Construction of Music Intelligent Interactive Teaching System Based on J2EE Platform

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Abstract. In response to the problems of low data interaction efficiency, long system response time, and poor quality of music teaching in traditional teaching systems, this article proposes a study on building a music intelligent interactive teaching system based on the J2EE platform. Choose J2EE as the system development platform, analyze and explore its main service functions, allocate short addresses of each device reasonably, and complete the system network communication design. The use of ASP and ADO technology to achieve intelligent interaction of teaching data provides a foundation for achieving intelligent interactive teaching of music. Using genetic algorithm to intelligently generate test papers, complete the design of the music teaching exam module, and thus achieve the operation of the music intelligent interactive teaching system. The experimental data shows that after applying the designed system, the maximum interaction efficiency of teaching data reaches 188MB/s, the minimum response time of the system is 0.45 s, and the highest score for music teaching is 98 points, fully verifying the better application performance of the designed system.

Keywords: Music Teaching · Intelligent Teaching · Teaching System · Student Exercises · j2ee Platform · Interactive Teaching

1 Introduction

As a very important carrier of culture and art, music plays an increasingly important role in people's life and learning. With the progress of education and teaching system reform, cultivating students' overall quality has become the latest goal of teaching, which has gradually improved the status of music teaching in the teaching system. As an important part of cultivating students' quality education, music education in primary and secondary schools has attracted the attention of the educational community and the whole society. At the same time, teachers are required not only to impart basic knowledge and skills of music to improve students' cultural skills and knowledge, but also to guide and cultivate students. In the process of teaching according to the teaching plan, teachers should effectively use teaching means to give full play to students' independent learning and

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exploration ability, become the main body of teaching activities, and cultivate students' good learning interest, create a positive learning atmosphere, let students actively learn and receive knowledge under the correct guidance of teachers, and through absorption and reengineering, systemize and organize knowledge, build their own learning system, cultivate students' core literacy, and achieve students' all-round development[1].

In recent years, the development of computer software technology has changed people's work and life patterns. In terms of teaching, people's way of acquiring knowledge is also changing significantly. The situation of a single mode of receiving traditional education in the classroom is changing. Especially in recent years, the breakthrough development of Internet technology has enriched and diversified the original online education model. People gradually accept the mode of completing various learning tasks through the network. With the continuous development and application of information technology, the field of education has gradually integrated the trend of intelligence and interactivity. As an important art discipline, music education also needs to keep up with the times and improve teaching effectiveness and learning experience through advanced technological means. The traditional music teaching method has problems such as limited teaching resources, insufficient interactivity, and high difficulty in personalized teaching, which cannot meet the diverse learning needs of students.

Reference [2] proposed an intelligent music classroom teaching system based on the Internet of Things. Using the theory of Internet of Things for reference, an intelligent music classroom teaching system is designed. The intelligent music classroom teaching system can analyze the characteristics of students and teaching content, and then push the appropriate content to students. Teachers can develop more flexible teaching strategies and more accurately evaluate students' performance. Reference [3] proposed a music classroom aided teaching system based on intelligent speech recognition. The auxiliary teaching system of music classroom supported by intelligent speech recognition technology is constructed, and the audio classification technology of music classroom is studied. The support vector machine is used to divide the audio into five types: mute, background, music, voice and noisy voice. At the same time, a smoothing method based on the classification result sequence is proposed to obtain audio segmentation points. According to the actual needs of music classroom teaching, the system model is constructed, and speech feature recognition is carried out with the support of intelligent speech recognition.

The two existing systems mentioned above have certain effectiveness, but the music teaching effect is not satisfactory and cannot meet the development needs of music teaching. Therefore, the research on the construction of music intelligent interactive teaching system based on J2EE platform is proposed. The concept of "interaction" first appeared in the computer field, which was extended from scholars to the field of education and teaching in the 1970s. The starting point of "interactive" teaching method is to let teachers and students enjoy the learning process of teaching and learning more, and attach great importance to interactive communication and reflection in the classroom. This paper introduces the concept of "interaction" in order to improve the quality of music teaching. The construction of a music intelligent interactive teaching system based on J2EE platform proposed in this article has innovative points in the following aspects:

(1) By using ASP and ADO technology to achieve intelligent interaction of teaching data, the efficiency of data interaction has been effectively improved.
(2) By reasonably allocating the short addresses of each device and designing system network communication, the response time of the system has been successfully shortened.
(3) By utilizing genetic algorithms to intelligently generate test papers and designing music teaching exam modules, the quality of music teaching has been improved.

