

Retraction

Retracted: Design and Implementation of Music Teaching System Based on J2EE

Scientific Programming

Received 18 July 2023; Accepted 18 July 2023; Published 19 July 2023

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] Y. Zhu and S. Liang, "Design and Implementation of Music Teaching System Based on J2EE," *Scientific Programming*, vol. 2022, Article ID 2179882, 10 pages, 2022.

Research Article

Design and Implementation of Music Teaching System Based on J2EE

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Received 10 July 2022; Revised 15 August 2022; Accepted 20 August 2022; Published 22 September 2022

Academic Editor: Lianhui Li

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In order to improve the quality and management efficiency of music education, research on the music education system based on J2EE is carried out. The music education system adopts J2EE technology, UML modeling technology, SQL Server 2012 database, Web programming technology, MVC mode, etc., which can effectively guarantee the operation performance and security performance of the system in the later application. By analyzing the background, current situation, and demand for the music education system, the design and implementation of the music education system based on J2EE are proposed, the overall realization of system management functions, music teaching management functions, music course management functions, and other functions.

1. Introduction

With the popularization of concept-based teaching methods such as quality education and comprehensive education in schools, my country has invested more energy in art education. In particular, cultivating evangelists in art education, the Art Department of Yun Normal University has entered a new stage in its music teaching management under this background. Through a series of means to make teaching more scientific and standardized. The rapid economic and social development has changed people's long-standing production and living patterns to a considerable extent. In terms of education, the increasingly accelerated social rhythm makes the traditional face-to-face centralized teaching mode gradually unable to meet people's increasing learning needs [1]. In recent years, with the rapid development of computer and multimedia technology, and information-based online teaching method based on the Internet has been gradually accepted and recognized by people. At present, the popularity of the Internet in my country is increasing day by day, and the online teaching mode has gradually become a normalization that relies on

and complements the traditional offline teaching mode due to its advantages of fast dissemination, wide-coverage, and less impact on time and space. Educational model [2]: at the end of 2019, the novel coronavirus pneumonia (COVID-19) outbreak broke out all over the world, and people's social environment was greatly affected. Due to the epidemic, the teaching of domestic primary and secondary schools and colleges and universities was also unable to provide normal classroom teaching activities as scheduled, making the online teaching-based remote teaching mode the main teaching method of various educational institutions during the epidemic. Although the epidemic situation in my country has basically been effectively controlled, the development of the epidemic situation is still relatively severe on a global scale. Therefore, effectively reducing social activities through online teaching is still one of the main methods to effectively prevent and control the epidemic. In this context, people's attention to music teaching system research has gradually increased [3].

The realization process of the music education system is very complicated, and it is necessary to study the practical activities of music education based on theoretical

knowledge. However, many current ITS systems do not have this basic knowledge, so the educational process achieved is too simple [4]. This paper starts from the development status of music education at home and abroad and develops a music education system based on J2EE according to the basic requirements and characteristics of music education. This paper adopts J2EE development technology, overall use of UML modeling, SQL Server 2012, JAVA language, MVC mode, and Web programming technology from the actual needs, to provide a basic guarantee for music education. The specific content of the music education system based on J2EE is mainly reflected in the following aspects: design and implementation of system management functions, design, and implementation of music resource management functions, design and implementation of music course management functions, etc. [5].

With the increase of music teaching needs and users, the demand for music teaching curriculum resource data and network bandwidth resources has also shown explosive growth. The service provision capability of traditional music teaching systems has been unable to meet the increasing demand for music curriculum data dissemination. Therefore, it is very necessary to use the more advanced cloud computing distributed network technology and network load balancing algorithm to optimize and upgrade the service provision capability of the music teaching system [6].

