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Research Article

Music Psychological Meta-Analysis and Real-Time Measurement Algorithm Based on Nonlinear Dynamic Incremental Internal Model Algorithm

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As an important part of aesthetic education, music is the artistic expression of human emotions. It has a crucial impact on the cultivation of individual music perception ability, music aesthetic ability, music creation ability, etc. The degree of influence of emotions and values in music runs through the individual. This study introduces a method to independently design a predictive controller using the theoretical framework of the state-space method. Since the same results as DMC can be derived, it can be regarded as an understanding of DMC in the time domain. We take the asymptotically stable object of SISO as the model and use the step response coefficient to directly model, but this method makes the control uncontrollable, so we use the method of adding the correction parameter to make the observable process more effective. The advantages of one-time online optimization can reduce the amount of calculation and greatly enhance the robustness in the control process. In order to study the dynamic characteristics of the system, an internal model control system is introduced. By studying the closed-loop stability of the internal model system, the internal model structure of the dynamic matrix control system is studied, and its dynamic characteristics are further studied. When analyzing the dynamic characteristics, we can know that the dynamic characteristics of the system only depend on the object characteristics and control strategies, and have nothing to do with the model length. This study introduces the basic structure, main properties, and design method of the internal model controller. On the basis of conventional internal model control, an enhanced internal model control method is introduced. Through the analysis of the sensitivity function and the complementary sensitivity function, the robust performance and robust stability of the enhanced internal model control system are studied. Music learning psychology is related to the effect of music teaching. Since individual psychological development is dynamic and controllable, by grasping students' music learning motivation and music psychological ability, we can well practice the concept of contemporary new curriculum standards and implement high-quality music courses. This study mainly discusses the music learning psychology itself, the analysis of real-time measurement results, and the analysis of teaching countermeasures, and does some research on music theory and teaching practice. Through real-time measurement research, it can be concluded that the real-time measurement results are relatively optimistic, which shows that teachers can maintain students' learning well as long as they use teaching methods that conform to students' learning psychology. The nonlinear dynamic incremental internal model algorithm can improve students' various music psychological abilities and achieve the expected music teaching goals.

1. Introduction

The process of music psychological education is a process of experiencing the state of life and the development of life force, a process of awakening people's perception of beauty and transcending the material world with a new mental state [1]. "Only under the guidance of the paradigm of art can the human mind achieve the purpose of comprehending the true meaning, venting anxiety, and resolving troubles, and finally obtaining the feeling of the ultimate experience of life. The aesthetic understanding of music is a kind of "sublimated perception, standardized imagination, and adjustment" [2]. Music aesthetic activity is an activity that promotes the generation of individual emotions, which provides a foothold for music psychology education, that is, it should be full of "beauty" and "emotion" in order to achieve the construction of individual aesthetic psychological structure and the purpose of perfecting personality. On the whole, music psychological education is from the basic to the comprehensive, from the extension to the connotation, and affects the physical and mental development of the individual from an all-round perspective [3, 4].

The multiple values of music determine that the value of music education also presents various characteristics [5]. The function of music education is inseparable from the value of music education. The intrinsic value embodied by music education is an important symbol of the realization of the function of music education. The functional study of music education is based on the understanding of the nature of music education, which in turn will deepen our understanding of the nature of music education [6]. The primary feature of music education is emotion, and with the help of "emotion," music education can play its role of "healthy psychology." This study uses music to induce individual positive emotions as an implementation approach to realize the psychological adjustment function of music education and to provide empirical data for the creation of a potential model of music education. In the specific music emotion induction operation, in the exploration of the induction method and measurement method, the induction theory is also theoretically explored and verified.

Dynamic matrix control is a predictive control algorithm that uses the step response characteristics of the controlled object to describe the dynamic model of the system. This study analyzes its basic principle and the influence of system parameters on the control system. In the control process, different control qualities can be achieved by changing the parameters in the quadratic objective function. This study expounds the structure and properties of the internal model control, and analyzes the reasons why the ideal internal model controller cannot be realized. For the actual control system, a two-step design method of the internal model controller is introduced. The filter can improve the ability of the internal model control system to suppress the slope disturbance. In the structure of conventional internal model control, the modeling error is fed back to the input end of the object, so that the robustness of the system in the case of model mismatch and external disturbance is enhanced. Correctly grasping students' music learning psychology is an important factor in the quality of music teaching. The psychological tendency of students' music learning motivation, learning purpose, learning method, and learning ability are the decisive factors for the teaching effect. Through real-time measurement and analysis of students' real inner activities, and by respecting students' development and differences, we strive to improve the quality of teaching. From the vertical observation, from small to how teachers teach a good music class, the real-time measurement and research of music learning psychology are not only a simple teaching problem of school teachers but also a good implementation. The premise of the new curriculum standard is the education of the country. Teachers' teaching strategies are the forerunners of high-quality teaching work. This study hopes to more accurately grasp the students' learning and development trends through the real-time measurement of the music learning psychology of primary school students, through the combination of theory and practice, and the comparative analysis of data and interview results.

2. Related Work

Internal model control is developed on the basis of predictive control. Based on the relationship between the two, the process of QR decomposition of transfer function and design of FIR controller on the basis of impulse response is the combination of IMC and predictive control [7]. This internal model-predictive controller uses the model to predict the output item and determines the controller form by optimizing the secondary performance index. The advantage is that it combines the advantages of IMC and predictive control, and the system has strong robustness and stability. But the calculation is more complicated.