2 Design of Music Intelligent Interactive Teaching System

2.1 System Development Platform Design Module

According to the design system requirements, J2EE is selected as the system development platform, and its structure is shown in Fig. 1.

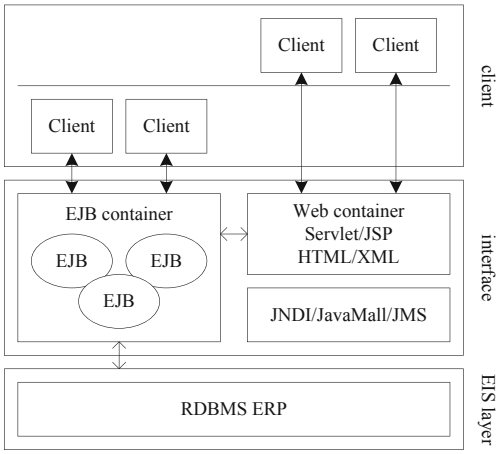

Fig. 1. J2EE Platform Structure

As shown in Fig. 1, J2EE is a technical architecture (application development direction) composed of various components and the standards and technical guidelines that standardize these components. Its main features can standardize and simplify the system deployment and development, and improve the reusability, security and cross platform of the system. The core of J2EE is to promote the compatibility between different architecture platforms using J2EE, and to standardize and standard various components, technical levels and architecture services. J2EE is essentially an architecture. Its core is the standard version of the Java 2 platform or the Java platform. It can simplify the management, deployment and development of solutions at the enterprise level. While inheriting the characteristics of the standard version of "write once, run across platforms", J2EE can fully support XML technology, JSP technology, Servlet technology and EJB technology. At the same time, it can apply security mode to protect the data in the Internet, and illustrate the convenience of database access through CORBA and

JDBC application interfaces. J2EE makes the development platform unified, and can support adding directory, deploying and packaging applications and EJB while supporting the integration of existing applications. It can reduce the complexity of the system and reduce the development cost of the whole system while improving the performance and security.

The core of J2EE is component, and the application using J2EE structure can simplify the development of programs. Reusable business logic is encapsulated in the form of components, and background services are provided by J2EE servers, which can be regarded as a container at this time. Developers can get rid of the heavy service development and only need to focus on the development of business logic.

Important services such as remote connection, JNDI addressing, transaction management and security management can be customized in the form of containers in the J2EE server. The main services are as follows:

(1) Life cycle model

The creation and removal of EJBs can be managed through the life cycle model. The life cycle of EJB mainly includes three states: create, move and remove. The expression is:

$$\begin{cases} T_{EJB} < \alpha_{\min} & \text{Create Status} \\ \alpha_{\min} \le T_{EJB} \le \alpha_{\max} & \text{Mobile status} \\ T_{EJB} > \alpha_{\max} & \text{Remove Status} \end{cases} \tag{1}$$

In formula (1), T_{EJB} It represents the life cycle value of EJB; $\alpha_{\min}$ And $\alpha_{\max}$ Represents the lower and upper limit values for EJB status determination.

(2) J2EE remote connection model

The remote connection model mainly implements the low-level interaction, that is, the interaction between the enterprise bean and the management client. The client can call after the enterprise bean is created, similar to the concept of virtual machine. The success of J2EE remote connection depends on the network traffic, as shown in the following formula:

$$\begin{cases} Q_t \ge Q^* & \text{J2EE Remote connection successful} \\ Q_t < Q^* & \text{J2EE Remote connection failed} \end{cases} \tag{2}$$

In formula (2), Q_t Represents the J2EE remote connection network traffic; Q^* It represents the standard value of network traffic.

