes of the sumatran orangutan has two block;The article 3 and article 3 of the sumatran orangutan chromosomes have three block;The article 17 and article 17 of the sumatran orangutan chromosomes has four block.The picture shows and the sumatran orangutan genome-wide has a good linear.

3.2 THE PHYLOGENETIC TREE ANALYSIS

According to construct phylogenetic tree can get 2.4: sources of different species of PDCD4 gene in the evolutionary tree is divided into two teams, rat (rn), mice (mm), the dog (cl) and wild boar(ss) are grouped together, and the rat (rn) and mice (mm) for a cluster, the dog (cl) and wild boar (ss) for a cluster, and the other eight kinds of mammals distant relatives;Other eight kinds of mammals gathered for a close genetic relationship.The eight kinds of mammals, overall and can be divided into two teams, human (hs), chimpanzees (pt), gorillas (gg), the sumatran orangutan (pa) and white-cheeked gibbons (nl) for a cluster, marmosets (cj), macaques (mu) and baboons (pn) gather as a cluster;In marmosets (cj), macaques (mu) and the baboon (pn), marmosets (cj) alone for a cluster, monkey (mu) and baboons (pn) gather for a cluster;In human (hs), chimpanzees (pt), gorillas (gg), the sumatran orangutan (pa) and white-cheeked gibbons (nl) ,white-cheeked gibbons (nl) alone for one ,person (hs), chimpanzees (pt), gorillas (gg) and the sumatran orangutan (pa) into a cluster;And then the sumatran orangutan (pa) alone for a cluster,human (hs) , chimpanzees (pt),and gorillas (gg) get together for a cluster;Eventually

gorilla (gg) alone for a cluster,human (hs) and chimpanzees (pt) for a cluster, closest relative.

3.3 THE ANALYSIS OF SYSTEM CONFIDENCE ALL BRANCHES OF THE TREE

PDCD4 gene of mammalian phylogenetic tree with repeated sampling analysis (the Bootstrap test) 1000 times to test system confidence level of all branches of the tree.The result is shown in Fig. 2.PDCD4 gene in the evolutionary tree is divided into two teams, one rat (rn), mice (mm), the dog (cl) and wild boar (ss) branch of confidence of 100%.The same confidence reached 100% and rat (rn) and mice (mm).Marmosets (cj), macaques (mu), baboon (pn), human (hs), chimpanzees (pt), gorillas (gg), the sumatran orangutan (pa) and white-cheeked gibbons (nl) branch of confidence just 16%, that may be caused by mutations in the process of evolution.

4.DISCUSS

This study based on maximum likelihood (ML), largest contracted (MP) and the adjacent formation (NJ) topology are basically identical.Evolutionary tree as a whole is divided into two, and rat (rn), mice (mm), the dog (cl) and wild boar (ss) are grouped together, and marmosets (cj), macaques (mu), baboon (pn), human (hs), chimpanzees (pt), gorillas (gg), the sumatran orangutan (pa) and white-cheeked gibbon (nl) together as one.With tree species is roughly same, based on fossil evidence shows that the genetic evolution is accompanied by species differences occur together, is a relatively ancient genes.

Past research has shown PDCD4 gene in the development of the occurrence of a variety of human tumor cells play an important inhibitory effect, expressed in a variety of human tumor cells in low or even lack of expression.Through the analysis of the system development of PDCD4 gene, we've got people, chimpanzees and other 12 kinds of mammalian evolutionary relationships of PDCD4 gene for gene therapy of tumor therapy provides the theory basis of molecular level[4].This study covers only a part of the mammal PDCD4 gene, need to add more in the future research of sequence data mammals PDCD4 gene phylogenetic analysis.

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The Effect of B2O3 on the New Type CaO-SiO2-Al2O3 High Alumina Steel Continuous Casting Mold Slag

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Abstract: In the process of continuous casting of high-aluminum steel, in order to avoid or reduce the reaction between Al in the molten steel and SiO2 in the mold slag, a high-alumina continuous casting powder with low SiO2 and high Al2O3 content was designed. By adding appropriate amount of acidic oxide B2O3 coordinates the acidity and alkalinity of slag, and the influence of B2O3 content on the melting characteristics, viscosity characteristics and heat transfer characteristics of slag film is analyzed by experiments. The results show that when the content of B2O3 is in the range of 3-11%, the melting temperature, viscosity and viscous flow activation energy of the flux decrease with the increase of B2O3 content, and the heat flux increases. The isothermal transformation curve (TTT curve) shows the time increases and the crystal growth rate decreases; Under the experimental conditions, increasing B2O3 content can inhibit the CaF2 precipitation in the protective slag.
Keywords: high aluminum steel; mold flux; viscosity

1 PREFACE

In recent years, with continuous development of continuous casting technology, some of the relatively high aluminum content such as 20Mn23AlV (low magnetic steel), 38CrMoAl (nitride steel), Al-TRIP steel (automotive steel) [1] Die casting process from the original production to continuous casting. However, due to the high content of aluminum in the steel, the content of Al2O3 in the mold during casting increased significantly, which led to great changes in the properties of continuous casting mold flux and the surface quality of continuous casting and slab.

Jeffrey [2] and other studies have shown that when molten steel with high aluminum content is contacted with conventional slag, [Al] easily reacts with the slag (SiO2), which leads to the increase of Al2O3 in the molten slag, and the slag cannot flow evenly between the billet and the Crystallizer, which causes the bonding between the billet and the Crystallizer. Wang et al. [3] Pointed out that during the casting of high-aluminum steel, mold slag flux radiative heat transfer characteristics of a significant change; Zhang [4] et al simulated high-aluminum steel casting process slag composition changes Trend, the study concluded that the viscosity of slag increased sharply with the increase. It can be seen [5], the conventional high SiO2 content of flux in the casting of high-aluminum steel is not conducive to stabilizing the metallurgical properties of mold flux, affecting the continuous casting process, thereby deteriorating the slab surface quality.

2 RESEARCH PROSPECTS

Researchers [6] at home and abroad are committed to the development of new high alumina steel continuous casting protection slag, at present, the main focus is on the study of low alkalinity and new CaO-Al2O3, the former by reducing the content of CA in slag, minimizing the degree of alkalinity change caused by the reaction of SiO2 and aluminum in the slag. The latter is to replace the traditional SiO2 with Al2O3, so as to reduce or avoid the occurrence of the reaction, reduce the change of slag composition, and then through the selection of appropriate fluxes and carbon content so that the reaction after the protection slag with suitable melting point, viscosity and crystallization properties and other physical and chemical properties [7].

Based on the design idea of conventional slag, domestic and foreign scholars have studied deeply the casting of high aluminum steel with low alkalinity continuous casting protection slag [8]. Compared with traditional slag, low alkalinity continuous casting flux can solve some problems of continuous casting, improve the quality of casting billet to some extent, but it still can't solve the problem of continuous casting process of high aluminum steel fundamentally. High aluminum steel, especially the crack-sensitive steel grades [9], using low alkalinity continuous casting slag casting, the surface of the cast slab has more or less longitudinal cracks, sags and other quality defects, which is thicker than the slag residue, the flow of liquid slag and slag film Heat transfer is closely related to Al2O3 close.

In recent years [10], metallurgical workers at home and abroad have made a lot of research on the physicochemical properties of the new type

CaO-Al2O3 high AL steel continuous casting slag. Blazek and other people established the CaO-Al2O3 base high aluminum steel casting protection slag. The results show that the interaction between the slag is obviously reduced and the quality of the billet is significantly improved, but it is accompanied by the consumption and lubrication of slag. Cho et. Through the design of CaO-Al2O3 base continuous casting slag to study the 1.45%Al content of high aluminum steel continuous casting process, it is found that compared with the traditional slag continuous casting process, CaO-Al2O3 base continuous casting slag lubrication and heat transfer effect and the quality of the billet have been improved, At the same time, it is found that the crystallization of slag film is too strong to influence slag lubrication, in the end, the quality defects of the billet, as shown in Fig. 2, show that the defects of the slab caused by the CaO-SiO2 and CaO slag continuous casting process can be seen that the transverse and longitudinal defects of the traditional CaO-SiO2 slag continuous casting production are obvious, the transverse longitudinal defect of the billet in the continuous casting of CaO-Al2O3 is basically disappeared, but there are still obvious drag marks, which may be caused by the insufficient lubrication. Wang Anlin studied various oxides (e.g., Li2O). The effect of the addition of Na2O, MN, ZrO2) on the crystallization behavior and heat transfer performance of CaO-Al2O3 base continuous casting slag, and provide some theoretical basis for designing reasonable CaO-Al2O3 base protection slag: Chops et al studied the crystallization property of CaO-Al2O3 base high alumina steel continuous casting flux, The effects of oxides such as B2O3, Li2O and ZrO2 on crystallization were evaluated, and the crystallization ability of CaO-Al2O3 slag was solved.

Therefore, this paper uses CaO-Al2O3-SiO2-MgO-Na2O-Li2O slag system and mixed with different content of B2O3 to make high aluminum steel continuous casting protection slag, study the influence of different B2O3 content on the physical and chemical properties of high aluminum steel slag, laying the theoretical foundation for the design of high aluminum steel slag.

3 EXPERIMENTAL PROGRAMS

The protection slag composition of high aluminum steel is based on the low melting point region formed by high Cao, high Al2O3 and low SiO2 content in CaO-Al2O3-SiO2 ternary slag system (as shown in Fig. 1), which is prepared by adding flux of Na2O, Mogo, Li2O, CaF2 and B2O3, the chemical constituents of the design slag are shown in table 1. According to the patent SiO2 content is less than 7% [11], the molten slag in the SiO2 and steel liquid Al does not react or react lightly, so the slag system design SiO2 content of 6%.

Table.1 The main chemical compositions of the protective slag of high aluminum steel for experiment

Components	CaO	Al2O3	SiO2	F-	MgO	Na2O	Li2O	B2O3
Quality Score/%	29	30	6	6.8	6	10	4	4,6,8,10

Using Slag column deformation method to analyze the melting characteristics of slag, including the softening temperature of the slag, the temperature of the hemispherical point and the flow temperature, the viscosity of the slag is analyzed by the high temperature viscometer, including the viscosity of the slag and the activation energy of the flux, etc. the heat transfer characteristics of the slag film are analyzed by using the slag film heat flux simulator, including the film thickness Slag film heat flux and slag film crystallization characteristics, the principle of this experiment is found in the literature, using SEM analysis of slag film structure, using X-ray diffraction analysis of slag film crystallization phase, using the hot wire method to build the slag line TTT curve.

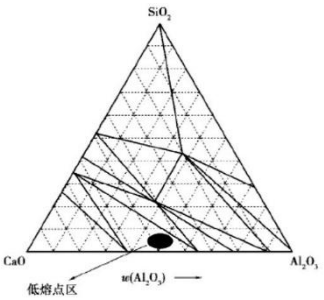

Figure.1 Ternary phase diagram of CaO-SiO2-Al2O3 slag

4 RESULTS AND DISCUSSIONS

4.1EFFECT OF B2O3 CONTENT ON MELTING CHARACTERISTICS OF SLAG

The melting point of mold slag should be lower than the surface temperature of the billet shell, the surface temperature of the billet at the mold outlet is generally greater than 1 200℃, therefore, the spherical point temperature of the slag is usually 1 000-1 200 ℃. The effect of B2O3 content on molten properties of high alumina steel continuous casting flux as shown in Figure 2.

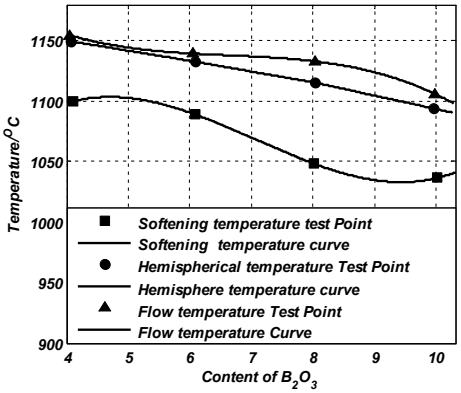

Figure.2 Effect of B2O3 content on melting

characteristics of high alumina steel slag

As shown in Figure.2, the spherical point temperature of the slag system of continuous casting of high alumina steel is less than 1160 ℃, which accords with the melting point control range of the continuous casting flux. As the B2O3 melting point is low (450 degrees Celsius), it is easy to form the low melting point material in the slag, and the effect of reducing the melting temperature of the slag is remarkable, with the increase of B2O3 content, the melting point of the slag decreases gradually, and the B2O3 content in 4-10, the average temperature of the protection slag hemisphere is reduced by about 8 ℃.

4.2EFFECT OF B2O3 CONTENT ON VISCOSITY CHARACTERISTICS OF SLAG

If the viscosity of slag is too large or too small, the thickness of the residue film in the mold is uneven, resulting in poor lubrication and heat transfer, resulting in cracks in the billet. B2O3 is a network forming body, which can increase viscosity, meanwhile, B2O3 can significantly reduce the melting temperature of slag and increase the superheat of molten slag, thus reducing the viscosity, so the influence of B2O3 on the viscosity of slag is more complicated.

Effect of B2O3 content on viscosity characteristics of high Al steel slag as shown in table 2, the temperature of turning point in the viscous temperature curve of the slag is Tbr to characterize the solidification temperature of the slag, and the viscosity temperature curve is shown in Figure. 3.

Table.2 Effect of B2O3 content on viscosity characteristics of high alumina steel slag

w(B2O3)	Viscosity(1300℃)/Pas	Turning Temperature /℃	Activation /(kJ/mol)
4	0.172	1220	418
6	0.147	1210	369
8	0.139	1200	299
10	0.132	1170	279

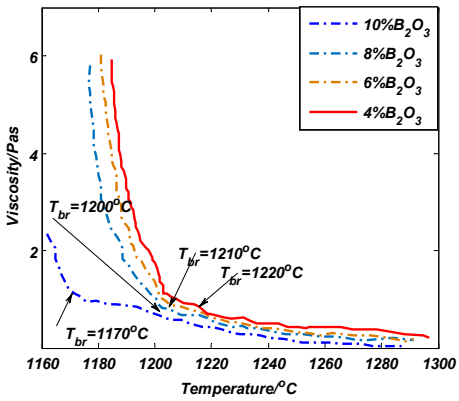

Figure.3 Effect of B2O3 content on viscosity temperature curve of high alumina steel slag

It can be seen from table 2 that when the content of B2O3 is 4-10%, the viscosity of slag, the temperature of turning point and the activation energy of viscous flow have a downward trend with the increase of B2O3 content in slag, but the change process slows down when B2O3 content exceeds 8%.

According to the experimental results of the melting point and viscosity of the slag, B2O3 mainly decreases the melting temperature of the flux and makes the melt have a higher degree of superheat, which in turn reduces the viscosity of the slag. Melt at higher degrees of superheat, the molecular activity increased, giving more available for the use of atoms or molecules of the hole, so that the structure of loose, and increased mobility, so that the lower the viscosity of the flux. The magnitude of the activation energy of the fluxes of the fluxes reflects the fluidity of complex Si-O (Al-O) complex ions during the temperature change. The fluidity is closely related to the temperature sensitivity of the ion fluxes. With the increase of B2O3 content, the viscous flow activation energy of slag decreases, which shows that the thermal stability of complex ion clusters tends to increase.

4.3 Effect of B2O3 on heat transfer performance of slag

The effect of B2O3 on the film heat flux of the slag film in the continuous casting of high alumina steel was studied by the slag film heat flux simulator, and the heat flux characteristic time and the flux density of slag film were shown in Figure.4. The thermal characteristic time of the slag film refers to the time required for the copper Crystallizer to form a stable air gap from the immersed slag. The maximum slag film heat flux is the maximum value of the heat flux of the copper mold immersed in the liquid slag, which mainly reflects the heat transfer capacity of the liquid slag, and the average heat flux is the average of the maximum heat flux to the characteristic time period heat flow. It mainly reflects the control heat transfer ability of solid state slag film.

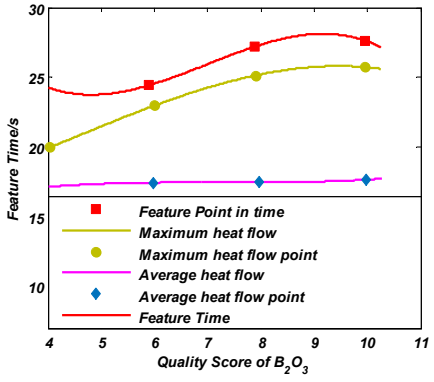

Figure.4 Effect of B2O3 content on the characteristic time of slag film and heat flux of slag film

It can be seen from figure.4 that with the increase of B2O3 content, the characteristic time increases, the maximum heat flux density and the mean heat flux

increase. The formation of the interfacial air gap between the slag film and the Crystallizer is related to the crystallization property of the slag. The weaker the crystallization tendency of the slag, the longer the time required to form a stable air gap between the slag film and the Crystallizer, the longer the heat flux characteristic time of the slag film is; for molten slag, the thermal conductivity of liquid slag is related to nbo/t in molten slag, the smaller the nbo/t, the weaker the thermal conductivity The average heat flux of solid slag film is closely related to the crystallization rate and thickness of slag film, and the average heat flux decreases with the increase of slag film thickness and crystallization rate. The above analysis shows that the heat transfer characteristics of the slag are closely related to the mold rate and the thickness of the slag film.

Effect of B2O3 content on film thickness and crystallization rate of slag in continuous casting of high alumina steel as shown in Figure.5:

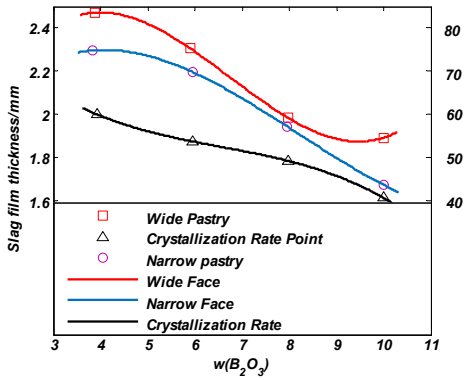

Figure.5 Effect of B2O3 content on thickness and crystallization rate of slag film

3.4 TTT CURVE OF B2O3 NON-REACTIVE PROTECTIVE SLAG

The precipitation of high melting point crystals in the slag ring requires a process, the isothermal transformation TTT curve of the slag is constructed by the hot filament method, and the formation and growth of the crystal of different B2O3 content are studied. The TTT curve of the B2O3 slag with 4% and 10% content is shown in Figure.6-7.

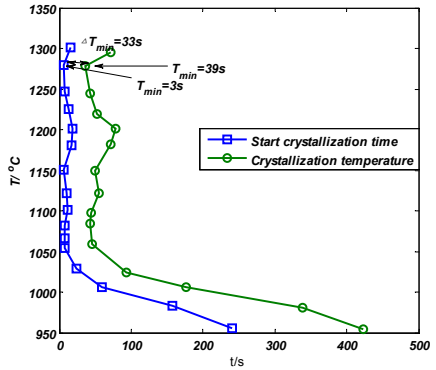

Figure.6 4%B2O3 TTT curve of non-reactive flux

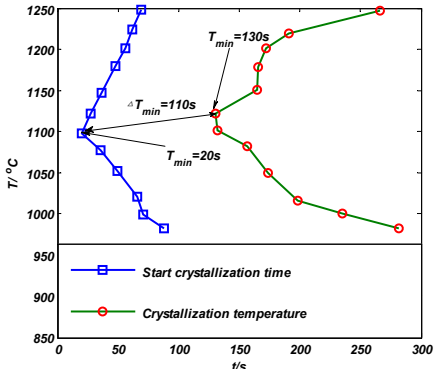

Figure.7 10%B2O3 TTT curve of non-reactive flux

Comparing Figure.6 and Figure.7, B2O3 content increased, the time needed for crystallization and full crystallization of the slag was obviously increased, and the time needed to complete the crystallization process increased from s to one s, and the crystal growth rate decreased. Because the slag is in the flow state during the casting process, with the prolonging of gestation time and the time required for complete crystallization, it is not easy to crystallize or crystallization ability of the slag adsorbed on the mold wall, that is, increasing the B2O3 content in the slag will help to weaken the slag ring, stabilize the slag consumption, and ensure the continuous casting process smoothly.

5 CONCLUSIONS

In order to avoid the interface reaction of steel slag, a low SiO2 and high Al2O3 protection slag is designed for the protection slag of high aluminum steel continuous casting, and the influence of B2O3 content on the physicochemical properties of the slag is analyzed, and the main conclusions are as follows:

The average temperature of the B2O3 in the 4–10 is 1100-1160 ℃, and the temperature of the sphere point of the slag is reduced 8 ℃

B2O3 has an important influence on the viscosity of high alumina steel, and with the increase of B2O3 content, the viscosity of slag, the turning temperature and the activation energy of viscous flow are all decreased.

With the increase of B2O3 content, the heat transfer characteristic time of the slag film of high aluminum steel is increased, the flux density of the slag film increases, the thickness of the slag film and the crystallization rate are decreased, the time of crystallization and complete crystallization of the slag is obviously increased, and the time required for the whole crystallization process is obviously prolonged.

Increasing the B2O3 content, prolonging the incubation time and slowing the growth rate of the crystal, which is beneficial to the formation of slag ring.

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Prediction of EOR Method based on Kernel Extreme Learning Machine

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Abstract: In recent years, with the rapid economic development in our country, the status of petroleum production has become more and more important. Timely grasp the production changes and operating conditions of the pumping well have very important meanings for the overall benefit and safety production of the entire oilfield. However, at present, in oil production engineering, due to the single application of well dynamic data and the inability to grasp the production changes of oil well production ahead of schedule, the production plan can not be effectively formulated and the overall benefits are affected. In oil well production, still dominates. However, because of its complex downhole conditions and harsh environment, the occurrence of faults is higher, affecting safety in production and oil production quality. Although there are theoretically some methods for oil well production prediction and fault diagnosis, such as LM algorithm optimized BP neural network (LMBP), genetic algorithm optimized BP neural network (GABP), RBF neural network, support vector machine (SVM), Etc., the production prediction and fault diagnosis can not be completed well yet, and the prediction error and diagnosis accuracy need to be greatly improved. Therefore, based on the improvement of limit learning machine algorithm, this paper proposes a method of oil well production prediction based on the combination of gray relational analysis and improved extreme learning machine and the fault diagnosis of sucker rod wells based on combination of wavelet packet and improved extreme learning machine Method to achieve a single well production and sucker rod wells trouble fast, accurate prediction and diagnosis.
Keywords: EOR, KEML, Prediction Method

1. INTRODUCTION

Pole-oil production still plays an important role in the exploitation of oil and today still holds an absolute advantage in all oil-producing countries. As the pump installed in the working environment of the poor underground, so it not only by the pumping unit, sucker rod, pump and other equipment, but also by gas downhole, wax, sand, so the failure rate is very high, Affected the normal production of oil fields. Therefore, we should do a timely and accurate monitoring of the well's working conditions, and quickly formulate the correct solutions to ensure that the wells can quickly and properly produce and improve their work efficiency. After a long period of analysis and research, oil well production prediction methods and pumping well fault diagnosis methods have made significant progress. At present, the prediction of oil well production is mainly based on the fitting formula method, but the oil well production prediction is a complex multivariable nonlinear dynamic system. It is difficult to predict accurately with the fitted formula method. The dynamometer method is a very effective fault diagnosis method for pumping wells. It mainly relies on the analysis and diagnosis of the shape characteristics of the dynamometer in different operating conditions. The key problem of fault diagnosis using dynamometer is how to mine the effective fault information from the collected data and select the diagnostic method with high speed and high diagnostic rate. Therefore, based on the improvement of extreme learning machine algorithm, this paper presents a method of oil well production prediction based on the combination of gray relational analysis and improved extreme learning machine, and a fault diagnosis method based on combination of wavelet packet and improved extreme learning machine.

2. OIL WELL PRODUCTION FORECASTING PRINCIPLE

Oil wells in oil wells have wells and oil and gas wells, this paper mainly oil and gas wells for the study. Single well production forecast is a dynamic issue. It is related to reservoir characteristics such as permeability, relative permeability of oil phase, effective reservoir thickness, fluid viscosity, reservoir average pressure, volumetric coefficient, oil saturation, oil pressure, water cut and other parameters. Permeability refers to the rate of penetration of a liquid in a medium at a certain pressure differential, indicating the ability of the soil or rock to conduct the liquid itself; porosity, the geometry of the void, the size of the particles, the orientation of the arrangement, etc. determine the infiltration The rate of the size. The effective thickness of the reservoir is the thickness of the part of the reservoir capable of producing oil in the reservoir. Determining the effective thickness of the reservoir is actually the determination of the boundary between the reservoir and the non-reservoir. The effective thickness of the reservoir should be determined by well logging interpretation data, core analysis and single-layer oil testing. By analyzing the relationship between relative permeability,

petrophysical parameters and pore structure, the oil saturation of the movable oil reservoir, Permeability and porosity; and then quantitatively and qualitatively interpret the logging data to make well logging criteria for the effective thickness of the reservoir. Fluid viscosity is generally used to indicate the size of liquid viscosity. Viscosity means the resistance factor associated with the properties of a liquid. It refers to the nature of the friction between molecules as it flows. Oil pressure refers to the residual pressure of the crude oil flowing from the bottom of the well to the wellhead. Hydraulic pressure and hydrostatic pressure of the points, the pressure refers to the production of hydraulic oil wells, hydrostatic pressure is closed when the oil pressure; because of friction and frictional resistance flow loss, so it is less than static pressure. Flow pressure and yield related, when the output increases, the pressure will drop; static pressure and formation pressure related to the formation pressure can be judged by static pressure drop situation.

For the forecasting problems of many influencing factors such as monthly production of water, hydraulic pressure, water cut, cumulative oil production and cumulative gas production, if the factors that have the most influence on the forecast target can be taken as input training samples, the oil well Production forecast. Therefore, this paper proposes to obtain the main influence factors through the gray relational analysis. Gray relational analysis (GRA) belongs to an important part of gray system theory. It is an effective method to mine the internal relations of data. Since Professor de gonglong was proposed, GRA has been widely used in many fields. Gray relational analysis is based on the gray relational degree, through the geometric similarity of the curve geometry and the geometric relationship between the data series to compare the degree of correlation between the various factors in the system. Gray relational analysis is to model and serialize the gray relation between the physical prototype and the operating mechanism or lack of physical prototype completely, and then establish the gray relational analysis model to quantify, order and visualize the gray relation. Modal provides a way.

3. EXTREME LEARNING MACHINE THEORY AND IMPROVEMENT METHODS

In order to solve the above problems caused by the gradient descent method in the feed forward neural network, Huang Guangbin et al. Proposed a new algorithm for single hidden layer feed forward neural network called Extreme Learning Machine (ELM).

After many scholars' efforts, extreme learning machine has been widely used in function approximation and pattern classification. However, when the activation function of limit learning machine is improperly chosen, the generalization ability of the network, especially the extrapolation ability, becomes very high Therefore, optimizing the type of neuron activation function according to practical problems is very important for designing a high performance neural network. Wavelet function is a function based on wavelet transform theory, which can effectively extract the local information of input data. The network structure of wavelet function has the advantages of easy to adapt to new data, fast convergence rate and large extrapolation error. Therefore, this paper proposes to introduce the Morlet wavelet into the ELM, using the wavelet function as the excitation function of the hidden layer of the network, which can improve the local processing ability of the network to the data. In the selection of the activation function of extreme learning machine, Huang Guangbin et al. Have proved Theorem 1 and Theorem 2 in [46] that when the hidden layer excitation function is infinitely differentiable, its hidden layer threshold and input weight vector can be assigned randomly , We can achieve the approximation of training sample set. It is easy to prove that the Morlet function is infinitely differentiable. Therefore, it is feasible to construct the Wavelet Extreme Learning Machine (WELM) using the Morlet function as the activation function of the hidden layer.

ELM is an easy-to-use and effective single hidden layer feed forward neural network learning algorithm. In this chapter, firstly, the artificial neural network and its characteristics are described briefly. Then, the importance of the algorithm in artificial neural networks Single hidden layer feedforward neural network theory and its shortcomings; for the lack of single hidden layer feedforward neural network leads to the limit learning machine, but it still exists only consider the empirical risk, there may be learning, generalization performance In the end, this chapter gives a method to improve the limit learning machine by introducing the theory of minimization of structural risk into the limit learning machine, and using the wavelet function to replace the general hidden-layer excitation function, so as to improve its over-learning , The generalization of relatively low performance defects. Using MATLAB R2010b software, the traditional training set (ELM), RBF neural network and support vector machine (SVM) are respectively used to train the training samples. The parameters c (penalty factor) and the parameter g (variance in the RBF kernel function) of the support vector machine (SVM) are also selected by the cross-validation method. The final selection of c is 5 and g is 0.02. The number of hidden layer nodes in ELM is N, which is 20, and RBF neural network, after multiple trainings, selects the best spread as 0.4. Finally, the best four fault diagnosis methods are constructed. The four trained fault diagnosis models are used to test the test sample set in Table 5.2 below, and then the four diagnostic methods are compared to simulate the test results respectively. The diagnostic results of the four diagnostic methods are shown in

Figure 5.7. As can be seen from Figure 5.7, there is only one true fault category in the improved RWELM fault diagnosis result, which is inconsistent and the accuracy is very high. The traditional extreme learning machine (ELM) has the worst diagnosis effect and three diagnoses The result is obviously different from the real value. Support vector machine (SVM) except one diagnose result is obviously wrong, others are the same as the real fault category; RBF neural network has two obvious deviations in diagnoses, and the rest are basically the same with the real ones.

4. OIL WELL PRODUCTION PREDICTION BASED ON EXTREME LEARNING MACHINE

In the oil well production forecasting process, with the scientific computing software MATLAB R2010b well production forecasting algorithm flow chart programming. Prediction of yield is essentially a kind of regression prediction problem. The selection of input eigenvectors has a great influence on the prediction results. Therefore, this paper first extracted the main influencing factors of oil well production by gray relational analysis, Sample sets, and then the sample data are normalized as the input vector to improve the limit learning machine, and finally the training and testing of the sample, and the prediction results.

The data provided by Hollysys petrochemical project are selected as the test objects. Selected five single-well production factors: monthly water, water content, cumulative oil production, cumulative gas production, oil pressure. First of all, through the gray relational analysis of these influencing factors, the relationship between each influencing factor and single-well production was obtained. Select the more relevant factors as the main influencing factors. Gray correlation analysis is described in detail in Chapter 2 above and will not be elaborated here. The correlation degree corresponding to the monthly production of water, moisture content, total oil production, cumulative gas production, oil pressure. From the correlation data of the various influencing factors, we can see that the correlation degree of monthly water production is the smallest, which shows that it has the least impact on single-well production, but the correlation of water content is larger, the monthly production of water and moisture content itself has Therefore, in this paper, we only consider the four main influencing factors of moisture content, cumulative oil production, cumulative gas production and hydraulic pressure. The four main influencing factors and the output form the final output forecast sample. Because the different dimensions of the influencing factors and yield will affect the prediction results to a certain extent, which is not conducive to the improvement of the prediction accuracy. Therefore, the sample data set should be normalized.

From the beginning of June 2010, the first month will be counted, followed by numbered order of February, March ... ie the number represents the first few months. A total of 26 months, the following papers are related to production time, according to indicate the first few months from June 2010. In this paper, rolling forecasting method to solve the actual forecasting needs. The basic idea is to first train the data for the first 10 months and then forecast the single well production for the 11th month, then add the data for the 11th month to the training group for training, and then predict the single well for the 12th month Yield; and so on. Fully realize the effective use of data, test the performance of the algorithm.

The MATLAB R2010b software was used to train and predict the sample data using RWELM, ELM, LMBP and GABP (Genetic Algorithm Optimized BP Neural Network) respectively. Among them, the traditional limit learning machine (ELM) hidden layer nodes set the same way as RWELM prediction; LMBP neural network and GABP neural network to select the best network structure, the three-tier network model selected as 4-12-1 Structure, hidden layer function using tansig type, output layer using purelin linear function.

Improve the production forecasting process of the limit learning machine according to this process step, and then make an example analysis of predicting the production of oil well according to the limit learning machine. Then, the sample data set extracted by the gray relational analysis in Chapter 2 is normalized and the input and output vectors are determined. Then, the forecasting model of single-well production is established, and the specific method of network parameter selection is given. Finally, simulation experiments are carried out. The results of RWELM, ELM, LMBP and GABP are compared and analyzed. The results show that RWELM, Of the oil well production forecast results and the actual output is the closest, the average relative error is the smallest. This shows that it is feasible to make single-well production forecasting using the improved limit learning machine.

5. CONCLUSION

At present, the application of single-well dynamic data can not grasp the production changes of oil well production in advance, and can not effectively formulate production plans to improve the comprehensive benefits of the oilfield. The downhole conditions of pumping wells are complicated and the faults are difficult to be identified in time. Corresponding maintenance measures can not be carried out rapidly, Reduce oil production quality and affect safety in production. In view of these two problems, this paper studies and improves the limit learning machine, and puts forward the oil well production forecasting and pumping well troubleshooting method based on the improved limit learning machine. The simulation results show that the average relative error of output forecasting is 1.1204%, fault diagnosis accuracy Which is 96.667%,

and the fault diagnosis time is short, which is better than the existing methods, which proves the feasibility of the proposed method.