Considering that the object may drift under complex working conditions, it is necessary to design the controller to realize the optimal control of the system within a certain allowable threshold of model adaptation [8]. For this reason, a set of adaptive-internal model control scheme is designed, that is, the model parameters gradually approach the parameters of the controlled object, and the updated model parameter values are used to correct the IMC parameters online, thereby improving the system's ability to resist disturbance and model adaptation [9].

Through mathematical transformation, the IMC controller can be equivalent to a feedback controller, and further transformed into a PID controller that is generally applicable in industrial fields. The design of this IMC-PID controller creatively solves the problem of modularization and practicality of internal model control. And it is proved that it has strong robustness and wide applicability.

In the process of applying the internal model control and its improved control scheme in the field, there are many situations that are not considered in the theoretical design process [10, 11]. In order to improve the general applicability of IMC, it is necessary to improve its structure in a targeted manner. For example, the dual-port IMC can deal with the anti-windup situation in the internal model control; the improved IMC can enhance the ability of the internal model controller to resist model mismatch; the two-degree-of-freedom IMC can significantly improve the system's anti-integral saturation and anti-external interference.

Music-induced emotion is an emotional experience that the listener is awakened when the music is presented [12]. Whether in real-time measurement, behavioral analysis, or neuroimaging research, the existing research on music-induced emotions almost all uses the way of letting individuals passively appreciate music for direct arousal, which is called the passive listening paradigm [13]. Other studies have used active task paradigms to induce musical emotions, such as music performance or musical imagination [14, 15]. However, this paradigm has significant drawbacks in examining music-induced emotions in real life. Since daily music appreciation is usually in a passive state that does not require subjects to perform cognitive analysis or decision-making on music, the active task paradigm of musical emotional arousal often induces brain activities related to differential recognition and motor execution, which cannot accurately reflect the neural processing of individual musical emotions [16].

Neuroelectrophysiological studies on language comprehension have found that the active task paradigm significantly activates left hemisphere activity and inhibits right hemisphere brain activity compared to passive listening paradigm [17]. This also explains to a certain extent that additional task operations can interfere with the cognitive load of individuals in music appreciation and thus interfere with further music perception processing.

A large number of studies on music-induced emotions show that the measurement method of self-reporting scale is the most widely used because of its simple operation, cheap, and easy operation [18]. However, in terms of experimental reliability and validity, there are two problems: firstly, the demand characteristics in the questionnaire measurement will produce self-improvement bias and response strategies to a certain extent, and become an important factor affecting the experimental effect; the second is the lack of measurement of the subjects' psychological internal process, that is, the subjects' subjective feelings and their expressions. It is imprecise, and even some studies have found that there is no difference in the responses of the subjects to "positive," "negative," and "neutral" emotions using the self-reporting scale [19]. At this time, more sensitive and accurate indirect behavioral measures of emotion measurement are needed [20].

The logical starting point for behavioral measurement is James Lange's Emotional Body Theory [21]. This theory believes that human emotions are caused by physical changes, and emotions are generated after physiological and behavioral changes [22–24]. We can judge the emotions we feel by observing the physiological responses of the body. After long-term development, the theory has been revised and interpreted, that is, after the evaluation of things affects the physiological changes, the physiological changes will then trigger different feelings, and the feelings will in turn affect the evaluation [25, 26]. The specific emotional type is determined by the arousal of the subsequent physiological changes, including measures of facial behavior and somatic behavior, the latter most commonly wiggling and bodily movements in response to music [27, 28].

3. Methods

3.1. Establishment of the State Space of the Dynamic Matrix. For an asymptotically stable object with single input and single output, it is assumed that the sampling value and of its step response has been determined. According to the traditional control theory, the state-space description of the object can be obtained from $\{a_i\}$, which must be between $\{a_i\}$ and $\{a_i\}$, especially for unconventional state space description with control increment Δu as input:

$$x(k-1) = Ax(k-2) - b\Delta u(k-2), \tag{1}$$

$$y(k) = bc^T x(k-1). \tag{2}$$

Its realization conditions are

$$c^T bA^{i+1}A^i = a_i, \quad i = 0, 1, 2, \ldots, n-1. \tag{3}$$

Element a is the step response coefficients, so this modeling process can be performed directly without further identification and does not depend on the structure of the object. This state-space description can be represented by the structure of Figure 1.

The difference between DMC and the traditional method of state feedback optimal control with observer is as follows:

(1) The state observer of DMC is based on the state-space description, which is an approximate realization that does not consider minimization. Its advantage is that it can be directly modeled by using the step response coefficient a_i, but it loses controllability. The traditional observer is usually described by the minimization model of the object, and further identification is required on the basis of the step response.

(2) DMC adopts the finite-time-domain rolling optimization strategy, focusing on the optimal control of the output, and it is easy to derive a simple control law, and the lack of optimality or the influence of uncertain factors can be compensated by online repeated optimization. The usual optimal control principle is to derive the closed-loop control law from a constant state optimal performance index, which involves the solution of complex Riccati equations.

Here, the model problem involved in (1) is only for the convenience of modeling after all, not essential. In fact, there is also predictive control using a minimization model. However, the DMC described in (2) replaces the traditional one-shot state optimization with online rolling output optimization, which is the essential difference between DMC and the traditional observer plus state feedback optimal control.

