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EVALUATION METHOD OF COMPREHENSIVE ABILITY OF STUDENTS MAJORING IN PRESCHOOL EDUCATION BASED ON COMPUTER TECHNOLOGY

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Abstract. In order to improve the comprehensive ability evaluation effect of students majoring in preschool education, this paper combines computer technology to evaluate the comprehensive ability of students majoring in preschool education. Through linearization, this paper deduces the state space model of data load of students' comprehensive ability and the transfer function model of student's comprehensive ability data load. Moreover, this paper establishes an analytical expression between the model coefficients of the transfer function of student's comprehensive ability data load and the transfer parameters of student's comprehensive ability data load. In addition, this paper analyzes and selects the identification method of the parameters of students' comprehensive ability data load model. Since the parameters of the student comprehensive ability data load model have physical meanings, the parameter identification of the student comprehensive ability data load model is a gray box identification, and constraints are required when identifying the parameters of the student comprehensive ability data load model. The experimental study has verified that the comprehensive ability evaluation model of students majoring in preschool education based on computer technology can play an important role in the comprehensive ability evaluation of students majoring in preschool education. This article adopts the comprehensive load model in the Comprehensive Stability Calculation Program (PSASP) to eliminate the shortcomings of factor analysis in traditional teaching comprehensive evaluation, and has a certain reference value for the promotion of intelligent teaching in the future

Key words: computer technology; preschool education; students; comprehensive ability

Childhood is a very important period for human growth. Many potentials of human beings are stimulated in childhood. If this period is missed, the possibility of such potential stimulation will no longer exist. Therefore, it is no exaggeration to say that what a person masters in childhood can affect his life destiny [1]. Therefore, it is necessary to pay more and more attention to early childhood education, and to advocate scientific quality education for children to hope that children can improve their physical and mental quality in a healthy environment and scientifically cultivated, and then achieve the improvement of the quality of the entire nation. As we all know, art education is an indispensable part of quality education. Moreover, the great role of art education in cultivating people's moral sentiment, improving people's emotional character, and improving people's physical and mental quality is irreplaceable by other forms of education [2].

In the early childhood education system, which is increasingly valued by the people, scientific and efficient early childhood art education is very important for the healthy growth of the next generation and the overall improvement of physical and mental quality. Obviously, the success or failure of a kindergarten art education depends to a large extent on the comprehensive artistic quality of the kindergarten teachers themselves in each kindergarten. A child with high artistic ability, even if the child has a super high level of artistic talent, the future art prodigy may be strangled in the cradle by kindergarten teachers who do not understand art [3]. However, where does the comprehensive artistic quality of kindergarten teachers come from? Of course, it is the production and reserve base of preschool teachers—preschool education departments in colleges and universities and many preschool normal schools in various places. With the liberalization of the maternity policy, the demand for preschool teachers in various places is increasing, and the enrollment of preschool education majors in various schools is also increasing day by day [4].

Educational practice ability refers to the ability of educational subjects to apply theory to educational practice in a purposeful, planned and organized manner under the guidance of pedagogy, psychology and other theories, and to solve practical problems in education. Educational practice ability is a kind of ability that

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educators must have [5]. For preschool teachers, educational practice ability is the basic ability of preschool teachers to carry out preschool education activities, an important standard to measure the professional quality of preschool teachers, and an important basis for preschool teachers' post-service professional development. Therefore, preschool teachers must strengthen the cultivation of educational practice ability [6]. Many college-level colleges and universities have set up preschool education majors in order to cultivate skilled talents with early childhood education practical ability in response to the society's demand for preschool teachers. The preschool education major at the junior college level combines knowledge transfer and ability training to train students to be physically and mentally healthy, have good professional ethics, be proficient in the knowledge and skills required for the actual work of kindergartens, and have certain skills. Innovative ability, skilled application talents who can adapt to the needs of front-line work in kindergartens. Therefore, the preschool education major at the junior college level should give priority to cultivating students' educational practice ability [7].

Students majoring in preschool education must have good communication and coordination skills, including the ability to communicate with young children, the ability to communicate with parents of young children, and the ability to communicate with colleagues [8]. The ability to communicate with children means that students can have a good understanding of children's behavior and learning habits through scientific observation in educational practice, and can receive timely information such as expressions, language and physical behavior transmitted by children, so as to provide children with timely information. , accurate guidance or support; secondly, students are required to have good love, innocence and patience, care for and respect for children, which is a prerequisite for effective communication with children [9]: Third, students majoring in preschool education are required to have Communication skills for young children. In addition, due to the limitations of the language system, children may not be able to express themselves in language accurately and in an orderly manner. Students must also have good listening skills during educational practice, be good at listening, and use physical behaviors such as smiling and nodding to encourage children to express themselves and strengthen children. language ability. The ability to communicate with parents of young children refers to the ability of students to communicate with parents of young children in the process of preschool education practice activities: the ability to cooperate, requires students to have good oral expression skills, listening skills, and good communication skills or methods. And can use the Internet, home contact manuals or home visits to communicate with parents of young children. They are required to respect each other, understand each other, and help each other. At the same time, students are required to learn humbly in the process of practice and be good at listening to other children. Teachers' suggestions and opinions [10]. In addition, they should also actively participate in various academic seminars and teaching and research projects. Through communication and cooperation with other teachers in the project, they can not only improve their professional skills, but also enhance their relationship with colleagues, which will help Ding-professional development [11].

The organization and childcare ability of one-day activities refers to the ability of preschool education students to organize and arrange children's one-day activities in an orderly manner in the process of educational practice, so that various activities can be carried out smoothly, and at the same time, they can also smoothly carry out childcare work. Students majoring in preschool education must have good organizational skills in the process of educational practice. Organizational skills are the foundation of early childhood education. With good organizational skills, they can organize children's one-day activities well and ensure that one-day activities are carried out in an orderly manner. Improve the teaching effect [12]. Students majoring in preschool education must also have good safety and childcare ability in the process of educational practice, and have the ability to strengthen children's safety awareness and strengthen safety education through one-day activities, it is possible to predictably avoid some risk factors in activities [13].