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The Enlightenment of Organizational Justice Research on Human Resource Management

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Abstract: Organizational justice research shows that the higher the fairness of the organization members, the higher the cohesion of the organization and the efficiency of the members. This paper starts from the definition of organizational sense of fairness and the related research results, analyzes the revelation brought by organizational sense of fairness to human resource management, and explores the effective ways to improve human resource management as the starting point.
Keywords: Organizational Justice; Human Resource; Management

1. INTRODUCTION

In social life, people are most concerned about is the issue of fairness. All along, fairness is the goal pursued by everyone, but fairness in real life is often only an ideal manifestation. This is because, in real life, many factors in restricting the fair, there are two specific reasons: (1) because people in the age, gender, education and other aspects are different, there are differences, so the fair The knowledge will be different. Although society is developing, people's ideas are changing, but personal thinking and the impact of traditional ideas, the view of fairness is different. (2) real life, in the fair and unfair feeling, the same some differences. For example, people are less concerned about fairness, but are very sensitive to unfair things, easily aroused people's attention. In real life, the question of fairness is complicated, and fairness occupies an important position in the minds of people. Therefore, it is no doubt that the study of fairness has become an object of concern. Social development, people's ideas will also change, with the emergence of the disparity between the rich and the poor, the study of fairness issues become sensitive and complex. To this end, this article here on the organization of a sense of fairness, and how to improve the sense of organizational human resources management aspects of the corresponding measures.

2. DEFINITION OF ORGANIZATIONAL SENSE OF FAIRNESS

Organizational justice refers specifically to the organization members of the organization's internal and personal interests related to the system, policy and management measures and other aspects of fair feelings. And the sense of social justice is different, the sense of organizational justice mainly contains two levels, one refers to an objective state within the organization, through the organization of the system, policy, etc. to adjust to change this state, but difficult to achieve absolute fair The The other level refers to the organizational members of the organizational fairness of the subjective feelings, the two have a strong relevance, but not necessarily linked, that is, organizational fairness will not directly determine the sense of fairness of the members of the organization, will be affected by individual differences The A relatively fair system can not be positively influenced by the members of the organization if it can not be recognized and accepted by the members of the organization. From the point of view of organizational behavior, organizational justice has an important influence on the operation and development of the organization, and it is related to the level of organizational action.

At present, the research on the sense of organizational justice can be divided into two aspects, one is the organization of the sense of fairness and the relationship between the interaction, the second is the effect of organizational sense of fairness. In the aspect of organizational sense of fairness, the related research shows that it is mainly composed of three parts, namely, fair procedure, fair result and fairness. In the early study of the distribution of equity by Adams, the fairness of the distribution of the amount of compensation was used to measure the fairness of the organization. It was pointed out that if the distribution results matched the individual contribution of the organization, the individual would feel fair and would not have a sense of fairness. Volcker and others proposed procedural fairness in the study of the fairness of legal proceedings, pointing out that if the members of the organization can participate in the decision-making process, enjoy certain decision-making power, regardless of whether the decision-making results are beneficial to their own, will produce a sense of fairness. This is fundamentally different from the results of fairness, so that the organization of fair theory has been further improved. Since then, Bisi and others on the distribution of feedback on the implementation of the study, put forward the concept of interactive fair, Greenberg for its more detailed description, will be divided into interpersonal equity and information fairness. Interpersonal justice included in the organization of the lower level of communication process, the superior is to do the lower level, respect for each other and so on. Information fairness refers to the organization in the process of information

transmission, whether the parties to provide the necessary explanations, including the distribution of results and distribution of the interpretation. The research on the effect of organizational justice is mainly focused on the study of the relationship between organizational justice and employee behavior, including performance efficiency, collective consciousness and personal value. Related research shows that members of the organization feel the higher sense of fairness, the more able to stimulate its internal motivation, improve work efficiency and ability to work. On the contrary, there will be negative slow down, and even make damage to corporate image and interests of the act.

The so-called sense of organizational justice, refers to the unit or organization, people are closely related with their own, and related to personal interests of the organizational policies, institutions and the corresponding measures produced by a fair feeling. Organizational justice has two meanings: (1) the performance of objective state. In this sense, people in order to achieve organizational justice, so through the improvement of the system, the implementation of the organization to achieve fair goals, but in fact, the perfect organizational fair is almost impossible. (2) for the organization of a sense of fairness, the sense of organization referred to here is a sense of fairness of the members of the organization. Although there are differences in the above two aspects, but also complement each other, for example, a so-called fair system appears, no way to get the recognition of employees, then, this system can not fully play a role. So, it can be said that the sense of organizational justice is actually more important. However, even within the same organization, because of different members, the understanding of organizational sense of fairness is different, and to make different employees have the same sense of organizational sense of fairness, you need to have a prerequisite, such as the concept of fairness Understand the same. As people change in social attitudes, there will be some changes to the concept of fairness, which will be gradually accepted for the general concept of fairness, such as: consistent working hours, then equitable distribution based on the quality and quantity of labor, In production, the greater the contribution, the greater the harvest. And the so-called fair concept can be successfully implemented, but also need to have the appropriate procedures to protect. Under the new social situation, in order to guarantee the common interests of everyone, when necessary, appropriate coordination should be made between the various strata. The study of the sense of organizational justice, mainly from two aspects: First, its structural research, that is, how to organize the main sense of fairness which aspects of the composition of these aspects of how the relationship between the two; the study of its effect, that is, the sense of organizational justice and organizational behavior on the relationship.

3. TO IMPROVE THE HUMAN RESOURCES MANAGEMENT BASED ON THE REVELATION OF ORGANIZATIONAL JUSTICE

Based on the above definition of organizational sense of fairness and the analysis of relevant research, we can get the following inspiration: First, the sense of organizational sense of the members of the organization's performance, collective awareness and job satisfaction have a direct impact; Second, The fairness of the process and the fairness of the interaction. Only three of them can meet the requirements, so as to ensure that the members of the organization have a high sense of fairness. Thirdly, the sense of organizational justice is closely related to the behavioral goals of the members, and the operational efficiency of the organization. It can be seen that the sense of organizational justice has an important impact on the operation and development of an organization, we must take a reasonable approach to human resources management, efforts to enhance the organizational members of the sense of organizational justice. Organizational and individual differences affect people's understanding of fairness, and there are differences in the sense of fairness. But the sensitivity to unfair events is a common social phenomenon in which people are less concerned about fair events and are more concerned about unfair events. Organizational management must be based on the elements of organizational sense of fairness, to take a full range of management measures to reduce the probability of unfair events, to provide protection for the organization of fairness.

A company actively learn from the results of organizational justice to bring the revelation, take the following measures to improve the human resources management, organizational members of the sense of fairness has been significantly improved, and achieved good results. The establishment of a scientific performance appraisal and pay distribution system, the results of fair research shows that the fairness of the distribution of benefits to members of the organizational sense of fairness has a key impact. The so-called fair distribution of benefits, is based on a member of the allocation of investment, the key is the correct evaluation of the members of the input. At present, the salary distribution system based on the performance appraisal system can guarantee the fairness of the distribution of benefits to the maximum extent, but it is necessary to ensure the scientific and rationality of the evaluation index system. The implementation of organizational participation system, so that members participate in the process of organizational decision-making, which can effectively enhance the sense of fairness of members of the organization, to make up for the negative impact of the distribution of the negative impact. Members in the process of participating in organizational decision-making, you can build a

sense of belonging, and play the advantages of democratic decision-making to ensure the rationality of organizational decision-making. Improve the members of the complaint system, members of the complaint system is an important measure to protect members of the sense of fairness, when the organization is running an unfair phenomenon, or members of a sense of unfairness, you can communicate through the channels of communication with the organization and management personnel, if it is business management There are problems, the rectification of the problem, to enhance the sense of organizational justice. If the members of the organization's own problems, you can also arrange for staff to ease, to avoid the sense of imbalance caused by members of the work efficiency. Taking into account the business efficiency and personal needs. A company in the organization and management process, often encounter a situation, that some members work attitude correct, strong sense of responsibility, but the ability is not outstanding. These members are often more eager to be respected and realize self-worth. The organization should take into account the business efficiency and individual needs, to such members to arrange the appropriate positions, and training and other aspects to give appropriate care, which will not only affect the sense of fairness of other members, but also let other members feel the organization's care, Enhance the sense of belonging to the organization.

When appropriate, some relevant monitoring systems can be established. When employees are unfairly treated, the first thing they want to think about is the matter of appeals, which, through appeals, speaks of what happened to himself in order to get a solution. However, the complaint is not applicable to each employee, and some employees simply do not want to solve the problem in such a way, in many cases, employees do not understand the system, the information can not be grasped in time. Therefore, in order to ensure the smooth progress of the system, to set up a relevant rules and regulations, the fair supervision. It is worth mentioning that, in order to be fair, the supervisor itself to be subject to supervision, and the supervisors have no interest in the relationship between the work can really be fair and clear, prompting the relevant management staff in accordance with the system, so that employees Can appreciate the sense of organizational justice.

The staff participation system to improve, the relevant scientists have shown that as long as the staff involved, regardless of the distribution is not fair, employees will have a sense of fairness. And allow employees to participate in the free and democratic, can produce the following advantages: ① their participation in the role of representatives of the interests of employees can be reflected from a certain aspect, so that the program appears to be more fair; The implementation of the distribution system can be supervised. Some systems are unreasonable system, and as long as the strict implementation of the staff there is a sense of fairness; ③ can improve the relationship between the upper and lower levels. Although in our country, employees are always at a disadvantage, leaders are always able to grasp the more allocation of resources, leadership and staff rarely communicate between, but an enterprise, if you can not mobilize the enthusiasm of the staff, so that employees seriously Participation, then, the work is difficult to proceed smoothly. As long as the staff involved, leaders take the opportunity to express their own ideas, the establishment of lower and higher levels of communication between the system, closer to the emotional distance between employees and leaders, there will be opportunities to communicate with employees in order to enhance leadership and Mutual understanding between employees. Pay attention to the social benefits of the enterprise, the current society, many companies are concerned about the benefits of priority, but in the premise of priority under the conditions of benefit, but also to take into account the individual needs. In every business, there will be part of the staff, although they work diligently, but the performance is very unsatisfactory, the impact on the efficiency of the enterprise. In order to change this situation, companies can adjust their jobs by mobilizing jobs or training them, and reassigning them for a job to change the phenomenon so that they can experience the care of the organization the sense of social responsibility, feel the sense of fairness of the organization.

4. CONCLUSION

Organizational justice has an important influence on the individual performance and organizational development of the members of the organization, giving the inspiration to the organization's sense of fairness and improving the human resource management, which can improve the efficiency and cohesion of the organization. The fairness of the members of the organization of the impact of a wide range of factors, the full implementation of a fair distribution of benefits, member participation system and communication system, can minimize the probability of unfair events, members of the organization to avoid a sense of fairness. The establishment of a relatively fair human resources management mechanism, can fully stimulate the members of the power to promote the organization's better development.

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Research on "Officials of the Elite Athletes" Phenomenon

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Abstract: It is to point to every good athletes get the Olympic Games, the World Cup, the world championships, the Asian games over conditions of reward excellent athletes. In order to study and research at present our country "outstanding athletes GuanYuanHua" phenomenon, mainly USES the data analysis and interview method to the phenomenon of a deep discussion. The research results show that the official position reward although solved to some extent after retired athlete of the employment pressure, but athletes "official position reward" mechanism is the current national sports mechanism under of main performance, excellent athletes GuanYuanHua has become a serious problem. Chinese athletes cultivating mode and the drawback of the idea, need the government to speed up the relevant legislation, from source to grab, trying to expand the athletes in the employment of the space, to change "outstanding athletes GuanYuanHua" phenomenon has the very vital significance.
Keywords: Prominent athletes; Phenomenon of the officials; Official position reward; Body is an optimal

1. INTRODUCTION

Our country has a long history, from ancient times to the present are the state of sports. In particular, since the founding of new China, the CPC Central Committee in 1953 to the Central People's Government Sports Committee of the party group "on strengthening the people's sports work report", and instructions: to enhance people's health, improve people's health, Important political task. Pointed out the nature of the new Chinese sports, tasks and development direction largely encouraged the morale of sports workers and the broad masses of people to participate in physical exercise enthusiasm, and promote the vigorous development of Chinese sports.

Many places that, where the Olympic Games, World Cup, World Championships, the Asian Games awards ranking and other conditions of the elite athletes, can apply through my own, after the relevant departments of the audit, will be able to work according to the placement of cadres. Because many of the world champion sports market is relatively small, they are arranged into the sports institutions, and appointed for the level, deputy level and other positions of the management staff, but also in line with national institutions and sports institutions, the relevant provisions of the management. Therefore, the "excellent athlete" refers to the excellent athletes who have won the Olympic Games, World Cup, World Championships, Asian Games Awards and other conditions. However, it is worrying that the "excellent athlete officials" phenomenon is becoming increasingly serious, in the domestic people caused a strong question. Excellent athletes no matter how excellent, just a professional identity, and other occupations are not essentially different. Why is it specialized? What is the cause of this phenomenon? How to solve the resulting series of problems is the problem urgently needed to solve.

2. THE STATUS QUO OF THE PHENOMENON OF "EXCELLENT ATHLETE OFFICIALS"

(1) Excellent athletes living in office and cannot perform their duties

In China, the world, national athletes champion a few. Some of these elite athletes, the state gave official awards, but they are in office but cannot perform their duties. Thus, for this phenomenon, through a variety of ways, conducted a certain investigation and research: June 2010, 9 Olympic champion by the Shandong Provincial Sports Bureau one-time promotion for the deputy level of leading cadres, including weightlifters Liu Chunhong, Shooting athletes Du Li, archery athletes Zhang Juanjuan, who, although has become a deputy-level leading cadres, but they are still a few players in preparation for the Olympic Games, only from time and effort, it is difficult to perform their duties, the other Capacity and official level of the problem can be placed next; China diving star, known as the Chinese diving team diving queen Guo Jingjing, in September 2007 was officially appointed by the Hebei Provincial Sports Bureau for the provincial swimming diving movement management center deputy director , In the face of this deputy-level cadres, Guo Jingjing can be said to have never been appointed, but this position has been reserved for her; Tian Liang, was the first Chinese "official" athletes, before retirement to get "official title", but Because he engaged in sports training, over the years, although the body has never been in office, early this year Tian Liang has been from Shaanxi Province Liu Wei and Yang Wei, members of the CPPCC National Committee, did nothing on this year's "two sessions", and did not put forward a report on the work of the deputy director of the swimming management center, but his public office staff and related treatment were still retained because it was not removed from office. People's "voice", they live in such a "representative" position,

it can be said, greatly wasted the NPC deputies and CPPCC members of the valuable resources. This phenomenon is too numerous in our country, Wang Liqin, the Chinese table tennis team veteran, in September 2009 was also appointed as Shanghai Ping Yu Center Assistant; Xing Aowei, Chinese gymnastics team coach, in June 2010 was appointed For the Shandong Province Gymnastics Center Deputy Director; Zou Shiming, China boxing team to fight the main players of the London Olympic Games, in January 2011 was appointed deputy head of the Guizhou Provincial Sports Brigade.

In recent years, since Tian Liang in 2005, the first to become part-time active athletes in China after the officials, such officials are almost impossible to perform leadership duties of athletes have been more and more, cannot perform their duties or do not need to perform their duties, Has become commonplace, as the status of outstanding athletes official status, and this number is still increasing year by year. From the above data and information to further reflect the athletes, especially those who have achieved some success, and at home and abroad a little famous athletes, whether they are during the athletes, or retired, the official and cannot perform their duties China is still outstanding, so it raises more controversy.

(2) The phenomenon of excellent athletes are active and have some achievement

In the status quo of outstanding athletes, there is no lack of leadership in the leadership of the conscientious, meticulous success of the achievements of the example, even the Chinese Pinyin are not allowed to recognize the world champion, sports star Deng Yaping is the history of table tennis the greatest woman, Through their own hard work, and ultimately won the British University of Cambridge English degree and a master's degree in contemporary Chinese studies. In 2002, Deng Yaping held the post of two committees of the IOC Ethics Committee and the Sports and Environment Committee. In the second year, Deng Yaping became a staff member of the Beijing Olympic Organizing Committee's market development department. In the job, her outstanding performance has won everyone's affirmation. As well as Xiong Ni, Xie Jun and other outstanding athletes, they are in the official career, serious duty, do an official should perform the duties, and made gratifying achievements. But among these athletes officials, the real officials can still be very little.

(3) People’s view on the "excellent athletes official" phenomenon

In view of the phenomenon of "excellent athlete officials", the survey found in the public, Beijing Sports University doctoral tutor, Chengdu Institute of Physical Education Professor Hao Qin said: "National cadres as a reward for the practice of cadres is very unreasonable, Some foreign Olympic champions get a lot of money on the huge reward, but our country directly to the people rely on the position of the cadres of the country to give incentives for the current Chinese officials are ridiculed, but also the people of dishonesty, because the outstanding players are not equal to excellent Management cadres. "

Similarly, deputy director of Shaanxi swimming center Tian Liang left, the CCTV host Bai Yansong excellent challenge this question: "World champions group as deputy director, in fact, the director became a steward, deputy director has become honored, The official became a champion of the gift, people also love to not. "And he in the" News 1 +1 "column on the" Huang Sui incident "also conducted a deep analysis, which he said:" In the future even the sports system In a lot of administrative office, should also use the democratic way to compete for posts, as long as there is the power to sit in the official position, not only to bring the gospel to the people, the same sports career future is more beautiful.

The overwhelming majority of the public view is that the excellent player does not mean that the country's outstanding cadres, the official hat is a serious political form, should not be a reward.

(4) It did not get the championship and not the official athletes’ phenomenon

Behind the World Sports Champion, there are a large number of small train training, all the way from scratch to win the championship, did not even get any ranking athletes. These athletes, like the world champions, sweat on the sports battlefield, but for various reasons, they do not get flowers and applause, and no local government "self-sentimental" to chase the official position, even bonuses are less Pitiful Among these athletes, along the street stalls, begging along the street a few. These athletes should be of concern, how to solve their retirement after the way out, the government should also consider the issue.

3. DISCUSSION ON THE REASON OF EXCELLENT ATHLETE 'S OFFICIAL POSITION

According to the above information to understand: Guo Jingjing, Tian Liang and other outstanding athletes as officials cannot work in the post, causing the majority of the public question and worry: Do these units of the leadership is very rich? Is the world sports champion in the leadership of the political side of the ability to achieve a good level yet? What is the reason why the elite athlete is behind his office?

(1) States on the athletes to the official arbitrariness

The arbitrariness of the State for the purpose of giving official duties. Our country is a legal system, no matter what the official, first of all to follow the officials of the selection process. The survey was informed that many of our outstanding athletes basically do not have any formal selection of competition procedures and a word seems to be a Zhang appointment book, from a former still in the sports arena of outstanding athletes transformed into a national deputy official. The athlete's own

knowledge and ability in the end is not competent for this heavy position, did not do serious consideration and detailed analysis. Of course, you can also find the relevant departments of the leadership, but also from the actual situation, there is no hope that they are arbitrarily appointed these athletes officials, in the corresponding official office to make prominent achievements. They only the official cap as a random reward or condolence goods to the elite athletes, based on this purpose of the random, athletes officials of course not to attendance, performance appraisal and related tasks arrangements, let alone supervision and supervision , So many excellent athletes living in office and cannot perform their duties is reasonable, not surprising.

Countries on the athletes to the official on the athletes in the political and technical arbitrariness. In our country, to the official side, the benefit of one party, to make achievements, have to have a higher official function. As we all know, athletes because of the needs of motor skills, usually most of the time or all the time used in the training, even the basic cultural knowledge do not have time to learn to improve, let alone have a lot of time and energy research officer Even if these athlete officials perform their duties, they also play the most out of their own sports skills, and the skills and methods of state administration are still poor. If you do not pass the relevant knowledge of learning reserves and cultural knowledge of the accumulation of athletes officials is their own want to do their own work is also heartless. Obviously, it is also a ridiculous and depressing thing for athletes to ask them to act as officials and to earnestly perform an official's duties. From which we can see that the state of outstanding athletes to the official, for them in the official technical point did not do inspection and assessment, showing a great deal of randomness.

The arbitrariness of the country's "elite reward system" for elite athletes. In China, many domestic athletes not only in the logistics and life has been the most basic protection, and even study that school is no worries, after retirement, even more do not worry about - in the local provinces and cities as a The deputy director of the project center is the most common arrangement for the world champion athletes. And then in these athletes officials, such as Tian Liang, early on behalf of the state to give their official refused to express their firm attitude, but the fact that the front of our government leaders also insist on people to "keep public office", this Practice is not only the embodiment of human nature, but rather exposed the country on the sports system "cadre incentive system" arbitrariness.

Such a radish accounted for two pits, from the "excellent athletes for the official phenomenon" in the serious exposure of the waste of official resources. Imagine that more than 1.3 billion people in China, how many people are laid off every year, graduation, employment pressure plagued the hearts of every people, this resource if you really need to give employment and the ability of the people, is also what we expect.

(2) It is prepared to become "prizes" and used to encourage athletes to continue to pick gold.

As mentioned earlier, to the athlete cap, the purpose is only reward and comfort. According to the information learned, the state to promote some outstanding active athletes as a national administrative and public institutions cadres, is to solve the athletes in advance after the resettlement policy reflects the real purpose is not to let them do not runners from the official, but to encourage them Sports peak for the country glory, continue to pick gold wins, official award is to solve these athletes after retirement life and work concerns.

Under the pressure of a lot of public opinion, some outstanding athletes face the state to give officials positions refused. Among them, "Huang Sui incident" is a typical example and Huang Sui refused to accept after the retirement of the Provincial Sports Bureau to give her deputy directorial positions, and eventually with her husband to migrate to Australia life. Li Na as the Chinese tennis "a sister", also declined the Hubei Provincial Sports Bureau to give her provincial tennis management center deputy director, because Li did not have time to take care of this leadership position, because in the tennis court she has more Ambitious dreams and goals to be pursued.

This kind of athlete to "control the title" of the resettlement policy, seems to have become a sports champion retired placement of a "hidden rules." The country for the outstanding athletes to give the reasons behind the official, the real purpose of the corner, enough to let everyone see a lot of local athletes retired resettlement of the absurd and disorder.

(3) Official standard-oriented results

In Chinese "Olympic strategy" "gold medal supremacy" under the guidance of the goal, the results of the sports arena and the number of gold won the government to assess the outstanding athletes as the only guiding ideology. This idea has a direct impact on the Chinese athletes in the process of training athletes has always pursued the practice of sports first results, leading to our athletes only trained a good sports skills and skills, ignoring the other cultural knowledge of learning and skills improvement, Making our athletes as a whole, the lack of cultural quality and overall quality is not high. And these athletes in the long harsh training, the body were lot of damage. So these athletes retired after the employment pressure can be imagined, even the Olympic champion or world champion, also faced with a great challenge difficult to employment. The official reward of athletes is a serious dislocation of our official system, and it is also biased and misleading about the problem. This system appears to solve some of the outstanding athletes retired after

the life of the resettlement problem, in essence, can only increase the Chinese athletes, the future of life after retirement difficult. Regardless of the "excellent", have to withstand the real life of the test and baptism, even to a official, athletes who can operate it? So "excellent" is only a prerequisite for the necessary conditions, but the real ability and technology but also in the exercise of life, continue to improve. "Body and excellent is Shi", there are a lot of errors. We know that athletes battle the field, sweat tears, carrying a lot of people hope and sustenance. If you create a success on sports, glory is not only part of the athletes themselves, but for a long time to support and nurture his parents, the local people and the sports sector. So this official position to reward the means of excellent athletes, exposing the drawbacks of the system, is the result of our official standard-oriented. Athletes cannot join the official and the key is through what reasonable way to seal the official. It is unscientific to say that athletes with only athletic skills cannot bring the gospel to the people, because the officials under the current system have brought the gospel to the people? The answer is sad.

(4) It lacks of rule of law and supervision

China is non - legal countries. If the rule of law, China will not have heard of the phenomenon of official salesman. Moreover, Chinese "official resources" is not in the people, and in the system, so because of the lack of relevant legislation and the rule of law, supervision, and ultimately led to the system of real people or departments of the arbitrary sealing behavior, there is no formal formalities and Conditional requirements, subjective consciousness is relatively strong.

4. ANALYSIS ON THE INFLUENCE OF ELITE ATHLETES AS OFFICIAL

(1) Positive impact

It reflects the country's great care for the treatment of athletes. Many outstanding athletes for the country's sports has made contributions to the motherland won the honor, which is the pride and pride of the people. Because all the athletes in our system are different from the fully commercialized athlete management and employment in the western countries, all the Chinese athletes (basic necessities, school, training, competition, etc.) are basically the country. And some sports market is very small, the state for some athletes to provide a normal life and get good results after the high reward, is a matter of course. Therefore, the appropriate athletes arranged into the sports institutions and the corresponding positions, and the appointment of the level, deputy level of management, to some extent also in line with national institutions and sports institutions, the relevant provisions of the management. This is the excellent athletes retired after the employment placement provides a more general space. For example, Deng Yaping's success is gratifying, but if there is no country's preferred love and effort to build, how to Deng's brilliant today?

Successful transition from athlete to leading cadre. The state for the excellent athletes to the official, the successful realization of the transition from the athletes to the leading cadres, but also inspired a number of sports stars in the political leadership positions to display their leadership. For example, the outstanding achievements of Deng Yaping and others, their outstanding achievements in the leadership positions, it can be said that the fundamental realization of the transition from the athletes to the leading cadres, which is the "official reward" mechanism in the current real conditions, it is worth everyone is sure of the place.

Stimulate the majority of parents of the children's sports stars dream of the pursuit. More families, willing to cultivate children from childhood, love sports, become the confidence of sports stars. In such a fierce employment reality, parents worry that their children even admitted to a good university, but also not necessarily have a decent job and generous salary generous protection. From small to cultivate the next generation of physical exercise, enhance the physical, the health of the people have a lot of benefits.

(2) Negative effects

It is not necessary for the appointment of active athletes to be very bad for sports officials. Although the "deputy level" treatment is given sooner or later, but alienated the athletes retired resettlement system, the pure sense of the "rank" as a "prize" award to those excellent athletes. Among them, the negative impact of this phenomenon is manifested in:

In its position and do not seek their jobs, a waste of national administrative resources. The state of the official as a reward to give outstanding athletes, and excellent athletes put the official as part-time and fame, "do not seek their jobs", long-term leave is still reserved for the preparation and "eat empty rates" treatment is serious about our administrative resources waste. We know that every year a strong lineup of civil service examinations and many graduates and graduates have become a "bite the old family" and "ant", the national civil service positions in the brutal competition, and excellent athletes are top of the official name, big gap, it is inevitable not Jiaoren exclaimed.

Favoritism, loss of fairness. Chinese sports under the national system, the Chinese athletes all the basic are the country package, their game results naturally for the country as an honor to enjoy, in fact, they are to "glory for the country" political tools, therefore, there is a so-called rationality. But also because those who have not won the world championship and so have a lot of dedication and "no future" athletes, the system and in order to get rid of "baggage" and do not want to continue to "nurture" them, resulting in their lives without landing, the things that have been criticized.

Excellent athletes as official, neither nine to five, nor do the corresponding work, and some simply go away.

This reward system does not fully respect the individual wishes of the athletes. It is not only responsible for the post, but also seriously hurt the public's credibility to the government, which is an irresponsible performance to the public. From the legal point of view, the athletes of public officials, because in the normal cannot perform their duties, but as a national public officers arbitrarily mess "official hat" as, slander and despise the legal dignity and authority of our country.

It causes the children to pursue fame and fortune psychological distortions. Many parents let the children love sports from small, the pursuit of sports stars dream, the negative side of the performance in the child from the heart of a kind of utilitarian induction, so that the child's inner deviation, once the dream cannot achieve, To the loss and cannot afford to blow.

"Race and excellent is the official" goal-oriented is a deviation. Regardless of "body and excellent", or "race and excellent", all from the ancient Chinese "learning and excellent", it comes from "the Analects of Confucius Zhang Zhang" (19-13). The full reference should be "sub-summer said: Shi and gifted school, learn and excellent is the official." Duan Yu-chul in the "Shuowen Jiezi Note" wrote: "Instructor official, this now also. This is the official and the teacher, all things that are also. "In this way," Shi and gifted school, learn and excellent is the official. "Should be interpreted as: spare time should go to study, To learn to improve themselves; learning, research and more to participate in specific work and practice. The relationship between learning and learning is the relationship between learning and practice, which is in fact related to "practice - cognition (learning) - practice - re - cognition (learning)" in Marxist dialectics. However, today has always thought that the meaning of this sentence is to learn to become an official, it is just a misunderstanding. For our system under the "race and gifted is" under the guidance of the goal, a very small number of athletes, "dog ascension", "Fan Jinzhongju", but there are some "Zhang Shangwu who", after retirement life extremely misery, People are sad. Under the existing institutional system, the separation of physical education, a lot of ordinary, did not get the champion level athletes, because there is not much production, survival skills and skills, will obviously become the system under the "victim."

5. CONCLUSION

Chinese sports training model to determine the sports results of all the guiding ideology, in a sense led to athletes after retirement, the employment space is narrow, survival becomes a problem.

(1) The lack of rule of law and supervision must speed up the pace of legislation. China is the rule of law, and today's "excellent athletes for the official" phenomenon, to a large extent because of the lack of rule of law and supervision, and ultimately led to the system of real people or departments of the arbitrary seal behavior. Therefore, China has a government department, should be a clear legislation for this, with the means of legal provisions and restrictions cannot just for the excellent athletes to provide official, timely to the official also through a legitimate way.

(2) It must be from the source of sports training system reform, and gradually change the Chinese athletes training mode. To abandon the outcome of the tournament to determine all the guiding ideology, to improve the overall quality of all athletes, and thus broaden the employment of athletes, official rewards mechanism may be abolished.

(3) For those who have a very small number of knowledge and management of athletes, the continuation of the controversial Cai Zhenhua, Deng Yaping model, through the legitimate procedures and channels as an official, the officer as the main job, wholeheartedly into the official work, rather than Put the official as part-time, retain the official cap to eat air rates. Even if the Olympic Games to participate in the glory of the country, but also must immediately clear up the ranks of officials to maintain the seriousness of the law. And for those who even won the gold medal, the officer can play their talents athletes, but also in the sports sector or the relevant government departments to give preferential policies, open selection examinations, and finally provide them with the right jobs, so that this policy has become A way out of the athlete after retirement.

(4) Promote the sports teams in colleges and universities to provide excellent athletes to provide employment space, in recent years, the number of college sports teams in the number of sports teams is increasing, the number of coaches is also increasing, so the colleges and universities for the outstanding retired athletes in the school sports team Employment to create space, to provide employment opportunities. So that outstanding athletes retired, in their own sports professional continue to play their talents, training the next generation of sports successor. The government should pay attention to the lives of more athletes who are not champions and the placement of decommissioning. At the same time, through a variety of ways for athletes to provide learning and master skills, survival skills training opportunities to encourage them in a highly competitive life reality, to have a positive attitude and tenacious morale, the spirit of the sun, looking for their own Lifestyle, happy face after retirement life.

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On the Significance of Strengthening Legal Education of College Students

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Abstract： College students are the backbone of promoting social civilization and progress and building a socialist legal system. To strengthen the legal education for college students has great significance. The article analyzes the significance of strengthening the legal education of college students from the following six aspects: to strengthen the legal education of college students is the need to build a socialist country ruled by law, to strengthen college students 'legal education is an important part of strengthening and improving college students' ideological and political education and moral education, to strengthen the legal education of college students is the need of socialist spiritual civilization construction, strengthening legal education for college students is necessary for constructing socialist market economy, to strengthen the legal education of college students is the need of improving the overall quality of college students and achieving the all-round development, to strengthen college students' legal education is an urgent need to improve the existing problems in legal system education and to build an effective mechanism of legal system education.

Keywords: legal education; college students; significance

The legal education of college students refers to the purposeful, planned and organized teaching and educating of basic legal knowledge to students in colleges and universities in the process of implementing ideological and political education and moral education in order to cultivate compound talents with legal awareness and legal qualifications to adapt to the requirements of a modern society under the rule of law.

The CPC Central Committee and State Council's "Opinions on Further Strengthening and Improving College Students' Ideological and Political Education" pointed out that it is necessary to deepen the quality education with the goal of all-round development of college students. We will strengthen democracy and legal education and enhance the concept of law-abiding and obeying rules. In October 2014, the Fourth Plenary Session of the 18th CPC Central Committee passed the Decision of the Central Committee of the Communist Party of China on Several Major Issues in Ruling the Country Governing by Law in an All-Round Way, pointing out that it is necessary to promote awareness of the rule of law throughout the society, carry out propaganda and education on the rule of law in depth, incorporate the rule of law education in the national education system, improve the populace publicity and education mechanism. College students are the backbone of promoting social civilization and progress and building a socialist legal system. To strengthen the legal education for college students is the inherent need of the construction of socialist spiritual civilization and an inherent requirement and an important guarantee for building a socialist country governed by the rule of law and realizing the strategic goal of governing the country according to law.

With the advent of the 21st century, the level of comprehensive quality has become an important indicator for evaluating qualified personnel. The importance of legal quality as an important component of overall quality is self-evident. As a group subject to higher education, college students shoulder the important task of promoting the construction of the socialist legal system in our country. Young college students are in an important period of formation and development of world outlook, outlook on life, values. During this period, there was a certain development in the aspects of ideology, morality and psychology of college students. However, on the whole, social life experiences are not yet rich enough and ideas are not yet mature enough. There is also a clear phenomenon that it is disconnect between knowledge and practice. In addition, due to the diversity of social life, diversified value orientation and the complexity of college students' living environment, college students are in a period of immature thought and view of life is still established. All of these have created complex thinking and mentality of college students. Therefore, the legal education of college students is very important and very urgent. For a long time, the ideological education in colleges and universities has placed too much emphasis on moral education, neglecting legal education, lack of understanding of legal education, formalized popularization education, negative impact in real life and lack of positive publicity. The legal education lags far behind the pace of social development, giving no real attention to legal education of college students. The legal education of college students is to educate students to know law, abide by the law, use law and protect the law, and cultivate the legal literacy of college students so that they can better solve the problems

they encounter in their daily lives and adapt to the development of the society.