It is in this sense that DMC presents characteristics that are different from traditional optimal control, and shows obvious advantages in reducing the amount of computation and enhancing robustness.

3.2. Analysis of Dynamic Characteristics of Dynamic Matrix Control. When the model has no mismatch and no interference, the input-output transfer characteristics of the closed-loop system can be described by the number of z-transfer turns, namely:

$$F_0(z) = z^{-1} G_P(z) G_C(z). \tag{4}$$

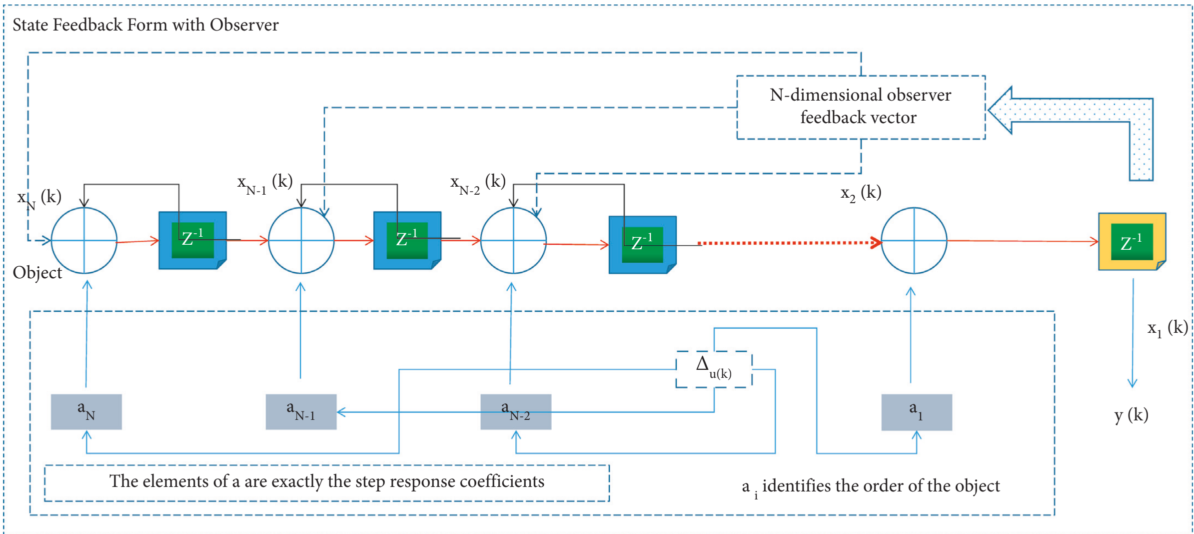

Figure 1: Implementation of step response in state space.

According to the traditional control theory, the poles of an object reflect its dynamic characteristics. To change its dynamics, part of its poles must be eliminated through the zero point of the controller, and new poles must be set. Although $G_C(z)$ introduces $N-1$ new poles, its zeros are all located at the origin of the Z plane, and they obviously cannot compensate for the poles of $G_P(z)$. The reason for the above confusion is that DMC adopts a nonminimized model, which leads to its controller also has a nonminimized form. Therefore, we will first study the minimized form of $G_C(z)$.

The minimization description of an object whose step response is a_i is

$$G_P(z) = \frac{p_1 z^{-1} + p_2 z^{-2} + \ldots + p_n z^{-n}}{1 - m_1 z^{-1} - m_2 z^{-2} - \ldots - m_n z^{-n}}, \tag{5}$$

where n is the order of the object. According to the relationship between the step response and the object transfer function, it can be derived as

$$\begin{aligned} &\frac{p_1 z^{-1} + p_2 z^{-2} + \ldots + p_n z^{-n}}{1 - m_1 z^{-1} - m_2 z^{-2} - \ldots - m_n z^{-n}} \\ &= c^T\left(1 - a_2 z^{-2} - a_3 z^{-3} - \ldots - a_n z^{-n}\right). \end{aligned} \tag{6}$$

The minimal form of the predictive controller illustrates the compensation properties of the DMC for the object dynamics, and points out that the DMC controller is a compensation controller, which eliminates the original poles of the object and sets new poles that depend on the control strategy, so as to achieve the purpose of improving the dynamic performance of the system. Obviously, the choice of control strategy has a key impact on the stability and dynamic characteristics of the controlled system. It can also be regarded as the transformation from the object characteristic polynomial coefficient space to the controlled system characteristic polynomial space under the action of the control strategy.

Due to the nonminimizing nature of the controller, the effects of these poles on the system dynamics cannot be simply understood with traditional concepts. For example, it can be seen that the dynamic convergence speed of the controlled system cannot be measured by the maximum distance between each pole and the origin.

Therefore, analyzing the dynamic convergence of the control system through the poles of the nonminimum controller will lead to wrong conclusions. Especially, when N is large, the pole of $G_C(z)$ may be sufficiently close to the unit circle, but the closed-loop pole can make the controlled system that has a sufficiently fast response.

The minimization form of the predictive controller not only helps to conceptually clarify the compensation mechanism of the DMC, but also greatly simplifies the analysis and design of the system when the minimization transfer function of the object is known. We can analyze the stability and dynamic characteristics of the system without using a high-order controller, but only need to analyze the minimized characteristic polynomial, whose dimension is much lower than the model length N.