(3) J2EE Transaction Management Model

The transaction management model can complete the establishment of the relationship between transaction methods and divide the transaction methods into separate units. By configuring the transaction attributes of enterprise class beans in the configuration file, you can achieve relevant transaction processing. It does not need to write and debug the transaction code separately in each bean, and the container manages the transaction uniformly, reducing the complexity of the code and improving the readability of the system[4]. The calculation formula of J2EE code complexity is:

$$A = \frac{q_d}{\beta \times t_d} \times 100\% \tag{3}$$

In Eq. (3), A It represents the complexity of J2EE code; q_d Represents the number of J2EE codes; β It represents auxiliary calculation parameters; t_d It represents the running time of J2EE code.

(4) J2EE security model

The configuration of web components can be completed using the J2EE security model. Access to system resources is determined by the relationship between roles, customers, and permissions. Roles have activated permissions, customers belong to roles, and authorization can access resources. J2EE security is mainly determined by permissions, and the expression is:

$$B = \{B_1, B_2, B_3, B_4, B_5, B_\varepsilon\} \tag{4}$$

In Eq. (4), B Represents the J2EE security permission set; B_1 Represents J2EE role security permissions; B_2 Represents J2EE client security permissions; B_3 Represents J2EE activation security permission; B_4 Represents J2EE authorized security permissions; B_5 Represents J2EE access security permissions; B_ε It represents other J2EE security permissions.

(5) Database connection pool model

Due to connection restrictions, the database connection is time-consuming and limited. Through the use of the database connection pool, this problem can be solved through the management of the connection pool. Due to the limitation of research space, it is not necessary to repeat it too much.

J2EE server can run containers and Web components in containers; The execution of servlet components and ordinary JSP pages can be managed through the Web container. The management of client components is uniformly completed by the client container.

The above process completes the design of the system development platform, laying a solid foundation for the functional design and implementation of the subsequent music intelligent interactive teaching system.

2.2 System Network Communication Design Module

The network address mentioned in this study refers to the short address, which contains 16 bits in total. Before network communication, the music intelligent interactive teaching system needs to allocate the short address of each device[5]. After system initialization, the 16 bit network address will be dynamically allocated. The 16 bit network address includes 0 to 65535. All 0 addresses are used by the coordinator. Other addresses will be allocated using the following mechanism:

(1) Step 1: Determine the maximum number of all child nodes that can be connected to each parent node N_m, the system gives a reference parameter $N_m = 20$;
(2) Step 2: Determine the maximum number of all child routing nodes that can be connected to each parent node R_m, where $R_m \leq N_m$, the reference parameters given by the system $R_m = 6$;
(3) Step 3: Determine the maximum depth of the network node as S_m, the reference parameters given by the system $S_m = 6$;
(4) Step 4: Determine the network depth of the node's parent node D_m, where $D_m < S_m$, the reference parameters given by the system $D_m = 0, 1, 2, 3, 4, 5$;

(5) Step 5: Calculate the offset of the network address allocated by the parent node to the child node at a certain depth. The calculation formula is:

$$\chi(D_m) = \begin{cases} 1 + N_m * (S_m - D_m - 1) & R_m = 1 \\ \frac{1+N_m-R_m-N_m*R_m^{(S_m-D_m-1)}}{1-R_m} & otherwise \end{cases} \tag{5}$$

In formula (5),$\chi(D_m)$ It represents the offset corresponding to the network address allocated by the parent node to the child node at a certain depth.

(6) Step 6 starts to calculate the network addresses of router nodes and terminal nodes.

There are mainly two types of node network access, namely non router node network access and router node network access [6]. The address of the parent node is C_k, depth is D_m, and has N Non routing child nodes, of which the n When non routing sub nodes join the network,$n \leq N$, the short address calculation formula of this sub node is:

$$C_n = C_k + \chi(D_m) * R_m + n \tag{6}$$

In formula (6),C_n Indicates the short address of the child node.