1. To Strengthen the Legal Education of College Students is the Need to Build A Socialist Country Ruled By Law

The establishment and implementation of the strategy of governing the country according to law requires that all members of the society have appropriate legal qualifications. Only by making citizens in the entire society universally have legal knowledge, legal awareness, and legal beliefs, can we establish a socialist society ruled by law. However, the idea of democracy and legal system can't be spontaneously generated in the human mind. Only through legal education can we establish a modern concept of democracy and the rule of law. Therefore, strengthening legal education and fostering the legal quality of citizens have become the most important task in building a socialist country ruled by law.

The legal education of college students as an important part of the legal construction of the country and legal education plays an important and fundamental role in establishing a state under the rule of law, creating legal talents and training law-abiding citizens. Contemporary college students' legal education should pay attention to the establishment of legal awareness and legal belief in the cultivation of students. Only through systematically legal education for college students and giving full play to the normative role of law on human behavior can college students avoid the frequent occurrence of crimes and send a large number of social members with the spirit of the rule of law to the society and gradually form a good legal culture atmosphere and legal environment, laying a solid foundation for the realization of a country ruled by law.

2. To Strengthen College Students' Legal Education is an Important Part of Strengthening and Improving College Students' Ideological and Political Education and Moral Education

The characteristics of contemporary college students, the specific historical tasks shouldered by contemporary college students and the actual conditions of contemporary college students objectively require strengthening the status and role of legal education in ideological and political education and moral education throughout colleges and universities.

With the process of reform and opening up and the socialist market economic system's building, diversification of people's values and deepening reform in higher education have brought new changes and characteristics to the situation of contemporary Chinese college students. We must proceed from the strategic height of socialist career and from the reality of new changes and new features of contemporary college students. We should further strengthen the ideological and political education function of legal education for college students and further strengthen the actual results so that students can abide by the law and use law in reality and in practice, achieve the unity of knowledge and practice, so that the legal education of college students in practice reflects the dual requirements of the law itself and its ideological and political education function.

At the same time, we should grasp profoundly the relationship between morality and law when carrying out legal education for college students, and we should be good at digging the moral sources contained therein, and realize the nature of the moral education of legal education for college students. We must give full play to moral education's guiding, motivating, and guaranteeing functions for the healthy growth of young students and school's work so as to help young students to establish their lofty ideals and cultivate good moral qualities. We should strengthen the legal system construction and regulate their moral behavior from a legal point of view, thus strengthen the constraints of the moral behavior, further improve their own moral quality, turn the requirements of spiritual civilization on ideological and morality into a kind of behavior habit, and change the moral norms from the mandatory constraints of law into the conscious moral cultivation.

The legal education of college students is an important part of the ideological and political education and moral education in colleges and universities. The legal education of college students should stand on the strategic height of the cause of socialist modernization. By combining with the new situations and problems emerging from the current college students, innovating the methods of legal education and integrating with other contents of ideological and political education, college students should be guided to establish and cultivate the correct values, a good moral sentiment, a positive mental state to continue to improve their moral and legal literacy.

3. To Strengthen the Legal Education of College Students is the Need of Socialist Spiritual Civilization Construction

The construction of social spiritual civilization and the formation, consolidation and development of socialist morality depend not only on education but also on the rule of law. The legal system without education is simple and passive. Education without the rule of law is feeble. The course of "Ideological and Moral cultivation and Legal Basis" set up in colleges and universities is precisely the combination of "education" and "legal system". The two factors are closely integrated with each other and promote each other, which play an immeasurable important role for the construction of spiritual civilization in colleges and universities, effectively improving the overall quality of college students, to cultivating talented persons of cross-century construction.

Legal education for college students is an organic

combination of ideological and moral construction and educational and scientific and cultural construction and an important part of the construction of spiritual civilization in colleges and universities. Colleges and universities should conscientiously strengthen the legal system construction and legal education for college students, help young students to establish correct values, enhance the concept of democracy and legal system, think about problems from a legal point of view, pay attention to the cultivation of rational thinking ability and the development of rational thinking habits, avoiding the emotional engagement, replacing the law with emotion,which has become an important task of contemporary college students' moral education as well as the construction of university spiritual civilization. Colleges and universities can launch legal education activities, to guide students to abide by the law, regulate behaviors, improve their moral quality, and constantly promote the development of spiritual civilization in colleges and universities.

4. Strengthening Legal Education for College Students is Necessary for Constructing Socialist Market Economy

China implements the socialist market economic system economically. The socialist market economy is a law-based economy. Every step of the operation of the market economy is closely linked with the law. As the market becomes increasingly competitive, economic disputes have become more and more frequent, and the law has become even more important. Legal means has become an important means of adjusting the social relations between people. All rules and systems should be formulated in accordance with the law. The law has determined the status of the main body of the market and regulated the conduct of market transactions, which provides an extremely important guarantee for the order development of the socialist market economy. As a part of the main body of market economy and society, college students must have certain legal knowledge, possess certain legal qualities, understand the importance of law to the economic development of the country, understand the legal norms closely related to social life, and cultivate the consciousness of law-abiding, enhance their awareness of the law and take legal channels as an important means of settling disputes so as to prepare them for their entry into workplaces and into complex social life in the future. Therefore, strengthening the legal education of college students has become the inherent need of market economy development.

5. To Strengthen the Legal Education of College Students is the Need of Improving the Overall Quality of College Students and Achieving the All-round Development

In today's world, the competition among countries is not only the competition of comprehensive national strength, but also the competition of talents. The development of social life, the building of a socialist marketing economy and the advancement of the socialist spiritual civilization and political civilization all require compound talents with an all-round developed and high comprehensive quality. College students are the builders and successors of the cause of socialism in our country. The quality of college students directly affects the construction of our socialist cause. Therefore, improving the comprehensive quality of college students and realizing all-round development are the urgent needs of the construction and development of the cause of socialism with Chinese characteristics.

To rule the country by law and to build a socialist country ruled by law, the quality of law has become an indispensable quality for today's college students. To strengthen college students 'legal education can not only cultivate the legal quality of college students, learn legal knowledge, enhance legal awareness and improve legal literacy, but also make a positive and important contribution to college students' knowledge structure, values, moral qualities, ways of thinking and mental status, and so on, which will have great benefit to improve the overall quality of college students. At the same time, while the legal education carried out by various colleges and universities teaches students the basic knowledge of law, combines the legal education with the ideological and political education, and combines knowledge education with ability education to help the students achieve all-round development.

6. To Strengthen College Students' Legal Education is an Urgent Need to Improve the Existing Problems in Legal System Education and to Build an Effective Mechanism of Legal System Education

Since the establishment of the "Law Foundation Courses" in 1986, the legal education of college students in our country has been on the right track with 30 years' development. Some achievements have been made, and the law awareness and legal literacy of college students have been greatly improved. However, in recent years, criminal incidents have frequently taken place among college students, criminal problems have become increasingly prominent, and the proportion of crimes has risen year by year. The criminal cases of college students have drawn more and more attention from the society, such as Ma Jiajue case, Yao jiaxin case and poisoned case of Fudan University. In society there has been a huge negative impact, arousing the public's deep thinking on the legal education of contemporary college students. At the same time, it exposes that there are many problems that can't be ignored in the legal education of college students.

First of all, the legal awareness of college students is still weak, and legal knowledge is still lacking. Although most of the students accept the legal education through the classroom learning at the beginning of their studies, and they has acquired a

certain amount of legal knowledge. However, due to the limitations of classroom education, fewer time schedules, more content and less teaching quality, students having no study enthusiasm and other reasons, the mastering and grasping of the legal knowledge of college students is still defective and inadequate.

Second, many college students pay insufficient attention to the legal status and legal construction in our country. They do not regard the law as their own code of conduct and the main means of adjusting social relations. When their legitimate rights and interests are impaired, they do not have much awareness of the law as the primary means of solving the problem. All of these reflect the weakness of legal emotion and law consciousness of college students.

Once again, the school does not pay enough attention to legal education. The form of legal education is single. The emphasis on legal education for college students in schools is not enough. First of all, it is reflected in the lack of input in the construction of teacher resources in many colleges and universities. The teachers of legal education are generally also as moral teachers or ideological and political staff. The profession and theory of legal education is not enough and there is less investment for the construction of teaching staff.

In addition, many colleges and universities are still inadequate investment in the legal education practice. Many colleges and universities have not set up off-campus practice base to lead students to practice in society. This is very detrimental to the development of legal education for college students. In addition, the form and content of legal education is relatively simple. The vast majority of educational forms in the legal education practice in the school are still confined to the traditional classroom-teaching mode, which emphasizes on imparting knowledge of legal theory, neglecting practical teaching links, neglecting to foster students' legal beliefs and cultivating their legal and behavioral habits. It has become the primary task for college students to transform the teaching of simple legal knowledge in the moral education of traditional school into the comprehensive quality of law.

How to improve college students 'legal awareness, enhance college students' concept of legal system, effectively strengthen the legal education of college students, and build an effective mechanism and legal education model to promote the legal quality of college students are the topics that ideological and political education workers urgently need to study and solve. There is great significance to strengthen the legal education to the socialist modernization and the construction and development of a socialist country ruled by law.

It not only serves the needs of building a socialist country governed by the rule of law, but is also an important part of strengthening and improving the ideological and political work and moral education for college students. It is not only the need of building a socialist spiritual civilization, but also the requirement of improving the overall quality of college students, and also the urgent problems of legal education and the effective mechanism of legal education. The legal society is the goal of our country's legal system construction. Nowadays, our college students are the backbone of our society in the future. They shoulder the historic mission of realizing the great rejuvenation of the Chinese dream for the Chinese nation.

College students can know about law, understand law, abide by the law, and use law according to strengthen the legal education of college students and enhance the legal literacy of college students, so that they have a profound understanding of the law, scientific understanding and the application of practice, understand the spirit of the law, believe the role of law, and firm legal beliefs, enhance their own legal awareness and legal concept, and contribute their part for the construction of a socialist country ruled by law.

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A Study on the Economy of Solar Power Generation in Certain Region of Nigeria

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Abstract: This article presents a case study of a commercial/residential neighbourhood in Lagos, Nigeria, compares the photovoltaic power generation and diesel power generation in terms of economic indices such as upfront investment and levelized cost of electricity, and reaches some valuable conclusions.
Keywords: solar power; photovoltaic power generation; diesel power generation; levelized cost of electricity

On account of an underdeveloped electric power industry, Nigeria has been suffering serious power shortage. With an installed generating capacity of 6 million kW, Nigeria's actual power output is less than 4.5 million kW, whereas the total demand for electric power is 13.5 million kW, which is 3 times as much as the current total power generating capacity of the country[1]. Consequently, nearly all factories, office buildings, and homes have to rely on diesel power generators, making Nigeria the leading importer of diesel generators in the world. In recent years, cooperating with Western developed countries and some global energy giants, the Nigerian government managed to implement numerous solar power projects with some success. Aiming to study the pros and cons of photovoltaic power generation and diesel power generation, this article makes a case study of a commercial/residential neighbourhood in Lagos, Nigeria, conducts a comparative analysis of the economies of photovoltaic power generation and diesel power generation, and reaches some valuable conclusions.

1. OBJECT OF STUDY

The object of this study is a commercial/residential neighbourhood located in Lagos, Nigeria, with a resident population of around 50 people. Comprised of 2,500 square meters of office space and 1,000 square meters of living space, the neighbourhood has electrical fixtures with a total power of 290 kW, and two sets of diesel generators (the more frequently used set has a generating capacity of 350 kW and an original value of 7.3 million Naira, while the other set, the backup generator, has a generating capacity of 500 kW and an original value of 13.718 million Naira, hence a total cost of 21.018 million Naira). Running alternately, each day the two generators work 17.5 hours in total, consuming on average 371 liters of diesel per day, or 135,571 liters per annum. Every 250 hours the generators receives a servicing, costing 18,000 Naira each time, i.e. 36,000 Naira per month, or 468,000 Naira per annum. A designated electrician is charged with the daily operation, maintenance and servicing of the two generators, on a salary of 45,000 Naira per month, or 540,000 Naira per annum. The economic costs of the diesel generators are shown in Table 1.

Table 1 Economic Costs of Diesel Generators of a Commercial/Residential Neighbourhood in Lagos, Nigeria

Generator Capacity	Generator Original Value (Naira)	Generator Working Hours/Day	Diesel Consumption per Annum (Liter)	Maintenance & Servicing Cost per Annum (Naira)	Labour Cost per Annum (Naira)
350 kW	7.3 million	17.5	135,571	468,000	540,000
500 kW	13.718 million				

2. ECONOMY ANALYSIS OF DIESEL POWER GENERATION

According to relevant statistics, assuming each liter of diesel generates 4 kWh of electricity, then the total electric power per annum (Q) generated by the two generators is:

$$Q=135,571*4=542,284 \text{ kWh}$$

Without taking into account the depreciation cost of the generators, the levelized cost of electricity produced by diesel power generation is shown in Table 2.

Table 2 Composition of Levelized Cost of Electricity Discounting Generators' Depreciation (Diesel price: 135 Naira/Liter)

	Diesel Consumption Cost	Maintenance/ Servicing Cost	Labour Cost	Total
Cost per annum (1000 Naira)	18,302	468	540	19,310

Levelized Cost of Electricity (Naira)	33.75	0.863	0.996	35.61
Percentage	94.78%	2.42%	2.8%	100%

It can be observed that the total expenses incurred each year by the two sets of generators are 19.31 million Naira, which amount to 91.87% of the original value of the two generators combined. Diesel consumption (18.3 million Naira) makes up 94.78% of all the expenses, while maintenance/servicing and labour merely account for 5.22%, meaning diesel consumption contributes most to the expenses of diesel power generation.

When taking into account depreciation and amortization of the diesel generators, and following the 5-year accelerated depreciation method widely used in Nigeria, we have the levelized cost of electricity produced within a five-year depreciation period, after the two generators' annual depreciation is amortized over the total electric power generated per annum, as shown in Table 3.

Table 3 Levelized Cost of Electricity after Taking into Account the Two Generators' Depreciation Cost Amortized over a Depreciation Period

Year of Depreciation	Depreciation Coefficient	Generator A Depreciation Cost	Generator B Depreciation Cost	Total Depreciation Cost	Depreciation Cost per kWh	LOEC
Year 1	0.3	2,190,000	4,115,404.91	6,305,404.91	11.62	47.24
Year 2	0.25	1,825,000	3,429,504.10	5,254,504.10	9.69	45.30
Year 3	0.2	1,460,000	2,743,603.28	4,203,603.28	7.75	43.36
Year 4	0.15	1,095,000	2,057,702.46	3,152,702.46	5.81	41.42
Year 5	0.1	730,000	1,371,801.64	2,101,801.64	3.88	39.48

It can be observed that, by adopting the 5-year accelerated depreciation method, the depreciation cost's proportion to the levelized cost of electricity decreases year by year, gradually dropping from 24.6% in Year 1 to 9.83% in Year 5. Meanwhile, the diesel consumption remains the major component of the diesel power generation expenses, its proportion rising from 71.44% to 85.49%.

To sum up, the levelized cost of electricity of diesel power generation of the commercial/residential neighbourhood in question is 39.48~47.24 Naira/kWh within the five-year depreciation period, and stays at 35.61 Naira/kWh after the five-year depreciation period.

3. ECONOMY ANALYSIS OF SOLAR POWER GENERATION

Based on the latest suppliers' quotations, on the whole there is a linear relation between the installed capacity of the solar module and material costs, occupied area of the solar module, and load power. Table 4 shows the various parameters as follows:

Table 4 Parameters of the Installed Capacity of Photovoltaic Systems

Installed Capacity	Power Supply Mode	Material Costs (1,000 Naira)	Solar Module Occupied Area (m2)	Service Room Floor Area (m2)	Load Power (kW)
1kW	Grid-connected	250	7	0	0.4
	Stand-alone	500	7	1.5~2	0.4

As the total power of all electrical fixtures in the neighbourhood in question is 290 kW, accordingly, for photovoltaic systems with an installed capacity of 290*2.5=725 kW, the cost factors are described by Table 5.

Table 5 Installing Cost of Photovoltaic Systems

	Material Costs (1,000 Naira),	Solar Module Occupied Area (m2)	Service Room Floor Area (m2)
Grid-connected Mode	181,250	5,075	0
Stand-alone Mode	362,500	5,075	1,087.5-1,450

It can be observed that, for the same neighbourhood, the upfront investment for photovoltaic systems under grid-connected mode amounts to 181.25 million Naira, which is 8.62 times as much as that for diesel power generation; under stand-alone mode, the upfront investment for photovoltaic systems is 362.5 million Naira, which is 17.25 times as much as that for diesel power generation.

According to the sunlight intensity of Nigeria, assuming each kW of photovoltaic installation produces 1,700 kWh per annum, then throughout the life cycle (20 to 25 years in theory; 20 years for the purpose of this article), each kW of photovoltaic installation produces 1,700*20=34,000 kWh. For each kW, divide the material costs by the total power generated and we have the levelized cost of electricity under two modes, as shown in Table 6.

Table 6 Levelized Cost of Electricity of Photovoltaic Systems

	Material Costs per kW	Power Generated per kW	Levelized Cost of Electricity

	(1,000 Naira),	(1,000 kWh)	(Naira)
Grid-connected Mode	250	34	7.35
Stand-alone Mode	500	34	14.70

It can be observed that, notwithstanding the expensive upfront investment, the levelized cost of electricity generated by photovoltaic systems under grid-connected mode is merely 7.35 Naira/kWh, only 21% of that of diesel power generation; under stand-alone mode, the levelized cost of electricity is 14.7 Naira/kWh, which is 42% of that of diesel power generation. In other words, photovoltaic power generation requires almost zero late-stage investment, which is an absolute advantage compared to diesel power generation in terms of production costs.

4. CONCLUSION

To sum up the analysis of their investment cost and levelized cost of electricity, the economies of the two power generating systems, namely diesel power generation and photovoltaic power generation, can be compared as follows:

Table 7 Diesel and Photovoltaic Power Generation: Investment and Cost Comparison

Commercial/Residential Neighbourhood	Diesel Generators		Photovoltaic Systems	
	After Depreciation Period	Within Depreciation Period	Grid-connected Mode	Stand-alone Mode
Upfront Investment (1,000 Naira)	21,018	21,018	181,250	362,500
Levelized Cost of Electricity (Naira)	35.61	39.48~47.24	7.35	14.70

It is therefore evident that, in the case of this small-sized commercial/residential neighbourhood with a resident population of around 50 people in Lagos, Nigeria, to satisfy the 290 kW electricity demand, two sets of diesel generators (350 kW and 500 kW respectively) were purchased and installed, entailing a total upfront investment in the sum of 21.018 million Naira, and late stage cost of 19.31 million Naira per annum; the levelized cost of electricity is 39.48~47.24 Naira/kWh within the depreciation period and stays at 35.61 afterwards. As for solar power generation, to meet the same electricity demand would require the installation of 750 kW of photovoltaic modules, entailing an one-time upfront investment in the sum of 181.25 million Naira under grid-connected mode, which is 8.62 times as much as that for diesel power generation. However, a photovoltaic system has a life cycle of up to 20 years and requires virtually zero late-stage investment. In consequence, the levelized cost of electricity produced by photovoltaic power generation is merely 7.35 Naira/kWh, i.e. 21% of that of diesel generated power. Under stand-alone mode, the one-time upfront investment is 362.5 million Naira, which is 17.25 times as much as that for diesel power generation. Since the battery's life cycle is only 6 years, late-stage investment mainly consists of spending on replacing batteries, and the levelized cost of electricity is 14.70 Naira/kWh, i.e. 42% of that of diesel generated power.

By comparing the economies of two power generating systems for the same neighbourhood, it can be observed that photovoltaic power generation has an absolute advantage over diesel power generation in that the former requires virtually zero late-stage investment (except the need to replace batteries under stand-alone mode). The levelized cost of electricity of photovoltaic power generation is only 21%~42% of that of diesel power generation; the main challenge with photovoltaic power generation is the expensive upfront investment, which is usually 8~17 times as much as that for diesel power generation.

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Design of medical management information system with multi-platform function

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Abstract: Multi-platform medicine management system is a client management software that support Internet web service and Android Internet service. Analyzes the key technologies of Android client, data exchanges scheme optimization and technology, using SSH framework to build the background, and using JSP to write active web page, it's web part consists of two parts. The Android client is written in MVP mode. The system was built for help enterprises to manage the procurement and sales of drugs better. On function modules, the system is divided into three parts, the first part is the warehouse management, mainly related to the distribution of goods warehouse, check and other functions; the second part is the human resources management, mainly for different positions of users to be limited; Financial management, for the purchase of pharmaceutical goods, such as the purchase of goods generated by the integration analysis.
Keywords: Multi-platform; Medicine management system; Mobile service; Web service

1. INTRODUCTION

The medical management system is integrated into marketing, storage, financial and user integrated management software[1]. Nowadays, the pharmaceutical industry is a indispensable important component of national economy in our country, it followed more and more complicated drug management, which requires the pharmaceutical company timely introduce medicine management system in order to improve medical management level and efficiency of management. Therefore, it is a common task for developers and medical personnel to develop excellent medical management system and provide users with comprehensive services.

In the information age, people work and life are also changed, for medical management system users, their management style may not confined to the PC client, convenient and quick web management are attractive. At the same time, with the development of the mobile devices constantly, people rely on mobile devices, we can greatly enhance the timeliness of the message. Therefore, cross-platform software is more attractive to users. Therefore, the system should be multi-platform to facilitate user management.

In the current environment of medical reform, the state is increasingly strict in the requirements of drug circulation. The policy requires that the circulation of drugs must be online, and the circulation information must be checked online. As an important part of drug circulation, pharmaceutical companies have put forward new requirements for the existing medical management system. In response to this requirement, the medical institutions urgently need a quick and convenient management system to manage the medical supply and marketing. Considering the advantages of multi-platform software, the management system can be managed on mobile phones and computers, which greatly promotes the efficiency of work. Therefore, multi-platform is of great value, and the system can provide management services to users anytime and anywhere.

2. System framework

2.1 Web Server Platform

SSH is an integrated framework for struts+ spring+ hibernate and is a popular open source framework for Web applications[2]. System of integrated SSH framework from the responsibility is divided into four layers: the presentation layer, business logic layer and data persistence layer and domain module layer, to help developers to build in the short term clear structure, good reusability, convenient maintenance of Web application. Using Struts as a system of the whole infrastructure, responsible for the separation of MVC, in the model part of the Struts framework, jump control business, using Hibernate framework to support the persistence layer, Spring to do management, management of Struts and Hibernate. Particular way is: use the object-oriented analysis method according to the demand for some models, these models as the basic Java Objects, and then write basic DAO (Data Access Objects) interface, and give the Hibernate DAO implementation, using Hibernate architecture implementation of DAO class to implement the conversion between Java classes and database and Access and finally by the Spring to do management, management of struts and Hibernate.

2.2 Android Mobile Internet Platform

With the advent of the mobile Internet era, mobile communication and Internet are integrated mutually, which prompts mobile devices to access the Internet resources anywhere and anytime with the help of Wifi and 4G. The intelligent mobile phone is taken as

a landmark tool of the mobile internet era, and then Android becomes an open platform for mobile devices[3].

2.3 Multi-platform implementation

Through a background service, we can easily connect the web platform and the Android platform easily, achieve the same information in different platforms, and be able to synchronize with new information. As shown in figure in, we can undertake all kinds of operation on the browser on the system, the system will record all of this, all relevant information is stored in the cloud server database, so we can look up to these online by mobile phone.

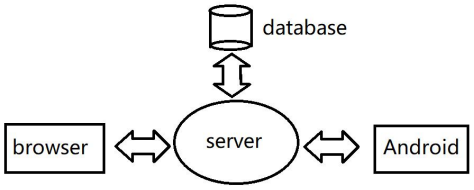

Figure 1 Multi-platform Implementation

3. System Design

3.1 System business process

After building the database, we can construct the business process of system. According to the working process of pharmaceutical company, the system is divided into four parts: drug management, sales management, warehouse management and member management. The system is dedicated to standardizing all information in order to improve the efficiency of the company's management and improve the speed and accuracy of drug information delivery. So almost all of the systems are connected to the database. From incoming goods to warehousing, from sales to return service, we will record the relevant records to the database, and check the data periodically, and timely fix the data with problems.

There are two modules: one is the web client and the other is the mobile client. It is provided to company personnel and other users respectively. The company's employees operate mainly on the web client. The mobile client is used to provide company information to other users, including the company's medicines, news and contact information. As shown in figure 2, the business process of the system is given.

According to the market condition and inventory of drugs, the relevant department formulates the drug purchase plan, then records and submits it through the system. If the purchase plan is approved, buy drugs from the drug manufacturer. The warehouse keeper then records the drug into the system. Of course, we also need to sell drugs to hospitals or pharmacies. When we receive the sales order, the warehouse needs to update the medical information and record the sales record to the system.

Other users (not members of the company) can view the company's drug information through the phone client, the latest news from the company, and contact the company via the phone.

3.2 System function process

The web client is the main part of the system, with five functional processes. The most important functions are sales management and warehouse management, which are the value of the system. Account management plays a role of authority and information security. And member management and financial management only play an auxiliary role. See figure 3 for details.

3.3 Database design

Data is the core of all kinds of transaction processing, and the design of the database is very important for the system. We use the SQL Server database software to establish the database of the system. We designed more than 20 data tables, such as manageuser tables, company tables, and medicine tables, which often appear in the system operation process. As an example, we show user tables, company tables, and medicine tables shown in tables 1,2, and 3.

Table 1 Manageuser table

Feild Name	Data Type	Null or NOT	Index
id	int	NOT	Primary
managerName	Varchar(255)	NOT	
managerPwd	Varchar(255)	NOT	
managerRole	Varchar(255)	NULL	

Table 2 Company table

Feild Name	Data Type	Null or NOT	Index
id	int	NOT	Primary
URL	Varchar(255)	NOT	
CompanyName	Varchar(255)	NOT	
address	Varchar(255)	NULL	
phone	Varchar(255)	NULL	

Table 3 Medicine table

Feild Name	Data Type	Null or NOT	Index
id	int	NOT	Primary
permissionNum	Varchar(255)	NOT	
medicineName	Varchar(255)	NOT	
englishNmag	Varchar(255)	NULL	
tradeName	Varchar(255)	NULL	
company	Varchar(255)	NULL	
location	Varchar(255)	NULL	

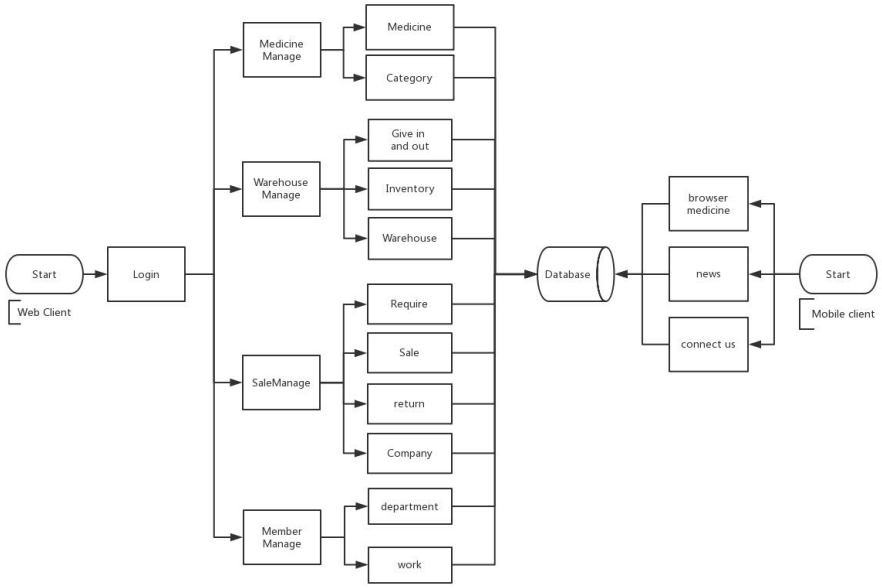

Figure 2 System business process

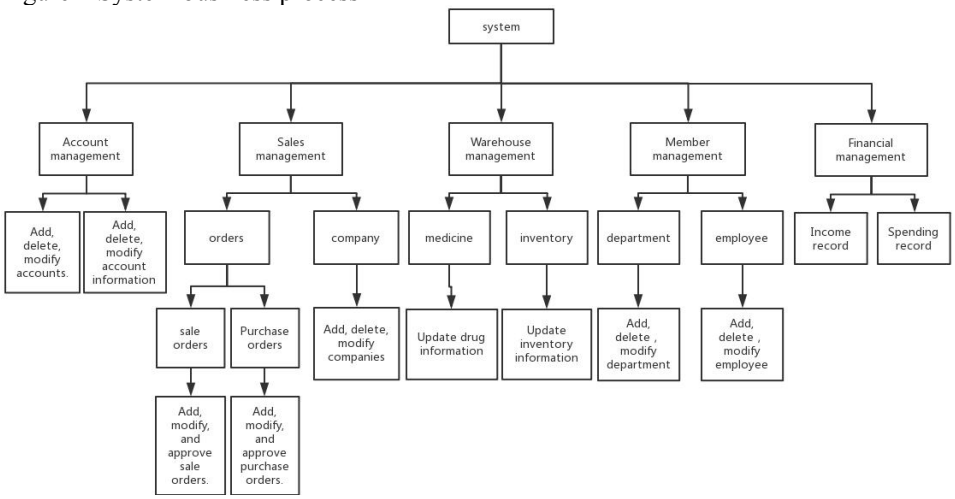

Figure 2 Sysem function process

4. Main Modules

The system consists of five modules. The sales management and the warehouse management are rewritten in combination with the sales management system and the warehouse management system. They are also at the heart of the system. I will describe these two sections in more detail below.

4.1 Sales management module

Sales management consists of two parts: one is the order record and the other is the merchant management. Orders are divided into purchase orders, sales orders, and, of course, returns. Merchant management is important in order to record vendors that have transactions with the company.

A drug entering the warehouse requires at least three orders. Pharmaceutical companies often need to make plans before they buy into the inventory, detailing the requirements for each type of drug in the plan list. After the approval is passed, the list of plans will be converted into the purchase order. Then they buy drugs from the dealer. When these drugs arrive at the warehouse, they will appear on the inventory list. In this way, the company purchased the required drugs. Similar to the purchase of drugs, the company records the purchase demand of other merchants and takes the medicine from the warehouse and records it in the table. After the sale is completed, a sales record sheet will be generated. Sometimes employees need to fill out a return form because the drugs are substandard.

Figure 4.1 Sales order

Many businesses are vital to the company, and every transaction is recorded. We not only record the

information of drug circulation, but also preserve the company's interest chain. We need merchant management modules to manage these companies better.

4.2 Warehouse Management Module

The warehouse is where all the drugs are stored, so the warehouse management is mainly about the management of the drugs in the warehouse. The first point, when receiving the goods, we will add relevant drugs in time. When handling the shipment, we need to query the inventory data and shipping order, and update the data immediately. The second point, the information in the warehouse must be consistent with the information provided by the China food and drug administration. So we will check, update the data periodically. The third point, sometimes, some uncontrollable factors cause the drug to be damaged, and we have to check and record it in time to prevent the data from being inconsistent with the actual situation.

In addition, the other part of warehouse management is to manage all warehouse information of the company, including warehouse name, location, size, type and storage medicine, etc. This makes it easier to manage different types of drugs in different areas.

4.3 Other Modules

Account management controls the user's actions. Users of different roles have different permissions, and the account manager assigns them the right to work in different modules without interfering with each other.

Figure 4.2 worker salary

The member management module mainly records employee information, including the company's department, staff's work and their salary.

Financial management is not very important, and its main role is to count the company's drug sales and staff salaries. Or do a simple cost analysis.

5. Conclusion

The system is designed to optimize the management of pharmaceutical companies and improve management efficiency. Bring together the relevant management modules to ensure that information flows quickly, saves time and energy, and improves reliability.

However, there are many problems in the process of system implementation, such as:

1. How to ensure that the drug data is the same as the data circulating on the Internet.
2. How to manage the operation rights of different users?
3. How to update database information in time?

Through continuous learning and accumulation of experience, solve each problem, let the system achieve the desired effect. It's got me a lot.

Acknowledgments

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Telescopic Computer Mounting Structure

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Abstract: At present, with the development of society and improvement of science and technology, computers have been widely used in various fields, and people are demanding more and more computers. The installation of the display device usually takes the form of mounting the display screen on the base. The setting of the rotating torque of the screen relative to the base has a great influence on the performance of the display. This paper designed a retractable computer mounting structure
Keywords: Display device, Rotating torque, Retractable, Computer mounting structure

1. INTRODUCTION

At present, with the development of society and improvement of science and technology, computers have been widely used in various fields, and people are demanding more and more computers. The installation of the display device usually takes the form of mounting the display screen on the base. The setting of the turning moment of the screen relative to the base has a great influence on the performance of the display. For some applications, larger rotational torque is required; in others, smaller rotational torque is required. Tight hinges can be used to position the display at angles; loose hinges can be used to smoothly adjust the angle of the display. However, for the hinge mechanism which is already set up in the manufacturing process, it is difficult to adjust the rotational torque so that it is difficult to meet the hinge moment requirements in different occasions. In addition, most existing computer mounting structures can only be adjusted in the Z-axis direction. Therefore, there is an urgent need to provide a retractable computer mounting structure on the market.