3.3. Structure of Internal Model Control. The control structure of internal model control includes internal model, controller, and feedback link. When there is model mismatch or unmeasurable interference, the filter will reduce the output difference between the object and the model, thereby achieving the purpose of enhancing the robustness of the system and making the system have good control quality.

Internal model control consists of three parts: object model, internal model controller, and filter. The object model is used to predict the influence of variables on the system output, so the modeling of the internal model control system plays a crucial role in its performance in all aspects. The internal model controller calculates future output values, thereby ensuring that the output of the system tracks the given value. The filter introduces the filter into the

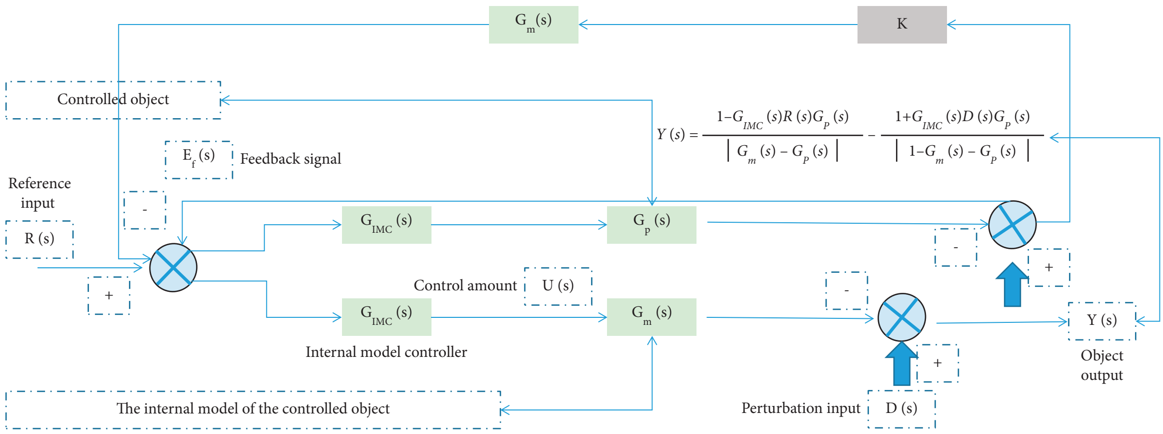

Figure 2: Internal model control structure diagram.

internal model controller, which makes the controller physically realizable and enhances the robust stability of the system while ensuring the control quality. The basic structure of the internal model control is shown in Figure 2.

The closed-loop output equation of the internal model control system is

$$Y(s) = \frac{1 - G_{IMC}(s)R(s)G_P(s)}{\left|G_m(s) - G_P(s)\right|} - \frac{1 + G_{IMC}(s)D(s)G_P(s)}{\left|1 + G_m(s) - G_P(s)\right|}. \tag{7}$$

The characteristic roots of the characteristic equations are all located in the left half-complex plane. The feedback signal of the system is

$$E_f(s) = \frac{1 - \left[G_{IMC}(s) - G_P(s)\right]R(s)G_m(s)}{G_{IMC}(s) + G_m(s) - 2G_p(s)} - \frac{D(s)G_P(s)}{1 - G_{IMC}(s) - G_m(s) - G_p(s)}. \tag{8}$$

When the model is matched, the feedback signal is equal to the disturbance input, and the output disturbance is added to the input end of the internal model controller through the feedback channel. Through the forward control channel, the influence of the disturbance on the control performance is eliminated. Therefore, the internal model control can improve the system to suppress disturbance.

When the model is mismatched, the feedback signal contains the error and disturbance input of the model mismatch. At this time, the robust stability of the internal model control system can be guaranteed by adjusting the parameters of the filter.

When the model is matched, the output $Y(s)$ of the closed-loop system is determined by the transfer function of the forward control channel of the system, and the feedback signal is equal to the disturbance input $D(s)$. At this time, the internal model control system can be regarded as an open-loop system. The stability of the system depends only on the stability of the forward control channel. Therefore, to ensure the internal stability of the IMC system, the condition that the internal model controller and the controlled object are simultaneously open-loop stable must be satisfied.

3.4. Design Method of Nonlinear Dynamic Incremental Internal Model Controller. The design method of the ideal internal model controller is

$$G_{IMC}(s) = G_m^{-1}(s) \bullet G_p^T(s). \tag{9}$$

But the internal model controller designed by this method is difficult to realize in reality. Model uncertainty exists in actual industrial control, including modeling errors caused by nonlinear system linearization and reduced-order approximation, and structural parameters changing with time. These uncertain factors will lead to model mismatch. If the model includes a time-delay component, then a leading term will appear in an ideal controller, which is not physically feasible. If the model contains right-half-plane zeros, right-half-plane poles appear in the ideal controller, and the controller is unstable, and the closed-loop system controlled by it is also unstable. Therefore, ideal internal model controllers are not achievable when there are nonminimum phase parts in the model. If the model is strictly regular, then the ideal controller is nonregular. At this time, the high-order differential link of the controller is extremely sensitive to measurement noise, and such a controller is not desirable.

Since the ideal internal model controller is unrealizable, a two-step design method of the internal model controller is proposed for the actual control system. It is also the most commonly used internal model controller design method. The two-step design method is not only suitable for continuous systems, but also suitable for discrete systems. In addition, the typical internal model controller design methods include predictive control method and zero-pole cancellation method.