When the router node is connected to the network, the address of the parent node is C_k, depth is D_m, and has N Routing child nodes, of which the n When routing sub nodes join the network,$n \leq N$, the short address calculation formula of this sub node is:

$$C_n = C_k + \chi(D_m) * (n-1) + 1 \tag{7}$$

In the process of network address allocation, the system will have a variety of problems, especially when the number of nodes in the network increases slowly, the network address limit will be highlighted. In general, the network address has 16 bits, which can accommodate up to 65535 nodes. During the allocation process, set the parameters of using network address allocation, and each parent node can accommodate at most N_m Child nodes,R_m Sub routing node, the maximum depth is S_m;Then there is a mathematical relationship between these parameters and the maximum value. At the same time, the reference value used is the parameter set by the system, and the relationship between these parameters and the maximum value is shown in Table 1.

As shown in Table 1, the formula for calculating the number of summary points is:

$$Z_n = \frac{R_m^{S_m} - 1}{R_m - 1} * N_m + 1 \tag{8}$$

In Eq. (8),Z_n It represents the amount of summary points.

When deploying network nodes, the actual total number of nodes cannot exceed 65535. If the set parameters are used, when the set parameter value is greater than 65535 nodes, the nodes in the network can not form a full tree, but can only form part of the network. At this time, the address is not enough and new nodes cannot be added to the network; When the set parameter value is less than 65535 nodes, even if all nodes in the network reach the set value and join the network, 65535 addresses are not used up. At this time, all network nodes are assigned to network addresses, and the network forms a full tree, and the remaining network addresses cannot be used[7]. To avoid wasting

Table 1. Relation between set value and maximum value

parameter	R_m	S_m	N_m	Number of summary points
Initial parameters	6	5	20	31101
$R_m + 1$	7	5	20	56021
$R_m + 2$	8	5	20	93621
$N_m + 1$	67	5	21	32656
$N_m + 1, R_m + 1$	7	5	21	58822
$N_m + 1, R_m + 2$	7	5	22	61623
$N_m + 1, R_m + 3$	7	5	23	64424
$N_m + 1, R_m + 4$	7	5	24	67225
$S_m + 1$	6	6	20	186621
…	…	…	…	…

network addresses, the set value can be slightly greater than 65535, so the parameters selected in this paper are $N_m = 20$, $R_m = 6$, $S_m = 6$.

The above process completes the design of system network communication, reasonably distributes the short address of each device, and provides support for the stable operation of the design system.

2.3 Intelligent Interactive Module of Teaching Data

The design system mainly uses ASP and ADO technology to realize the intelligent interaction of teaching data, which provides the basis for the realization of music intelligent interactive teaching.

ASP is the abbreviation of Active Server Page. It is an open application environment without compilation. It provides flexibility of CGI programs and scripts while ensuring performance. Unlike CGI, ASP runs in the process of the server and is multi-threaded. It can be optimized to handle a large number of users. It combines the simple scripting of HTML with Active Server components and other tools to create a dynamic website with strong interactivity. The essence of ASP technology is the server side ActiveX technology, which is the object-oriented network data service technology[8]launched by Microsoft. ASP commands are first interpreted and executed on the server side, and then the execution results are downloaded to the web browser running on the client side or the local application system of the office web browser. It runs on the server side. Users can't see the ASP source code and can't interfere with the normal operation of the program, thus ensuring the security of the server side program.The teaching data interaction program is shown in Fig. 2.

As shown in Fig. 2, the teaching data is transmitted in the network based on the execution results, which improves the transmission speed. The page encapsulated with ASP instructions must submit an access request to the server program in HTTP mode, otherwise the server will refuse to provide the client copy and operation results because

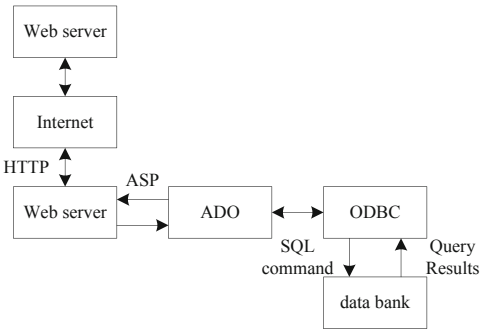

Fig. 2. Schematic diagram of teaching data interaction program

it is unable to determine the specific logical location of the client that is applying. As an object-oriented network application technology, ASP has 7 objects to complete the operation of remote database.