Rotational torque refers to the torque required to prevent movement of another ring or washer when one bearing ring or washer is rotated. Hinged means the two objects are connected by hinges. Hitch commonly used in machinery, vehicles, windows and doors, utensils, two parts of the device or part of the connection. According to different points of points of articulation can be divided into: ① virtual hinge and real hinge; ② single hinge and complex hinge. Steel structure, beam and column connections usually take three forms, flexible (also known as articulated), semi-rigid and rigid connections.

In engineering practice, how to distinguish a node is rigid, semi-rigid or hinged connection mainly depends on the rotational stiffness, rigid connection should not produce significant connection angle deformation, that is, the connection angle deformation of the structural resistance reduction should not exceed 5%. The nature of the connection should be characterized by the following three indicators bending stiffness, rotational stiffness, ductility (ability to rotate).

Flexural capacity is the main link strength, in addition to shear strength. Rigid connections In theory, the ability to withstand bending moments and shear forces should not be less than the carrying capacity of the beam, that is, not less than the plastic hinge moment of the beam and the full plastic shear of the web. The framework of the earthquake zone should require higher, reflecting the principle of "strong connections - weak components." For flexible connections, only the shear capacity is required. Semi-rigid connection between the rigid and flexible connections, must have a certain degree of bending resistance.

The rotational stiffness of the connection is represented by the slope of the moment-angle curve, which is not a constant and the rotational stiffness has an influence on the deformation and bearing capacity of the frame. The effect on deformation needs to be analyzed in conjunction with the normal use limit state. For this purpose, the initial stiffness of the connection or the secant stiffness under normal load should be examined. Rigidity of rigid connection, in theory, need to reach infinity, but in fact as long as a certain limit can be seen as a rigid connection, the question is how to make a quantitative definition.

Rotational ability is ductile index.[1] Plastic design of the framework of the plastic hinge parts require a certain degree of rotation, so that the subsequent redistribution of internal forces can occur.

2. DESIGN EDEAS AND PROGRAMS

(1)Design plan

The retractable computer mounting structure comprises a hydraulic lifting device, a display and a hydraulic pump, the bottom of the hydraulic lifting device is arranged as a base, a telescopic rod is fixed on the base, a horizontal support rod is fixed on the telescopic rod.The base is provided with an electrostatic protection panel, the left side of the base is provided with a plug, the plug and the hydraulic lifting device are electrically connected, the electric switch button is arranged directly in front of the base, the telescopic rod is composed of an outer rod and an inner rod , And the telescopic rod is provided with a hydraulic switch button. A hydraulic pump is mounted on the right side of the telescopic rod,

vertical support rods are fixed on the left and right sides of the horizontal support rod, and the horizontal support rods and the vertical support rods are fixedly connected by a fixing piece; the display is arranged on a horizontal support rod , And both sides of the display are fixed by a vertical support rod, the hydraulic pump is fixed on the base, and the hydraulic pump and the telescopic rod are hermetically connected by a hydraulic pipe.

The inner cavity of the base is provided with a slide rail, which is respectively an X-direction slide rail and a Y-direction slide rail[2].

A supporting column is arranged at the bottom of the telescopic rod, and an electromagnet is arranged at the bottom of the supporting column. The electromagnet and the electricity storage device are electrically connected.

The bottom of the horizontal support rod is provided with a wiring hole. The fixing part is provided with screws. The inner cavity of the vertical support rod is provided with a key slot, and the outer side of the vertical support rod is provided with a mounting hole.

(2)Design specific structure

This telescopic computer mounting structure,which comprises a hydraulic lifting device (3), a display (8) and a hydraulic pump (13). The bottom of the hydraulic lifting device (3) is arranged as a base (2), and a telescopic rod (4) is fixed on the base (2), a horizontal support rod (5) is fixed on the telescopic rod (4), Electrostatic protection panel (18), The left side of the base (2) is provided with a plug (1) and the hydraulic lifting device (3) is electrically connected to the front of the base (2) is provided with an electric switch button (15), telescopic rod (4) is composed of an outer rod and an inner rod, and the telescopic rod (4) Is provided with a hydraulic switch button (11), the right side of the telescopic rod (4) is equipped with a hydraulic pump (13), the horizontal support rod (9) is fixed on both sides of the vertical support rod (7), And the horizontal support rod (5) and the vertical support rod (7) are fixedly connected by the fixing member (6). The display (8) is arranged on the horizontal support rod (5) and both sides of the display (8) are fixed by the vertical support rod (7). The hydraulic pump (13) is fixed on the base (2), And the hydraulic pump (13) and the telescopic rod (4) are connected by a hydraulic pipe (12).The inner cavity of the base (2) is provided with a slide rail (14), the slide rails (14) are respectively X direction slide rails and Y direction slide rails, the bottom of the telescopic rod (4) is provided with a support column (19), and the bottom end of the support column (19) is equipped with an electromagnet (20), The electromagnet (20) and the power storage device are electrically connected, the bottom of the horizontal support rod (5) is provided with a wire hole (9), the screw (6) is provided on the fixing member (6), the inner cavity of the vertical support rod (7) is provided with a keyway (16), and the vertical support rod 7 The mounting hole (17)is provided outside.

Figure 1 is a schematic structural view of the utility model;

Figure 2 is a schematic structural view of the utility model vertical support rod;

Figure 3 is a top view of the base of the utility model.

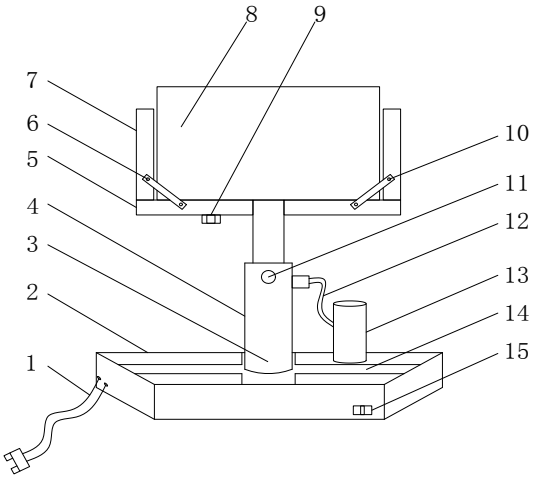

Figure 1 A schematic structural view of the utility model

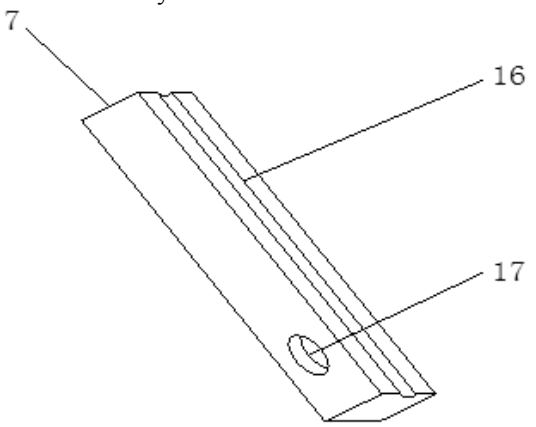

Figure 2 A schematic structural view of the utility model vertical support rod

In the figure: 1-plug; 2-base; 3-hydraulic lifting device; 4-telescopic rod; 5- horizontal support rod; 6-fixing member; 7-vertical support rod; 8-display; 9-wire hole; 10-screw; 11-hydraulic switch button; 12-hydraulic pipe; 13-hydraulic pump; 14-slide rail; 15-electric switch button; 16-keyway; 17-mounting hole; 18-electrostatic protection pane; 19-support column; 20-electromagnet. [3]

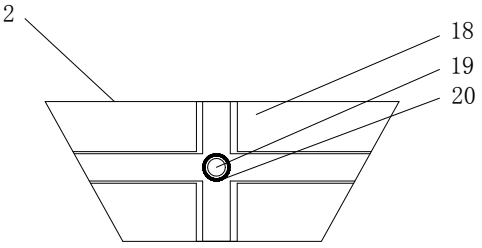

Figure 3 A top view of the base of the utility model.

This retractable computer mounting structure,

characterized in that: The inner cavity of the base (2) is provided with a slide rail (14) which is respectively an X-direction slide rail and a Y-direction slide rail. A supporting column (19) is arranged at the bottom of the telescopic rod (4), and an electromagnet (20) is mounted on the bottom of the supporting column (19). The electromagnet (20) is electrically connected with the electricity storage device. The bottom of the horizontal support rod (5) is provided with a wiring hole (9). The fixing piece (6) is provided with a screw (10). The inner cavity of the vertical support rod (7) is provided with a keyway (16), and the outer side of the vertical support rod (7) is provided with a mounting hole (17).

3. Working principle

When using it, the height and distance of the display 8 can be effectively adjusted according to the needs, and the X-axis direction rail and the Y-axis direction rail can be adjusted by setting the electromagnet 20 on and off in the horizontal direction and the vertical direction ; In height, by controlling the raising and lowering of the hydraulic lifting device 3. So as to achieve a certain appropriate distance and the appropriate height, then complete the adjustment, and then meet the user's scientific distance【4】.

4. Summary

The structure of the device is simple to design. The L-shaped fixed structure is used to clamp the computer display in the middle. The utility model is convenient for installation and disassembly and is convenient for maintenance【5】. The utility model is provided with telescopic rods and X, Y direction slide rails so as to adjust the space in three directions , For scientific use, according to the needs of the computer monitor the height and distance effectively adjusted to meet the user's scientific use of the distance, the human body also has a protective effect.

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Research on haze prediction based on improved depth learning algorithm

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Abstract: Haze poses a threat to environmental protection and human health. therefore, it is very important to predict haze effectively so that people can take preventive measures in advance. In view of the complexity of haze components, high data dimension and imbalance characteristics, this paper applies extreme learning machine to deep confidence network, avoiding tedious parameter iteration process, only need to set the number of hidden layer nodes, so that the network has fast learning ability and accurate prediction ability.
Keywords: Deep learning; Extreme learning machine; Haze prediction

1. INTRODUCTION

Haze refers to the phenomenon that particles in the air make the atmosphere turbid, blurred vision and lead to deterioration of visibility. Its typical characteristic is the visual range obstacle caused by the aerosol system composed of non-aqueous substances[1]. There are many reasons for haze weather, but the main reason is the rise of PM2.5 concentration. PM2.5 not only has a serious impact on air quality, with the continuous deterioration of air quality, haze weather phenomenon more and more, more and more harm. Therefore, it is very important to accurately predict the degree of haze, take preventive measures in advance, and reduce the harm of haze to people's lives[2].

The commonly used prediction methods include principal component analysis, fuzzy comprehensive evaluation, artificial neural network, grey system theory and so on, but they all have shortcomings[3]. In this paper, depth learning and extreme learning machine are combined to establish the prediction network, and extreme learning machine is used to replace the traditional feedback and global optimization methods to fine-tune the network, which improves the learning speed and prediction accuracy.

2.EXTREME LEARNING MACHINE(ELM)

ELM adopts single-hidden layer feed forward networks (SLFNs) structure.The advantage of SLFNs is that for a finite sample set, when the excitation function of SLFNs is nonlinear, the network can approach the sample set with zero error by setting up at most n hidden layer nodes and randomly determining the input weights[4]. It shows that SLFNs learning ability is only related to the number of single hidden layer nodes, and independent of the input weights[5].

For the sample set $\{x_i, t_i\}_{i=1}^{N}$,wherein $\mathrm{X}_i = [x_{i1}, x_{i2}, \cdots, x_{in}]^T \in R^n$ is an input vector and $t_i = [t_{i1}, t_{i2}, \cdots, t_{im}] \in R^m$ is a trained desired output vector, the standard expression of the SLFNs structure containing N hidden layer nodes is

$$\sum_{i=1}^{N} \beta_i G(W_i \ X_j + b_i) = o_j, j = 1, \cdots, N \quad (1)$$

Wherein G(x) denotes an activation function of the hidden layer node, $W_i = [w_{i,1}, w_{i,2}, \cdots; w_{i,n}]^T$ denotes an input weight value connecting the input node with the i-th hidden layer node, $\beta_1 = [\beta_{i1}, \beta_{i2}, \cdots, \beta_{im}]^T$ denotes an output weight value connecting the i-th hidden layer node with the output node, and b_i denotes an offset of the i-th hidden layer node. $\mathbb{W}_i \ X_j$ represents the inner product of $\mathbb{W}_i$ and X_j. o_j represents the actual output value of the j-th output node.

SLFNs can fit the sample set with zero error, then there must be β_i and $\mathbb{W}_i$ so that $\sum_{j=1}^{N} \| o_j - t_j \| = 0$, i.e.

$$\sum_{i=1}^{N} \beta_i G(W_i \ X_j + b_i) = t_j, \ j = 1, \cdots, N \quad (2)$$

The matrix form of equation (2) may be expressed as $H\beta = T$. Wherein H represents a hidden layer node output matrix, β represents an output weight matrix, and T represents an output layer output matrix.

$$H = H_n(W_1, W_2 \cdots, W_N, b_1, b_2, \cdots, b_N, X_1, X_2, \cdots, X_N) =$$

$$\begin{bmatrix} G(W_1 \ X_1 + b_1) & \cdots & G(W_N \ X_1 + b_N) \\ \vdots & \cdots & \vdots \\ G(W_1 \ X_N + b_1) & \cdots & G(W_N \ X_N + b_N) \end{bmatrix}_{N \times N}$$

$$\beta = \begin{bmatrix} \beta_1^T \\ \vdots \\ \beta_N^T \end{bmatrix}_{N \times m}, T = \begin{bmatrix} t_1^T \\ \vdots \\ t_N^T \end{bmatrix}_{N \times m} \quad (3)$$

When the activation function G(x) is infinitely differentiable, W_i and b_i can be given randomly and remain constant during training, and H is determined accordingly. Then training SLFNs is equivalent to

solving the least squares solution of the linear system $H\beta = T$, β is determined as $\hat{\beta} = H^{+}T$ [6]. Where H^{+} represents the Moore-Penrose generalized inverse of the matrix H. Compared with other algorithms, ELM has obvious advantages in learning speed and generalization performance.

3.DEEP LEARNING AND ITS IMPROVEMENT

3.1 DEEP LEARNING

Deep learning is a kind of method performing representation learning on the data,represents attribute categories or features by combining low-level features to form a more abstract high-level[7]. The depth structure used in this article is DBN structure. DBN is a probability model composed of several restricted Boltzmann machine(RBM) models superimposed from bottom to top. The RBM structure diagram is shown in figure 1. DBN structure diagram as shown in figure 2.

RBM has a visual layer, a hidden layer.Nodes in different layers are all linked, and nodes in the same layer are not connected[8].The nodes in the same layer are independent of each other, and an hidden layer node is only related to the visible layer nodes.When the visible nodes state v are set, the activation state of each hidden layer node is conditionally independent.The activated probability of the j-th hidden layer node can be calculated by the probability formula $\mathrm{p}(h_j = 1 \mid v;\theta)$ .In order to obtain DBN model, the visual layer of each RBM model is regarded as the input layer, and the hidden layer is regarded as the output layer. According to the greedy training method, layer-by-layer training is started, and finally a group of RBM is obtained. Finally, the training data is used to fine-tune the whole model. The traditional fine tuning method is to expand a group of RBM, and then adjust the weights and offsets of DBNs by feedback and global optimization methods, but the adjustment time is long[9].

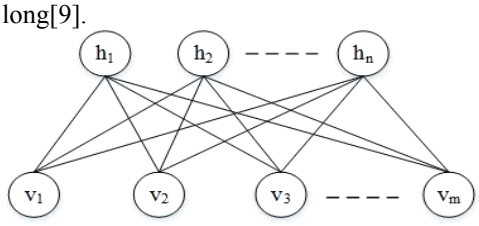

Fig.1 RBM structure diagram

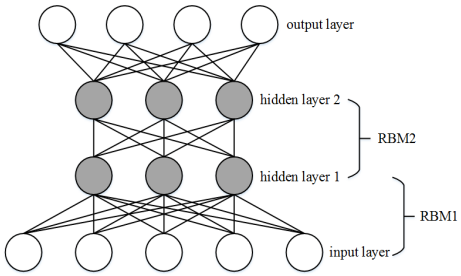

Fig.2 DBN structure diagram

3.2 IMPROVED DEEP BELIEF NETWORK(IDBN)

DBN containing one input layer I, n hidden layers $H_i(i = 1, 2, \cdots, n)$, and one input layer O is represented as $I \Rightarrow H_1 \Rightarrow H_2 \Rightarrow \cdots \Rightarrow H_n \Rightarrow O$. In this learning process, each layer is a feature map of the previous layer, thus a series of hierarchical features of the original input data can be obtained.The greedy training method is used to pre-train the model from the input layer to the (n-1)-th hidden layer to obtain n-1 RBM models. Then the last layer uses supervised ELM to map the previously obtained feature vectors to the output layer. This greatly reduces the information loss and avoids the tedious iterative process of the traditional BP algorithm.

Assume that that n-th hidden layer has N nodes and the (n-1)-th hidden layer has m nodes, the network structure can be expressed as

$$\sum_{i=1}^{N} \beta_i G(W_i \; H_{n-1,j} + b_i) = o_j,\ j = 1, \cdots, m \tag{4}$$

Since the network has a zero error approximation function, there is β_i so that

$$\sum_{i=1}^{N} \beta_i H_{n,j} = t_j,\ j = 1, \cdots, m \tag{5}$$

The matrix form of equation (5) is $H_n \beta = T$,wherein

$$H_n(w_1, w_2 \cdots, w_N, b_1, b_2, \cdots, b_N, H_{n-1,1}, H_{n-1,2}, \cdots, H_{n-1,m}) =$$

$$\begin{bmatrix} G(W_1 \; H_{n-1,1} + b_1) & \cdots & G(W_N \; H_{n-1,1} + b_N) \\ \vdots & \cdots & \vdots \\ G(W_1 \; H_{n-1,m} + b_1) & \cdots & G(W_N \; H_{n-1,m} + b_N) \end{bmatrix}_{m \times N}$$

$$\beta = \begin{bmatrix} \beta_1^T \\ \vdots \\ \beta_N^T \end{bmatrix}_{N \times m}, \quad T = \begin{bmatrix} t_1^T \\ \vdots \\ t_N^T \end{bmatrix}_{N \times m} \tag{6}$$

According to ELM algorithm, training a DBN is equivalent to solving linear system $H_n \beta = T$.

Thus, $\hat{\beta} = H_n^{+} T$. Wherein H_n^{+} represents the Moore-Penrose generalized inverse of the matrix H_n . The biggest advantage of ELM algorithm is that it can fit the sample set with zero error only by setting the number of hidden nodes in the network[10]. This feature makes IDBN structure have fast learning ability and fast convergence speed.

4.MODELING AND SIMULATION

4.1 MODELING

Based on the atmospheric composition data and meteorological data of Tianjin from November 2016 to March 2017, the main influencing factors of haze were determined by principal component analysis method, including humidity, wind level, SO2, CO, NO2, O3 and PM2.5 concentration of the previous day. Therefore, the above factors are used as input variables to the model. During pre-training, data from

November 2016 to February 2017 are used as training sets and data from March 2017 are used as test sets. In order to verify the validity of the IDBN, different prediction steps are selected here. Here, the input variables of i-th day are used as input, and the PM2.5 concentration of (i+n)-th day is used as output . The IDBN and DBN models for predicting the first day, the third day and the seventh day of the future are established respectively. Through multiple training, when the training error approaches zero, the network operation parameters are shown in table 1.

Table 1 Run parameter settings

Algorithm	Number of hidden layers	Number of nodes per hidden layer	Learning rate
IDBN	3	100 100 500	1
DBN	3	100 100 500	1

4.2 SIMULATION RESULTS

As shown in fig. 1 ~ 6, severe pollution occurred on March 22, 2017. SO2,CO and NO2 on the day were relatively large, and the relative humidity was also very large, while the wind level was small, resulting in a large error in the prediction results of both models. The analysis shows that the selected sample set is limited and no similar phenomenon has occurred in the sample set, which leads to such a large prediction error. And as the prediction period becomes longer, the prediction accuracy of both models will decrease.

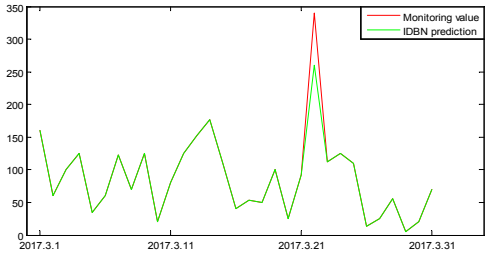

Fig.1 Predict the first day based on IDBN

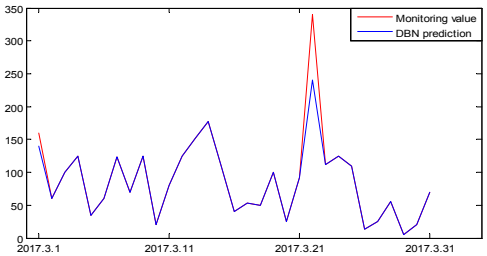

Fig.2 Predict the first day based on DBN

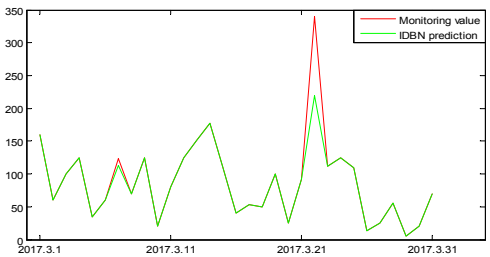

Fig.3 Predict the third day based on IDBN

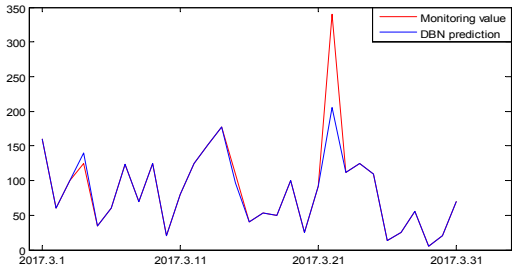

Fig.4 Predict the third day based on DBN

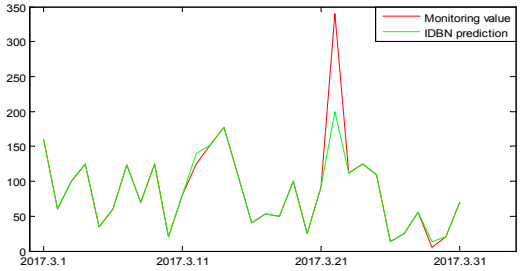

Fig.5 Predict the seventh day based on IDBN

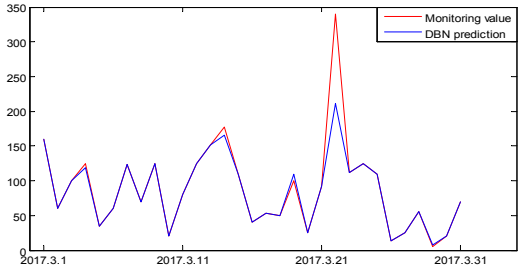

Fig.6 Predict the seventh day based on IDBN

Taking the predicted PM2.5 concentration on the first day as an example,the training time, training and test accuracy of the two models are calculated,and the specific results are shown in table 2.

Table 2 Indexs comparison

Algorithm	Training time	Training accuracy	Test accuracy
IDBN	31.873 s	99.17%	96.77%
DBN	10.277 s	96.92%	93.55%

From the above results, we find that the IDBN model can achieve the training and testing accuracy of DBN model. Especially in training time, the advantages of IDBN are more obvious. This is because IDBN based on ELM combines the advantages of ELM, does not need to adjust the weight and bias of the training, save time in the process of fine tuning, but also save time for the training of the whole deep neural network.

5. CONCLUSION

In this paper, the characteristics of elm network structure are used for reference, and it is introduced into the traditional depth learning algorithm DBN, which improves the traditional fine tuning method based on global learning algorithm. IDBN can not only ensure the accuracy of the original training and testing, but also significantly accelerate the training

speed of deep learning.

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Application of Multimedia Teaching in College Art Education

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Abstract: Multimedia teaching is increasingly applied in college art education, and good teaching effect has been achieved. The mode has very good teaching practicability and plays a great role in improving teaching efficiency and students' autonomous learning ability. The application of multimedia teaching in college art education was analyzed in this paper. The author hopes to promote the development of multimedia teaching in college art education.
Key words: multimedia teaching; college art education; application analysis

1. INTRODUCTION

With the development of information technology, multimedia technology also rose in 1990s and it has been widely applied in each field [1]. Multimedia teaching is a modern teaching method which develops with the internet technology. It is a digital learning platform which is elaborately designed and developed by taking streaming media teaching video as the carrier for the specific subject knowledge points and teaching links. The major features of multimedia technology include: brief and abundant contents, distinct and interesting themes, scenario orientation and visualization as well as interestingness. Multimedia teaching transforms the traditional teaching mode. With it, students can carry out mobile and fragmented flipped study to meet individual learning needs [2].

Multimedia teaching is especially suitable for the students majoring in art with large thinking jump. Their knowledge level is different, and their individual features are prominent. They have their own ways to handle affairs. They are curious about all cutting-edge and advanced things which bring certain challenges to them. However, such students own strong practical ability and actively give play to their abilities for the operation-based experiments. For the courses they are interested in, they show great initiative. Especially with the rapid development of modern network, they are full of enthusiasm for current network technology and process. All these are propitious to multimedia teaching. Hence, multimedia teaching gains consistent good reputation from both teachers and students in colleges. Multimedia teaching plays an important role in education, and is developing at full speed under the network era [3].

At present, multimedia art teaching basically achieves the complete coverage because of its rich expression ability, high interactivity and multi-dimension. These advantages contribute to motivating students' learning interest and enhancing their autonomous learning ability. Since the 20th century, apart from routine teaching, foreign education field have conducted multiple researches on multimedia teaching by focusing on technology and educators, such as comparative study with traditional teaching, intervention of learners' study for different learners, and regarding multimedia as the cognition and interaction tool[2]. In China, multimedia-based foreign language teaching receives extensive attention of national policy and people from all walks of life. Multimedia hardware construction and software resource construction almost cover all schools.

2 PROBLEMS OF MULTIMEDIA TEACHING IN COLLEGE ART EDUCATION

Although multimedia teaching has been widely applied and has achieved the good effect, there are still many defects in college art education field. (1) Multimedia application awareness is weak. The idea of multimedia teaching and learning of students and teachers are not mature. Many teachers cannot break through traditional teaching thinking, and they lack the ability of computer operation and fail to make the best of multimedia platform. (2) Most teachers of art colleges almost just apply PPT and the disc matched with the teaching material in multimedia teaching. This makes art course become courseware presentation. But such form just displays textbook knowledge in the electronic form, and loses student-teacher interaction in traditional teaching. Besides, the original intention of multimedia teaching is not achieved. (3) there is short of innovation, high-quality teaching courseware and learning resources. A very important part of art study is to cultivate the creation ability. The survey shows that, 42% of teaching courseware just directly transfers teaching materials in the electronic form [4], and the teaching is even copy or "cramming" teaching. Students' practical ability training is rarely concerned, and the function of multimedia application is not exerted. (4) Currently, multimedia teaching is mostly in the teaching stage without pertinence. Teachers cannot conduct targeted teaching for the students with different foundation and learning ability. Art multimedia teaching is a passive learning mode. Teachers' guidance is not strong, and students lack initiative [5-6].

3 MULTIMEDIA TEACHING SYSTEM DESIGN

3.1 Technological means of the system

The core of the whole system is teaching module, and the system adopts C/S frame structure, Internet standard protocol and TCP/IP communication protocol [7]. In view of communication efficiency and control flexibility, communication part is directly based on transport layer in the hierarchical structure of TCP/IP reference model, which contributes to enhancing control of communication interface and user interface.

As shown in Fig.1, two independent UDP socket connections and one TCP socket connection are established between the server and the client in the communication process.

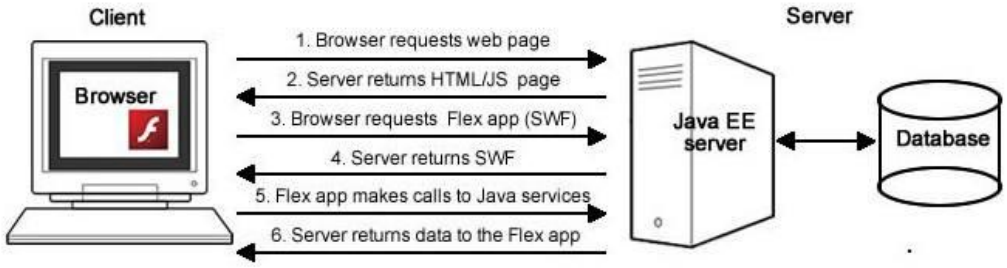

Fig.1 Connection diagram between the server and the client

The voice at the teacher terminal is sampled through the sound card by the microphone. After software smoothening and compression in the computer, on the one hand, the voice is transmitted to the client through network; on the other hand, it together with the video is stored in the server. The image signal is gathered by the Video Capture Card from the video head or camera. After software smoothening and compression in the computer, on the one hand, the image signal is transmitted to the client through network; on the other hand, it together with the audio is stored in the server. The system can store text, voice and image information in Web database for future use.

3.2 Windows Sockets application program adopted by the system

The core of TCP protocol includes transport layer protocol (TCP, UDP), network layer protocol (IP) and physical interface layer. The three layers are usually achieved in the core of operating system. The system adopts Windows Sockets application program. The relational graph is as follows;

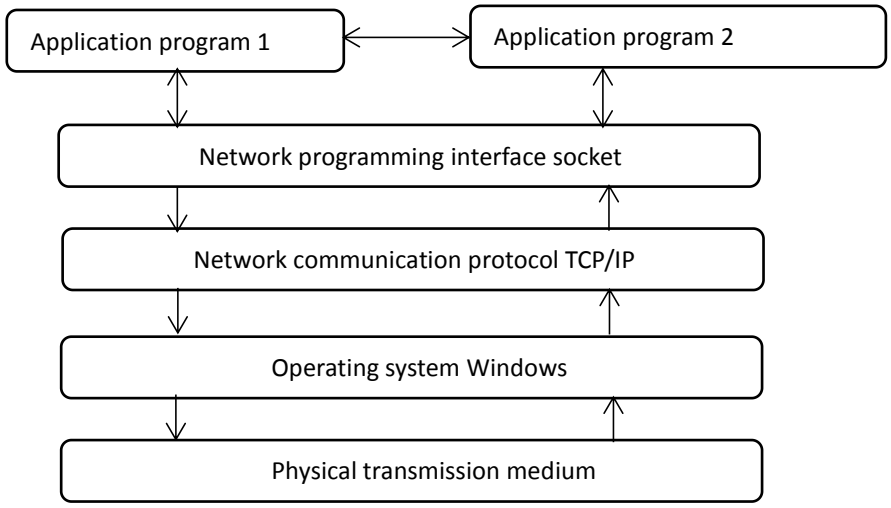

Fig.2 Relational graph of application program and socket

3.3 Function and interface design of multimedia teaching system

The emergence of multimedia teaching undoubtedly opens up a new direction for college art teaching. Multimedia teaching reform is imperative. There are large advantages in the application of multimedia technology in art teaching.

(1) Adapt to specialty development direction. Due to the specialty nature, students need to know all kinds of modern network designs, which cannot be separated from network information technology. According to traditional teaching mode, students have no sufficient time and energy to learn systematically in the process from study to application. They can only utilize the fragmented time to accumulate their knowledge. Hence, multimedia gives play to its huge value.

(2) expand learning resource channel. The strong promotion of multimedia will certainly bring the change of learning environment. The school, family and society will certainly offer advanced learning equipment and rich network resources, which

intangibly expands students' learning resource channel and achieves breakthrough and innovation of traditional teaching.

(3) Solve the problem of low resource utilization rate and storage rate, and avoid long-term disconnection between resource construction and teaching application; make up for the shortcomings of network teaching system with the unit of course such as high application and development cost, long development period, poor openness, large construction difficulty and severe repeated construction; adapt to the teaching development requirements of training autonomous learning ability and improving self-control ability so as to achieve individual teaching objective.

The main interface of teacher terminal in the teaching system contains teaching content, teaching management, teaching center, interactive platform and control platform, etc. This design is the first version. Later, the required modules may be added as needed. The teaching content may be set by clicking the setting button (teaching setting based on the material library). The system interacts with each database backstage, and is open to users. After the completion of setting, users may click to start teaching. The teaching content is automatically displayed on the computer through the perform system. In the teaching process, students and teachers may interact through corresponding buttons of the control platform. The teaching process will be automatically stored in the corresponding teaching database and teaching material database. Students' question answering situations will also be automatically transmitted to the corresponding student database.

4 CONTRASTIVE ANALYSIS OF SYSTEM APPLICATION

4.1 Experimental design

To test the effect of the multimedia teaching system, we conducted the contrast test which lasted for one semester. We chose art students in a college of Liaoning Province for the experiment. In the one semester, traditional teaching mode was applied for the students in Class 1 (50 students), while this teaching system was adopted for the students in Class 2 (50 students). After one semester, students' learning situations were compared.