The categories involved in the ability to create and utilize the environment mainly refer to the class environment in which kindergarten teachers work, and the ability requirements are also raised from the two aspects of creating a good spiritual environment and material environment, mainly including four basic contents: First, the ability to establish a good environment A good teacher-child relationship can help children establish a good peer relationship and make them feel warm and happy: second, it can establish class order and rules, create a good class atmosphere, and make children feel safe and comfortable; third, it can create a helpful environment It is an educational environment that promotes children's growth, learning, and games: Fourth,

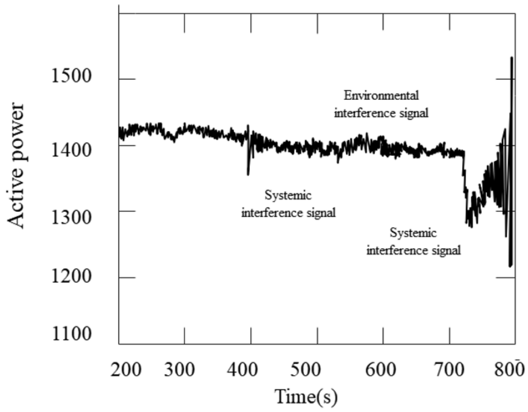


Fig. 1.1: Schematic diagram of system response signal and environmental interference signal

it can rationally use resources to provide and make suitable teaching aids and learning materials for children to trigger and support children's active activities [14].

Literature [15] believes that the educational practice ability of preschool education students at the junior college level includes interpersonal communication skills, organizational management skills. Literature [16] analysis skills according to the training objectives of preschool education majors at the junior college level. In the process of analysis, a talent training target framework was constructed. In this target framework, it is believed that the training targets are divided into five major items, of which the three items of knowledge, ability, practice and experience involve the educational practice ability of preschool education students at the junior college level. Competencies include environment creation and utilization, daily life organization and care, play activity support and care, educational activity planning and implementation, motivation and evaluation, and communication and cooperation, reflection and development; practice and experience include observing educational practice, participating in educational practice and researching educational practice.

The main contributions of this article are as follows: This article adopts the comprehensive load model in the Comprehensive Stability Calculation Program (PSASP) to eliminate the shortcomings of factor analysis in traditional teaching comprehensive evaluation, and has a certain reference value for the promotion of intelligent teaching in the future

This paper combines computer technology to carry out the comprehensive ability evaluation of students majoring in preschool education, and constructs an intelligent comprehensive ability evaluation model for students majoring in preschool education.

1. Preschool education data comprehensive processing algorithm.

1.1. PMU data characteristics and parameter identification method analysis. The online stability analysis based on the measured data is an effective method to solve the problem of the difficulty of stable calculation caused by the time-varying data of students' ability. However, the online stability analysis of student ability data faces the problem of inaccurate time-varying student ability data component models. Taking the load model as an example, it is a natural choice to collect the operational data of student ability data in real time to identify the load model online, which can meet the time-varying requirements of the load model. At the same time, more and more educational systems are equipped with PMU (Phasor Measurement Unit) devices, which help to obtain high-precision student ability data operation data (Figure 1.1). The operation data of student ability data collected by PMU is mainly stimulated by the following three signals: system response signal, environmental interference signal and artificial excitation signal.

1.2. PMU principal analysis. The functional block diagram of the PMU is shown in Figure 1.2. GPS receivers rely on the Global Positioning System to provide high-accuracy pulse-per-second (PPS) signals to data acquisition devices. The error between PPS and Coordinated Universal Time (UTC) is no more than $1/\mu s$,

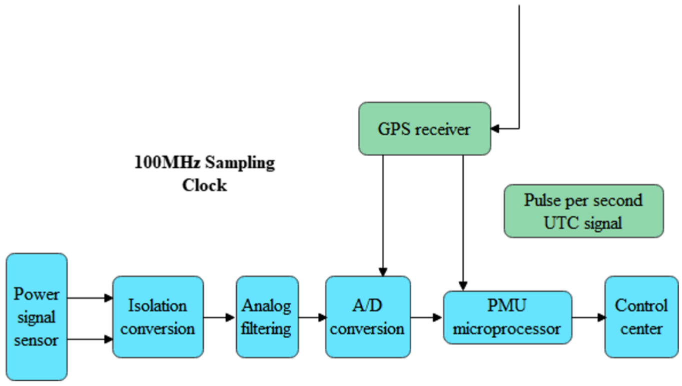


Fig. 1.2: PMU functional block diagram

so the phasor angle error measured under the 50Hz power frequency is within 0.0180, and the synchro phasor measurement is realized. Next, the GPS receiver transmits the International Standard Time information to the data acquisition device. The signal used to sample the bus voltage is subjected to A/D conversion after isolation conversion and analog filtering, and the A/D converter controls data acquisition with a synchronous signal. The PMU microprocessor then continuously calculates new fundamental voltage and current phasors. Finally, the data is uploaded to the dispatch center through the high-speed communication channel.

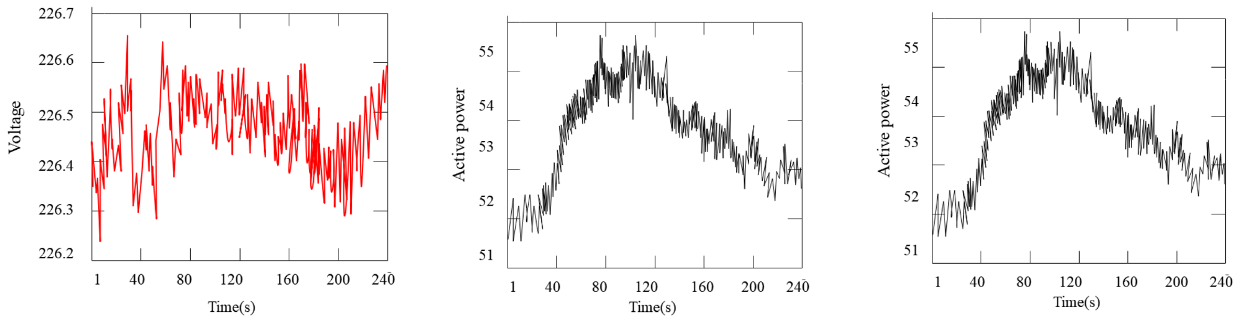
The PMU device can provide accurate and detailed information for the real-time dynamic monitoring of the running status of the student ability data. The daily operation data of the student ability data collected by the PMU has the following three characteristics:

1. High accuracy. The PMU device uses the unified time of GPS timing to collect data, and the synchronization accuracy between each PMU device is high, which facilitates the comparison and analysis of the wide-area education system. In addition, the sampling frequency of the PMU is 25 frames, that is, a sampling value every 40ms. The high sampling frequency enables the PMU to record the dynamic information of the educational system in detail.
2. Large amount of data. When the PMU is installed in the educational system, the data collected by the PMU includes important parameters such as date, time (accurate to milliseconds), and synchrophasors of the educational system. Therefore, the amount of data collected and stored by the PMU is very large, and these data need to be preprocessed and selected during load modeling.
3. Small data fluctuations. Figure 1.3 is a schematic diagram of the voltage amplitude, active power and reactive power collected by the PMU installed in the educational system. It can be seen from Figure 1.3 that the maximum fluctuation of the voltage amplitude during the daily operation of the student ability data is 0.2%, and the fluctuation of the voltage amplitude is very small and changes all the time. The active power and reactive power response fluctuate around 6%, and have the same trend of change. Therefore, the signal-to-noise ratio of the small disturbance data measured by the PMU is low, which will affect the load modeling accuracy.

1.3. Hardware system. This paper adopts the comprehensive load model in the Comprehensive Stability Calculation Program (PSASP program), which consists of an equivalent static ZIP load and an equivalent motor in parallel. The equivalent circuit is shown in Figure 1.4:

The differential equations are shown in equations (1.1) to (1.3).

$$\frac{ds}{dt} = \frac{T_M - T_E}{T_J} \tag{1.1}$$



(a) The voltage amplitude collected by the PMU

(b) Active power amplitude collected by PMU

(c) Amplitude of reactive power collected by PMU

Fig. 1.3: Schematic diagram of the data collected by the PMU

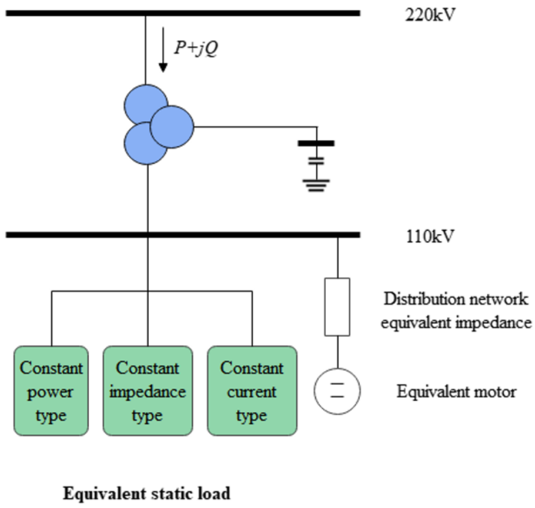


Fig. 1.4: The comprehensive load model used in this paperm

$$\frac{dE_d'}{dt} = \frac{\left(X - X'\right) I_q + T_{d0}' E_q' s - E_d'}{T_{d0}'} \tag{1.2}$$

$$\frac{dE_q'}{dt} = \frac{\left(X - X'\right) I_d + T_{d0}' E_d' s - E_q'}{T_{d0}'} \tag{1.3}$$

In the equation, the mechanical load torque and electromagnetic torque equations are shown in equation (1.4) and equation (1.5), respectively.

$$T_M = K_L \left[\alpha + (1 - \alpha)(1 - s)^p\right] \tag{1.4}$$

$$T_E = -R_e(\dot{E}, \hat{\dot{I}}) K_p = -\left(E_d' I_d + E_q' I_q\right) K_p \tag{1.5}$$

In the above equations,

$$X^{'} = X_s + \frac{X_r X_m}{X_s + X_m} \tag{1.6}$$

$$X = X_s + X_m \tag{1.7}$$

$$X_m = T_{d0}^{'} R_r - X_r \tag{1.8}$$

K_L is the load rate coefficient of the asynchronous motor, and Kz is the coefficient that converts the impedance of the base value of the unit itself into the impedance of the base value of the coefficient in the equivalent circuit. K_p is the coefficient for converting the standard value of the system base value into the standard value of the base value of the motor itself. The active power and reactive power of the motor can be expressed as follows,

$$P_m = T_E = -\left({E_x}' I_x + {E_y}' I_y\right) \tag{1.9}$$

$$Q_m = V_y I_x - V_x I_y \tag{1.10}$$

Its form is shown in equations (1.11) and (1.12).

$$P_s = P_Z^* \left(V/V_0\right)^2 + P_I^* \left(V/V_0\right) + P_P^* \tag{1.11}$$

$$Q_s = Q_Z^* \left(V/V_0\right)^2 + Q_I^* \left(V/V_0\right) + Q_P^* \tag{1.12}$$

In the equation, V_0 represents the load node voltage at the equilibrium point.