This paper analyzes the existing problems and status quo of the music teaching model of the Department of Art of Yunshi University and uses the object-oriented analysis and design ideas in combination with the actual situation, combined with J2EE computer technology, to realize the informatization, scientific, and standardization of music teaching. This system uses the open-source SSH (Spring Struts Hibernate) as the basic framework of the system and uses SQL Server with excellent security and operability as the database [7]. Using the MVC model to design the Struts architecture ensures that the system has good maintainability and at the same time enhanced data. The importance of music teachers in the traditional teaching mode is relatively high, and most of them teach in the form of face-to-face teaching. The traditional teaching mode has a single method and lacks of change in content, which leads to poor information transmission in a short period of time [8]. At present, the desire of students who study music in schools is relatively high, and the "narrow" information input forms a great contrast with reality, which cannot meet the needs of students who study music. Through this complete system, it can be a good teaching environment. It is an improvement of the teaching system, which makes music teaching appear in multiple dimensions while reducing the teaching pressure on teachers. On the other hand, it can meet the needs of students for music learning. Processing power: realizes the separation of data and view, and technology makes the system into a system with strong scalability and maintainability. This paper mainly assists students in the initial construction of a new model of music teaching from the aspects of cultivating students' interest in learning, adjusting teaching goals, expanding teaching content, innovation, teaching evaluation, and improving teaching methods [9].

The teaching mode emphasizes the coordination of covering music, performance, and enjoying unified comprehensive teaching so that students can get a comprehensive and rich music aesthetic experience, and learning can create a new realm of their own personality, and gradually improve the quality and personalization of modern music. Comprehensive healthy development. This subject takes the informatization of the music teaching system as the research content and realizes the teaching system based on WEB, which can not only optimize knowledge but also apply the project-based collaborative teaching mode technology to the informatization of the music education system. This teaching system builds applications on the B/S structural framework development environment and multilayer system architecture to assist music teaching activities [10].

2. Introduction to Related Technologies

2.1. J2EE. J2EE includes the following three component types: one is the in-app program, which is mostly used for internal training computers; the second is Servlet and JSP components, which are often used in some Internet; the third is the EJB component, which completes its functions on the server-side. J2EE belongs to JAVA, and its programming method is similar to JAVA, but there are some substantial differences. J2EE components can be used in application programs, and at the same time, they can be consistent with the J2EE specification [11].

Since J2EE has a complete set of specifications, in general, J2EE can be regarded as a constraint of the JAVA2 platform on music education. In addition, J2EE has many advantages; for example, it can meet various requirements of the bottom layer of the system through containers, and the development speed of system personnel has been greatly improved. J2EE uses the middle-tier integration framework for program development, which reduces the cost of system development, and not only improves its performance but also ensures the security of system operation [12].

2.2. JAVA Language. At the end of the 20th century, in order to design a cross-platform and distributed software system, Sun Computer Systems researched and launched the JAVA language in the United States, which is an object-oriented design language. For software developers, learning JAVA is simpler to use, and can also perform exception handling and automatic collection of discards. The programming language has functions such as porting and interpretation, so it has been widely used after its launch [13].

After continuous development, JAVA has been continuously expanded on the basis of the original programming language and has become a mainstream technology in the computer software industry. Chip technology, Internet connection technology, and other fields [14]: based on the many advantages of JAVA, its application is also very wide, and its main application directions include game systems developed in large numbers today and mobile Internet-related systems. At the same time, it is also widely used in many colleges and universities, such as educational

administration, college teaching, and other management systems. At the same time, due to its various advantages, it is often used in the relevant information systems of government departments [15].

2.3. UML Modeling Technology

2.3.1. Introduction to UML. UML (Unified Modeling Language) is the best way to represent program visualization. It is commonly used in current program design. In short, using this UML pattern to design programs makes the program layering more obvious, and the later testing of software design. And the maintenance is simpler, for developers, it will greatly reduce their development and testing time [16].