4.2 Effect analysis

Table 1 Effect analysis

Group	Number of students previewing	Number of students answering questions actively	Number of students practicing after class	Number of students submitting assignments	Number of students participating in evaluation
Experimental group	31	25	44	47	39
Reference group	14	3	23	31	24

Compared with the reference group, the class for which multimedia system was introduced shows the significant effect in preview stage, classroom teaching process, after-class practice or course evaluation link. Firstly, the class for which multimedia system was introduced previewed more sufficiently. More than a half of students finished the preview task, while less than 1/3 of students in the reference group completed the preview task. In the classroom teaching process, the class for which multimedia system was introduced presented more active classroom atmosphere, with higher enthusiasm for discussion. More than 20 students actively expressed their opinions on the theme, while only several students in the reference group actively or passively expressed their views. In the after-class practice link, the class for which multimedia system was introduced could participate in practice more actively and submit the assignments more timely. In the teaching evaluation stage, the class for which multimedia system was introduced showed more diversified evaluation methods, with higher participation degree, and students learned more efficiently.

5 MEASURES TO STRENGTHEN APPLICATION OF MULTIMEDIA TEACHING IN ARTEDUCATION

(1) To strengthen consciousness cultivation of students and teachers in multimedia teaching and learning, enhance teachers' proficient in multimedia application, increase multimedia platform use rate, cultivate students' autonomous learning ability and let college art education really regard multimedia platform as the "main battlefield" of teaching and learning.

(2) To strengthen exchange and learning between teachers and students, and avoid teachers' excessive dependence on multimedia teaching. Teachers should propose some preview requirements before class, gather, upload and share learning materials. Teachers may apply text and voice to ask questions, answer questions and discuss in classroom, and guide students to express their views in the design problems. After class, teachers may publish design tasks through multimedia and require students to complete practice by teamwork. Then, the problems and the solutions in the process may form texts and be displayed in the multimedia form. In the teaching evaluation link, students should be encouraged to carry out self-evaluation and mutual evaluation.

(3) To enrich art course resource library. Multimedia resource library should focus on the development of courseware library, art course standard library, teaching-type network course library, question answering and tutoring system library of art experts, material and case library. Content presentation modes include knowledge point text, exercise text, activity text, introduction graph, teaching vide and discussion vide, etc.

(4) Multimedia teaching and traditional teaching have both advantages and disadvantages. The two should be fully combined. It is required to make the best of modern technology to achieve teaching innovation and reform. Meanwhile, teachers cannot excessively depend on the technology, and those traditional and classical teaching methods should not be forgotten.6

CONCLUSION

The application of multimedia teaching in college art education links students and teachers in real time. Multimedia teaching is extensively accepted by college art education. However, the application analysis in this paper is just exploratory research. The experimental study of the teaching mode proves that, college art education based on multimedia teaching can promote teaching efficiency and enhance students' learning initiative and autonomous learning ability. However, the application of multimedia teaching mode in college art education still involves many research directions. It is necessary to continuously explore and discover them so as to make contributions to China's modern technology and education.

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Based on Augmented Reality Experience Type Teaching Presentation Software Design and Application

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Abstract: As a frontier technology, augmented reality has become the focus of attention, and it is also promoting the rapid change of education in our country. From the theoretical perspective, augmented reality technology has many advantages, it solves the shortcomings of the traditional education of information technology in software and hardware aspects, especially the outstanding performance, reality beyond time and space, to create a new learning environment, so as to make learners get a better learning experience. It can be said that the application of augmented reality technology in education is a good interpretation of the true meaning of science and technology to improve life and the integration of digital into reality. From the perspective of practice, the development and platform design of educational software based on augmented reality greatly enriched the traditional teaching resources and made the teaching mode more diverse in the new era.

Keywords: Augmented Reality; Experiential; Teaching Presentation Software

1. THE DEFINITION OF RELATED CONCEPTS

In recent years, with the rapid development of information technology, augmented reality technology has become the focus of public concern. As a new technology and branch of virtual reality, augmented reality technology has shown great charm and has become a new force to promote the development of modern education, which is of great significance to further improve the quality and level of education in China.

1.1 Augmented reality

Augmented reality (AR), as its name implies, is a new technology based on virtual reality technology to create real world feelings through computer virtual information. The latest Apple patent indicates that virtual reality technology will be widely used in the future development. However, the emulation situation generated by augmented reality is not a real world, but only a supplement to it. At present, there is no consensus on the definition of augmented reality in the academic world, and different scholars have different views.

Based on the analysis of various viewpoints, the author believes that the so-called augmented reality, refers to the use of computer information technology, a variety of information to the real world specific time and space conditions of the experience (including tactile, auditory, visual, etc.) through the simulation mode, so that people can experience the real, in order to create a realistic feel beyond reality the. The application of this technology embodies the concept of science and technology to serve human beings, and changes the traditional thought of "people should adapt to the machine".

1.2 Teaching demo

In the daily teaching work, the demonstration is a necessary important link and means. Through various forms of demonstration, the teacher can display the curriculum knowledge in a proper way to the students so that everyone can understand and master better. The demonstration is widely used in teaching and its type is very rich. According to the difference of presentation materials, demonstrations include demonstrations of objects, models and specimens. They can also be divided into movie, video, sound and slide presentation. They can also include experimental demonstrations and operation demonstrations, or drawings, tables and map presentations. According to different demo requirements and contents, presentations can also be divided into demonstrations and visualized presentation of physical phenomena through visualization. Teaching demonstration we usually say, mainly refers to the teacher according to the teaching content, combining students' actual learning, using different teaching materials or in kind, or by direct demonstration of emotional display of multimedia technology, so that students can better understand and master the knowledge.

In teaching, the important role of teaching demonstration is to help students learn and understand curriculum knowledge better, enrich teaching forms, and enhance your interest in learning. Moreover, through intuitive and clear presentation, teaching demonstration can help students develop good operation skills and cultivate good innovative thinking and analytical ability.

2. THE PROBLEMS IN THE TRADITIONAL TEACHING DEMONSTRATION

On the whole, the application of demonstration teaching in classroom teaching can simplify and visualize relatively difficult and complex knowledge, and make classroom knowledge content easier to

understand and memorize, thereby significantly improving students' interest in learning and learning effect. However, it can be seen through practice that there are still shortcomings in the traditional demonstration teaching.

2.1 Neglecting the students' subjectivity

Influenced by the traditional teaching idea, most of the present demonstration teaching still takes teachers as the core, and the students are in a passive position. Teachers' indoctrination teaching in class is also relatively mechanized, which directly leads to students' interest in learning is not high, and it is not conducive to cultivating students' autonomous learning ability and analytical inquiry ability, so that the overall effect of classroom is not good. In addition, because each class time is limited, the teacher in order to complete the task of teaching, in teaching, can only select the key and difficult to demonstrate knowledge, and it can only complement to classroom teaching, it will cause the lack of classroom interaction, teaching demonstration of the potential mining is not enough.

2.2 Demo controllability is not strong

Technically speaking, the current demo system, demonstration teaching aids and demonstrations are very rich. Teachers can choose static flat view presentations or 3D animation demonstrations, and teachers can get demo resources through multiple channels. However, most teachers are still used to apply simple teaching demonstration methods, and adopt the past inherent demo program, so it is difficult to adjust flexibly according to classroom content, which leads to lack of controllability in demonstration teaching, which is not consistent with students' psychological expectation and learning needs.

2.3 Demo is easy to break out of textbooks

Some teachers in the demonstration teaching, often in order to pursue the effect of demonstration and infection, and too much application of different presentation and multimedia forms. Although this makes the classroom look more colorful, it is possible to deviate the teaching knowledge from the textbook. Some students say that all kinds of presentation contents and forms are easy to make the teaching content appear disordered, even break away from the key contents of the text, and disturb the normal learning thinking of students. These are not conducive to the promotion of students' learning initiative, but also difficult to effectively excavate the students' learning potential, so that the demo effect is discounted.

3. ENHANCE THE ADVANTAGES OF PRACTICAL TEACHING DEMONSTRATION

Compared with the traditional teaching demonstration, augmented reality teaching demonstration has many advantages, which not only makes the demonstrable object "promising", but also achieves the "accessibility" effect. Moreover, the demonstration type can greatly enhance the interaction between teachers and students, thus making the demonstration more vivid.

3.1 The combination of virtual reality and vividness and intuition

As we all know, the outstanding advantage of augmented reality technology is that it can realize the organic integration of virtual environment and real environment. The demonstration of augmented reality teaching is also the same. It can greatly enhance the real experience of demonstration effect, achieve the high degree of unity between object and virtual, so as to give full play to their respective advantages. In fact, the ability to achieve the combination of virtual and real is mainly based on the virtual information generated by computers to simulate the real world situation, so that the audience is as if they are in the real environment. This demonstration method can fully mobilize all kinds of perception organs of students, enable them to understand and learn curriculum knowledge vividly and intuitively, and further expand knowledge breadth and depth, enrich the cognitive field.

3.2 Teaching pleasure and arousing interest

According to the traditional teaching concept, teachers are the protagonists of the teaching process, and they are directly responsible for the teaching management and curriculum design. Therefore, under the influence of this idea, traditional teaching is also from the perspective of service teachers, ignoring the considerations of students' interests, feelings and ability training. The augmented reality teaching demonstration is fully reflects the subjectivity of students, it emphasizes that according to the needs and characteristics of students, of course design, and select the appropriate means of demonstration, the complex and abstract teaching demonstration, the static content, a dynamic visual demonstration, specific and vivid, thus greatly enhance the learning effect.

3.3 Diverse forms and promotion of cognition

With the development and improvement of the augmented reality technology, the demonstration teaching of augmented reality has also been greatly developed, and its teaching function and advantages are also increasingly prominent. Compared with the traditional demonstration, augmented reality teaching demonstration solves the problem of time and space completely, and enables the students to better understand the content of curriculum knowledge by creating simulation scenarios, effectively combining virtual presentation with real situations. Moreover, augmented reality teaching and give full play to the advantages of computer information technology, through the computer programming and information processing operation, can conveniently construct meet the teaching needs and the spatial structure of the real environment, so as to further enrich the teaching content and expand the scope of cognition.

4. DESIGN OF EXPERIENTIAL TEACHING DEMONSTRATION SOFRWARE BASED ON AUGMENTED REALITY

In order to complete the teaching demonstration, the corresponding supporting software cannot be separated. Augmented reality experience teaching demonstration software, mainly according to the teaching objectives, curriculum contents and teaching methods, follow the construction principle theory of learning and experience requirements situatedcognition, designed the core technology to enhance the reality of the teaching software. The software mainly consists of two parts: one is to support the platform and environment of augmented reality technology; and two is a specific teaching demonstration.

4.1 The overall architecture of the software

For education practitioners, in order to get rich information materials, it is inseparable from the use of digital cameras, and its proficiency is directly related to the quality of video content. Through the investigation and study, many teachers in the digital camera to explain, because the limits of the experimental environment and teaching space, equipment and other factors, teachers can hold the real digital camera, is standing on the platform to show its internal structure, function and key operation demonstration for everyone, most students find it difficult to close clear understanding the composition and function of digital camera. The teaching demonstration of augmented reality can solve these limitations well, and its software design should be developed from two aspects. One is to compile the overall organizational structure according to the content of the demonstration; two is to program the computer software based on the augmented reality technology.

4.2 The design idea of software

Objectively speaking, the emergence and development of augmented reality technology is closely related to virtual reality technology. Therefore, it not only exhibits the same advantages as virtual reality technology, but also has its unique artistic attributes and technical characteristics. From the analysis of the artistic attributes, the augmented reality technology in the construction of the simulation situation, fully embodies the aesthetic sense of the integration of virtual and reality. From the perspective of technology characteristics, augmented reality focuses on building a virtual environment for simulation, and using advanced computer technology to enhance people's sensory experience, so as to feel the feeling of being in the real world.

5. DEVELOPMENT PROCESS AND TECHNOLOGY REALIZATION OF EXPERIENTIAL TEACHING DEMONSTRATION SOFTWARE BASED ON AUGMENTED REALITY

5.1 software development process

In essence, the experiential teaching demonstration software based on augmented reality is a new kind of multimedia teaching resources. Therefore, the article fully absorbs the experience and achievements of traditional multimedia resources and augmented reality technology, and on the basis of refining and summarizing, develops corresponding software development process for augmented reality experiential teaching demonstration.

In the design process, we focus on the various needs of augmented reality experiential teaching, strive to achieve flexible interaction between students and software, and widely apply virtual three-dimensional models, so as to build a good cognitive foundation and learning environment. Specifically, the software includes 4 development stages, analysis, design, implementation, and test release.

5.2 implementation of software

(1) The making of sound and text enhancement information

In order to provide a good learning experience and personal experience, the virtual information design to enhance the experience of teaching demonstration software reality must be committed to the pursuit of science based, to construct a realistic teaching situation, and is convenient for teachers of knowledge to explain, and satisfy the interaction between learners and teachers need. Therefore, in the research, we choose digital video camera as a physical reference and collect data such as image, voice and text, and process related information by virtual information technology, so that all kinds of information and virtual models can be superimposed.

(2) The creation of Targets recognition diagram

For augmented reality, in order to achieve interactive functions and achieve seamless connection with real objects, the core technology adopted is three-dimensional tracking and registration key technology. This technology can capture the dynamic and static markings, and achieve the purpose of tracking the real objects, so as to locate and track the real objects accurately, and finally complete the superposition of the virtual content.

The main application of the Qualcomm Corp identification method in the design of Targets recognition map. In the development of enhanced information design, the emphasis is focused on the component composition and model of the digital camera. Because the model is relatively stable, and the number of components is not much, and in order to use the browser, breakthrough time and space constraints, thus in dealing with the server to process graphics data, in order to achieve the purpose of analysis, and according to the different knowledge points, are designed to be identified.

(3) Augmented reality function production

From the point of view of processing, augmented reality involves two main links. It takes the video camera as the starting point and the virtual

enhancement information as the end. That is to say, the first stage of augmented reality is the recognition of the real object, and the second stage is to display the superimposed virtual information.

(4) Software debugging and exporting

The completion of software project does not mean the end of the work. In order to get the best use effect, it is necessary to debug the performance and operation state of the software at the same time. The key is to find the deficiency of the software and release it before it is modified and perfected. Because in the running of the project, the real object is traced mainly by image recognition, and the operation environment is real. Each identification card corresponds to the specific presentation content. Therefore, when debugging the software, the system must be debugged for the image recognition, tracking and positioning and information content.

6. CONCLUSION

The development of information technology makes people's life more convenient. As the development of virtual reality technology, the augmented reality technology has many advantages, such as flexible and vivid, virtual reality, and so on, and quickly integrate into various fields of society. The wide application of this technology in the field of education not only enriches the teaching means, but also makes students understand the teaching content more easily by creating simulation scenarios, thus greatly improving the learning effect. It can be said that based on augmented reality teaching demonstration software, we can create a new learning environment and achieve the perfect integration of real space and virtual world, greatly improving the teaching experience and experience of teachers and students.

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Analysis of Energy Saving Control in Sewage Treatment

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Abstract:Along with the increasing seriousness of water pollution and the state of water to continue to strengthen environmental protection consciousness, the control process of sewage treatment more and more get the attention of the people, for the sewage pump frequency conversion control in the process of grey prediction PID algorithm research, through the algorithm, realization of PID parameter self-tuning, can effectively improve the dynamic and static characteristics of control, shorten the adjusting time, reduce the overshoot, enhance anti-jamming capability. The simulation results show that using gray prediction PID algorithm to control frequency converter for motor speed when can quickly reached set value, the control effect is smooth, and the system dynamic characteristics of good, up to the control requirements.

Key words:Sewage treatment works; Frequency control of motor speed; PID; Energy saving;

1. INTRODUCTION

With the increase of population, the development of economy and the acceleration of industrial pace, the discharge of urban sewage in China is also increasing, causing serious water pollution. However, sewage treatment is a comprehensive technology involving many science, such as chemistry, physics and biology, and its process mechanism is complex, the operation requirements are very strict, and it is difficult to realize. Therefore, in order to change the backward status of the wastewater treatment control technology, the research and development of the automatic control system of sewage treatment have very practical significance[1].

In the design of sewage treatment plant, air blower, water pump, this type of load more is designed according to the demand of working at full capacity, but most of the time the door does not need to work in the actual application in full load condition. Therefore, it is the most scientific and economical control method to use the inverter to directly control the load of the fan and water pump. Because of the frequency converter can realize motor soft stop, soft start, so to avoid the motor stopping voltage impact, reduce the failure rate of the motor, prolong service life, it also reduces the capacity requirements of power grid and reactive power consumption. The variable frequency speed regulation with its excellent speed regulation accuracy, the application range of the brake performance is widely and so on many advantages is considered by the domestic grandfather as the most promising speed regulation mode[2].

2. THE PRINCIPLE OF FREQUENCY CONVERSION

2.1The structure and function of the converter

The main task of the converter is to convert the alternating current of the constant voltage frequency to the variable voltage alternating current to realize the control of the speed of the ac motor[3].

Inverter can be divided into direct frequency conversion and indirect frequency conversion. The direct frequency converter transforms the frequency of the work frequency into a controlled frequency exchange, without the intermediate dc link, namely the so-called ac converter. While the indirect frequency converter first converts the working frequency current into the direct current through the rectifier, and then the direct current is turned into an alternating current with adjustable frequency by the inverter. The basic structure of the converter is shown in figure 1:

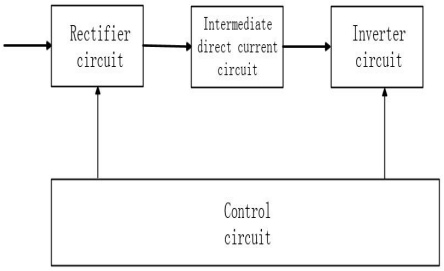

Fig.1 basic composition of frequency converter

2.1.2Variable frequency speed regulation energy saving

The motor variable frequency speed control technology is the energy saving technology of stepless speed regulation by controlling the power supply frequency of ac asynchronous motor and changing the speed of the motor smoothly.

The rotor speed of the asynchronous motor is as follows:

$$n = n_0(1-s) = 60f(1-s) \tag{1}$$

The above formula n_0 represents the synchronous speed; f represents the stator frequency; s represents the slip rate of asynchronous motor. p represents the logarithm of the magnetic pole[4].As can be seen from the formula, there are three ways to speed adjustment:

Change the stator winding of the motor p.

Change the motor slip s.

Change of power supply frequency f.

The speed can be adjusted by changing the logarithm of the pole, but this speed is not smooth, it is stepless.However, the variation range of the general asynchronous motor is very small, so it is very small to adjust the slip rate.After comprehensive consideration, the motor speed can be changed smoothly by changing the power supply frequency of the motor under the condition that the magnetic poles of the motor are unchanged. However, it should be noted that while changing the power supply frequency of the motor, the output torque of the motor should be kept unchanged, which means that the magnetic flux of the motor will remain constant. Therefore, in the process of motor speed regulation, the ratio of power supply voltage and frequency should be constant. This also means that the frequency conversion device needs to be able to achieve coordinated control[4,5].It is easy to realize the closed-loop automatic control by applying the variable frequency speed control precision, power factor and efficiency.

2.3The principle of variable frequency speed regulation energy saving

The energy consumption of water pump is analyzed by throttling regulation and frequency conversion. Before conversion, the outlet flow adopts electric regulating valve to adjust the opening degree, so that the valve has a large resistance to the water supply. The characteristic curve of the pump and the resistance curve of the pipeline are shown in figure 2.In the figure, Q represents flow, H represents the lift curve of the pump, and P is the power curve of the pump. Throttling doesn't change the water pump characteristic curve, the export control valve opening down, pipeline characteristic curve by Ⅰ to Ⅱ.Through the analysis can know, the smaller the outlet valve opening, the smaller outlet flow Q, when the head must be the greater the pipeline resistance, and the pump rotating speed is constant, its output power and torque, most of the power consumption on the pipeline resistance, therefore very waste of energy[6].

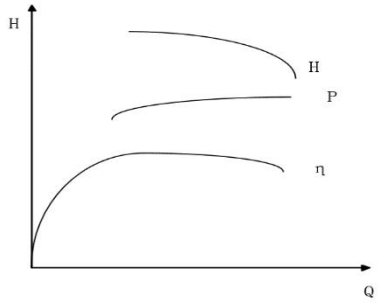

Fig.2 The characteristic curve of the water supply pipe network

Variable frequency speed control is to change the operating speed of the water pump by changing the working speed of the water pump, so as to change the working point to achieve the adjustment as shown in figure 3:

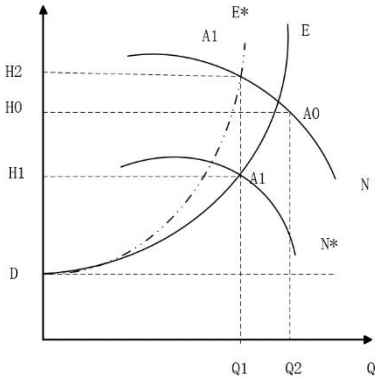

Fig.3 A H-Q curve of the pump frequency control

According to the similar law of impeller of water pump, the change of Q, H and P is as follows:

$$Q_1 = Q_0(n_2 / n_0) \tag{2}$$

$$H_2 = H_0(n_2 / n_0)^2 \tag{3}$$

$$P_1 = P_0(n_2 / n_0)^3 \tag{4}$$

According to the above equation, the flow rate of the water pump is proportional to the square of the rotational speed, and the pressure is proportional to the second square of the rotational speed, and the axial power is proportional to the three times of the rotational speed. As a result, when the pump speed decreases, its power consumption is also greatly reduced.

3. GREY PREDICTION IMPROVES PID CONTROL

It is difficult to obtain satisfactory control effect by adopting the conventional PID control, which is characterized by the complicated mechanism, such as non-linear, slow time and hysteresis. Using grey prediction algorithm to improve PID control has the advantages of fast response, small error and small overshoot. Therefore, the grey prediction algorithm is used to improve the PID control.

3.1Grey theory

In recent years, grey theory and artificial neural network have been widely used in the field of prediction [7-9]. Grey theory is a theory that studies the uncertainty of a few, and is suitable for the prediction of data processing, model establishment and development trend in the background of a few uncertainties[10].Grey forecasting model is a mathematical prediction model, the basic principle is through a series of accumulation, integral and differential, decreasing operation to eliminate some of the original data sequence random factors, so as to more accurately predict the data column of the next moment.The grey prediction model is also called GM (1,1) model. GM(1,1) modeling steps are as follows:

(1) Irregular data normalization

Set the raw data as $x^{(0)}(1), x^{(0)}(2), \cdots, x^{(0)}(n),$ Remember to $x^{(0)} = (x^{(0)}(1), x^{(0)}(2), \cdots, x^{(0)}(n))$ .Once again, it can be concluded that: $x^{(1)} = (x^{(1)}(1), x^{(1)}(2), \cdots, x^{(1)}(n))$,

$x^{(1)}(k) = \sum_{i=0}^{k} x^{(0)}(i), k = 1, 2, \cdots, n$.

(2) Set up differential equations

$$\frac{dx^{(1)}}{dt} + ax^{(1)} = u \tag{5}$$

The formula is the GM(1,1) equation, in which the grey constant can be obtained by the least square method:

$$\begin{pmatrix} a \\ u \end{pmatrix} = (B^T B)^{-1} B^T Y_n \tag{6}$$

$$B = \begin{bmatrix} -\frac{1}{2}(x^{(1)}(1) + x^{(1)}(2)) & 1 \\ -\frac{1}{2}(x^{(1)}(2) + x^{(1)}(3)) & 1 \\ \cdots & \cdots \\ -\frac{1}{2}(x^{(1)}(n-1) + x^{(1)}(n)) & 1 \end{bmatrix} \tag{7}$$

$Y_n = (x^{(0)}(2), x^{(0)}(3), \cdots, x^{(0)}(n))$

The solution of differential equation (called time response function) is:

$$\hat{x}^{(1)}(k+1) = (x^{(0)}(1) - \frac{u}{a})e^{-ak} + \frac{u}{a} \tag{8}$$

This is the predicted value of the increment sequence, which decreases in turn.

$$\hat{x}^{(0)}(k) = x^{(1)}(k) - x^{(1)}(k-1) \tag{9}$$

The final calculation is predicted:

$$\hat{x}^{(0)}(k+1) = (e^{-a} - 1)[x^{(0)}(1) - \frac{u}{a}]e^{-a(k-1)} \tag{10}$$

3.2 grey prediction improved PID control design

This design to dc motor driven dosing pump as an example, the principle diagram as shown in figure 4, figure, the input voltage for the motor, through comparison with the PID controller feedback voltage error, treated with PID controller for the input voltage, and then the voltage signal into the controlled object control motor running. At the same time, a feedback voltage signal is generated into the improved GM(1,1) controller, and the predicted voltage signal is obtained, and the output prediction voltage of the next moment is obtained through the low-pass filter. The prediction error is obtained by comparing the predicted voltage signal with the given voltage, and then the prediction error is used to correct the PID parameter, so that the motor speed can reach the given value quickly[11].

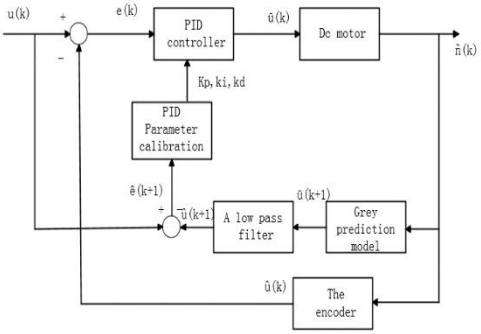

Fig.4The grey prediction model PID control schematic diagram

The rated output power of the charging pump driven by dc motor is 2.0k W, the rated voltage is 220V, the rated current is 9.0A, and the rated speed is 370rad/s. The moment of inertia is 0.025. The sampling frequency is 100 Sa/s. Log p is equal to 1. The initial parameters given by PID are =12.4, = 0.68, = 1.12.

Using the SIMULINK module in Matlab to simulate the above information, the simulation results are shown in fig.5, fig.6:

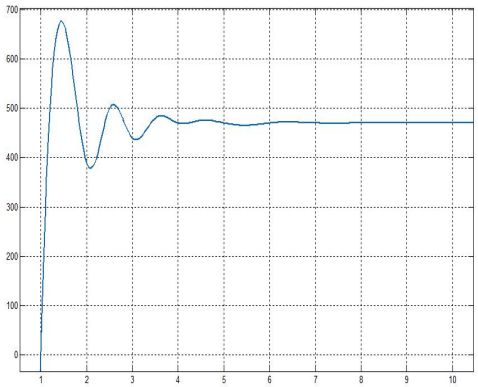

Fig.5 The traditional PID control simulation

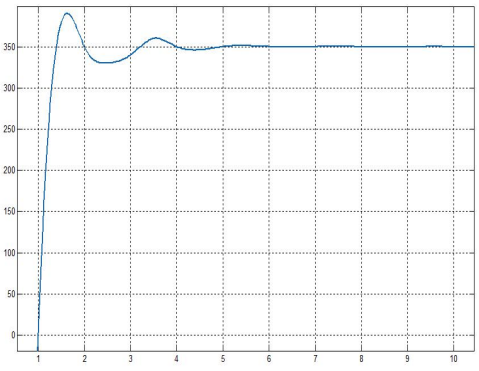

Fig.6 The grey prediction model PID control simulation

As shown in the figure above, figure 5 is the result of traditional PID control, with large curve overshoot and large system fluctuation, which fully reflects the shortcomings of PID controller's slow reaction speed

when controlling the nonlinear system. FIG. 6 is the result of the traditional grey prediction PID control. The system overshoot is reduced to 400 rad/s, and the fluctuation is small. The stabilization time is shortened to 2 seconds, and the effect is outstanding. Therefore, it can be seen that the improved grey self-correction PID control and drug pump work is ideal, and the dosage rate is fast and uniform, the dosage is accurate and the effect is better.

4. CONCLUSION

Through simulation experiment, the improved grey prediction model PID control method to control dosing pump speed, makes the rapidity of dosing rate, the dosage of the stability and accuracy are improved very good, get the ideal control.

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Research and Design of Multi-core DSP Multi-level Boot Based on KeyStone Architecture

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Abstract: The DSP system is usually run offline in practical application. After the DSP is powered on, a boot process is required, that is autoboot. The boot of multi-core DSP is always the difficulty of DSP research. However, in some practical applications, programs that are loaded when the DSP is started are stored separately, which further increases the difficulty of starting the DSP. In response to this problem, multi-level boot technology of multi-core DSP based on KeyStone architecture is proposed in this paper. Taking TMS320C6678 as an example, the design of multi-core DSP multi-level boot is given, with the multi-level boot realized by I2C, SPI and SRIO interfaces, the I2C and SPI interfaces to achieve the local loading of application during DSP boot and SRIO interface to achieve remote loading. The design realizes multi-core DSP self-starting and application program loading separately stored when starting up, which provides effective reference and help for multistage boot and program loading of high-performance multi-core architecture DSP.

Keywords: Multi-core DSP, Boot Loader, SRIO interface, TMS320C6678, Multi-level store separately, program loading, boot

1 INTRODUCTION

With the continuous development of computers and microelectronics, the demand for embedded processors such as radar systems, military communications and sonar is on the rise. As a result, multi-core digital signal processors (DSPs) are gaining more and more attention. With its strong performance and excellent energy loss ratio, it is more and more widely used. For the start of multi-core DSP, TI officially provides little information, multi-core DSP starts more complexly than single-core DSP. And in some practical applications, it is required to separately load and run stored applications at boot, which in turn increases the difficulty of starting the DSP. In order to meet the application requirements of multi-core DSP, this paper proposes DSP multi-level boot mode.

Boot is broadly divided into two categories: the host boot and memory boot. In host boot mode, the boot process configures the DSP to be at slave mode and waits for code to be transferred from the external host to internal memory and starts the DSP execution of application. Memory boot is the process of loading an application program from external memory into internal memory and executing it [1]. TMS320C6678 DSP application loading depends mainly on the processor's external interface, the processor has a wealth of external interfaces, such as: EMIF16, SRIO, Ethernet, PCIe, I2C, SPI and Hyperlink [2]. Therefore, there are many ways to achieve its boot. I2C, SPI and SRIO interface are here selected to achieve multi-level boot.

2 TMS320C6678 BOOT MECHANISM

(1)TMS320C6678 Multicore Digital Signal Processor

TMS320C6678 is a multi-core fixed floating-point digital signal processor based on KeyStone architecture newly released by Texas Instruments (TI), with eight TMS320C66x cores, and it is the industry's first 10GHz DSP with a processing frequency of 1.25GHz and 160GFLOPs, yet consumes only 10W of power [3]. Each processor core has multi-level memory, with L1P, L1D, L2SRAM in the C66x core. Multicore shares MSM SRAM (Multicore Shared Memory SRAM), and provides a variety of external interfaces such as I2C, SRIO, SPI [4].

(2)TMS320C6678 Boot Mode

In order to meet the design requirements of different systems, TMS320C6678 offers a variety of boot modes. TI official EVM board has BOOTMODE Pins configuration. Boot mode can be selected by configuring BOOTMODE [12: 0]. Non-TI official development board, if not configured pin, can configure the boot mode by configuring the GPIO [13: 1] pin [5]. The configuration table of boot is shown in Table 1.

Table 1 TMS320C6678 Boot Configuration Table

Boot Mode Pins												
12	11	10	9	8	7	6	5	4	3	2	1	0
PLL Mult I2C/SPI Ext Device Cfg			Device Configuration							Boot Device		

The fields BOOTMODE [12: 0] configure the boot mode, the field BOOTMODE [12: 3] is used to configure the related peripherals of the boot. Therefore, the definition of field BOOTMODE [12: 3]

depends on the selection of boot mode [6], and the boot mode supported by C6678 is shown in Table 2.

Table 2 TMS320C6678 Supported by the Boot Mode

Boot Mode Pins [2:0]	Device Boot Modes	Boot Modes Description
000	EMIF16 / No Boot	The application loads execution asynchronously from the outside via a 16-bit EMIF interface.
001	Serial Rapid I/O	In this boot mode, the RBL configures the SRIO to operate in both DirectIO and messaging mode.
010	Ethernet (SGMII)	PASS PLL configuration assumes input rate same as CORECLK (P|N);BOOTMODE[12:10] values drive the PASS PLL configuration during boot.
011	Ethernet (SGMII)	PASS PLL configuration assumes input rate same as SRIOSGMIICLK(P|N); BOOTMODE[9:8] values drive the PASS PLL configuration during boot.
100	PCIe	The external host transfers the application to the on-chip memory through the PCIE bus address mapping.
101	I2C	In master mode:Read boot table from I2C EEPROM Configure RBL to load the application into the specified data block. In passive mode:The external I2C host sends the application to the DSP, the data format meets the format of the boot table.
110	SPI	The DSP loads the application into Flash which is connected by SPI bus and loads it as a boot table data block.
111	HyperLink	Passive boot mode, the host needs to be responsible for configuring memory and direct boot DSP load application

3 IMAGE FILE FORMAT AND IMAGE LOADING INTERFACE

(1)Image File Format

An image file is a file whose application code is stored in a format that is recognizable by Boot Loader. The application compiles and generates the .out format executable file under CCS development environment. Because the .out executable carries a lot of debugging information, programming .out files to Flash can result in a waste of memory resources [7]. So .out format executables go through a series of toolchain conversions, filtering out redundant information, keeping useful information, and generating files in a format that Boot Loader can recognize.

The application generates .text segment, .cint segment, .const segment, .switch segment after CCS compilation. The size of each segment and the starting address stored in memory are stored in the image file. So that Boot Loader accurately identifies the content and storage address of each data segment to implement application loading [8]. Texas Instruments Incorporated offers a range of conversion tools to convert .out executables into boot Loader recognizable file formats such as hex6x, b2i2c, b2ccs, i2ccrom and others [9]. TI also provides a dedicated application format conversion tool batch file (.bat) for you to easily achieve the program file format conversion. Table 3 shows the storage formats of image files, which can be identified by the Boot Loader.