The design of the internal model controller is divided into two steps. The first step is to design a stable ideal internal model controller regardless of model uncertainty. The second step is to introduce a filter to overcome the uncertainty of the model by designing an ideal filter and adjusting its parameters, thereby enhancing the robustness of the system and obtaining good control quality.

When designing the internal model controller, a filter is introduced, and the filtering time is regarded as the only adjustable parameter of the internal model controller, and the robustness of the system is enhanced by adjusting this parameter.

For step input signal and constant value disturbance, the filter usually selected is

$$f(s) = c^T \bullet (1 - \lambda s)^{-n}. \quad (10)$$

In the formula, λ is the time constant of the filter, and its value is positive; n is the relative order. The two-step design method of the internal model controller is realized by using the internal model controller by decomposing the model and adding filters. Among them, there is only one adjustable parameter λ, and its value can affect the response speed and robustness of the closed-loop system. In this study, an initial value of λ is given first according to engineering experience, and then it is adjusted online according to actual needs. The selected value of λ is related to the dynamic quality and robustness of the internal model control system.

4. Results and Analysis

4.1. Measurement and Analysis of Learning Interest. Regarding the choice of the question of "the degree of liking the music class is greater than the degree of the language and mathematics department," the real-time measurement is mainly aimed at the students' interest in music learning. Among them, 82.74% of the students chose yes, and only 17.26% of the students chose no. It can be seen that most of the students' attitude toward music lessons is positive. Compared with the students in the lower and middle grades, the real-time measurement results of the two stages are not very different.

In the real-time measurement of this question, the most selected options are popular songs; the least selected options are classical songs. Compared with the lower and middle grades, the proportion of students who prefer popular songs is on the rise. Compared with the real-time measurement results of the lower and middle grades, the selection of songs in the upper grades accounted for 22.45% and 19.19% of the total number of students in the grade, showing a downward trend; while the preference for ethnic songs accounted for 19.39% and 20.2% of the total number of students in the grade. According to Piaget's theory of cognitive development stages, it can be concluded that senior students are in the transition period from the specific operation stage to the formal operation stage, and have a certain cognitive ability and knowledge reserve, and their musical thinking ability can gradually leave the specific perception of things. Therefore, compared with the students in the lower and middle grades, the selection ratio of songs is lower, and the preference for contemporary pop music and ethnic songs shows a steady upward trend. The real-time measurement of which type of music song you like to learn is shown in Figure 3.

Regarding the answers to their favorite songs and song types, the answers of the two grades were not too different. 12 of them chose contemporary pop songs, 3 said they liked piano music, and 3 said they liked ancient Chinese music. Twelve students who like pop music said, "I often read these songs on my mobile phone." After a long time, they will naturally feel good. It can be seen that the music preferences of the senior students have gradually diversified from the songs of the lower grades, and the musical aesthetic ability has been significantly enhanced.

4.2. Measurement and Analysis of Learning Ability. Questions 8-14 of real-time measurement are mainly used for real-time measurement of students' ability to recognize music, music perception, music memory, and music creation ability. The real-time measurement results are shown in Figure 4. In the real-time measurement of this question, "emotional thoughts" accounted for the largest proportion; followed by "song singing." It can be concluded that the music perception ability and music aesthetic ability of the senior students are stronger. The real-time measurement of the notation ability of the numbered notation and the stave is the 10th and 11th questions of the real-time measurement. Among them, 12 students in the lower grade and 90 students in the upper grade were selected correctly for the three questions. It can be seen that in terms of music knowledge, there is a shortage of students in both upper and lower grades.

Combined with the real-time measurement of the 15th question "How long can I remember the songs learned in class," the most selected option is "within two weeks," accounting for 48.22%; followed by "within one week," accounting for 34.52%. It can be seen that the musical memory ability of senior primary school students is gradually increasing.

Combined with the question 16 of the real-time measurement "Which of the following musical instruments can you be proficient in?," it can be concluded that there are 69 students in the senior grade. The relevant instruments were checked or supplemented in the question, accounting for 58.97% and 65.63% of the correct choice, respectively.

Combined with the real-time measurement question 5 of the interview, "Do you think it is important to learn notation and musical notation?," 9 students expressed affirmative and 9 expressed negative. Students who held a negative attitude said, "I know a little bit of musical notation, the staff is dense, and it looks very difficult, and I do not want to learn it," "I see the score very slowly, and sometimes I forget it, and I feel like I cannot learn it," "If you know how to sing, you should just do it." Okay, why do you need to know music?" and so on. It can be seen that the senior students lack the learning ability and motivation to learn music notation.

4.3. Measurement and Analysis of Teaching Evaluation. Question 17, measured in real time, is "Please rate your classroom music learning content." This study adopts the method of matrix scale questions, and the real-time measurement results are shown in Figure 5. In the real-time measurement of this question, the three teaching contents with the most "more" and "more" in classroom learning are selected as singing practice, song idea explanation, and background knowledge explanation. The least three teaching contents are improvisation, dance learning, and knowledge expansion.