In the case of small disturbance, the fluctuation of mechanical torque T_M is small, so the torque T_M is assumed to be a constant value in this paper. After linearizing equations (1.1) and (1.12), the state space model of the load can be obtained:

$$\begin{gathered} \dot{x}(t) = Ax(t) + Bu(t) + Le(t) \\ y(t) = Cx(t) + Du(t) \end{gathered} \tag{1.13}$$

In the formula, $u(t) = [\Delta V \Delta\theta], y(t) = [\Delta P \Delta Q]$, the state variable is $x(t) = \left[?E_x'?E_y'?s\right]$, and $?e(t)$ is the noise vector. The matrices A, B, C, D are shown below:

$$\begin{gathered} \boldsymbol{A} = \left[\begin{array}{c} \frac{-X}{XT_{d0}'} s_0 E_{y0}' \\ -s_0 \frac{-X}{XT_{d0}'} - E_{x0}' \\ -V_0 \sin(\theta_0) \frac{V_0 \cos(\theta_0)}{X^2 T_j} 0 \end{array} \right], \\ \boldsymbol{C} = \left[\begin{array}{c} \frac{V_0 \sin(\theta_0)}{X'} \frac{-V_0 \cos(?_0)}{X'} 0 \\ \frac{-V_0 \cos(\theta_0)}{X'} - \frac{V_0 \sin(\theta_0)}{X'} 0 \end{array} \right] \end{gathered} \tag{1.14}$$

$$\boldsymbol{B} = \left[\begin{array}{cc} \frac{X-X'}{XT_{d0}'} \cos(\theta_0) & -\frac{X-X'}{XT_{d0}'} \sin(\theta_0) V_0 \\ \frac{X-X'}{XT_{d0}'} \sin(\theta_0) & \frac{X-X'}{XT_{d0}'} \cos(\theta_0) V_0 \\ -\frac{E_{x0}'}{XT_j} \sin(\theta_0) + \frac{E_{y0}'}{XT_j} \cos(\theta_0) - \frac{E_{x0}' V_0}{XT_j} \cos(\theta_0) - \frac{E_{y0}' V_0}{XT_j} \sin(\theta_0) & \end{array} \right] \tag{1.15}$$

$$\boldsymbol{D}=\left[\begin{array}{cc}\frac{E_{x0}'}{X'}\sin(\theta_0)-\frac{E_{y0}'}{X'}\cos(\theta_0)+\frac{2P_z^*}{V_0} & \frac{E_{x0}'V_0}{X'}\cos(\theta_0)+\frac{E_{y0}'V_0}{X'}\sin(\theta_0)\\ \frac{2V_0-E_{x0}'\cos(\theta_0)-E_{y0}'\sin(\theta_0)}{X'}+\frac{2Q_z{}^{\circ}}{V_0} & \frac{E_{x0}'V_0\sin(\theta_0)-E_{y0}'V_0\cos(\theta_0)}{X'}\end{array}\right] \tag{1.16}$$

There are five parameters related to the equilibrium point in the formula, which are respectively s_0, E'_{x0}, E'_{y0}, θ_0, V_0. Among them, θ_0 and V_0 are determined by the mean of $\theta(k)$ and $V(k)$. Since the linearization of the load is related to the equilibrium point, there are 9 load transient parameters to be identified, which are P_z^*,$Q_z^*, X, X', T'_{d0}, T_j, s_0, E'_{x0}, E'_{y0}$.

Since the measured data of the PMU mainly include voltage amplitude, active power and reactive power, this paper simplifies the above load model into a single-input dual-output model of $u=[\Delta V, y=[\Delta P \Delta Q]$, and sets $\theta_0=0$. Therefore, the load state space model matrix $ABCD$ can be simplified as:

$$\boldsymbol{A}=\left[\begin{array}{ccc}\frac{-X}{X'T_{d0}'} & s_0 & E'_{y0}\\ -s_0 & \frac{-X}{XT_{d0}'} & -E'_{x0}\\ 0 & \frac{V_0}{XT_j} & 0\end{array}\right], \boldsymbol{C}=\left[\begin{array}{ccc}0 & \frac{-V_0}{X'} & 0\\ \frac{-V_0}{X'} & 0 & 0\end{array}\right] \tag{1.17}$$

$$\boldsymbol{B}=\left[\begin{array}{c}\frac{X-X'}{XT_{d0}'}\\ 0\\ \frac{E_{y0}'}{XT_j}\end{array}\right], \boldsymbol{D}=\left[\begin{array}{c}-\frac{E_{y0}'}{X'}+\frac{2P_z^*}{V_0}\\ \frac{2V_0-E_{x0}'}{X'}+\frac{2Q_z}{V_0}\end{array}\right] \tag{1.18}$$

The load state space model is converted into a load transfer function model, and the expression of the load transfer function model is shown in equation (1.19).

$$\begin{aligned}\Delta P&=\frac{b_{0p}s^3+b_{1p}s^2+b_{2p}s+b_{3p}}{s^3+a_1s^2+a_2s+a_3}\Delta V+H_1\Delta e\\ \Delta Q&=\frac{b_{0q}s^3+b_{1q}s^2+b_{2q}s+b_{3q}}{s^3+a_1s^2+a_2s+a_3}\Delta V+H_2\Delta e\end{aligned} \tag{1.19}$$

In the formula, Δe is the noise, and H_1 and H_2 are the noise transfer functions of active power and reactive power, respectively. The coefficients of the terms are shown in equations (1.18) and (1.19).

$$a_1=\frac{2X}{XT_{d0}{}'}, a_2=s_0^2+\frac{X^2}{X^2T_{d0}'^2}+\frac{V_0E_{x0}{}'}{XT_j}, a_3=\frac{V_0E_{x0}{}'X}{X^2T_{d0}{}'T_j}+\frac{V_0E_{y0}{}'s_0}{XT_j} \tag{1.20}$$

$$\begin{aligned}b_{0p}&=\frac{2P_z^{\cdot}}{V_0}-\frac{E_{y0}{}'}{X'}, b_{1p}=\frac{4XP_z^*}{XT_{d0}{}'V_0}-\frac{2XE_{y0}{}'}{X'^2T_{d0}{}'}, b_{3p}=\frac{2E_{x0}{}'P_z^0X}{X'T_{d0}{}'T_j}+\frac{2E_{y0}{}'s_0P_z^{\cdot}}{XT_j}\\ b_{2p}&=-\frac{X^2E_{y0}{}'}{X'^3T_{d0}^2}+\frac{2X^2P_z^{\cdot}}{X'^2T_{d0}'^2V_0}+\frac{V_0s_0X}{X'^2T_{d0}{}'}+\frac{2E_{x0}{}'P_z^{\cdot}}{XT_j}-\frac{V_0s_0}{XT_{d0}{}'}-\frac{s_0^2E_{y0}{}'}{X'}+\frac{2s_0^2P_z^*}{V_0}\end{aligned} \tag{1.21}$$