Table 3 Boot Loader recognized file format table

_c_int00 Entrance address
.text Segment size
.text Segment start address
.text Segment content
.cint Segment size
.cint Segment start address
.cint Segment content
.const Segment size
.const Segment start address
.const Segment content
.switch Segment size
.switch Segment start address
.switch Segment content
Fill bytes

(2)Image Loading Related Interface

During the boot process, the image file uses two loading mode which are online loading and remote loading. The online load mode uses the I2C interface and the SPI interface of the TMS320C6678 processor. SRIO interface is used for remote loading mode. The following is the relevant interface used in the process of loading the image file:

(2.1)I2C

The TMS320C6678 includes an I2C peripheral module and provides an interface for the DSP to connect with other devices with I2C. This interface follows Philips Semiconductors' Inter-IC bus (I2C

bus) specification (version 2.1). External components can be connected to the DSP via a 2-wire serial bus, enabling up to 8 bits of data to be sent and received [11].

(2.2)SPI

The SPI module provides an interface for DSP and other compatible SPI devices. The main function of this interface is to connect SPI ROM to boot, and to connect other chip level components (such as temperature sensing or I / R O extension) [12].

(2.3)SRIO

SRIO is a non-proprietary, high-bandwidth, system-level interconnect. It is a packet-switched interconnect intended primarily as an intrasystem interface for chip-to-chip and board-to-board communications at gigabyte-per-second performance levels. Uses for the architecture can be found in connected microprocessors, memory, and memory-mapped I/O devices that operate in networking equipment, memory subsystems, and general-purpose computing[10].

A SRIO interface for TMS320C6678 is a high performance, low pin interconnect interface for embedded systems and markets. The synchronous interconnection environment can be established by using RapidIO in the design of substrate, which can provide more connection and control assistance for each component. RapidIO is a device addressing concept based on memory and processor bus, which is completely controlled by hardware. This allows RapidIO to reduce overall system costs by providing lower latency, reducing packet processing overhead and increasing system bandwidth. All of this is critical to wireless interfaces. Serial RapidIO supports DirectIO transmission and Message Passing transmission. Serial RapidIO supports DirectIO transmission and Message Passing transmission [10].

4 MULTISTAGE BOOT DESIGN

(1)Basic Principles of Boot

Boot is self starting. In C6678 address space, 128K internal rom is integrated from 0x20B00000 to 0x20B1FFFF. A boot loader (ROM Boot Loader, RBL) is solidified in this ROM, which can not be changed by the user. Its main function is to initialize C6678 when it is powered on, so as to assist the interface of the processor to load the application program. In addition, it can read applications from external memory to internal high-speed RAM to complete application loading. The most core function of Boot Loader is the loading and jumping execution of application program. Whether the function can be executed correctly is directly related to whether DSP can complete the self-boot of power-on [1].

C6678 has eight nuclei, but ROM code has only one. So the eight cores uniformly execute the ROM code. The ROM code is assigned differently based on the kernel number (that is, DNUM). For core0, it mainly reads the boot mode of DEVSTAT register (response boot mode and some parameter configurations, set by BOOTMODE [12: 0]). The initialization of some interfaces and PLL configuration are performed according to the current boot mode, and whether to move the data is according to the boot mode. If needing to move, such as for SPI boot, the SPI external ROM code will be loaded into C6678 memory by segment. If not needing to move, such as for EMIF16 loading, jump directly to the starting address of the EMIF16 external Nor Flash to start execution. For the other seven cores, they go to the IDLE state after booting, then wait for the core0 to send the IPC interruption, once the interrupt arrives, they jump to the application's entry address and execute [1].

(2)Multistage Boot Process

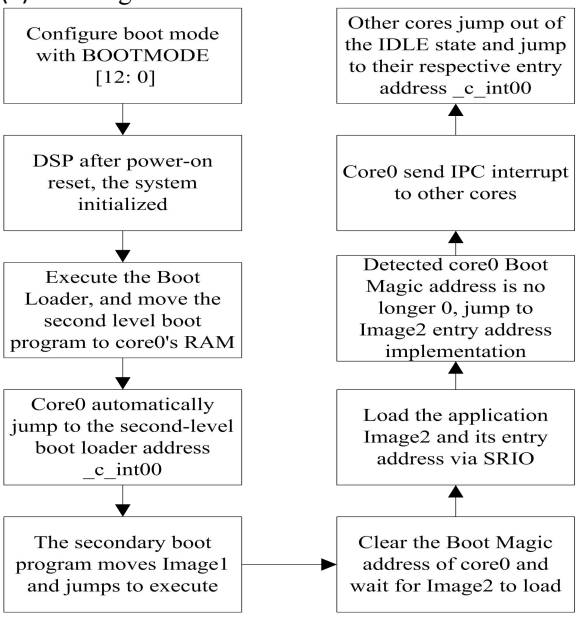

Figure 1 Program loading process diagram

In the design of multistage boot, start core0 first. After core0 starts, it sends an IPC interrupt to core1~core7 and starts core 1 and core 7. To satisfy the loading of an application that is stored separately at boot, the core0 application is stored in two parts. One part of the application Image1 is stored in the SPI Nor Flash and the other part of the application Image2 is stored externally. The Boot Loader is a primary bootloader. The secondary boot program is stored in I2C EEPROM. The level 3 boot program is stored outside the DSP. After the DSP is powered on, first execute the RBL in the Boot ROM. The initiated process is then handed over to the secondary boot program that exists in the EEPROM. The secondary boot program loads the user's application Image1 from the SPI Nor Flash. The tertiary boot program uses the SRIO interface to load another part of the user's application Image2 from the outside. Here another DSP processor (labeled as DSP_B) loads Image2 over SRIO to the DSP to be started (labeled as DSP_A). The program loading of the other cores is loaded by the SRIO from the outside into the

respective RAMs. Then write the Boot Magic address, and send the IPC interrupt to the other kernel by core0, and start the corresponding kernel. The program loading process is shown in figure 1.

(2.1)The boot of the first level

After the DSP_A is powered on, the DSP_A is initialized by Boot Loader. Including boot mode, little endian mode, big endian mode, PLL frequency and other parameters. And load the secondary boot program stored in the I2C EEPROM to the internal RAM of the core0. After loading, the program automatically jumps to the entry address of the secondary boot program to execute. The first level boot process is shown in Figure 2.

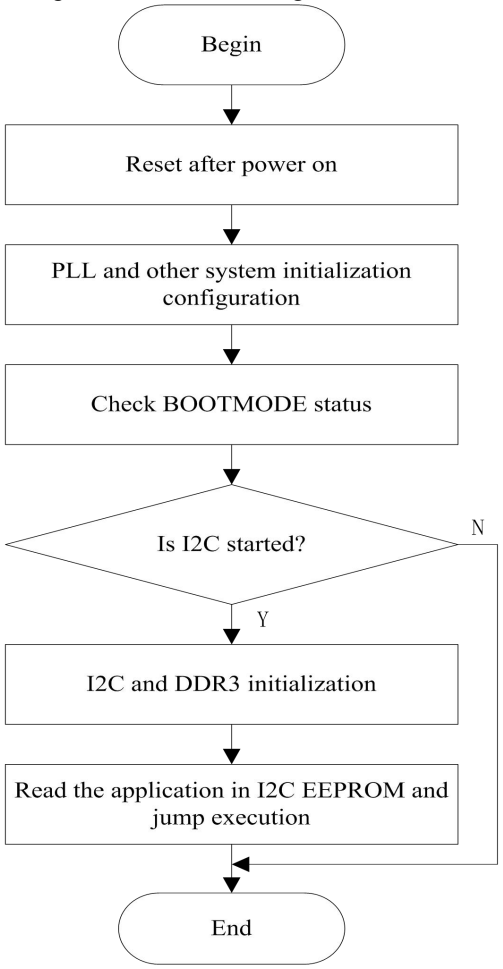

Figure 2 The boot of first level diagram

(2.2)The boot of second level

After DSP_A finishes executing Boot Loader, it automatically jumps to the program entry address of core0 to execute the secondary boot program. The work of the secondary boot program in EEPROM are:

a. SPI interface and DDR3 are initialized.

b. Load application Image1 stored in SPI Nor Flash.

C. After loading Image1 is completed, the program jumps to the Image1 entry address to execute. The secondary boot process is shown in figure 3.

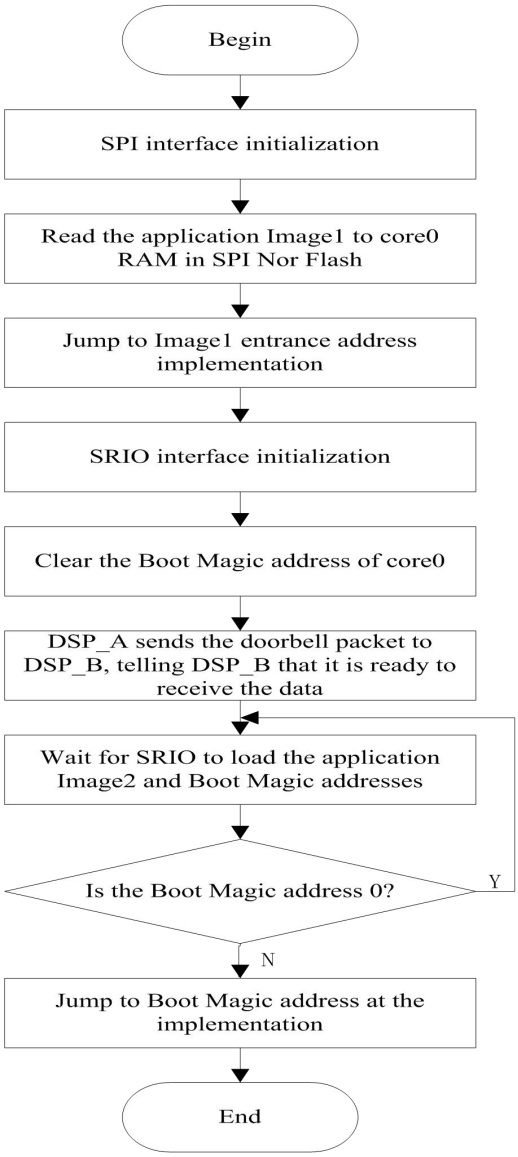

Figure 3 Secondary start diagram

(2.3)The boot of third level

This level of program loading is done via SRIO. DSP_A sends a doorbell packet to DSP_B. DSP_B receives this interrupt and starts transmitting data to DSP_A. The external application Image2 is loaded via SRIO into the internal Ram of the core0 of DSP_A to be started. The application data transfer is completes and the Boot Magic address of Image2 is transferred. When DSP_A detects that core0's Boot Magic address is no longer zero, the program jumps to execution.

What the application Image1 does: (1) SRIO initialization. (2) Clear the Boot Magic address of core0. (3) Send doorbell packet to DSP_B to inform DSP_B that the preparation for receiving has been completed. (4) Wait for the application Image2 to load, and the wait status is determined by detecting the Boot Magic address. (5) Program jump. SRIO transfers the application Image2 to the internal RAM of the core0. The entry address of the application Image2 is then sent to the Boot Magic address.

DSP_A detects that the Boot Magic address is no longer 0, waiting to end. And the program jumps to the Image2's entry address.

(2.4)The boot of the other cores

During the core0 boot, core1~core7 has been in the IDLE state, waiting for the core0's IPC interrupt to wake it up. To wake up the other 7 cores, write 1 in the IPC interrupt generation register (IPCGRx) to produce IPC interrupts. Other cores receive the IPC interrupt, read the corresponding program entry address, and jump to execute. In this design, the core1~core7 applications are loaded from the outside into the internal RAM of each core via SRIO. The boot process for core1~core7 is shown in figure 4.

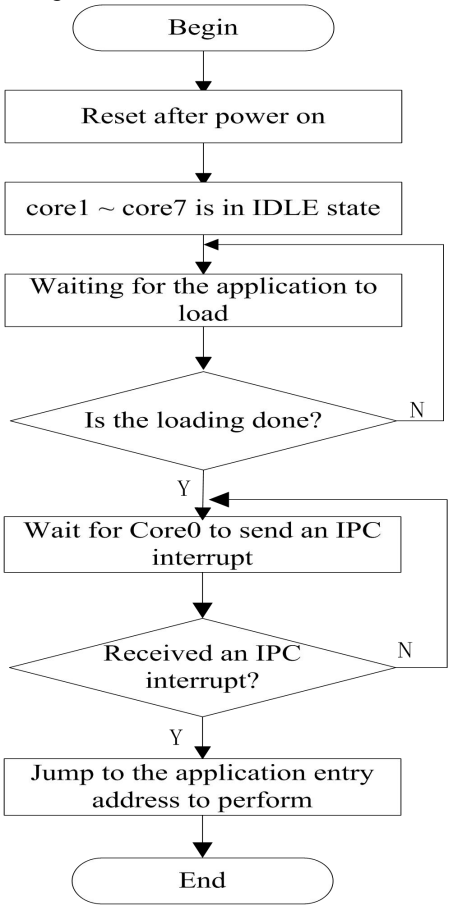

Figure 4 The boot flow chart of core1~core7

5 CONCLUSIONS

This paper designs and implements the multistage boot of DSP, and loads the separately stored application program successfully. Since the multi-core DSP integrates rich external interfaces, it can provide a variety of boot methods, which also provides sufficient conditions for multi-level boot. In this multi-stage boot design, I2C, SPI and SRIO interfaces are selected. Taking TMS320C6678 as an example, the design flow and implementation of multi-core DSP are given, and the multistage boot of multi-core DSP and the loading of separately stored application are effectively implemented, which meets the design requirements. The design of this paper provides an efficient and reliable method for loading the DSP program. It also provides an effective reference and help for multi-level boot of high performance multi-core architecture DSP.

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Promote the Construction of Grass-roots Party Organizations in University Libraries with Literary Culture

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Abstract: This paper starts from the construction of basic-level party organizations in university libraries, carefully analyzing the current status quo of libraries, students and librarians as well as the existing problems in libraries. In addition, the paper proposes service measures to improve the basic Party organizations of the library. The research is mainly focused on the enhancement of librarians' service awareness, proceeding of basic vocational training and innovative service tools and the using of network information platforms to expand library information services.
Keywords: Literary Culture; University library; Grass-roots Party organization

1. INTRODUCTION

By the profound implementation of the spirit of the 19th National Congress of the Communist Party of China and Xi Jinping's series of important speeches, university libraries aim at serving the Party and the school, taking reference service as the orientation as well as attaching importance on consummating the organization form and management methods by means of reform and innovation [1]. On the account of providing systematic, authoritative, efficient, and convenient information resources for the work of Party building to lay a solid foundation for it, university libraries should improve the service level and service quality of the library concurrently.

2. CURRENT STATUS ANALYSIS OF LIBRARIES, STUDENTS, AND LIBRARIANS

2.1 The Status of the Library Itself

At present, the library's service mode is basically the arrival and closed service. Under the impact of Internet reading, the use ratio of libraries continues to decline, which means the libraries are facing pressure to expand services and increase their own utilization [2]. The network information service of the library is still in its infancy. Although the course of "Information Retrieval and Utilization" has been set up, there is a serious shortage of teachers, resulting in fewer beneficiaries and failing to serve the teachers and students. Also the limitation of library staffs leads to the lack of specialized personnel to provide information services for students. At present, in the information society, libraries must cater to the trend of the times by using the Internet to deliver services to readers rather than continuing to implement closed-door services.

2.2 Status of Student Information Literacy

Although in the information society, various network services have spread throughout China, students have deficient network information resources [3]. The most basic teaching resources of network video such as MOOCs, School Online, Love Courses, China National Open Classes and Netease Cloud Classes are barely used by students. As for information searching, Chinese students lean thoroughly on Baidu without any recognition of the existence of other feasible databases. The students are poor at seeking for online self-learning information resources. In response to this situation, the library has to stress out and propagate the utilization of online information resources to students.

2.3 Status of Librarians' Network Quality

Most of the librarians are in circulation management which all belong to non-library majors. Their cultural level is in dearth, not to mention their information literacy. Also the absence of learning or training of network information resources generate their scarce information literacy without mentioning providing students with those services [3].

3. ANALYSIS OF CURRENT PROBLEMS IN THE LIBRARY

3.1 Singularity of Information Service Means

Faced with the ever-changing information technology and increasingly diversified readers' needs, our library has also actively responded to and innovated service measures with initiatives. However, being burdened by some reasons with all aspects, the service methods are still relatively simple. Take our library as an example, the traditional services such as lending of paper books and researching of online information resources are dominant., however, it skimps on e-learning resource services and information push services. The main reason for this situation include the lack of information service specialists and currently poor information literacy of librarians. And to develop qualified information service personnel takes time [4].

3.2 Librarians' Scant Awareness of Information

The overall information quality of librarians needs to be strengthened. Also, the scarce levels of overall services is mainly due to the void of self-awareness

of information and sense of crisis. In addition to completing normal circulation management, they do not feel like acquiring network knowledge which leads to the limited information capacity of librarians [5].

4. COUNTERMEASURES FOR IMPROVING LIBRARIANS' SERVICE ABILITY

As the frontiers of school teaching and scientific research, university libraries are also the academic institutions serving the aforementioned aspects with the crucial responsibilities for education through service. Serving the reader wholeheartedly is always the purpose of running the library and is also the foundation for the library's survival and development. The construction of library service-oriented Party organizations must always adhere to the purpose and closely cling to the functions of colleges include personnel training, education and teaching, scientific research and cultural heritage. Based on the awareness, levels, content and methods of service and with regard to service mechanisms and other aspects, university libraries will study and plan the construction of service-oriented Party organizations in the library to provide readers with documentation resources and multilevel network information services that positively uplift and promote the main theme of the society and give full play to the educating functions of the libraries [6].

4.1 Strengthen Librarians' Service Awareness and Improve Their Information Literacy

Giving full play to the vanguard role, the party members of the grass-roots Party branch of the library should always establish and strengthen service awareness, keeping up to enhance vocational study and service skills as to correct students' learning attitudes and values resorting to their individual academic standards and personality charm[7].Also by exerting the function of library information service window, the librarians will pay attention to and place the service of Party building to the same position as the network information service. Librarians should strive to establish a long-term exchange and cooperation relationship with Party workers and teachers, reinforce communication and interaction with teachers and students and avail of their own first-rate services to expand the library's influence among readers.

In the era of network information, librarians act as organizers and navigators of information in information services for readers. They are the bridges connecting readers with the information superhighway and the soul of the entire consulting activity. Librarians should not only assist readers in using the library's electronic resources, but also guide the readers to search, analyze, filter, and refine accurate information in the vast network of information resources. Therefore, information retrieval skills are demanded for librarians to provide services. The development of speed quotient can not only enhance the ability of librarians to obtain the required information, but also improve the information sensitivity and capability of information analysis and identification of librarians. Nowadays, the exploitation of characteristic information resource databases is deemed as an crucial part of library information services by the majority of university libraries, which requires that librarians are able to develop, integrate and utilize resources [8]. It's obvious that university librarians are incapable of carrying out in-depth information service work without superb skills. Therefore, the cultivation of speed quotient is the most pressing task for university librarians.

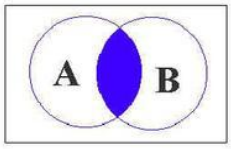
4.2 Conduct Vocational Training for Librarians and Enhance Service Capabilities

Librarians are the main body of library work. Their professional qualities and vocational standards determine the level of library service for Party building work. To provide high-quality professional services, the core is the construction of high-quality librarians. Librarians call for strong learning abilities and constantly supplementing and accumulating professional knowledge such as ideology and politics, library and information, information technology and law according to their vocational needs. Additionally they need to consummate their knowledge structure and fathom the work and research of Party building, cultivate their own political acumen and continuously improve professional service capabilities which cover information resource collection and integration, intelligence analysis, etc. With the aforementioned achieved, only by this way can they be recognized by teachers and students in the service of research of Party building [9].

Information Retrieval is the process and technology that organize information in a certain way and filter the relevant info according to the need to of the users. Boolean logic retrieval is the most commonly used, including three kinds of Boolean logic operators as the logic "and", logic "or" and logic "not". The mastery of these three operators motivates the efficiency the during retrieval process. Confronted with a large number of reader and required to provide information retrieval services for them, librarians must possess proficient search techniques to advance service quality and service efficiency. The Boolean logic operator is one of the must-have technologies for librarians [10].

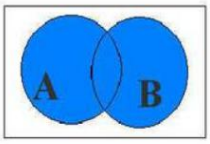
（1）Logic "and", denoted by the symbol "and" or "*", represents the "intersection" relationship and is used to narrow the search scope. Its logical expression: (A and B) or (A * B)

It means that only under the condition that the set of information contains both the search word A and the search word B in the search record, that the wanted documentation is acquired. Logical AND improves the precision in the search process.



A and B

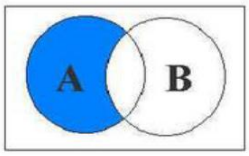
（2）Logic "or", represented by the symbol "OR" or "+", means "intersecting" relationships, which are used to expand the search scope. Logical expression: (A OR B) or (A + B)



A or B

This means that the search records containing search word A or search word B or both in every case, that the wanted documentation is acquired. Logical OR improves the recall rate in the search process.

（3）Logical "not", denoted by the symbol "NOT" or "-", indicates the "exclude" relationship for narrowing the search. Logical expression: (A not B) or (A - B)



A not B

It means that the search records only can contain the search term A not the search term B, that the wanted documentation is acquired. Logical "not" can improve the precision in the search process [11].

4.3 Innovation of Library Service Tools

With the popularization and development of information technology, network technology, and mobile terminal equipment, libraries should convert their existing service models into open services with the reinforcement of information service tools and establishment of library services on campus networks and the Internet. The system adopts the Internet to build a digital resource sharing platform which reforms information delivery and knowledge services as well as provides comprehensive digital services. According to the conditions, the mobile client-side and new media platform public number are gradually introduced to grant Party building workers with information services of Party building anytime and anywhere.

4.4 Using Internet Information Platform to Expand Library Information Services

As the new media era approaches, information can be disseminated through the Internet at the speed and scope beyond imagination. In the tide of information, for the purpose of avoid being misled or even deceived by false information, information literacy should be taken the precedence to intensify includes learning to distinguish authentic information from false information. As the center of school's information resource, the library should pay attention to the use of new technologies and blaze the trial of new ideas. While stressing on the construction of resources, the library will also permeate readers' information literacy into construction of library connotation .Applying to media such as the Internet, forums, and WeChat platforms to infiltrate traditional culture, patriotism, etc. in an easy and pleasant way as to provide a uplifting atmosphere for the formation of a harmonious Party building culture.

The ability to evaluate information is not a single process or a final stage, but it runs through the entire process of information retrieval. The assessment of information is to evaluate the quality of the information throughout the entire search process and then decide whether to change the search method and strategy or not according to the current situation of search efficiency, as the part of diagnosis, screening and elimination.

As a long period of time goes by, information used to be scarce in the ancient times, but now it has been flooding in the Internet era. In the face of a huge network information database, librarians become the best assistants for readers to obtain accurate information so that the abilities to discriminate between true and false information from massive information and analyze the quality of it become essential for the librarians. The value of information is closely bound up with its current nature, mobility and authority. The process of information evaluation is fundamentally a judgment process to get rid of crudeness [12].

In short, under the new situation, grass-roots Party organizations must improve their service capabilities and maintain their pure quality and advanced quality in order to promote transformation and upgrading. Other than that, they must be people-oriented to give full play to their functions and yearn for the interests for the mass and also reinforce the abilities of self-purification, self-improvement, self-renewal as well as self-enhancement of Party organizations. As for the library Party organizations, by taking the practice of mass line educational activities as an opportunity to closely connect with teachers and students, solving various problems in service work for readers, alternating a variety of bad working styles and actively creating service-based grass-roots Party organizations that the promotion of library service capabilities can be enormously boosted.

5. CONCLUSION

The overall development of the librarianship is constantly improving the library's service quality and

service levels to meet the growing cultural needs of readers on account of the needs of China's political, economic and cultural development. To this end, initially, we must strengthen the leadership of the library, the overall awareness and the holism of Party members and cadres as well as incorporate the work of departments into the overall interest of the development of the library. Subsequently, the ability of Party members and cadres to grasp the overall situation is demanded. By studying through political theory, proceeding vocational skills training and other channels, he Party members and cadres' awareness and control of the overall librarianship development can be accomplished.

6. FUND PROJECT

This article is one of the phased achievements of the research project of Party building as well as ideological and political education called "Promote the Construction of Grass-roots Party Organizations in University Libraries with Literary Culture" (Project ID: 2017DJ02),originated in Institute of Information Technology of Guilin University of Electronic and Technology in the year of 2017.

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Seismic Response Analysis of Vibration Isolation System Based on MATLAB

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Abstract: The basic isolation technology is one of the most important methods in the passive control of the structure. It adjusts the vibration period of the upper building structure by isolator, so as to reduce the seismic energy transmitted to the superstructure and achieve the purpose of isolating earthquakes. MATLAB is a famous mathematical software for linear system analysis and simulation, and provides a wide range of external interface programs. It can be applied to other software platforms through interfaces. Based on this, this paper intends to use the MATLAB SIMULINK toolbox in the theoretical analysis modeling and dynamic simulation of EDF isolation structure. Then the results are compared with other software analysis results, and the feasibility and effectiveness of the model are checked.
Keywords: SIMUlINK; Isolation system; Seismic response analysis

1. INTRODUCTION

In order to protect the safety of human life and property, and reduce the earthquake disasters, earthquake engineering scientists and engineers in various countries are committed to improving the seismic capacity of buildings [1]. A complete set of seismic design theories has been formed. The study of structural seismic response control in foreign countries is biased towards the development of seismic materials [2]. In the 1970s, R.I. Skiner et al. the New Zealand scholar, pioneered the development of a reliable, economic and practical lead rubber core isolation pad, which greatly promoted the practical process of isolation technology [3]. The research on structural seismic response control in China is biased towards the theory of basic isolation. Wei Demin used the high-rise building 3D finite element analysis program ETABS to analyze the seismic responses of high-rise building structure with base isolation [4]. Compared with the non-isolation structure, the results showed that the base isolation can reduce the horizontal and torsional seismic response of high-rise isolated structure, which provides a basis for the promotion of base isolation technology in high-rise buildings. Based on the function of linear analysis of MATLAB software, the simulation model of isolation system is established, and the model is applied for simulation analysis, which provides a new way for simulation analysis of isolation system.

2. THEORETICAL BASIS

(1) Principle of isolation technology

The traditional theory of earthquake is to control the stiffness of the structural system by making proper design of the building structure, so as to form a ductile structure system, and then resist the earthquake action. However, with the improvement of building requirements in modern society, many important buildings do not allow structural members to enter the plastic stage [5]. A lot of repair and reinforcement work after the earthquake is complex and costly. The ductile structure system, which relies on the plastic deformation of structural members to consume seismic energy to ensure the safety of large earthquakes, cannot meet the needs of modern society. In order to solve this problem, a large number of theoretical experiments have been carried out by scholars at home and abroad, and the vibration isolation technology has also developed. The vibration isolation technology of building structure is a safe, reasonable, economical and effective shock absorption technology, and isolation strategy is adopted to separate the earthquake action from the building structure. The vibration isolation technology divides the building into three parts: the superstructure, the isolation layer and the substructure [6]. As shown in figure 1, the concentrated deformation of the isolation layer can obstruct the transmission of the seismic energy to the superstructure, so that the structure is more safe and reliable.

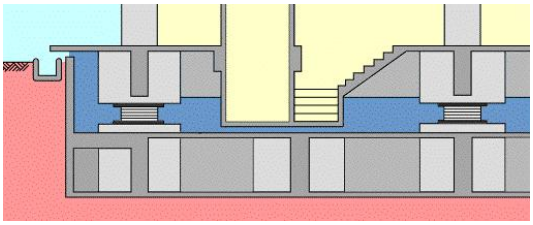


Figure 1 Isolation structure

The basic principle of the vibration isolation technique is to set the vibration isolation system between the structure foundation and the superstructure to form a flexible isolation layer to prolong the acceleration response of the superstructure. With the difference of cycle and damping ratio, the ratio of the effect caused by the two ways will also change (as shown in figure 2). Besides, the vibration isolation system takes on the

concentrated deformation energy of the structure rather than the relative deformation of the structure itself. That is, most of the energy input is absorbed by the isolation system (as shown in figure 3), which greatly weakens the seismic action of the superstructure and protects the structure of the building [7].

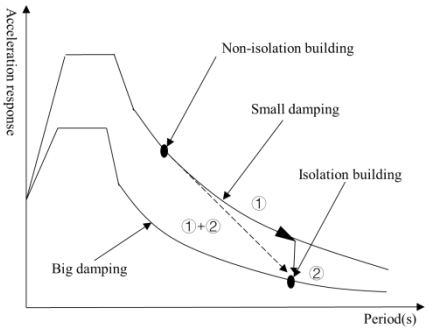


Figure 2 Acceleration response spectrum

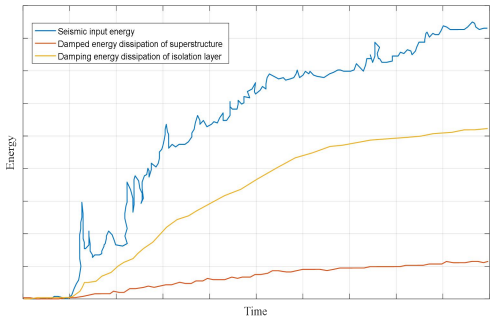


Figure 3 Energy dissipation of vibration isolation system

(2) EDF base isolation system

EDF base isolation system, series isolation system, is made up of laminated rubber pad made of lead bronze plate. In general, the upper floor of the isolation layer can be assumed to be rigid in the horizontal plane, and the horizontal displacement of the isolation layer is often restricted by the lateral displacement of the rubber pad with the smallest diameter [8].

It is assumed that the maximum static friction force of series isolation bearings is Q_{sy}, and the shear force produced by seismic action is Q_s. When the shear force is $Q_s \le Q_{sy}$ and the sliding plate does not produce slipping, the restoring force characteristic curve can be described by linear model. When the shear force is $Q_s \ge Q_{sy}$, the sliding plate of the series isolation bearing can be slipped, for the dry friction materials in Kulun, the relationship between horizontal force and displacement can be described by an ideal elastoplastic model [9]. Before the bearing is yielded, its horizontal stiffness is the lateral stiffness k of the common rubber isolator under the slip plate. After the bearing is yielded, the horizontal stiffness of the bearing is 0, and the relationship between the horizontal force and displacement of the series isolation bearing can be expressed as:

$$Q_s = \begin{cases} k_s x_b & (Q_s \le Q_{sy}) \\ \mu_s M sign(\dot{x}_b) & (Q_s \ge Q_{sy}) \end{cases}$$

The restoring force model of a base isolation system consisting of such a support is a bilinear model of the ideal elastoplastic restoring force model, as shown in figure 4.

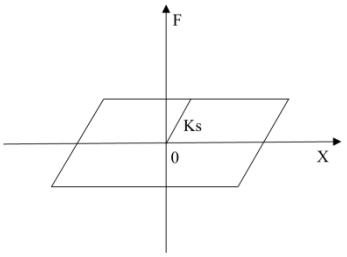


Figure 4 Bilinear model of ideal elastoplastic resilience model

The EDF base isolation system is made up of laminated rubber block whose cover is made of lead bronze plate and working principle is shown in figure 5. The motion equation consists of the following formula:

$$[M]\{\ddot{x}\}+[C]\{\dot{x}\}+[K]\{x\}=-[M]\{I\}(\dot{x}_b+\ddot{x}_g)$$

$$\ddot{x}_b+\frac{Q_s}{M}+\sum_{i=1}^{n} a_i\ddot{x}_i=-\ddot{x}_g$$

Where: Q_s is the isolation layer shear.

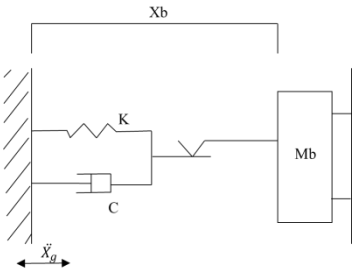


Figure 5 Schematic diagram of isolation system

(3) Brief introduction of SIMULINK toolbox

At present, Matlab is the most popular software tool for science and Engineering Computing in the world, playing an important role in universities and research departments at home and abroad [10]. As the function of MATLAB language is more and more powerful, in the field of scientific computing and system simulation, it constantly adapts to the new requirements, and put forward new ways to solve problems.

The SIMULINK environment is launched by Math works before and after 1990, and is used to build system framework and simulation environment under Matlab. Differential equations can be described by this effective tool in graphic way, so as to solve the corresponding differential equations. The function of

SIMULINK is not only the solution of differential equation, it provides various modules which can be used in the simulation of control system, such as the modules of the motor system, the mechanism system, the communication system and so on [11]. SINMULINK is one of the most important components of MATLAB. It provides an integrated environment for modeling, simulation, and comprehensive analysis of dynamic systems. A complex simulation model can be constructed by visual mouse operation.

Because of its powerful function and friendly interface, SIMULINK is now widely used in many fields, such as control system, aeronautics and space system, automobile system, civil building system, ship system and so on.

In the simulation of EDF isolation system, Continuous, Math Operations, Ports & Subsystems, Sinks, Sources and Signals & Systems module are used in this paper.