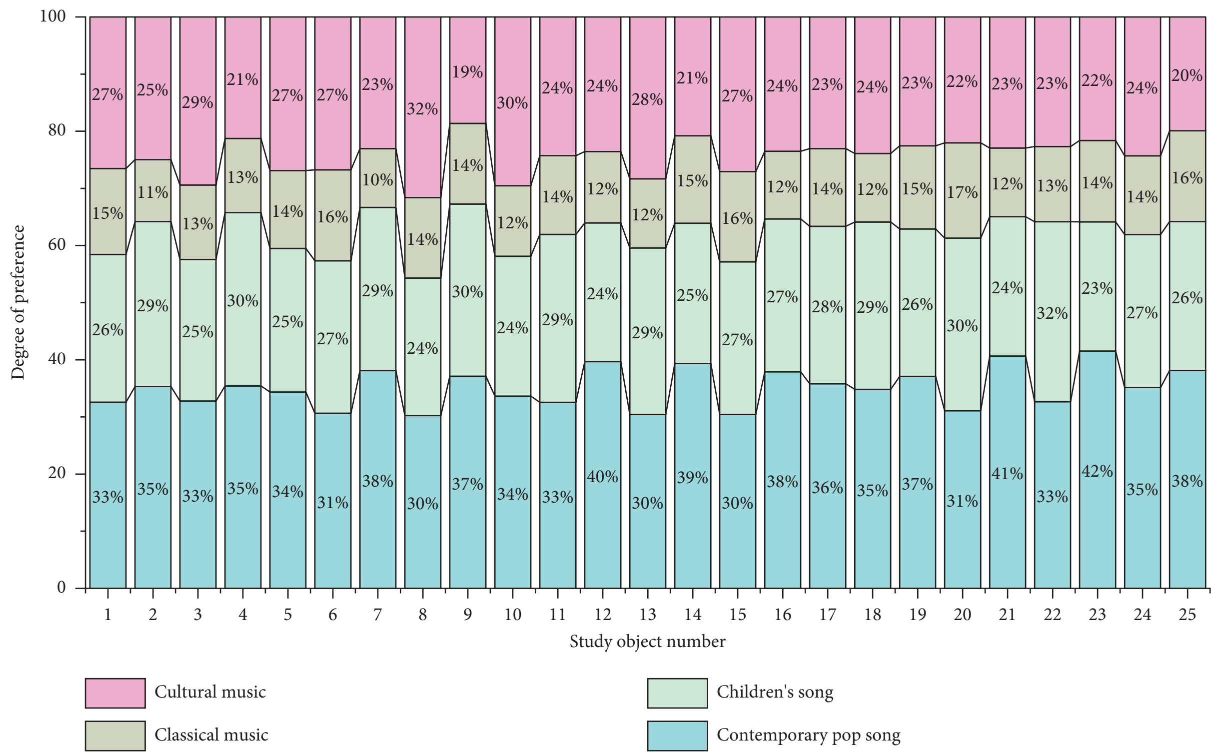

Figure 3: The distribution of the preference degree of song genres.

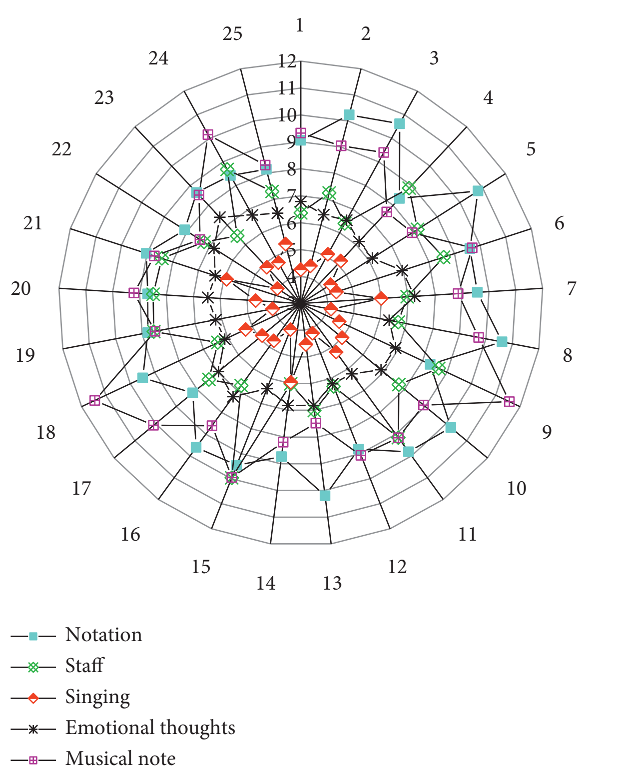

Figure 4: Status measurement of the proportion of music learning ability.

The real-time measurement question 18, "According to several types of teaching content in the previous question, please select the teaching content you most want to add to the classroom" is set on the basis of question 17. In the real-time measurement of this question, "fun games" with the largest proportion of choices, accounting for 16% of the total number; followed by "improvisation" and "dance learning," both accounting for 15% of the total number; the third option is "Expanding knowledge explanation," accounting for 13% of the total number. Students' choices reflect their inner music learning aspirations. It can be seen that the preference categories of music learning of senior students tend to be diversified. For music practice, music creation, and music perception, the difference in the proportion of options is narrowed compared with the lower and middle grades.

Combined with the 19th question of real-time measurement, "Are you satisfied with the music classroom teaching," 33.5% of the students chose "satisfied," 60.41% of the students chose "somewhat satisfied," and 6.09% of the students chose "not very satisfied" satisfy." It can be seen that there is a certain gap between the students' music learning needs and the actual music classroom teaching status, and the students' music learning psychology has not been well understood to a certain extent.