$$\begin{aligned}b_{0q}&=\frac{2V_0-E_{x0}{}'}{X'}+\frac{2Q_Z^*}{V_0}, b_{1q}=\frac{\left(3V_0-2E_{x0}{}'\right)X}{X'^2T_{d0}{}'}+\frac{4Q_Z^*X-1}{XT_{d0}{}'V_0}\\ b_{2q}&=\frac{\left(V_0-E_{x0}{}'\right)X^2}{X'^3T_{d0}'^2}+\frac{2Q_Z{}'X^2}{X'^2T_{d0}'^2V_0}+\frac{V_0X}{X'^2T_{d0}'^2}-\frac{\left(E_{x0}'^2+E_{y0}'^2\right)V_0}{X'^2T_j}\\ &+\frac{2\left(V_0^2+Q_Z{}'\right)E_{x0}{}'}{X_jT_j}+\frac{\left(2V_0X'-E_{x0}{}'\right)s_0^2}{X'}+\frac{2Q_2^*s_0^2}{V_0}\\ b_{3q}&=\frac{E_{x0}{}'V_0^2X}{X'^3T_{d0}{}'T_j}-\frac{\left(E_{x0}'^2+E_{y0}'^2\right)V_0X}{X'^3T_{d0}{}'T_j}+\frac{E_{x0}{}'V_0^2}{X'^2T_{d0}{}'T_j}+\frac{2Q_Z{}'E_{x0}{}'X}{XT_{d0}{}'T_j}+\frac{2\left(V_0^2+Q_Z^*\right)E_{y0}{}'s_0}{XT_j}\end{aligned} \tag{1.22}$$

Among them, $b_{1p}=b_{0p}\times a_0, b_{3p}=(2a_3\times P^*)/V_0$, so (1.18) $\sim$ (1.19) can be simplified into 9 equations, the load transient parameters can be used to solve the 9 load transient parameters to be identified: $P^{*2}, Q_z^*, X, X', T_{d_0}{}', T_j, s_0, E_{x0}{}', E_{y0}{}'$.

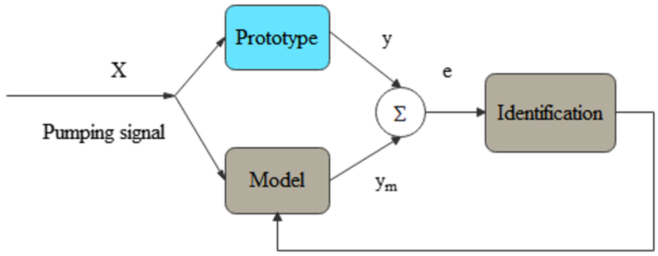


Fig. 1.5: Schematic diagram of system identification

1.4. Analysis of parameter identification method. In the overall measurement and identification method, the commonly used load model parameter identification methods are based on the system identification theory, and there are many methods. Only by selecting a system identification method suitable for the characteristics.

System identification is to establish a mathematical model describing the dynamic behavior of the system based on the input and output time functions of the system. Figure 1.5 shows the principle of system identification.

Under the action of the same excitation signal x, the real model and the identified model generate the output response Y of the actual system and the output response ym of the identified model, respectively. The error e is obtained by comparing Y and ym, and then the model parameters are corrected through the optimization algorithm until the error e meets the accuracy requirements. Specifically, firstly, according to the prior knowledge, the identification experiment is designed, the identification data set is selected, the model structure is determined, and the error accuracy standard is selected. Then, the unknown parameters in the model are identified through the input and output data, and finally the applicability of the model is checked. The detailed system identification process is shown in Figure 1.6.

From the process of system identification, it is concluded that three kinds of information need to be set in advance to identify a model, namely data set, model set and model parameter identification method.

$$y(t)+a_1y(t-1)+\cdots+a_ny(t-n)=b_1u(t-1)+\cdots+b_mu(t-m) \tag{1.23}$$

We use a discrete-time model, mainly because the measured data is usually collected by sampling, so the connection between the sampled measured data and the discrete-time model is more direct. Equation (1.20) is converted into the form of equation (1.21), and the next output value is determined by the measured input and output values. Equation (1.21) is also more practical.

$$y(t)=-a_1y(t-1)-\cdots-a_ny(t-n)+b_1u(t-1)+\cdots b_mu(t-m) \tag{1.24}$$

Equation (1.21) is written in the form of a vector:

$$y(t)=\phi^T(t)\theta \tag{1.25}$$

In the formula,

$$\phi(t)=[-y(t-1),\cdots,-y(t-n),u(t-1),\cdots,u(t-m)]^T \tag{1.26}$$

$$\theta=[a_1,\cdots,a_n,b_1,\cdots,b_m]^T \tag{1.27}$$

We assume a given system in which the value of the parameter θ is unknown, but there are input and output measurements $Z^N=\{u(1.1),y(1.1),\cdots,u(N),y(N)\}$ of the system at time $1\leq t\leq N$. By optimizing

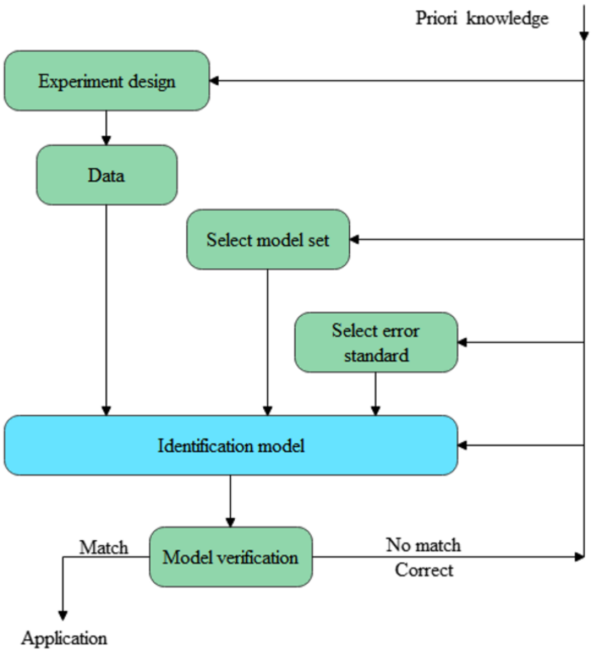


Fig. 1.6: System identification flow chart

the parameter θ, the calculated model output $\hat{y}(t,\theta)$ fits the measured output value $y(t,\theta)$ as much as possible, which is the core idea of the least squares method. The mathematical expression is shown in formula (1.25).