ADO technology can be combined with ASP to execute SQL in HTML pages and query, update and delete the data information of the site server in the browser.ADO uses the RecordSet object as the main interface for data access, and uses VbScript and Jscript languages to control database access and output display of query results. ADO can connect to SQL Server, Oracle, Sybase and other databases that support ODBC. Its advantages lie in its simplicity, high speed, low memory usage and low disk usage. The ActiveX Object based on ADO structure optimization is called ADODB. The execution environment required by ADO on the server side is Windows Server and IIS 5.0, and the execution environment on the client side only requires a general browser[9]. The specific steps of ADO data access are shown below.

Step 1: Set the database source.Generally, ODBC can be used to select the database name, and specify the drivers and database files for books and periodicals, or use OLE DB to access directly;

Step 2: Use "Sewer. CreateObj ect" to establish the connected object, and use the "Open" command to open the database to be accessed and queried;

Step 3: Set the SQL command, and use the "Execute" command to start the action of accessing the database. For example, Set rs = conn. Execute (SQL command), where corm is the name of the object to be connected;

Step 4: Use the RecordSet object command to display the results of the query operation.Where rs.fields.count represents the number of fields in the record; Rs. Eof indicates whether the specified last line has been reached.

The above process completes the development of intelligent interactive program for teaching data, providing a certain means of support for interactive teaching.

2.4 Music Intelligent Interactive Teaching Assessment Module

Music intelligent interactive teaching assessment is also a key component of music intelligent interactive teaching system. This research uses genetic algorithm intelligence to form music intelligent interactive teaching assessment papers. The specific process is as follows:

Genetic algorithm is a computer algorithm based on the principles of natural selection and genetic genetics, which is usually used to solve optimization problems.The design of music intelligent interactive teaching examination paper can be realized by using genetic algorithm through the following steps:

1. Determine optimization objectives and evaluation indicators: consider the knowledge points to be examined in the examination paper and their importance, and determine appropriate evaluation indicators, such as the difficulty, quality and coverage of the examination paper.
2. Design test paper generation rules: according to the assessment requirements and evaluation indicators, design a set of test paper generation rules, such as random selection of knowledge points, question type proportion control, etc.
3. Generate initial test paper library: use the above generation rules to generate a certain number of initial test paper libraries.
4. Define the chromosome coding mode of genetic algorithm: convert the components of different test papers (such as the number of questions, the combination of knowledge points, etc.) into chromosome coding mode to facilitate the comparison and selection of different test papers by genetic algorithm.
5. Determine the fitness function: convert the evaluation index of the examination paper into the fitness function, which is used to compare the advantages and disadvantages of different examination papers, and determine the selection and crossing mode of the parent chromosome.
6. Iterative optimization of genetic algorithm: select, cross and mutate the parent chromosomes to generate new offspring chromosomes, and evaluate and sort the offspring chromosomes according to the fitness function. Continue to iterate until the preset stop condition is reached.
7. Generate the final test paper: generate the final music intelligence interactive teaching examination paper according to the optimal solution obtained by genetic algorithm optimization.

It should be noted that the design of music intelligent interactive teaching examination paper using genetic algorithm is a relatively complex process, which requires reasonable details design and adjustment according to the actual situation.

Establish a state space to control the indicators of automatic test paper generation E. E Each row of is composed of the control indicators of a test question, such as question number, question type, chapter, difficulty, etc., and these attribute indicators are coded and expressed in binary form, while each column is all the values of an indicator in the question bank. The following describes the definition of genetic algorithm in combination with the test paper generation system.