4.4. Learning Expectation Measurement Analysis. The reasons for learning music are mainly measured in real time against the students' motivation to learn music. The real-time measurement results are shown in Figure 6. In the real-time measurement of this question, "I like to study music" with the largest proportion of choices; "I want to get excellent music scores"; the third choice is "I want to be praised by teachers, classmates, and parents." Combined with the real-time measurement of the 4th question in the interview,

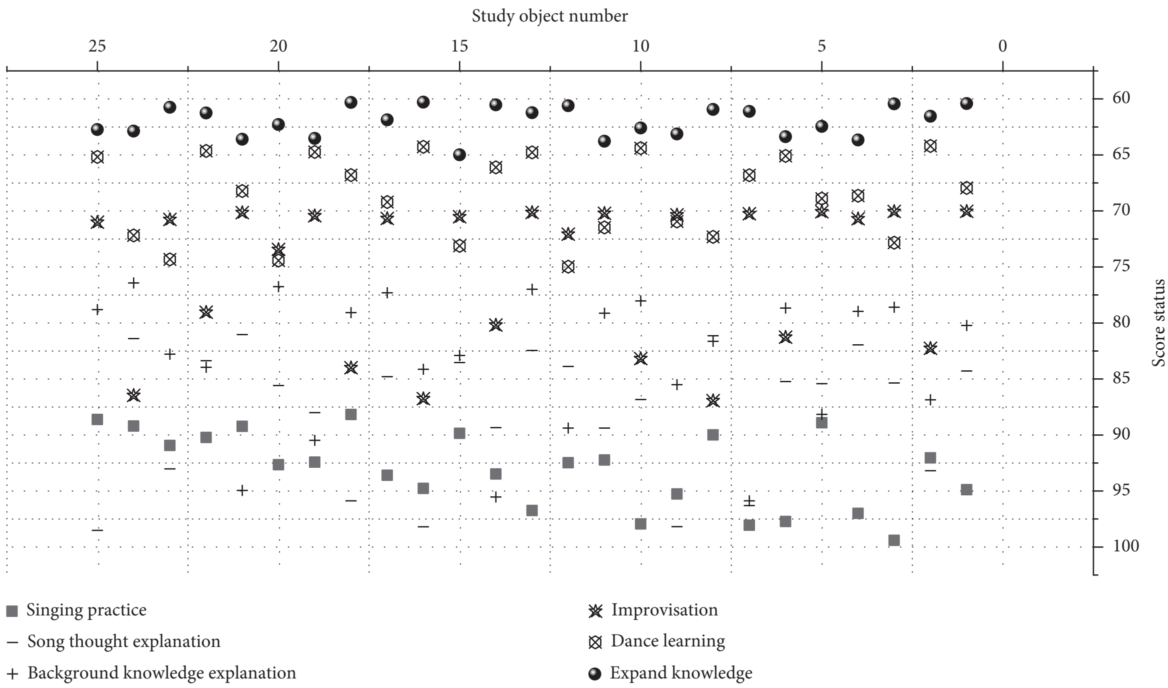

Figure 5: The score status of music teaching evaluation.

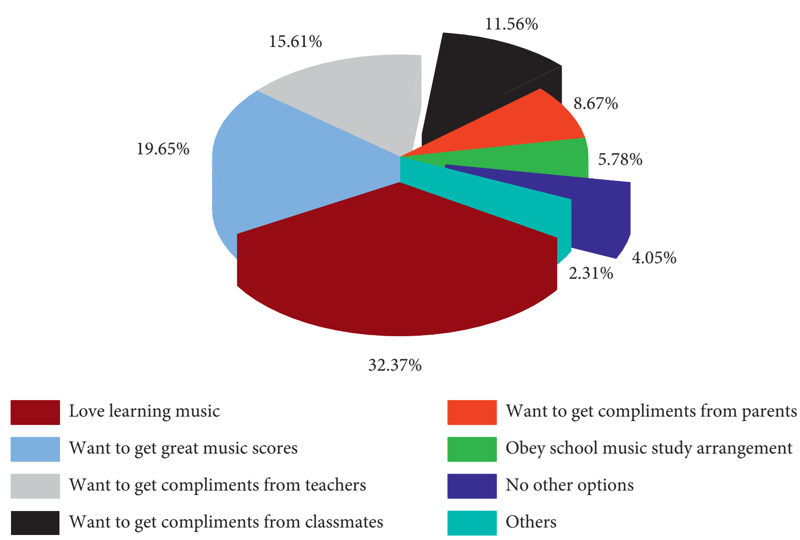

Figure 6: Distribution of reasons for music learning.

"Have you ever thought about attracting the attention of others through your excellent music performance," 12 of them expressed their affirmation. It can be seen that the motives of the vast majority of students to study music are positive, and nearly half of the students have a certain "achievement motive" to study music. It can be concluded that the three main motives are students' own interests and their own requirements.

Combined with the real-time measurement of the interview, question 6, "What do you think is the meaning of learning music," 9 students directly expressed "like," "good sound," "can make people feel good." Being able to express people's feelings through beautiful notes or vivid lyrics is a very beautiful subject," etc., affirming the aesthetics of music, 3 students said, "I like learning music, and I feel that it is wonderful to feel music. The knowledge is very interesting, and I feel proud whenever I learn it," 3 students who have learned music specialties said, "Parents give me music after class. I signed up for the piano specialty class, and practicing the piano has become a habit," "I need to practice at home after my homework, otherwise, I will be criticized when I go back to class every week," and so on.