$$V_N\left(\theta, Z^N\right) = \frac{1}{N}\sum_{t=1}^{N}[y(\mathrm{t}) - \hat{\mathrm{y}}(\mathrm{t},\theta)]^2 = \frac{1}{N}\sum_{t=1}^{N}\left[y(\mathrm{t}) - \phi^T(\mathrm{t})\theta\right]^2 \tag{1.28}$$

In the formula, $V_M\left(\theta, Z_N\right)$ is the loss function. It should be noted that the loss function of the least squares method has no physical meaning, this choice is because the loss function is easy to calculate and easy to understand. The parameter obtained by minimizing the loss function $V_N\left(\theta, Z_N\right)$ is denoted as $\hat{\theta}_N$.

$$\hat{\theta}_N = \arg\min V_N\left(\theta, Z^N\right) \tag{1.29}$$

Since $V_N\left(\theta, Z_N\right)$ consists of the squared term of the parameter θ, the parameter can be solved by setting the derivative of $V_N\left(\theta, Z_N\right)$ to zero, that is:

$$0 = \frac{d}{d\theta}V_N\left(\theta, Z^N\right) = \frac{2}{N}\sum_{t=1}^{N}\phi^T(t)\left[y(t) - \phi^T(t)\theta\right] \tag{1.30}$$

The estimated value of the obtained parameter θ is shown in formula (1.31):

$$\hat{\theta}_N = \left[\sum_{t=1}^{N}\phi(t)\phi^T(t)\right]^{-1}\sum_{t=1}^{N}\phi^T(t)y(t) \tag{1.31}$$

According to the principle of linear algebra, equation (1.31) has a unique solution if and only if the matrix $\sum_{t=1}^{N}\phi(t)\phi^T(t)$ is non-singular, which is also the identifiable condition of the least squares method.

The least squares method is greatly affected by the perturbation level when applied. Otherwise, as the perturbation level increases, even if the order of the model is correct, the estimated value of the least squares

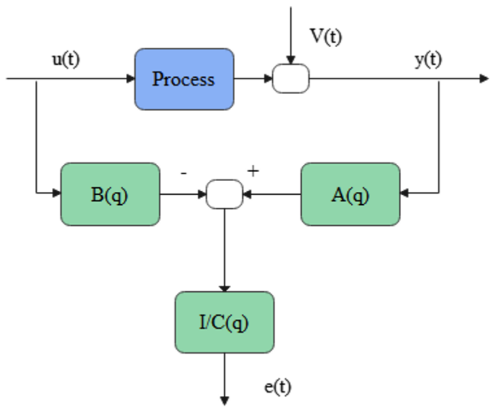


Fig. 1.7: The generation process of the forecast error method error

method is biased. Therefore, to solve this problem, one way is to use a higher-order model, but the higher-order model may not match the real model and may appear numerically unstable. Therefore, the improved least squares method can be used to improve the accuracy of model identification. The improved least squares method includes pre-technical error method, output error method, auxiliary variable method and so on. Among these methods, the most widely used is the forecast error method.

The model expressed by equation (1.20) is improved, and the model is extended to the ARMAX model with noise model, and the unit forward operator q and the unit delay operator q^{-1} are introduced, which are $qu(t) = u(t+1), q^{-1}u(t) = u(t-1)$ respectively. We set $A(q) = 1 + \sum_{k=1}^{n} a_k q^{-k}, B(q) = \sum_{k=1}^{m} b_k q^{-k}, C(q) = 1 + \sum_{k=1}^{m} c_k q^{-k}$, and the difference equation model is shown in equation (1.32).

$$y(t) = [1 - A(q)]y(t) + B(q)u(t) + C(q)e(t) \tag{1.32}$$

That is,

$$y(t) = \frac{B(q)}{A(q)}u(t) + \frac{C(q)}{A(q)}e(t) = G(q)u(t) + H(q)e(t) \tag{1.33}$$

Among them, e(t) is white noise. $v(t) = H(q)e(t), v(t)$ is the colored noise after the white noise is filtered by the filter H(q). According to the principle of conditional probability, the single-step prediction value of the above model is shown in equation (1.34).

$$\begin{aligned} \hat{y}(t|t-1) &= G(q)u(t) + \hat{v}(t|t-1) \\ &= H^{-1}(q)G(q)u(t) + \left[1 - H^{-1}(q)\right] y(t) \end{aligned} \tag{1.34}$$

Then the prediction error is equation (1.35).

$$y(t) - \hat{y}(t|t-1) = -H^{-1}(q)G(q)u(t) + H^{-1}(q)y(t) = e(t) \tag{1.35}$$

e(t) represents the part of the output y(t) that cannot be predicted from the data before time t-1. Figure 1.7 is the generation process of forecast error.

Therefore, the model parameters can be obtained by minimizing the loss function of equation (1.36).

$$V_{PEM} = \frac{1}{N} \sum_{t=1}^{N} \left[H^{-1}(q)y(t) - G(q)H^{-1}(q)u(t)\right]^2 \tag{1.36}$$

It is worth noting that the consistency of the forecast error method is premised on the loss function reaching the global minimum value. However, this requirement is generally difficult to meet in actual situations. In more cases, the loss function reaches a local minimum value, so the obtained model parameters are the local optimal solution.

2. System design. First, this paper constructs a comprehensive ability assessment system for students majoring in preschool education. The database of this system is divided into the central database and the front database. The central database is responsible for storing courseware information, test information, homework information, and test question information related to teachers, class information, teacher information, and student information related to school administrators, and test question information, knowledge point information, and video information related to system administrators, workbook question information, system administrator information, school information and school administrator information related to teachers. The front-end database is responsible for storing the data generated in the school classroom (information related to students' quizzes and information related to student attendance).