In genetic algorithm, the so-called L individual X, that is, the length is L 0 and 1 strings of, referred to as individuals;L It is called individual chain length,L All records of individuals $f = \{0, 1\}^L$, called individual space, and the expression is:

$$E = \begin{bmatrix} e_{11} & e_{12} & \cdots & e_{1,m+n} \\ e_{21} & e_{22} & \cdots & e_{2.m+n} \\ \vdots & \vdots & \ddots & \vdots \\ e_{m+n,1} & e_{m+n,2} & \cdots & e_{m+n,m+n} \end{bmatrix} \tag{9}$$

In the test paper generation system, the individual is each test question, and the number of control indicators of each test question is its chain length. The so-called population is N A collection of individuals (individuals are allowed to repeat), referred to as a population.N It is called the population size, and the expression is:

$$N = \left\{\overline{X} = (X_1, X_2, \cdots, X_N), X_i \in (E)\right\} \tag{10}$$

When genetic algorithm is applied, the quantity to be controlled must be coded first. In order to facilitate calculation, binary encoding is adopted here, that is, the character set is composed of 0 and 1. For the convenience of description, we only select a part of the control quantity: chapter, question type and difficulty of the test question for coding, such as 1001011100. After coding, determine the fitness function of the test question. In genetic algorithm, external information is basically not needed, and only the fitness function is used as the basis for optimization. The only requirement of genetic algorithm for fitness function is that the function cannot be negative. In the theory of evolution, the survival of the fittest is the principle of natural evolution. There should be criteria for excellence and inferiority, and the fitness function is used to describe the fitness of each individual. For optimization problems, the fitness function is the objective function. The purpose of introducing fitness function is to evaluate and compare individuals according to their fitness and determine the degree of superiority and inferiority. The fitness function expression is:

$$F : f \to g^{+} \tag{11}$$

In Eq. (11),F It represents the fitness function;g^{+} It represents the space of positive real numbers.

Suppose that the difficulty distribution of each question in a question type follows normal distribution $\lambda \sim N\left(\eta, \delta^2\right)$, where η Is the average difficulty,δ^2 Is the variance, which falls in the interval $[\eta - 3\delta, \eta + 3\delta]$ The probability sum within the range is approximately 1. We have identified five levels of difficulty in this system.Set the total number of test questions as *sum*, the number of each difficulty question is M_1, M_2, M_3, M_4 and M_5, there are:

$$sum = M_1 + M_2 + M_3 + M_4 + M_5 \tag{12}$$

Among them, $M_1 = \int_{-\infty}^{-2\delta} F(x)dx$, $M_2 = \int_{-2\delta}^{-\delta} F(x)dx$, $M_3 = \int_{-\delta}^{\delta} F(x)dx$, $M_4 = \int_{\delta}^{2\delta} F(x)dx$, $M_5 = \int_{2\delta}^{+\infty} F(x)dx$.

After determining the number of each question, the fitness function of difficulty can be determined.Let the difficulty coefficient of each question be P_f, the expected difficulty coefficient is e_f, the reciprocal of the square difference between the difficulty coefficient of each question and the expected difficulty coefficient is the fitness function F, there are:

$$F = \frac{1}{\psi^o * \left[P_f - e_f\right]^2} \tag{13}$$

In Eq. (13), ψ^o It represents the auxiliary factor of fitness function, which determines the performance of genetic algorithm.

According to the characteristics of this database and test paper generation method, we choose standard genetic algorithm to generate test papers.The process of generating test paper is as follows:

Step 1: According to the user's initial settings, randomly select a group of questions from the database and number each question. The function to generate the initial population is initpop(). Each chromosome coding bit in the population is selected from 0,1 with equal probability. After the chromosome coding is generated, the individual is decoded and fitness is calculated.

Step 2: Combine the calculation results with the state space library E Indicators in $E(n)$ For comparison, if it matches, there are:$F(k) \leftarrow F(k)+1$;If not, there are:$F(k) \leftarrow F(k)+0$.

Step 3: Conduct elimination selection, namely $F(k)$ Remove the test questions that are 0 to generate a new test question model.

Step 4: Design genetic operation: use the roulette wheel to select the designed function select() and return the selected individual number in the population. First generate a random number between (0,1)U, if $U < sum$, the first individual is selected.