3. SIMULATION OF SIMULINK MODEL

(1) Simulation of the original structure model

The differential equations of motion for the original structure is:

$$[M_u]\{\ddot{x}\}+[C_u]\{\dot{x}\}+[K_u]\{x\}=-[M_u]\{I\}\ddot{x}_g \quad (1)$$

In SIMULINK, it is more convenient to solve equations by equation of state. The state space is the n-dimensional space composed of the n state variables $x_1, x_2, \cdots, x_n$ of the system. Any state of the system can be represented by a state vector. The physical equation that the state vector should satisfy is called the state equation. The structural system or vibration control system under earthquake is a two order dynamic system, which can be expressed by two order differential equations [12]. For p inputs and q outputs, the general form of state space description for multi input and multi output linear systems is:

$$\begin{cases}\dot{x}=Ax+Bu\\ y=Cx+Du\end{cases} \quad (2)$$

Where: x、y and u are state vector, output vector and input vector respectively. A、B、C and D are state matrix, control matrix, output matrix and continuous matrix respectively. The values of A, B, C and D are determined according to the characteristics of the control system.

Supporting $X=\begin{Bmatrix}X_u\\ \dot{X}_u\end{Bmatrix}$, Y represents the output vector, then changing equation (1) and (2) to:

$$\dot{X}=AX+Bu(t) \quad (3)$$

The form of state space is as follows:

$$\begin{cases}\dot{X}=AX+Bu(t)\\ Y=CX+Du(t)\end{cases} \quad (4)$$

Where: State matrix $A=\begin{bmatrix}0 & I\\ -M_u^{-1}K_u & -M_u^{-1}K_u\end{bmatrix}$, I is a n-dimensional unit matrix; control matrix $B=\begin{bmatrix}0\\ -I\end{bmatrix}$; the output matrix is an $1\times 2n$-dimensional matrix that can be changed by the element, which is used to determine the state variable that needs to be output. the element is placed 1 to express the state variable and the element is set 0 to indicate that the state variable is not output.

$\dot{x}_u$ and x_u can be obtained through the state module. If we want to further seek the state $\ddot{x}_u$, Derivative module cannot be used. The Derivative module can only approximate the output derivative, which is different from the continuous state module. The module solver will not use a shorter time step when the input changes are relatively fast. In order to get the state $\ddot{x}_u$, it can be solved directly by $\dot{x}_u$ and x_u through formula (1).

$$\ddot{x}_u=M_u^{-1}[-M_u\ddot{x}_g-C_u\dot{x}_u-K_ux] \quad (5)$$

Figure 6 is a SIMULINK dynamic simulation for the original structure shear type multi DOF series system, which is composed of three parts: input, output and state space. The output is interlayer displacement, base shear, interlayer relative acceleration and interlayer absolute acceleration [13].

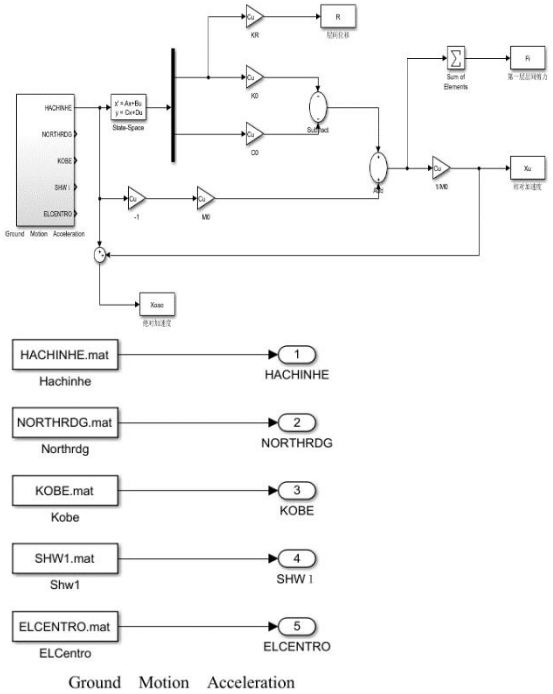
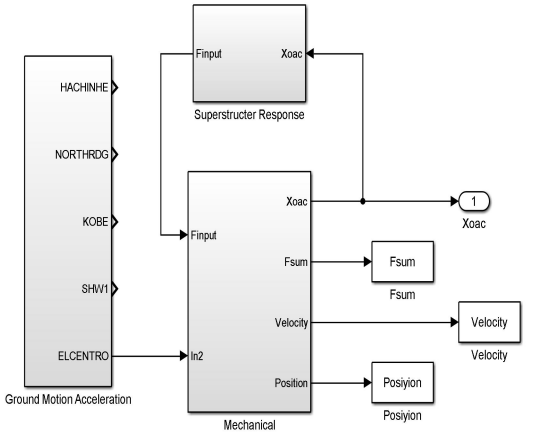


Figure 6 The dynamic structure diagram of the original structure SIMULINK

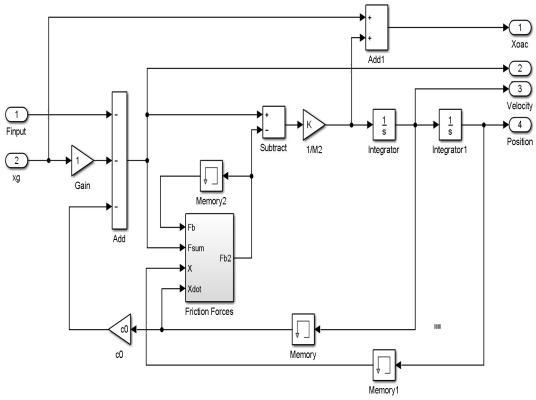
(2) Model simulation of EDF vibration isolation system

Figure 7 is a SIMULINK dynamic simulation for a EDF isolated system [14]. The model has three subsystems: Mechanical, Ground Motion

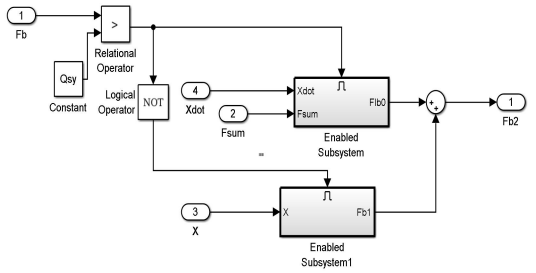
Acceleration and Supstruction Response. The Mechanical subsystem has two input: Finput and xg, which is respectively superstructure external force feedback input and ground acceleration. There are four output: Xoac,velocity,Fsum and Positon, which is respectively, the absolute acceleration of the seismic layer, the relative acceleration, the other joint forces except the friction, the relative displacement of the isolation layer. Besides, there is another subsystem named Friction Forces (friction) subsystem. Its inputs are Fsum, Xdot, X and Fb, which is respectively joint force, relative velocity, relative displacement and friction force except the friction force in the isolation layer. The output Fb is the friction force of the isolation layer, and Fb is an algebraic ring.

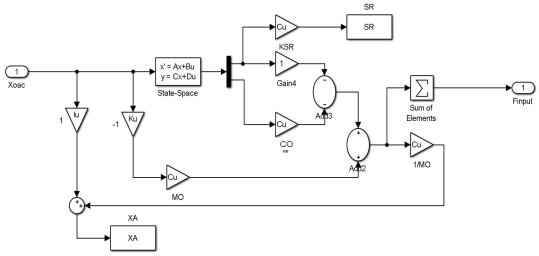


Mechanical



Friction Forces





Superstructure Response

Figure 7 SIMULINK dynamic structure diagram of EDF isolation structure

4. CALCULATION EXAMPLE

Taking a three story shear concrete struture as an example, the original parameters of the structure are shown in table 2.

Table 2 Structural parameters

Floor	Mass($10^6 kg$)	Stiffness($10^{10} N/m$)	height(m)
1	2.105	3.100	4.5
2	2.105	2.800	8.1
3	1.855	2.800	11.7

The original parameters of EDF base isolation system are shown in Table 3.

Table 3 Parameters of EDF isolation system

Mass of isolation layer	damping ratio	Initial stiffness $10^8 N/m$	Yield stiffness
$2.0*10^6 kg$	0.05	1.0	0

Yield force	Dynamic friction coefficient	Static friction coefficient
$10^5 N$	0.04	0.04

(1) Seismic wave selection

This paper uses 5 seismic records, which are 4 actual seismic waves: two near field seismic records (ELCentro and Hachinohe) and two remote field seismic records (Northridge and Kobe), whose peak acceleration are respectively 340gal,225gal,827gal and 818gal, and one personal site seismic wave: the Haiti seismic wave SHW1 whose peak acceleration is 190gal.

(2) Analysis and comparison of control effect

In the SIMULINK simulation, the results of structural floor displacement during different seismic input are shown in Table 4.

Table 4 Structural interlayer displacement (m)

	EL Centro	
Floor	Fix	Disp
0		0.123647
1	0.001204	0.000305
2	0.001037	0.000221
3	0.000555	0.000104
	Kobe	
Floor	Fix	Disp

0		0.446419
1	0.001686	0.001097
2	0.00131	0.000793
3	0.000658	0.000374
	Hachinohe	
Floor	Fix	Disp
0		0.106958
1	0.000547	0.000265
2	0.000418	0.000192
3	0.000206	9.03E-05
	Northridge	
Floor	Fix	Disp
0		0.60571
1	0.002242	0.001485
2	0.001775	0.001075
3	0.000468	0.000511
	SHW1	
Floor	Fix	Disp
0		0.314826
1	0.00039	0.00081
2	0.000268	0.000593
3	0.000126	0.000279

In this paper, the interlayer displacement time history curve of EL Centro wave is taken as an example. Figure 8 is a time history diagram of the interlayer displacement of the original structure and EDF base isolation system.

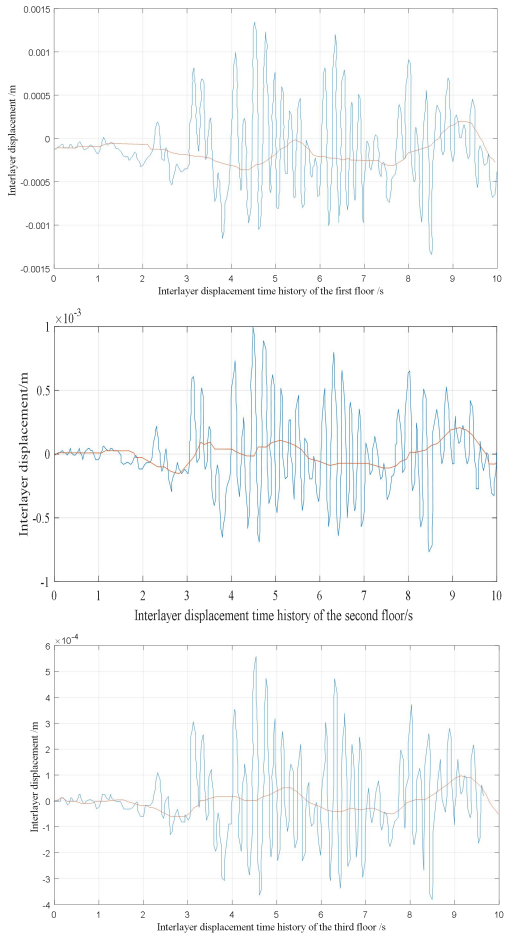


Figure 8 Time history diagram of interlayer displacement of original structure and EDF base isolation system

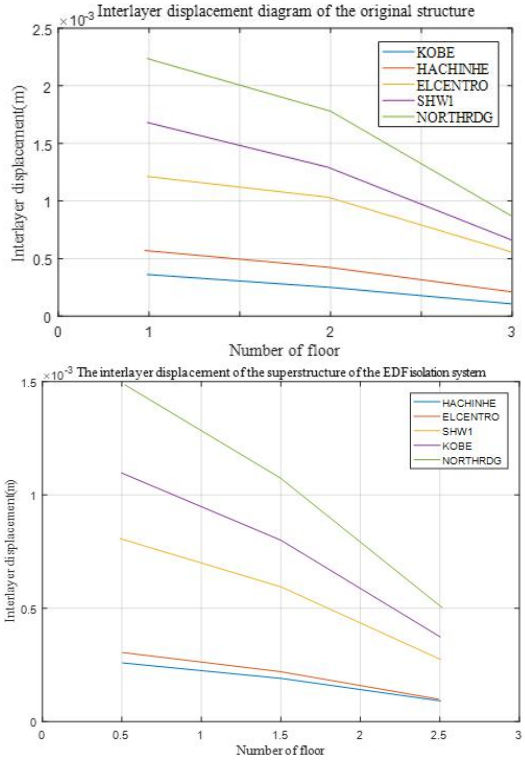


Figure 9 The interlayer displacement diagram of the original structure and the EDF isolation system

The interlayer displacement diagram of the second floor obtained by OpenSees software is shown in figure 10.

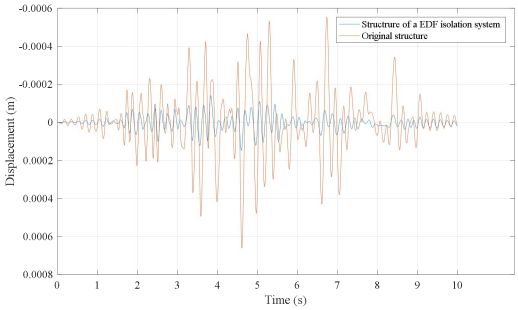


Figure 10 The interlayer displacement diagram of the second floor by OpenSees

From the above figures and tables, we can get the following results: (1) from figure 8, it can be seen that the interlayer displacement curves of the EDF isolation system are obviously less than the original structure, and the displacement is less than the original structure, and the expected effect of isolation is achieved. (2) from figure 9, it is known that the interlayer displacement responses the of the original structure and the EDF isolation system are different. The interlayer displacement under the action of the Northridge seismic wave is the largest and the change is the largest, and the interlayer displacement from large to small is Northridge seismic wave, Kobe seismic wave, EL Centro seismic wave, Hachinohe seismic wave, SHW1 seismic wave. (3) SIMULINK

toolbox has similar simulation functions with finite element software, and the simulation model established by it is also effective and feasible.

5. CONCLUSION

In this paper, the stiffness matrix and dynamic characteristics of the original structure and the EDF isolation system are described as state space form through the structural dynamics principle. The SIMULINK toolbox is used to simulate the original structure and the EDF isolation model, and the three floors shear concrete structure is taken as an example to draw the displacement diagrams of the original structure and the EDF isolation system. It is concluded that the EDF isolation system can well control the structural seismic response. Compared with the displacement diagrams obtained by OpenSees software, the model established by the SIMULINK toolbox is also effective and feasible, which provides an effective theoretical verification method for engineering applications.

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Analysis of Back Temperature and Conversion Efficiency of Solar Photovoltaic Panels

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Abstract: From the temperature is one of the important factors that affect the photoelectric conversion efficiency, the structure of the cell module and heat transfer characteristics are analyzed and establishing the mathematical model in this paper. Respectively, from the typical hourly meteorological parameters of Hengshui Raoyang in May ~September, calculate the typical day of the solar module back-plane temperature and photoelectric conversion efficiency, and draw on the curve of back temperature and conversion efficiency, finally get the back temperature range of the solar panel corresponding to the maximum photoelectric conversion efficiency, which is favorable to the study of reducing back temperature to improve efficiency.
Key words: conversion efficiency; back-plane temperature; heat transfer characteristic

With the rapid development of society and economy, oil, coal, and other energy sources are increasingly scarce in the constant exploitation and use of human beings, and a series of problems such as environmental pollution, water-soil pollution, and the greenhouse effect are also becoming more and more serious.The exploitation and utilization of renewable energy such as solar energy has aroused people's more concern. Solar energy is an inexhaustible green energy source. The solar energy resources in China are abundant, and it has no pollution, and the full use of solar energy and the improvement of photovoltaic power generation efficiency have attracted more and more attention.

1 INFLUENCE FACTORS OF PV MODULE PERFORMANCE

Solar power generation is a process that directly converts solar energy into higher-grade electrical energy, which is the photovoltaic effect[1]. The form of energy utilization is universal, easy to store and transmit[2], and this process has many advantages such as non-polluting, no noise, safe and reliable, simple maintenance etc. However, there are many factors affecting the solar PV module in the process of generating electricity.

The influence factors of PV module power generation performance mainly include: solar irradiation intensity, surface area gray of PV modules, component temperature, shadow shielding, ambient temperature, wind speed, and the loss of serial parallel connections between components [3].

1.1 Solar irradiation intensity

The intensity of solar irradiation is the amount of solar irradiation projected perpendicular to a unit area in a unit time. The intensity of solar irradiation is affected by the transparency of the atmosphere, the altitude of the area, and the sunshine time and so on[4]. The longer sunshine time is, the more sunny weather is, and the more earth's solar irradiation is obtained.

1.2 Surface area gray of PV modules

Because the solar photovoltaic panels are installed outdoors for a long time, the accumulation of dust on its surface is unavoidable. A large amount of ash can affect the performance of the component [5-6]. Ash deposition affects the performance of photovoltaic modules by changing the transmittance of the glass panel.

1.3 Materials for solar photovoltaic panel components

The quality of the material of the photovoltaic module represent the performance of the component, which directly affects the photoelectric conversion efficiency. The basic structure of the components such as glass panels, viscose, battery and backplane material have a certain impact on the efficiency, especially for the battery.

1.4 Component temperature

The temperature of components is an important factor affecting the performance. The intensity of solar irradiation, the transmittance of the photovoltaic module, the heat dissipation rate and the ambient temperature all affect the PV module's temperature. Under the continuous irradiation of the sunlight, the temperature of the photovoltaic module is gradually changed, which leads to the decrease of conversion efficiency [7]. As shown in Figure 1:

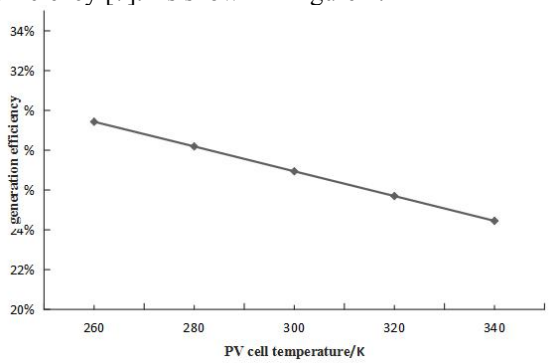

Fig. 1 Conversion efficiency varies with temperature

1.5 Other factors

The occlusion Issue affects the actual solar irradiation received by the photovoltaic panels, and the shaded parts may form hot spots [8]. The larger the shadow is, the smaller the output power of the photovoltaic module is. And the lower ambient temperatures and greater wind speeds also accelerate component cooling and have a positive impact on components. The loss of series and parallel matching between components affects the performance of components, and the solar photovoltaic panels connected in series have greater power than parallel connections.

2 HEAT TRANSFER ANALYSIS AND MATHEMATICAL MODEL ESTABLISHMENT OF SOLAR PANELS

2.1 The output power of the solar cell

The output power of a solar cell is a function of the intensity of the solar irradiation received on the surface of the battery and the temperature of the solar cell. When the module is a single-crystal silicon cell, the efficiency decreases by approximately 0.5% when the battery temperature rises 1°C. In this paper, the temperature coefficient of the components is 0.47%, so the expression of output power can be expressed as:

$$\mathrm{P} = \eta_{\mathrm{st}}[1 - 0.0047(T_3 - 298.15)]E \tag{1}$$

Where：P—— the output power of the battery;
T3——the temperature of the cell;
E——solar irradiation intensity on the inclined plane;
ηst——conversion efficiency at a solar irradiation intensity of 1000W · m-2, air mass AM1.5, and a battery temperature of 25℃.

2.2 Thermal balance equations of battery modules

As shown in Figure 2, the interior of the solar cell module is made up of a glass panel, an EVA viscose, solar cell, an EVA viscose, and a TPT backplane.

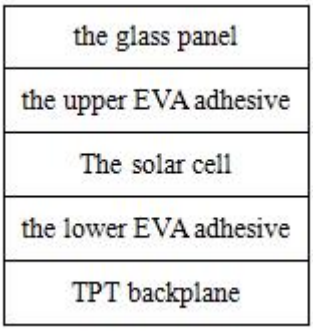

Fig. 2 The internal structure of the solar cell module

In order to simplify the analysis, the following assumptions are made:
The physical properties of the materials in each layer of the photovoltaic module are independent of the temperature and isotropic
The physical properties of each layer of PV modules are independent of the wavelength distribution of radiation, which can be set as a fixed value
The ambient air temperature on the upper surface of the component is the same as the lower surface's
The wind speed on the surface of the solar cell assembly is evenly distributed and invariable in the study
Neglecting the influence of dust and dirt on the surface of the component
Ignoring convective and radiative heat transfer from the side of the PV to the outside
The temperature distribution of each part of the photovoltaic module is average
The heat balance equation [9] of each layer can be listed:
1.a glass panel:

$$\alpha_1 E + \frac{T_1 - T_a}{\frac{\delta_1}{2k_1} + \frac{\delta_2}{2k_2}} = h_{1\text{-}a}(T_1 - T_a) + \varepsilon_1\sigma(T_1^4 - T_{sky}^4) \tag{2}$$

Where:α1——Absorptivity of glass panels;
T1——The temperature of the glass panels;
Ta——Ambient temperature;
δ1——Glass panel thickness;
δ2——The thickness of the upper EVA adhesive;
k1——The thermal conductivity of the glass panel;
k2——The thermal conductivity of the upper EVA adhesive;
h1-a——The convection heat transfer coefficient between the glass cover and the atmosphere [10] h=5.7+3.8u, u is air velocity;
σ——Black-body radiation constant,5.67×10-8w·(m-2·K-4);
Tsky—— Sky temperature.
2.the upper EVA adhesive:

$$\tau_1\alpha_2 E + \frac{T_3 - T_2}{\frac{\delta_3}{2k_3} + \frac{\delta_2}{2k_2}} = \frac{T_2 - T_1}{\frac{\delta_1}{2k_1} + \frac{\delta_2}{2k_2}} \tag{3}$$

Where ： α2——Absorptivity of the upper EVA adhesive;
τ1——Transmittance of the glass panel;
T2—— The temperature of the upper EVA adhesive;
k3——The convection heat transfer coefficient of the solar cell;
δ3——cell thickness.
3.The solar cell

$$\tau_1\tau_2\alpha_3 E = P + \frac{T_3 - T_2}{\frac{\delta_3}{2k_3} + \frac{\delta_2}{2k_2}} + \frac{T_3 - T_4}{\frac{\delta_3}{2k_3} + \frac{\delta_4}{2k_4}} \tag{4}$$

Where ： τ2——Transmittance of the upper EVA adhesive;
α3——Absorptivity of the solar cell;
T4——The temperature of the lower EVA adhesive;
k4——The convection heat transfer coefficient of the lower EVA adhesive;
δ4——The thickness of the lower EVA adhesive.
4.the lower EVA adhesive:

$$\frac{T_3 - T_4}{\frac{\delta_3}{2k_3} + \frac{\delta_4}{2k_4}} = \frac{T_4 - T_5}{\frac{\delta_5}{2k_5} + \frac{\delta_4}{2k_4}} \quad (5)$$

Where：T5——The temperature of TPT backplane;
k5——The convection heat transfer coefficient of TPT backplane;
δ5——The thickness of TPT backplane.
5.TPT backplane:

$$\frac{T_4 - T_5}{\frac{\delta_5}{2k_5} + \frac{\delta_4}{2k_4}} = h_{5\text{-a}}(T_5 - T_a) + \varepsilon_5\sigma(T_5^4 - T_G^4) \quad (6)$$

Where ： h5-a——The convection heat transfer coefficient between the TPT backplane and the atmosphere;
TG——Land surface temperature.
List the equations (1) to (6), substitute the known quantity, and then use a computer to solve the equations to accurately determine the temperature and output power of each part of the component.

The output power calculated by the software is brought into equation (7) to obtain the photovoltaic conversion efficiency.

$$\eta = \frac{P}{E} \times 100\% \quad (7)$$

3 CHANGES IN BACKPLANE TEMPERATURE AND CONVERSION EFFICIENCY IN A REAL ENVIRONMENT

The single-crystal silicon photovoltaic panels is selected in this paper, table 1 lists the data of the battery module materials.

Tab.1 Material and its parameters of the solar cell module

	Absorptivity α	Transmittance τ	Thickness δ/(mm)	thermal conductivity k /(w·(m·K-4))
the glass panel	0.05	0.91	3.2	0.7
EVA adhesive	0.08	0.90	0.5	0.35
the solar cell	0.80	0	3.0	148
TPT backplane	0.012	0.128	0.2	0.614

According to the meteorological data of typical meteorological year in Raoyang, Hengshui, this article selects the data from May to September and determines that the 28th day of each month is a typical day. Selecting the parameters such as hourly horizontal solar irradiation intensity and vertical solar irradiation intensity on a typical day. Then according to the formula (8), the solar irradiation intensity [9] of the inclined plane can be calculated.

$$E = I_F[\cos(\varphi - \beta)\cos\phi\cos\omega + \sin(\varphi - \beta)\sin\phi] + I_d\left(\frac{1+\cos\beta}{2}\right) + \rho I_b\left(\frac{1-\cos\beta}{2}\right) \quad (8)$$

Where：IF——directed radiation intensity;
φ—— local latitude, the latitude of Hengshui Raoyang is 38.23°;
β—— Installation angle of photovoltaic panels, according to the table of optimum installation inclination and power generation of photovoltaic power stations in various provinces and cities in China, the optimal installation angle of photovoltaic panels in Hengshui Raoyang can be found to be 36°;
ϕ——declination;
ω——hour angle;
Id—— horizontal scattered radiation intensity;
ρ——surface albedo, generally 0.2.
Finally, the solar radiation intensity of the slope on a typical day is calculated. And the solar radiation intensity increases first and then decreases. At 1 pm, the radiation intensity is maximum, as shown in Figure 3:

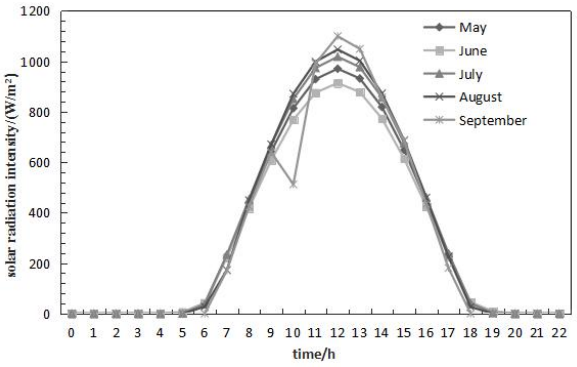

Fig.3 Hengshui Raoyang May to September typical solar radiation intensity

At the same time, according to the weather data report of typical meteorological year of Raoyang, the ambient temperature, the effective sky temperature, and the land surface temperature of typical days from May to September can be obtained.
In this paper, MATLAB software is used to solve a set of equations composed of (1) ~ (7), and the backplane temperature and conversion efficiency are finally calculated. Then draw the graph 4,5.

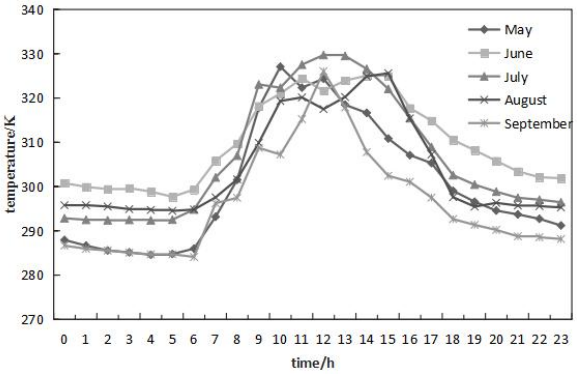

Fig.4 Solar module backplane temperature

From Figure 4, the range of the backplane temperature on May to September typical day is 280~330K, and the trend of backplane temperature is first increased and then decreased. At 0:00~6:00 and 20:00~23:00, when there is no illumination on the PV

panel, the temperature of the back-plate is approximately equal to the corresponding ambient temperature. Due to the increase of wind speed at 12:00 in June and August, the heat dissipation of the photovoltaic panels was accelerated, and then the corresponding backplane temperature was reduced.Compared with the change of the back-plate temperature in May to August, the change in September is greater.

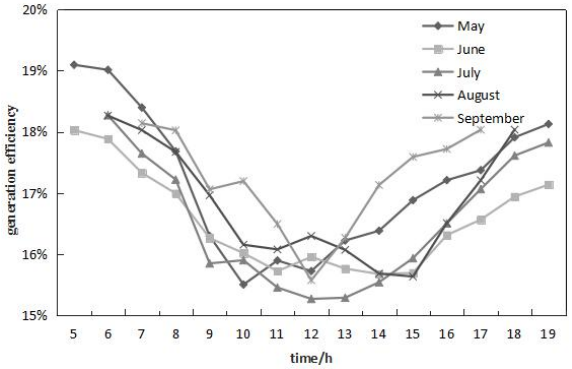

Fig.5 Efficiency of photoelectric conversion

Figure 8 shows that the conversion rate of the typical days from May to September is 15% to 19.5%. The conversion efficiency decreases first and then increases, which is opposite to the change in the back-plate temperature.In June and August at 12：00, the higher wind velocity and the faster the cooling of the module, which reduces the back-plant temperature and also improves the conversion efficiency at the same time. In this paper, the conversion efficiency of the manufacturer's photovoltaic panel is 18%,and the period of time above this efficiency is approximately 5:00 to 8:00 and 19:00 in May from the figure 5.

4 ENERGY-CONSERVATION PROJECT

For example, in the standard of village-level poverty alleviation targets, the installation scale of photovoltaic panels for each user is about 5 kW, and each household can install about 34m² of the manufacturer's photovoltaic panels. As the temperature of the photovoltaic panel rises, the conversion efficiency is decreased and the power output is also affected. According to the analysis and calculation of the conversion efficiency and back temperature curve, the relevant data can be obtained as shown in Table 2. The monthly actual generated energy for a 34 m² photovoltaic panel is 1223.75 kW·h. If the temperature of the photovoltaic panel can be reduced to the standard operating temperature in a reasonable manner, the monthly power generation can be increased by 128.89 kW·h.

Tab.2 Results of power generation analysis

	Actual	Ideal	Difference
Total monthly electricity generation(kW·h)	1223.75	1352.63	128.89

In order to reduce the temperature of the photovoltaic panel, it is necessary to remove the heat that raises the PV temperature . And the heat value can be calculated by equation (9):

$$Q = hA(t_m - t_f) \quad (9)$$

Where：Q——convection heat transfer;

h——heat transfer coefficient,50W/(m2·K)[11],

A——area of photovoltaic panels,34m2,

tm—— the initial temperature of the photovoltaic back-plane.

tf——The final cooling temperature of the photovoltaic back-plane, which is 25℃.

After calculation, the minimum monthly heat release is 10371kW, which can be collected to generate electricity or to provide hot water for the users ,and improve the economy.

5 CONCLUSION

In order to fully understand the relationship between photovoltaic system back temperature and power generation efficiency, this paper analyzes various factors that affecting photovoltaic power generation, establishes a mathematical model of PV modules, and solves the problem based on actual data through MATLAB software, then plots the graphs of back-plane temperature and conversion efficiency. The following conclusions were obtained through the study:

The temperature range of the back plate is 280K~330K, the temperature of the back-plane rises first and then decreases, while the conversion efficiency first decreases and then rises. And the lower the backplane temperature, the higher the conversion efficiency.

In the diagrams of back-plane temperature and conversion efficiency, there are some points that clearly deviate from the curve trajectory. Referring to the meteorological parameters of Hengyang Raoyang, there is no particular change in the solar radiation intensity and ambient temperature at the deviation points, but there is a clear change in local wind speed, and this factor has an impact on the calculated data.

In this paper, the conversion efficiency of the photovoltaic panel selected in the experiment is 18%, the calculated back-plane temperature corresponding to the generation efficiency is 297K, the minimum back-plane temperature is 284K, and the conversion efficiency is 19%. Finally, the back-plane temperature range corresponding to the maximum conversion efficiency is 284K~297K.

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Research-Oriented Teaching Mode of Image Processing Based on Quantum Computation

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Abstract: Recent years have witnessed the rapid development of the technologies of digital image processing, which is becoming more and more essential in our daily life. So, the teaching of image processing course is especially important for graduate students. This paper proposed the mode of research-oriented learning in the background of emerging technology. Basic knowledges, e.g. quantum computing and classical image processing, are introduced firstly. Then three levels learning content are designed for research-oriented learning based on quantum image processing and the experimental methods are discussed. After the concrete mode of research-oriented learning is given and discussed, some comparison tests between the research-oriented mode and traditional learning mode on graduate students. Theoretical analysis and tests show that the proposed mode can improve learning ability and scientific research ability.
Keywords research-oriented; teaching mode; image processing; quantum computation

1. INTRODUCTION

With the development of science and technology, image processing is playing an increasingly important role in people's daily life and work. Learning the course of image processing is essential for graduate students. The traditional learning mode is that students acquire knowledge entirely from teachers. In recent years, more and more researchers are focused on extending conventional image processing tasks and operations to the quantum computing framework, which primary work is devoted to utilizing quantum computing technologies to capture, manipulate, and recover quantum images in different formats and for different purposes [1]. Therefore, graduate students pay attention to the learning of image processing course.