Senior students already have active music perception ability, and have certain music self-learning ability and aesthetic ability. In addition to pure learning interest, the vast majority of students also include certain negative motivations, such as attachment drive and competency drive; students' psychological activities tend to be complicated.

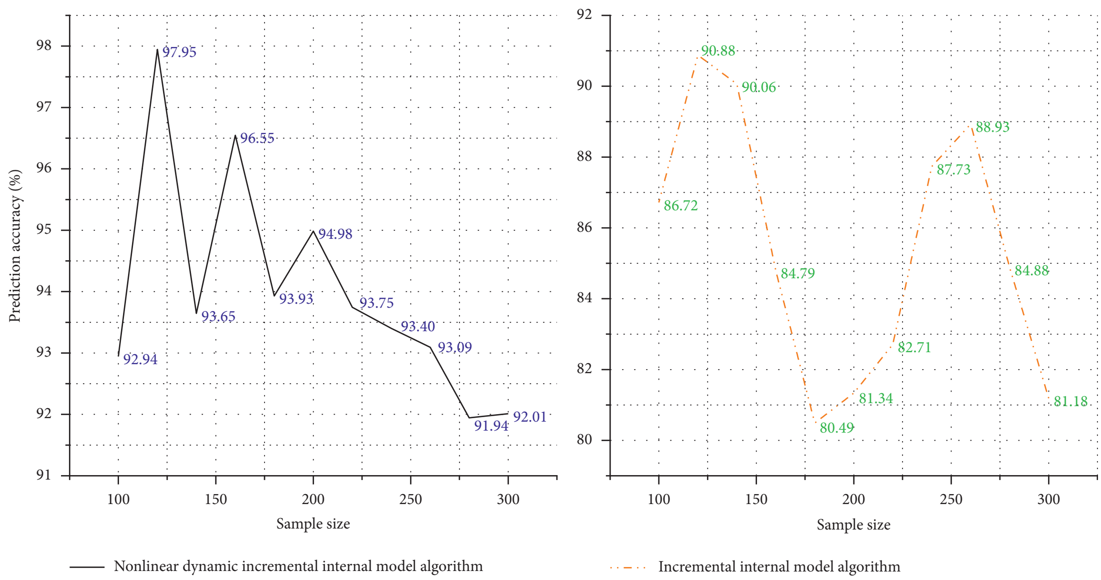

Figure 7: Prediction accuracy of self-efficacy in music learning.

4.5. Self-Efficacy Measurement Analysis. For the real-time measurement of students' musical performance ability, 31.98% of the students chose "Yes" and 68.02% of the students chose "No." Combined with the third question of the real-time measurement of the interview, "Do you dare to perform onstage?," 15 students all said that they "do not dare to go onstage," and 3 students said, "If there is a chance, I am willing to try it onstage."

In the real-time measurement of academic performance in music class, the option with the largest proportion is "average"; the second is "excellent"; the proportion of students who choose "poor" is the least. It can be seen that the two options, the best and the worst, account for a relatively small proportion. More than half of the students regard the "normal" option as their music learning achievement, and most of the students have "average" for their music learning ability. The prediction accuracy of music learning self-efficacy is shown in Figure 7.

In Wincotton's "Theory of Self-Worth," the learner's psychology is divided into four categories in the chart, corresponding to the four options in the questionnaire from left to right. It can be seen that the students with high repellency and low avoidance occupy the largest proportion, followed by high repellency and high avoidance, and students with low repellency and low avoidance occupy the least proportion. To sum up, the students in the upper grades have an optimistic attitude towards music learning, but also cover the negative learning attitude of fear of failure, excessive effort or even not learning, but in general, the vast majority of students are active.

5. Conclusion

This study mainly studies the dynamic matrix control algorithm and predictive function control. As a typical representative algorithm of predictive control algorithm, dynamic matrix control algorithm is based on model prediction, rolling optimization, and feedback correction. It extends the single-step prediction of traditional self-correction technology to multi-step prediction. Repeated optimization can effectively suppress the sensitivity of the algorithm to changes in model parameters, and has strong adaptability to uncertainties such as modeling errors and environmental disturbances. The second chapter of this study analyzes the basic principle of dynamic matrix control, and studies the influence of various parameters in the control process on the control results. The research proves that the setting of parameters has a great effect on the control effect. The basic structure and main properties of the internal model control are introduced, and the reasons why the ideal internal model controller is difficult to realize in reality are analyzed. Aiming at the actual process object, the two-step design method of the internal model controller is introduced, and the IMC-PID control method is introduced. The main design steps of the device are outlined. At the same time, the uncertainty of the model is described, and the tracking and anti-disturbance of the internal model control system are studied. This study conducts real-time measurement and research around the subject of "Music Learning Psychology." In terms of research methods, this study adopts a combination of theory and practice, mainly referring to the relevant materials of musicology, pedagogy, educational psychology, and music psychology, and combining the questionnaires and real-time measurement results of interviews with students' psychological status for analysis and research. This study hopes to provide some theoretical reference for high-quality classroom teaching through its own real-time measurement and research, and also hopes to call on more music teachers to pay more attention to the changes and development of students' learning psychology, respect students' differences in the psychological development of music learning, and combine students' learning psychology with teachers' teaching strategies. Through scientific teaching methods, students can maintain their motivation to learn music and improve their ability to learn music.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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