Step 5: Design the function crossover () for the single point crossing operation. The parent parent 1 and parent 2 generate child individuals child 1 and child 2. If the crossing occurs, process the code assignment and return the crossing point arrow cross; Otherwise, no processing is done and 0 is returned.

Step 6: Design the mutation () function for the mutation operation, and determine whether the individual child's code bit is operated according to the mutation probability Pmq. If a code bit is mutated, the code will be reversed.

Step 7: After the above steps of selection, crossover and variation are completed, a new test question model is generated, and its convergence is judged according to the set error precision. If it meets the requirements of the appropriate degree, the test paper is successfully formed, and it is transferred to the next step;Otherwise, go to step 3 and repeat the above process.

Step 8: Output the results and complete the test paper generation. When initializing the test questions, we choose the mode of parent selection, that is, random sampling without return, so that each test question can be selected. In the selection process, the probability of each question being selected is a non-uniform random event, and its probability depends on the last selection result [10].

Through the design of the above modules, the design and operation of the music intelligent interactive teaching system are realized, which helps to improve the quality of music intelligent interactive teaching.

3 Design System Performance Test

3.1 Experiment Preparation Stage

To verify the effectiveness of building a music intelligent interactive teaching system based on J2EE platform, a simulation experiment is designed. The experimental environment is as follows: Using Linux operating system and Eclipse development tools to develop a music intelligent interactive teaching system.

The preparation stage is the key to the smooth progress of the experiment. The design system adopts genetic algorithm in the music intelligent interactive teaching assessment module, which involves fitness function auxiliary factors ψ^o, which determines the advantages and disadvantages of the function of genetic algorithm, and is also the key to the stable operation of the design system. Therefore, before the experiment, it is necessary to add auxiliary factors to the fitness function ψ^o Determine the best value.

Get fitness function auxiliary factors through testing ψ^o The relationship with the running efficiency of genetic algorithm is shown in Fig. 3.

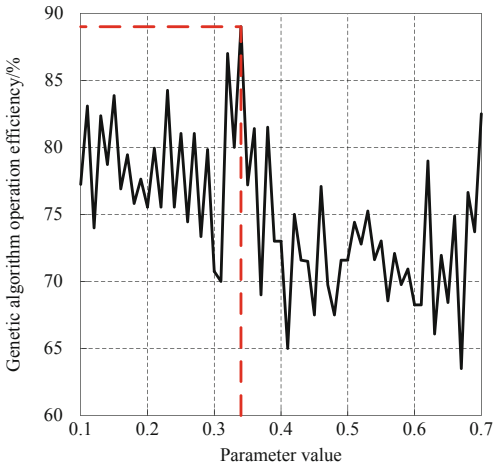

Fig. 3. Fitness function auxiliary factors ψ^o Relation diagram with running efficiency of genetic algorithm

As shown in Fig. 3, when the fitness function auxiliary factor ψ^o When the value is 0.34, the running efficiency of genetic algorithm reaches the maximum of 89%. Therefore, determine the fitness function auxiliary factor ψ^o The optimal value is 0.34.

The above process has completed the preparation of the experiment and provided convenience for the subsequent experiments.

3.2 Analysis of Experimental Results

Set the intelligent music classroom teaching system based on the Internet of Things (Reference [2] method) and the music classroom auxiliary teaching system based on

intelligent speech recognition (Reference [3] method) as comparison systems 1 and 2, and select teaching data interaction efficiency, system response time and music teaching results as evaluation indicators. The specific experimental results analysis process is shown below.

The efficiency of teaching data interaction obtained through experiments is shown in Fig. 4.