In this mode, graphical structural use case diagrams, sequence diagrams, activity diagrams, class diagrams, and state diagrams are used. These diagrams can realize many functions, including the whole process of a subject from production to demise. The standard is separated, and the original complete program is divided on the basis of these three blocks, so as to facilitate the operation of the program [17].

The UML view is mainly used to display the results of program processing. The relevant programmers can analyze the program according to the display. When using the WEB for related operations, the MODEL needs to be converted into the HTML running mode first. In the operating environment of the system, its own visual graphics can display the program, UML is a program that helps to generate view-related content and interact efficiently with clients [18].

M in UML design mainly refers to the data model object. In the whole process, the control layer of the use case diagram transfers the relevant model objects that need to be processed to the view layer, and the related operations are displayed in the view layer. In the whole process, the data model is a designed complex of calculation rules, processing flow and analysis rules, through which data is processed and displayed. The control layer is the bridge linking the view and the model layer, matching the two to facilitate processing and operation, which also makes the data and logic interfaces between the various layers of the program more coupled under the UML design. The use of this technology makes the systematic testing of music education systems simple and convenient [19].

2.3.2. Advantages of UML and Its Application in This System.

The most important function in UML, the realization of visualization technology, has always been one of the basic application frameworks on the Web, and its practical cases can be seen everywhere. Its basic core includes use case diagrams, sequence diagrams, and class diagrams. Key content: the first function is to realize the application demonstration function of system-related functions, the second function is to realize the business logic layer demonstration function, the third function is to realize the data access demonstration function, and the last main function of the domain model layer is to solve modeling problems. Each layer performs its own duties in its own field and has its own

tasks. UML separates and isolates the entire interface operation function of the system as a whole, and reduces the degree of interaction and coupling, which is important for the subsequent maintenance and expansion work. It is of great help to the design scheme and technical development of the entire research and development process of Web applications [20].

2.4. MVC Pattern. The abbreviation of the three concepts of model, view, and controller is represented by MVC. Through these three parts, the software design part in the WEB development process is realized, the rapid development, upgrade and maintenance of the system is realized, and modularization is provided for designers selection, which greatly optimizes the efficiency of program development. The schematic diagram of the MVC mode function implementation is shown in Figure 1 [21].

2.5. SQL Server 2012 Database Technology. SQL Server 2012 is based on the research and design of the previous version of SQL Server. It has been greatly improved on the previous version, and its cohesion, practicality, integration, and other properties have been further strengthened. Therefore, the software is more widely used in practical applications and can adapt to the daily data management needs of various software with increasing update frequency. Its practical application market is very large, but it is mainly used in the data information management system of large and medium-sized enterprises [22].

This version inherits the layered structure of its previous version. The first is the protocol layer. This layer is mainly used to operate and process-related data information, such as format changes, data-related operations, and structural responses of operations. Developers can directly operate this layer, and perform a series of required operations on the data through this layer. At the same time, developers can use this layer to change the format of data information and change its format to the desired pattern that can be recognized. The result of its modification is sent to the next layer, where the data is converted again as required. This time the data can be converted to the data information format that can be recognized and used by the user, so as to facilitate the user to match the required data and access to the data information, so it is called the access layer [23].

The characteristics and advantages of this system are summarized in the following four points: (1) broad applicability, (2) strong security, (3) high availability, and (4) scalability.

2.6. Web Programming Technology. The WEB programming technology adopted by the music education system is the current mainstream development technology system, including the development of the WEB terminal, the development of the mobile terminal, the development of the web interface and the development of database, and the development of the system realized from multiple perspectives. The development technology used for the system studied in