Research-oriented learning is a concept of learning that revolves around inquisitive, problem-oriented and critical thinking, autonomous and creative working and practical application in academic research. It is an individual competence that needs tutelage and fostering throughout the course of studies. As is known to us that the studies in the stage of graduate are student-centred learning. The supervisor only plays a guiding role in the teaching process. Anne Abraham compares a blended learning approach to the traditional delivery of an accounting subject to engineering students [2]. This mode of learning can appreciably enhance students' results and experience by providing a more student-centred learning environment. Ref. [3] presents a research-oriented e-learning system that could serve as a general model for Chinese university situation. This system comprises four layers, which are the access layer, the application layer, the service layer and the network layer. It is student-centered, Web based, and multiple accessed, thus enable students to propose questions, access study resources, search literatures, cooperate to accomplish projects, online discuss and explore results in a convenient and independent way. Petit present the Advanced Multicore Architecture (AMA) course, which follows a research-oriented approach to introduce students in architectural breakthroughs and uses active learning methodologies to enable students to develop practical research skills such as critical analysis of research papers or communication abilities [4]. This work also includes an assessment study that analyzes both the course contents and the used methodology. Some literatures also discuss the application of the emerging technology in the traditional teaching [5]–[7]. It is not difficult to see that the traditional teaching mode attaches importance to teaching, but does not emphasize the independent learning of students, which leads to poor ability of innovation.

To the best of our knowledge, this work is original about the construction of research-oriented learning mode for image processing base on quantum computation, which can improve the autonomous learning ability and research ability of graduate students. In this paper, the learning content of image processing and experimental method will be discussed and the research-oriented learning mode is proposed.

This paper is organized as follows. Section 2 briefly introduces the background knowledge on quantum computation theory. Section 3 designs a series of specific learning content and experiment on research-oriented learning. Then the mode of research-oriented learning is constructed in section 4. Section 5 analyses the application of the mode. The conclusions works are drawn in section 6.

2. QUANTUM COMPUTING THEORY

2.1 Qubit

In classical computing, bit is the most basic unit of computation. Each bit has a state in one time. In quantum computation and quantum information processing, the corresponding concept, qubit, is presented. Similar to bit, each moment qubit also has a state. Corresponding to classical information 0 and 1, qubit may be in states $|0\rangle$ and $|1\rangle$. However, qubit may also be in a state outside these two states. At each moment, a two-dimensional qubit may be in a linear combination of these two ground states, as shown in Eq. (1), which is usually called a quantum superposition state.

$$|\varphi\rangle=\alpha|0\rangle+\beta|1\rangle,\ \ where\ |\alpha|^2+|\beta|^2=1 \tag{1}$$

There are four computing basic states for two qubits, $|00\rangle$, $|01\rangle$, $|10\rangle$ and $|11\rangle$ respectively. At any moment, the state of the quantum system is

$$|\varphi\rangle=\alpha_{00}|00\rangle+\alpha_{01}|01\rangle+\alpha_{10}|10\rangle+\alpha_{11}|11\rangle \tag{2}$$

Similarly, superposition state of n-qubit is $|\phi\rangle$, as shown in Eq. (3).

$$|\phi\rangle=c_1|\phi_1\rangle+c_2|\phi_2\rangle+c_3|\phi_3\rangle+\cdots+c_n|\phi_n\rangle=\sum_{i=1}^{n}c_i$$

$$\text{where}\ \sum_i|c_i|^2=1 \tag{3}$$

2.2 Quantum measurement

A quantum bit can be continuously and randomly located in any superposition state. However, it will be collapsed by quantum measurement. Quantum measurement plays an important role in quantum information science. In general, quantum measurements are described by a set of measurement operators ($\{M_m\}$) that satisfy the relationship: $\sum_m M_m^{\dagger}M_m=I$ .and m represents the possible measurement result in the experiment. Assuming that the quantum states of the system are $|\varphi\rangle$ before the measurement, the probability that the result m occurs is

$$p(m)=\langle\varphi|M_m^{\dagger}M_m|\varphi\rangle \tag{4}$$

After measurement, the quantum states of the system are instantly changed to

$$\frac{M_m|\varphi\rangle}{\sqrt{\langle\varphi|M_m^{\dagger}M_m|\varphi\rangle}} \tag{5}$$

2.3 Quantum gate

Quantum computation utilize a number of basic quantum gates to perform basic operations on a quantum bit. Several basic quantum gates are introduced in this section.

Not gate/X gate

Not gate is a single quantum bit gate, the function of which is to exchange the states $|0\rangle$ and $|1\rangle$. The transformation matrix is as shown in Eq. (6).

$$X=\begin{bmatrix}0&1\\1&0\end{bmatrix} \tag{6}$$

2) CNOT gate

CNOT gate is a double quantum bit gate, also known as a controlled not gate. When the control qubit is $|0\rangle$, the target qubit remains unchanged, and the target qubit flips when the control quantum bit is $|1\rangle$. That is to say $|00\rangle\to|00\rangle,|01\rangle\to|01\rangle,|10\rangle\to|11\rangle,|11\rangle\to|10\rangle$ The transformation matrix is as shown in Eq. (7).

$$CNOT=\begin{bmatrix}1&0&0&0\\0&1&0&0\\0&0&0&1\\0&0&1&0\end{bmatrix} \tag{7}$$

3) Swap gate

3. THE DESIGN OF LEARNING CONTENT AND EXPERIMENT

Quantum computation is considered as an effective way to store, process, and transfer information using the unique properties of quantum mechanics, such as the entangled state and the superposition state [8]. No doubt quantum computing has become a novel computing model, which will be overcome the bottleneck constraints of classical computers. Quantum image processing, which is the field of quantum information processing, gains a wide attention in recent years due to its parallel computing abilities and effectiveness. Therefore, it is necessary for graduate students to learn some emerging technologies, e.g. quantum image processing. What aspects of image processing based on quantum computation will be learned in the studies are discussed in this section. We will discuss the learning content from three bottom-to-up levels as follows.

3.1 Quantum image storage

In the learning process of image processing, students only need to know that the classical N-by-N image is a matrix of real numbers. Each element of this matrix is called pixel, where is the gray value. Fig. 1 illustrates the conception of digital image.

136 136 133 135 . . .
136 136 133 135 . . .
. . . . .
. . . . .
. . . . .
21 29 25 26 . . .

Figure 1. An image with a size of and the corresponding gray value

In order to utilize quantum mechanics to perform image processing, the information of images should be stored into quantum state firstly. It is necessary for students to understand some basic knowledge of

quantum computers and how images are stored on quantum computers. Fig. 2 shows the framework of image processing based on quantum computation.

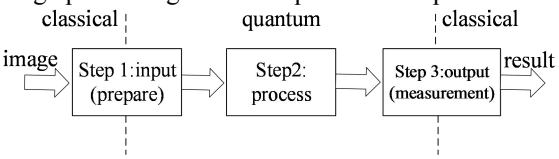


Figure 2. The framework of quantum image processing

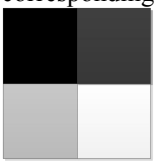
Several quantum image models have been designed to represent the image information including qubit lattice [9], Entangled Image [10], flexible representation of quantum images (FRQI) [11], and the novel enhanced quantum representation of digital images (NEQR) [12]. After reading the relevant literature, students should analyze and study the main representation of image now (FRQI and NEQR). So, for example, NEQR uses the basic state of a qubit sequence with q-qubit to store the gray-scale value of every pixel. Suppose that the range of the gray-scale value is from 0 to 2^q-1, the gray-scale value C_{YX} of the pixel coordinates (Y,X) is expressed by Eq. (8)

$$C_{YX}=C_{YX}^{q-1}C_{YX}^{q-2}\cdots C_{YX}^{1}C_{YX}^{0},C_{YX}^{k}\in\{0,1\},C_{YX}\in[0,2^q-1] \tag{8}$$

Hence, NEQR for a quantum image can be written as

$$|I\rangle=\frac{1}{2^n}\sum_{Y=0}^{2^n-1}\sum_{X=0}^{2^n-1}|C_{YX}\rangle|Y\rangle|X\rangle=\frac{1}{2^n}\sum_{YX=0}^{2^{2n}-1}\bigotimes_{k=0}^{q-1}|C_{YX}^{k}\rangle\otimes|YX\rangle \tag{9}$$

Fig. 3 shows an example of an 2×2 image, and the corresponding NEQR representation is on the right.



$$|I\rangle=\frac{1}{2}\left(|0\rangle\otimes|00\rangle+|100\rangle\otimes|10\rangle+|200\rangle\otimes|01\rangle+|255\rangle\otimes|11\rangle\right)$$
$$=\frac{1}{2}\left(|00000000\rangle\otimes|00\rangle+|01100100\rangle\otimes|10\rangle+|11001000\rangle\otimes|01\rangle+|11111111\rangle\otimes|11\rangle\right)$$

Figure 3. An example of image and its NEQR representation

In the study of image representation, students should fully understand its intrinsic meaning and compare it with classical image processing. Only in this way can they obtain the frontier knowledge and in favor of the next research work. Students will also understand that after the advent of a general quantum computer, images can be stored in quantum registers for further processing.

3.2 Quantum image pre-processing

In traditional learning process, the image processing course requests the students to master image processing algorithm after learning and solve some practical problem. However, because of limited hours, it may result in low learning efficiency. Furthermore, with the development of emerging technologies, more and more real-time images need to be processed, traditional image processing methods have encountered bottlenecks. More and more graduate students pay attention to image processing algorithm based on quantum computation.

Due to the entanglement and superposition of quantum, the pixel information of digital image is difficult to understand. Therefore, based on the quantum image models, students need to study some quantum image pre-processing algorithms, which are used to extract more efficient information from quantum images rather than pixels.

For example, there are some algorithms in classical image processing, such as edge extraction, image histogram construction, feature extraction, image matching and so on. Generally speaking, graduate students may have mastered these algorithms. Now what they need to do is, how to learn the image pre-processing algorithm in quantum framework.

In the process of learning some quantum image processing algorithms, students will face some difficulties without textbooks. They must extensively search the relevant literature to learn. Specifically, Image edge extraction is an important issue of digital image processing. The edge is caused by the discontinuities of an image's color intensity and the edges are the pixels at which the intensity changed fastest of the image. Based on this property, there are many famous edge extraction algorithms such as Sobel, Prewitt, and Canny. Students should consider whether the relevant algorithms have quantum versions. Through the reading of the literature, students will find that Qsobel, is discussed in quantum image processing [13]. By comparing the quantum algorithm with the traditional algorithm, graduate students will understand the application and advantage of the emerging technology in the traditional field.

In a word, to promote research-oriented learning, teachers should give correct guidance to graduate students to master more quantum algorithms in the process of independent study.

3.3 quantum image understanding

It is known to us that image storage and pre-processing are basics for the subsequent image classification and content understanding. The highest level of learning content is image understanding and classification. In classical image processing, the judgment of image similarity is used to perform image classification. Therefore, in this level, some certain quantum algorithm may be used to solve this problem in the future.

Since the development of quantum computing technology is not mature, there are few papers to discuss related problems. So, we should guide students to do a lot of innovative learning and research.

3.4 The construction of experimental method

Image processing is a very practical course, graduate students need to conduct a large number of experiments and simulations. However, universal quantum computer has not appeared yet. Teachers must consider that how to conduct experiments in

research-oriented learning for graduate students. The construction of experimental method is discussed in this section.

In one hand, it is well known that experiments for classical digital image processing are often done by MATLAB, in which the image processing toolbox provides a set of graphical tools for image processing, analysis, visualization and algorithm. As was discussed in Section 2, it is natural for graduate students to think that the simulations should be conducted by MATLAB based on linear algebraic constructions. To simulate the quantum states, the complex vectors are used. It facilitates the representation and manipulation of large arrays of vectors and matrices which makes it a good tool for simulating quantum states and their transformations. In particular, by treating the quantum images as large matrices, it is possible for the simulation of the transformation by using linear algebraic constructions equivalent to the quantum circuit elements. Therefore, graduate students can design some circuits and manipulate them, which can be effectively simulated.

In the other hand, IBM Q is an industry-first initiative to build commercially available universal quantum computers for business and science. We know this works exactly the same way in quantum computers and we know it can do what the real quantum computer does. It is very encouraging for graduate students and researchers. Through a lot of research-oriented learning, they may design some quantum image processing algorithms. In order to test these algorithms, students can conduct experiments in IBM Q. However, all of us are looking forward to the early advent of quantum computer.

4. THE CONSTRUCTION AND DISCUSSION OF LEARNING MODE

Based on some of the previous discussions, it is clearly for graduate students know what will be learned in their research-oriented learning of image processing based on quantum computation. In this section, we will discuss the construction of learning mode for graduate students.

Firstly, the setting principles and requirements are discussed as follows. On the one hand, the mode follows the principle of combining knowledge learning with creative learning. It does not negate the learning of knowledge, but to guide students to learn independently instead of receiving knowledge from teachers. In the other hand, the mode follows the principle of combining discipline learning with interdisciplinary learning. Due to the large number of real-time image processing, the classical computer is difficult to deal with it. Therefore, the emerging technology is just the chance, as described in this paper.

Secondly, the concrete learning mode will be given here according to the learning contents and experimental methods discussed in Section 3. As graduate students, they need master basic knowledges, such as quantum computing theory, classical image processing and so on. Then the research-oriented learning will be started from bottom to top. In particular, it is necessary to note that experiments can be conducted in all levels. The research-oriented leaning mode is constructed as shown in Fig. 4.

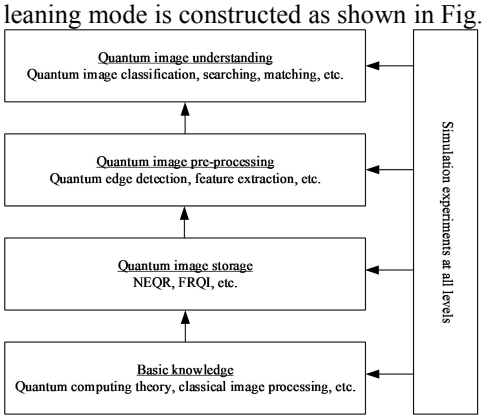


Figure 4. The hierarchical research-oriented research leaning mode

Finally, we will discuss how to implement the mode briefly. The teacher introduces some emerging technologies and proposes some researching problem in the first place. Graduate students start to retrieve literature according to the mode. Then can conduct experiments and discuss with classmates to solve some difficulties and publish the results of research-oriented learning.

5. MODE APPLICATION AND ANALYSIS

In order to test whether the cohort of students who experienced the research-oriented learning approach performed better than the cohort of students who experienced the traditional approach, 20 graduate students were randomly selected in Shaoyang University as samples for our testing. The other 20 students still take the traditional approach to learning.

First, a questionnaire was designed in order to test the views on research-oriented learning. A total of 20 questionnaire were handed out and these students were asked to fill in the questionnaire. Then 18 effective questionnaires were collected. In this case, most of the students are very satisfied with the research-oriented by analyzing the questionnaire, which is shown in Fig. 5.

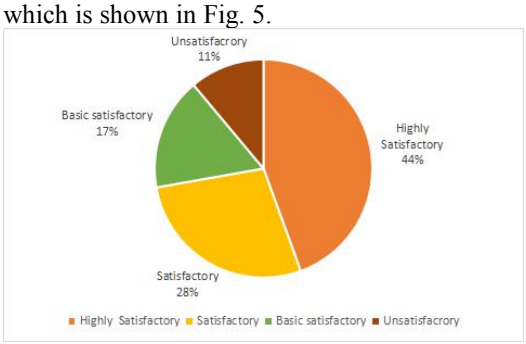


Figure 5. The satisfaction of research-oriented learning mode

Second, 10 graduate students were randomly selected for interview, which mainly includes the breadth and

depth of literature reading, the mastery of emerging technologies and any relevant information about their publications. In fact, the ability of independent leaning and innovation research has been improved significantly.

6 CONCLUSIONS

This paper studies some challenges of image processing course under the background of emerging technology. The concrete content and experiment method is designed and the research-oriented learning mode of image processing based on quantum computation is constructed. The mode is applied to some graduate students to verify the advantages by practice in teaching. It is proved that the mode has good theoretical value and instructive significance. To analysis and enquire the mode of research-oriented, from the viewpoint of image processing based on quantum computation, is of profound theoretical and practical significance.

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Market and Information Failure in Existing Building Air-conditioning Energy-saving Industry and Some Suggestions for Future

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Abstract: Market failure and information failure are two basic and well-known economics concepts. We notice that both market failure and information failure exist in the energy-saving industry due to various reasons. Lots of existing commercial or office building with central air-conditioning system have been built in China since from 1980s when market mechanism was still not so mature. Based on the author's long-term experience in the industry, some common technical and certain non-technical factors that affect the results of existing building air-conditioning energy-saving industry are analyzed. Especially, the situation of market failure and information failure are discussed, and some suggestion are proposed to help to solve the problems.
Keywords: Existing Building; Air-conditioning; Energy-saving; Energy conservation; HVAC; Heating Ventilation and Air-conditioning; Market Failure; Information Failure; Skyscraper; High Building

1. INTRODUCTION

Market failure and information failure are two basic and well-known economics concepts. Market failure is a situation in which the allocation of goods and services is not efficient [10]; and information failure exists when some, or all, of the participants in an economic exchange do not have 'perfect' knowledge, or where knowledge is asymmetric [11]. We notice that both market failure and information failure exist in the energy-saving industry due to various reasons. The context for this is that there are increasing market demand for energy-saving projects in the central air-conditioning system or Heating Ventilation and Air-conditioning (HVAC) system in the large-scale office or commercial buildings. Many cases show that the energy consumption by HVAC or central air-conditioning system may account for 40% or more of the total energy consumption depends on types of commercial buildings on the average [1], in some worst cases it took even a bigger proportion to around 70% [2]. In some southern China area like Guangdong where the temperature is high, and summer is long, the air-conditioning energy consumption is even higher, which not only makes the business owner overwhelmed but also has an extremely adverse impact on environmental conservation.

2. MARKET FAILURE AND INFORMATION FAILURE IN CENTRAL AIR-CONDITIONING INDUSTRY OF THE BUSINESS BUILDINGS.

Unfortunately, even before the HVAC system is put into use, market failure and information failure existed in central air-conditioning industry for the commercial and business buildings in China, although situation is improving, and many HVAC system in large-scale commercial buildings suffer an energy inefficiency. Many previous developed buildings were constructed when market mechanism was not so mature and regulations on energy-saving were still lagged, in such situation the interests of stakeholders played a very influential role. For any central air-conditioning system or HVAC system in an office or commercial building, from design and planning to the final use by the owners, it usually at least involves 8~9 stakeholders, including the consultants (in China usually called the designers), contractors, supervision companies, equipment and material suppliers, 'quality safety inspection stations' from the government, developers, property management companies, tenants and the owners. And each party may affect the application of energy-saving technology to safeguard their own interests. Among them, we should pay more attention to the following situations:

(1) Final users or owners of the building.

Usually final owners of the building focus only on some surface elements of the building such as appearance, location and cost, then they often did not pay attention to a greater improvement in the interior quality like energy-saving performance of air-conditioning or HVAC system. Some of the owner try to minimize the design and construction cost to as low as possible, that in turn forced the designers and contractors do something to compensate their loss. As a possible result, some owner may finally be supersized at the high air-conditioning running costs when the air-conditioning system is running. For example, some building enjoys a perfect business location and has a nice building structure and appearance, but the air-conditioning system is clearly inefficient in power use. In some case, the commercial area of building even suffers frequent unoccupied, or some business tenants have quickly withdrawn after beginning their business in the building, for they have experienced an 'unreasonable'

or 'unfair' HVAC system running charges.

(2) Consultants (in China called the designers).

Some consultants (in China they are called the designers) never seriously carry out necessary HVAC design calculations, that is because such calculation was never required by regulation to be submitted or be checked, the designers were only required to deliver a set of good looking construction plans. That not only made them save a lot of calculation efforts, but also allow them to quickly deliver their customer the plans. The grandstanding plans covered their shoddy work. Some designer may even deliberately increase air-conditioning cooling load and choose oversized water chiller and its ancillary equipment, to make sure that an insufficient capability of air-conditioning system will never happen. That is a lazy and safe way to avoid possible responsibility for insufficient air-conditioning cooling capacity, and what is more, usually they can charge more design fees for a bigger than necessary HVAC system. All such behavior may lead to 'an over-sized air-conditioning or HVAC system with small actual cooling load demand', a main reason that will lead to a great waste of investment and running cost in the long run. Some designer may take under-table design-fees from specific suppliers and not choose the best equipment. As a result, the equipment in the air-conditioning system do not match each other, resulting in a decrease in operating efficiency and an increase in energy consumption and initial investment.

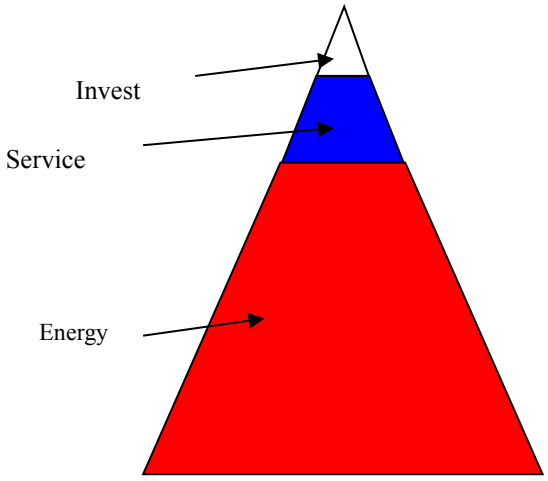

Fig 1 Life-long cost of a HVAC system

(3) Contractors.

Until last decades, the construction market usually had an incredible intense competition. The efforts to win a contract was painful and usually the price was unreasonably low. Some contractors even had to begin their job without down payment from the owner. To protect or increase the revenue and profit as a compensation, some contractors may act the same as the designers. They exaggerated the demand for cooling capacity, and frequently cheated on workmanship and materials (such as using the inferior insulation materials), which may also result in a decrease in operating efficiency and an increase in energy consumption for the HVAC or central air-conditioning system.

(4) Equipment and material suppliers

Some of them collaborated with or gave "commissions" to the designers, contractors or other stakeholders, to boost their sales by exaggerating the demand for cooling capacity or overstating the performance of their own equipment for sales purposes.

(5) Developers

Since the developers are often not the final user, they focused not on energy efficiency and running cost but the minimum initial investment when selecting the air-conditioning solution. However, statistics show that the user's cost of air-conditioning tends to be a pyramid shape throughout the service life of central air-conditioning system, that is, the one-time investment accounts for only a very small proportion, service and maintenance costs of the equipment late on account for much more while power consumption costs account for the overwhelmingly majority [3] (Figure 1). Therefore, a genuine strategy that meets the end user's interests is to optimize the costs during the entire life cycle, rather than minimizing the initial investment cost only.

The root cause of the above market failure and information failure problems lies in the lack of technical ability of the final user of the building. Customer preference is the most effective factor that can restrict the other stockholders. Unfortunately, most end user clients never know the technical issue so market fail cannot be avoided, then regulations are necessary. In some countries including US, many of such market activities, like the air quality of the building and the energy consumption standard, are forced to comply with the regulations made by the NGOs like the 'American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE) rather than governments itself. In China, governments are playing an increasing role to regulate the market, so the situation are really improving. But before that, numerous buildings with poor central air-conditioning energy efficiency have already been constructed and put into use.

3. FOR ENERGY-SAVING OF THE EXISTING BUILDINGS, TOO MUCH ATTENTION PAID TO UPGRADE THE HARDWARE AND TOO LESS EFFORTS ARE FOCUSED ON MANAGEMENT AND SKILLS.

In general, most of the air-conditioning costs of a high-rise building lies in the running cost. The air-conditioning costs of each month in summer usually vary from tens to hundreds of thousands of RMB depends on situations. Objectively, it has inevitably attracted high attention from end users due

to that high HVAC system running cost. A most commonly asked question from air-conditioning end users is "How to lower the electricity costs even by 10%?"

But the common problem is that too much attention is paid to upgrade the hardware while too less efforts are made to improve the 'soft' technical management skill. Here are some reasons to explain why that happens.

In the context of "bombarded marketing" by sales persons of many suppliers, very often when an energy-saving proposal is considered, the first considered question is how much money we need to invest to get hardware of the HVAC system upgraded. Unfortunately, although some users have achieved satisfied returns after accepting the supplier's suggestions, a considerable number of users fell into the traps the manufacturer's advertisements and found out that the invest overweighed the gain or even the energy consumption increased after investing large sums of money.

Why is that? Among those factors that determine the energy consumption of central air-conditioning, whether the equipment is properly equipped is only one of the whole, and an important factor is the technical skill and knowledge of the operation and management personnel. Quite beyond imagination, many electricity technicians rather than HVAC technicians are found running the sophisticate HVAC system. It is because a HVAC technician with intermediate level certificate needs to pass a variety of skill tests or exams including strong and weak electricity technology, refrigeration maintenance and welding technology, which is more difficult than being an intermediate level electrician, but the salary offered by the employer is the same. Therefore, it is rather difficult to hire a skilled front-line technician who are capable to run the sophisticate central air-conditioning HVAC system. Hence, the complex and expensive air-conditioning system in many buildings are operated by electricians who are totally unfamiliar with HVAC system. And many owners still believe that the central air-conditioning system can be operated by just simply pressing the start and stop button only like their home air-conditioning units.

They are quite wrong. In fact, to save energy, different operation strategies shall be adopted for the central air-conditioning system as the season and internal load of the building change. For example, outdoor air may be directly used in spring and autumn, and it is not necessary to rely on any of the refrigeration effort. In addition, the unit energy consumption of the same equipment may greatly vary with or without proper service and maintenance. Especially for the equipment in the refrigeration plant, the power usually reaches tens or even hundreds of kilowatts, and the efficiency difference due to different operating strategy is staggering after a cumulative running for 3,000~4,000h per year. All these can be simply achieved by a qualified HVAC technician but in many buildings only electricity technicians or engineers rather than HVAC technicians or professionals are hired.

Because of these facts, Mr. Lu Yaolin, former president of Shenzhen Refrigeration Association, sighed with emotion, "The key factors that lead to extreme low air-conditioning energy efficiency is because we own the most advanced imported equipment that reaching the 1990s technical standard, but our system design ability is lagged in the 1980s, and the worst is our skill of operation and management of the central air-conditioning system remains only in the 1970s level."

4. THE ENERGY-SAVING TECHNOLOGY IS ABUSED REGARDLESS OF ROOM AIR QUALITY.

Contrary to the above situation, technical personnel of some buildings have mastered certain energy-saving operation techniques but abused the them.

For example, if the intake of high-temperature fresh air from outdoors in summer are reduced, a significantly reduction of air-conditioning energy consumption will be recorded. So, some shopping malls and business buildings almost shut off the supply of outdoor fresh air in a way regardless of the health of employees and customers to save high air-conditioning costs in summer, and some even stops the fresh air delivery fan directly, resulting in a sharp deterioration in indoor air quality. Another fact is also found that some shopping malls shut down all fresh air fans in autumn and winter, leading to a lack of fresh air in door. Because the indoor temperature is still maintained within a normal range, and the employees and customers may not easily notice it, but their health has been threatened. This phenomenon is known as 'Sick Air Building', such cases are never rare found.

So, we suggest that regulation be made to force the owner of business buildings to ensure that the indoor air quality meet the satisfied hygiene standard when energy-saving method are used.

5. VARIOUS ENERGY-SAVING TECHNOLOGIES FOR EXISTING COMMERCIAL BUILDINGS.

At present, varieties of commonly used energy-saving technologies are presented to clients [5]. Here is brief introduction to some of those widely used energy-saving technologies, which are proven to have significant effect.

(1) Optimal design technology used in new project.

A carefully proposed plan could be the best and cheapest technical measure for energy conservation and environmental protection. The latest HVAC design and construction regulations and codes must be followed. For example, the cooling load shall be carefully calculated rather than be 'estimated' when a brand-new air-conditioning system is planned,

excessive safety margin should be avoided, and all ancillary equipment must match each other to avoid either a bottleneck effect or the common error that a small demanded task is provided with a too large device.

(2) Upgrade the old refrigeration plant and replace the old water chiller and water pumps [6].

At present, a considerable number of water chillers have been installed for 10~15 years. In fact, the efficiency of water chillers with technology 10 years ago is usually far below the current level. There was a significant decrease of the energy consumption for chillers supplied by most manufactures after 2010s.

Since the chillers often demand a high consumption of power, usually hundreds of kilowatts, we can easily recover the investment by replacing it with a new water chiller. Many cases in Shenzhen shows that, replacing old inefficient water chiller with a new and efficient one is a very good investment and an effective way for energy-saving [6].

Similarly, replacing the old water pump with a new one usually can be rewarded with same remarkable gains.

(3) Variable-frequency Drive (VFD) for water pump.

In China variable-frequency Drive (VFD) for water pump is widely used to solve the common error of inadequate design in which too big pumps are selected for applications with by far smaller actual demand.

(4) Impeller cutting of water pump.

This is a technology which acts quite similar to the Variable-frequency Drive (VFD) technology of water pump; however, its cost is by far lower than VFD, it is applicable to the circumstance where the actual needed pump head is far below the pump's rated head, and particularly applicable to the circumstance where the water amount and head are fairly constant.

(5) Oil or coolant analysis [7].

Oil or refrigerant analysis, like blood test, can accurately determine the unit's operation and wearing situation. After a certain period of running, the operating efficiency of the unit might be significantly reduced. At this time, refrigerant and oil shall be chemically analyzed to locate the wear part and determine whether oil and refrigerant inside need to be replaced. A healthy device always saves much more energy.

(6) Replacement of the old electronic thermostat system with DDC and other control solutions [4][6] to achieve smart adjustment of the ratio of fresh to return air.

The old electronic thermostat can only provide simple temperature control, but it never applies more energy-efficient control strategy. The old electronic thermostat failed to utilize the outdoor fresh air wisely and automatically under the frequent changing weather condition. In addition, it fails to balance the requirement of good indoor air quality and energy-saving [1][4].

(7) Individual billing system of the central air-conditioning.

As more direct links has been established between the bill they will pay and the degree they use the central air-conditioning. It is obvious that individual billing can effectively avoid the free-ride psychology of air-conditioning users, so that the users will consciously avoid wasting energy and make reasonable use of air-conditioning.

(8) Ice storage technology.

The difference between peak and valley electric charges is used to lower electricity costs. Many successful cases are reported [8].

Although the power consumption usually are not reduced though this technology, it does benefit from a cheaper night electric charges and hence the scarce energy resource are more efficiently used.

Besides above-mentioned energy-saving technologies, there are too many other various and effective energy-saving technologies that cannot be include in this single paper.

6. A GOOD ENERGY-SAVING SOLUTION SHOULD BE BASED ON CAREFUL DIAGNOSIS IN ADVANCE AND ADEQUATE APPRAISAL AFTER FULFILMENT.

What should be particularly stressed is that even if it is a good energy-saving technology, it may not always work without adequate diagnosis of the HVAC system in advance, on the contrary sometimes adversary effects are obtained regarding to energy-saving, and there are a lot of such lessons, and most of which are usually never been reported.

In fact, although energy-saving and improvement of efficiency requires hardware investment, software like skill and knowledge, especially careful diagnosis in advance and adequate appraisal after fulfilment as well as high management level are even more essential.

For instance, with the Variable-frequency Drive (VFD) technology for water pumps, power consumption of water pump may be reduced. In most cases, it almost always works to reduce the pump's power consumption but meanwhile it sometimes may deteriorate the power consumption for the entire HVAC system as whole. Some VFD water pump with poor automation strategy may slow down the water flow and reduce the power consumption of the pump itself, but the heat exchange efficiency of evaporator or condenser of chillers or heat exchange for terminal air-handling units user deteriorate, and the total power consumption of the entire HVAC system actually increases, so it would not always be a good energy-saving solution.

Therefore, the contractors which carry out the energy-saving projects should diagnose the HVAC system carefully before providing clients certain energy-saving solution. Bottlenecks and defects of the existing running HVAC system that causes the extra energy waste must be found before a remedy

proposed.

7. INFORMATION FAILURE AND A POSSIBLE SOLUTION: ENERGY PERFORMANCE CONTRACTING.

There exists information failure in the energy-saving industry. Energy consumption diagnosis and performance analysis involves complicated skill and technology in both theory and practice, and neither the pure theory-based "academics" nor the pure experience-based "doers" are capable to fulfill it alone. Usually most clients do not hire a HVAC technician or professional, so they have little skill and knowledge on these issues. Meanwhile some contractors may exaggerate the products and solutions that they can provide, while discredit other contractors' energy-saving products or solutions. Therefore, a neutral professional energy-saving technology consulting company is needed to provide customers with whole-process energy-saving guidance.

Recently, a kind of 'energy performance contracting' service is believed to be a perfect remedy for information failure in energy-saving market. The idea is, the ESCOs (Energy Service Company) rather than the owner of the building are to invest the energy -saving retrofit project, they will guarantee the energy-saving targets and get an allocation from the amount of saved power consumption fees. They will invest, and they take the risk as they are HVAC professionals. So, it sounds perfect to solve the information failure problem in energy-saving industry. But new question has raised. How can the ESCOs raise fund to start so many projects? Usually they aspire to obtain finance from banks. But are the banks willing to take the risk to finance these activities [9]? Who will and how to evaluate the retrofits benefits? Is there a mature standard and rule to guide such a technical and skill demanded job? All these issues are still to be answered. So that is why a third-party air-conditioning energy-saving consulting company is still very helpful to protect the benefits of both ESCOs and clients.

8. CONCLUSIONS

The air-conditioning energy-saving market has a great potential, but it is still at a very primary stage and with some factor of market failure or information failure. Among the reasons, the intrinsic one is that the end users' ability of skill and knowledge on HVAC is generally poor, and the external one lies in the misadvise from the other stakeholders due to various reasons. Some regulations are helping to improve the situation. A possible solution for this is the energy performance contracting service, and third party professional consultation service from third party air-conditioning energy-saving consulting company still can play a key role.

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