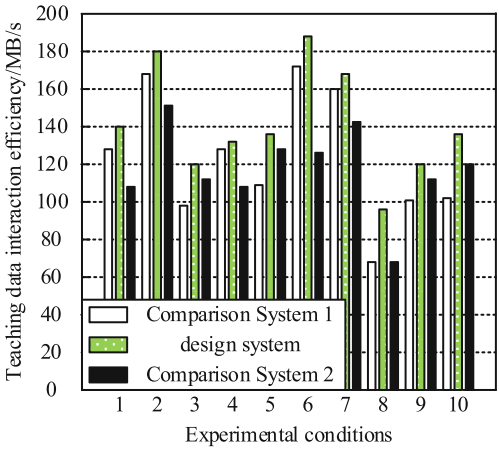

Fig. 4. Schematic diagram of teaching data interaction efficiency

As shown in Fig. 4, after the application of the designed system, the interaction efficiency of the teaching data obtained is higher than that of the two comparison systems, with the maximum value of 188 MB/s, while the maximum value of the interaction efficiency of the teaching data of System 1 is 172 MB/s, and the maximum value of the interaction efficiency of the teaching data of System 2 is 152 MB/s. It can be seen that the teaching data interaction efficiency of the designed system is high. This is because the proposed method in this study utilizes ASP and ADO technologies to achieve intelligent interaction of teaching data, which significantly improves the efficiency of data interaction compared to traditional teaching systems.

The system response time obtained through experiments is shown in Table 2.

As shown in the data in Table 2, the system response time obtained after the application of the designed system is shorter than that of the two comparison systems, with the minimum value of 0.45 s, while the minimum value of the system response time of System 1 is 3.56 s, and the minimum value of the system response time of System 2 is 4.15 s. The proposed method in this study significantly reduces waiting time for students and improves teaching efficiency by appropriately allocating short addresses to each device and designing system network communication.

The music teaching results obtained through the experiment are shown in Fig. 5.

Table 2. System Response Schedule/s

Test conditions	design system	Comparison system 1	Comparison system 2
1	2.03	3.56	5.02
2	1.56	4.23	4.15
3	1.02	5.02	5.02
4	0.56	6.12	5.23
5	0.45	5.18	6.45
6	0.89	6.32	7.02
7	1.10	5.78	7.45
8	1.20	6.59	8.02
9	1.02	7.70	5.45
10	0.89	6.59	7.25

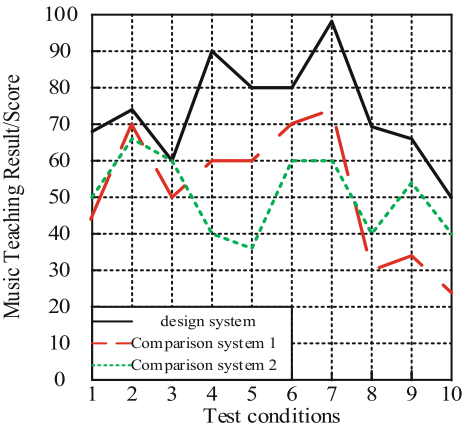

Fig. 5. Schematic diagram of music teaching results

As shown in the data in Fig. 5, after the application of the designed system, the music teaching results obtained are higher than those of the two comparison systems, with the maximum score of 98 points, while the maximum score of the music teaching results obtained by System 1 is 75 points, and the maximum score of the music teaching results obtained by System 2 is 67 points. It can be seen that the designed system can improve the efficiency of teaching data interaction, shorten the system response time, and effectively improve the music teaching performance of students. The proposed method in this study effectively enhances music teaching performance by utilizing genetic algorithm for intelligent paper composition and designing a music teaching examination module, thus demonstrating the effectiveness of the system in improving music teaching quality.

4 Conclusion

In the process of music teaching, through teachers' experience accumulation and summary, it can be found that the problems encountered by students in learning to a certain extent have their similarities. Through problem consultation, students can conduct real-time problem consultation, and understand and master the problems encountered by other students, so as to reduce unnecessary detours. Common problems can be solved by querying historical records; At the same time, teachers can summarize and summarize the original, typical and universal questions from the history question and answer records, and summarize them into the question database for unified processing, so as to facilitate later queries. By analyzing and summarizing the problem library irregularly, it is helpful for teachers to timely summarize and summarize the problems encountered in the teaching process, adjust teaching methods and teaching methods, improve teaching quality and increase feedback. Assisted teaching in the form of multimedia can stimulate students' interest, improve memory and understanding. The design system effectively improves the efficiency of teaching data interaction, shortens the system response time, improves the results of music teaching, and can provide more effective system support for music teaching.

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