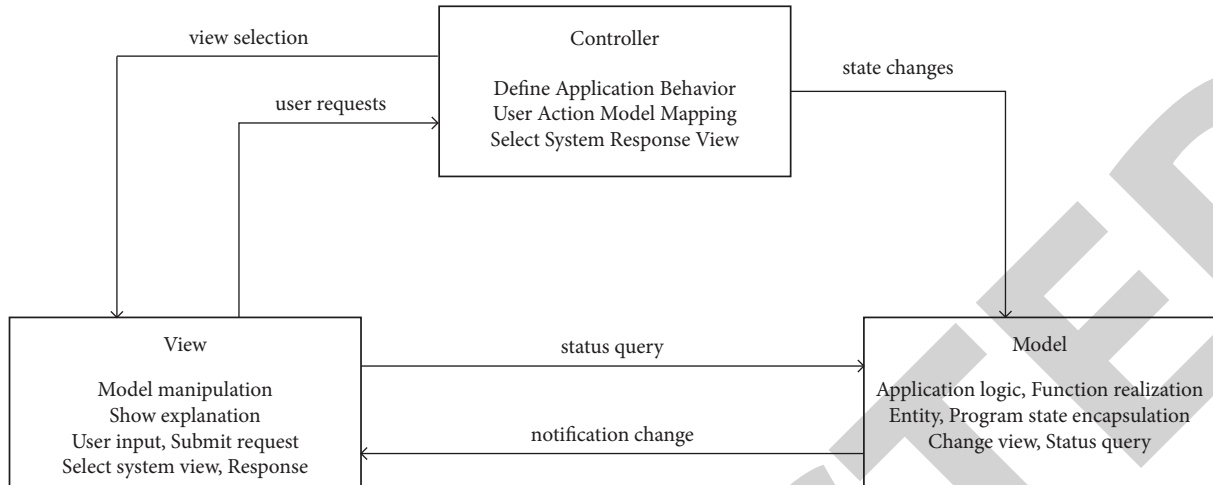


FIGURE 1: Schematic diagram of MVC mode function implementation.

this paper is implemented based on a three-tier architecture, including the design of the presentation layer, the business logic layer, and the data persistence layer, and is developed around the object instance of the music education system [24].

3. Demand Analysis of the Music Teaching System

3.1. Analysis of Functional Requirements

3.1.1. Information Release Module. The information release management part mainly includes two functions, one is to release news information, and the other is to release announcement information. The news information is for all users of the music teaching auxiliary system, and the management content includes news editing, news release, and news maintenance; the announcement is mainly for registered users, that is, teachers, students, or administrators, similar to news management.

3.1.2. Document Management Module. The music teaching auxiliary management system includes part of the official document management function, which manages the official document processing in the school teaching and office process. Official document management mainly completes the entire process from drafting, and approval to document issuance in learning. With the help of network technology and computer technology, the school's office work can be paperless, improve work efficiency, and supervise the circulation process of official documents.

3.1.3. Teaching Resource Management Module. The teaching resource management module mainly realizes the management of self-study resources, including music audio and video, homework exercises, music knowledge popularization, and other parts.

3.1.4. Auxiliary Teaching Management Module. The auxiliary teaching management module is mainly responsible for the system administrator, which realizes the management of courses, management of students' online examinations and exercises, interactive management of Q&A, discussion, and performance analysis.

3.1.5. System Management Module. The system management in the music teaching assistant is mainly used to serve the related activities of students and teachers, provide support for the normal operation of the system, and coordinate the collaboration and communication of different modules. This part of the management can be divided into music-assisted teaching, log management, and user management. The specific contents are as follows:

- (1) Music-assisted teaching: auxiliary teaching management is mainly through the statistics and analysis of existing data; school leaders or teachers conduct auxiliary decision-making management in order to improve teaching quality and management level.
- (2) Log management: the log management part is divided into two parts: operation log and system log. The operation log completes the management of all functional operation records; the system log completes the record management of the system running process.
- (3) User management: manages user identities such as teachers, students, leaders, and managers, as well as user basic information.