The system environment mainly involves the development environment and application environment. According to the system plan, the server is divided into a central database server and various pre database servers named after the school name. Each front-end database server implements load balancing. When the network between the central database server and the front-end database server cannot be connected, it will not affect the use of the school, avoiding a single point of failure of the database server

The system consists of three types of users: teachers, school administrators, and system administrators. Three types of users log in to the teacher system, school management system, and system management system, respectively.

In the system, information query business is equally important. In order to facilitate user use, different query methods such as combination query, fuzzy query, and precise query are provided according to the actual business

Data statistics are presented to users in the form of data visualization, allowing them to view the corresponding data intuitively, quickly, and efficiently. Data statistics are generated by collecting and calculating corresponding data.

Software architecture and database design have been determined. According to the three different types of users: teachers, school administrators, and system administrators, the system is divided into three subsystems: teacher system, school administrator system, and system administrator system, so that the functions of the subsystems are relatively centralized and there is relative independence between the subsystems. Database design includes conceptual model design and logical model design, and the construction of the database is completed through the principles of process iteration and gradual refinement.

The system adopts a three-layer framework based on SpringMVC, achieving low code coupling and componentization design. The separation and interdependence between the presentation layer and the business logic layer make web applications easier to modify and maintain. Separating the business layer from the data access layer can improve code reusability. Layering the code facilitates system code refactoring while laying the foundation for future distributed deployment of the system.

The task of conceptual structure design is to abstract it into a data model that does not depend on any machine according to a specific method on the basis of the requirements specification jointly confirmed by users and system personnel. The purpose of conceptual model design is to synthesize the user's data requirements into a unified model based on the results of the analysis of the requirements of a specific system. The entity relationship diagram (E-R diagram) is shown in Figure 2.1.

Teaching evaluation section code:

```
Document. querySelectorAll ("[djdm='01 ']"). forEach() (item)=>item. click());
SetTimeout (document. querySelector (". but20"). click());
Code for textbook evaluation section:
Var list9=Array. from (document. querySelectorAll ("[value='9.2 ']"));
Var list4=Array. from (document. querySelectorAll ("[value='4.6 ']"));
Var list=list9. concat (list4);
List. forEach (item=>{
Item. click();
});
SetTimeout (document. querySelect ("[type='submit ']"). click(), 1000);
```

Figure 2.2 describes the process steps for teacher users to view students' historical test scores, select the

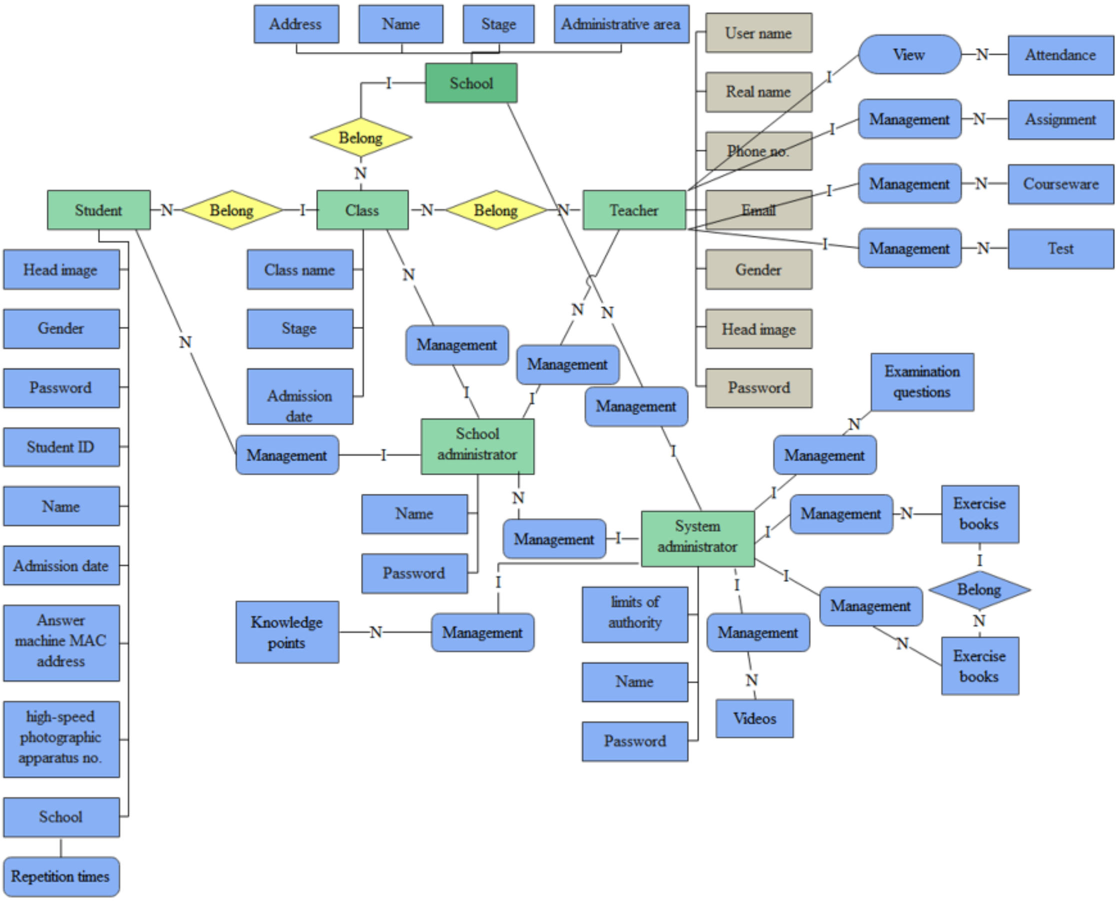


Fig. 2.1: Database conceptual model

semester to be searched in the drop-down box of the semester, and then select the subject to be searched in the drop-down box of the subject. Then, the teacher selects the class to be searched in the drop-down box of the class, selects the student number to be searched in the drop-down box of the student, and finally clicks search, and the page displays the line graph of the student's historical test scores.

The effect evaluation of the comprehensive ability evaluation model of students majoring in preschool education based on computer technology is carried out.The main source of data for this article is to validate the model through investigation and analysis. Using actual teaching data from multiple preschool education schools as input data, a total of 150 sets of data were obtained. After removing 6 sets of invalid data, 72 sets were used as training data, and the other 72 sets were used as experimental data. The results of the model obtained in this article were compared with the experimental data, and the evaluation results were quantitatively scored, and the final statistical test results are shown in Figure10 and Table 2.1.

From the above evaluation data, it can be seen that the average love results of the model in this article are quantitatively distributed between [79,90], and the evaluation results are relatively high, which is in line with the expected construction of the model in this article.Through the above research, it is verified that the comprehensive ability evaluation model of students majoring in preschool education based on computer technology can play an important role in the comprehensive ability evaluation of students majoring in preschool education.

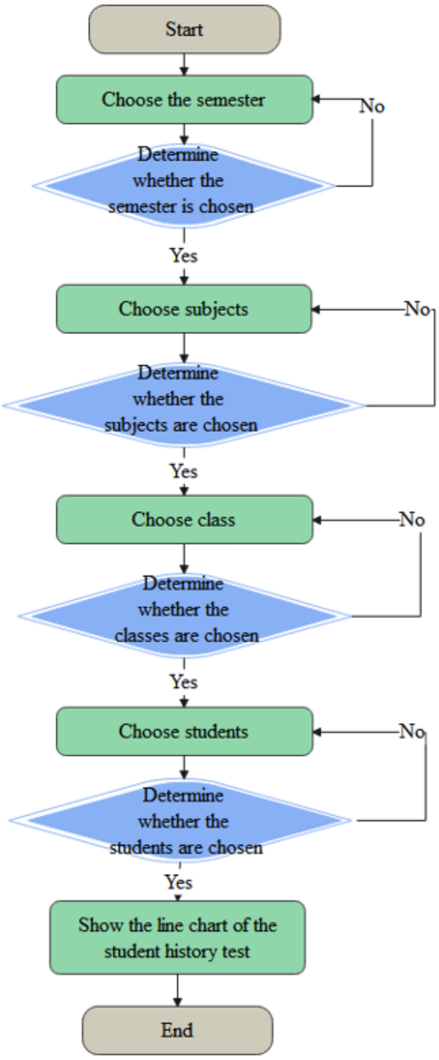


Fig. 2.2: The flow chart of viewing the student's comprehensive test scores and the line graph of each test scorem

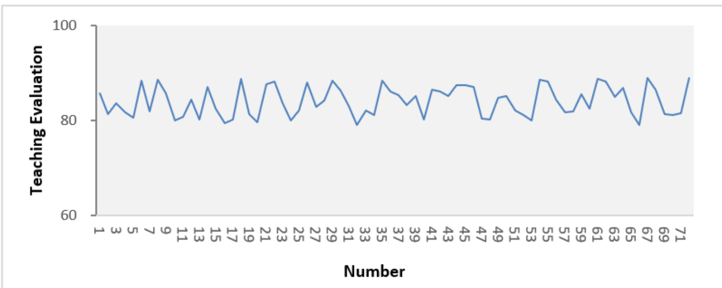


Fig. 2.3: Statistical chart of model evaluation results

Table 2.1: The effect evaluation of the comprehensive ability evaluation model for students majoring in preschool education based on computer technology

Number	Teaching Evaluation	Number	Teaching Evaluation	Number	Teaching Evaluation
1	85.813	25	82.184	49	84.875
2	81.312	26	88.002	50	85.216
3	83.661	27	82.920	51	82.083
4	81.787	28	84.257	52	81.116
5	80.623	29	88.350	53	79.968
6	88.386	30	86.353	54	88.633
7	81.986	31	83.044	55	88.124
8	88.593	32	79.085	56	84.384
9	85.787	33	82.084	57	81.708
10	80.126	34	81.166	58	81.869
11	80.747	35	88.407	59	85.535
12	84.322	36	86.201	60	82.460
13	80.192	37	85.289	61	88.711
14	87.061	38	83.183	62	88.234
15	82.474	39	85.141	63	84.983
16	79.393	40	80.231	64	86.818
17	80.161	41	86.518	65	81.673
18	88.867	42	86.067	66	79.179
19	81.400	43	85.173	67	88.887
20	79.739	44	87.444	68	86.555
21	87.578	45	87.393	69	81.341
22	88.142	46	87.019	70	81.275
23	83.728	47	80.343	71	81.489
24	80.125	48	80.192	72	88.996

3. Conclusion. At present, the overall artistic quality of kindergarten teachers is generally not high, and there is a big gap with the demand for art practice in kindergartens. This has a lot to do with the relative lag in the reform of preschool education majors in colleges and universities that train preschool teachers, and the lack of emphasis on educational goals and practical effects. The pedagogy, psychology and professional theory courses offered by preschool education departments in colleges and universities have problems such as being too old in content and not closely related to the practice of kindergarten art teaching. Secondly, the professional and technical courses offered by the preschool education major are too specialized, and cannot be smoothly integrated with the comprehensive artistic characteristics and the technical needs of children's artistic characteristics in the practice of kindergarten art teaching. All of these are the biggest obstacles to the smooth improvement of the comprehensive quality and teaching practice ability of students majoring in preschool education. This paper combines computer technology to carry out the comprehensive ability evaluation of students majoring in preschool education, and builds a comprehensive ability evaluation model for intelligent preschool professional education students. The experimental research results verify that the comprehensive ability evaluation model of students majoring in preschool education based on computer technology can play an important role in the comprehensive ability evaluation of students majoring in preschool education.

As the amount of data in the system continues to increase, more data mining techniques are used to improve and optimize algorithms for analyzing student abilities, making them more accurate. Dig out potential and valuable information from massive amounts of data. For example, combining data mining techniques to analyze the teaching achievements of teachers to optimize their teaching plans, improve their teaching abilities, and further optimize the overall team of teachers; By analyzing the amount of big data for students, personalized assignments are developed and learning suggestions are provided.

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