3.2. Model Analysis

3.2.1. Object Model Analysis. The needs of music teaching auxiliary management are mainly reflected through the use case model, which can build a bridge between ordinary customers and system implementers, allowing users to describe their own needs and the functions to be achieved by the required system in the most detailed way. There is a

particularly important relationship between the refinement of the use case diagram and the modularity of the use case diagram. The modeling of this system is to use UML to visualize the system functions and specific feasible methods. To achieve the goals of all parties, the first is customer needs, which must be easy for users to understand, and the second is to allow developers to fully understand so that development work can begin [25].

The establishment of use cases must focus on system participants. From this point of view, the premise of use case determination should be to conduct a series of analyses on the actual participants in the system and their related information and then combine the actions and behaviors of all participants. Only in this way can the functions required by customers be realized, and then specific and available use case analysis can be obtained. The language used for unified modeling can describe the use case from several aspects, and its participants and various subtle interrelationships between them. Solving these problems can specifically determine the construction of the use case.

We do the design work required for the use case from the top down, and the principle is progressively deeper. We will first establish the most basic use cases according to the specific needs of the project at the beginning, and then refine the use cases step by step on this basis to achieve deeper customer needs and target analysis. Figure 2 shows the school leadership using a case diagram.

School leaders mainly carry out operations such as official document handling, news and announcement browsing, and auxiliary decision-making management (music teaching).

Music teachers mainly carry out operations such as music examination question bank management, music courseware management, student field communication, and homework and examination management. The example of music teachers is shown in Figure 3.

Students mainly conduct music-related question consultation, online learning, and online testing, among which question consultation includes music knowledge, exam-related, and amateur discussions. The example of student use is shown in Figure 4.

System administrators mainly perform user management (including teacher management, student management, and authority management, leaders belong to teacher management and assign higher-level authority), log management, system settings and information release (including news management and announcement management), and other operations.

3.2.2. Data Model Analysis. The analysis of the data model is mainly carried out by means of the data flow chart, which can systematically and comprehensively describe the data logic of the music teaching auxiliary management system. In the process of information storage, processing, and flow reflection, the data flow diagram is mainly realized by means of centralized and general symbols. The characteristics of the data flow graph are mainly composed of the following two aspects:

- (1) **Abstraction:** abstract data information into specific information storage, processing and flow, and reduce unnecessary object processes
- (2) **Generality:** express all requirements as a whole, and associate all related information or business processing

A data flow diagram consists of the following four basic elements, namely, external entities, data flow, processing (function), and data storage. Each module uses a data flow diagram to represent the source of data and the relationship between data. The top-level data flow of the system is shown in Figure 5.

3.3. Analysis of Nonfunctional Requirements

3.3.1. Performance Requirements

(1) **Performance.** The safe and reliable operation time of the music teaching auxiliary platform is not less than ten years; the number of simultaneous online teachers and students is not less than 400; the response time of business processing shall not exceed five seconds; in order to adapt to the continuous increase of functions, automatic expansion support is required; all data transmissions must be stable and secure;

(2) **Security.** Security requirements mainly include data transmission encryption, data backup, and virus prevention.

Data transmission encryption: different levels of users set different access rights, and MD5 encryption is performed for user authentication; Data backup: data backup is performed regularly to ensure safe operation; Virus prevention: because it is in the form of a network, virus prevention and awareness enhancement are required.

(3) **Scalability.** In the process of music teaching, various teaching methods, teaching modes, and functions are changing with each passing day, and need to be maintained and upgraded from time to time. Therefore, the auxiliary teaching system must be scalable and configurable.

The auxiliary management of music teaching is realized by modularization, which improves the reusability and maintainability of the code by reducing the association between different modules.

The upgrade of the system must not affect the normal operation and only needs to be upgraded online on the server-side.

3.3.2. Design Goals. The design goals of the music teaching assistant management system based on J2EE mainly include the following aspects:

Practicality: simultaneously design information functions based on traditional operation methods to provide a concise and clear operation interface for teachers and students when teaching or learning music; **Fault tolerance:** when data errors are caused by a program running or

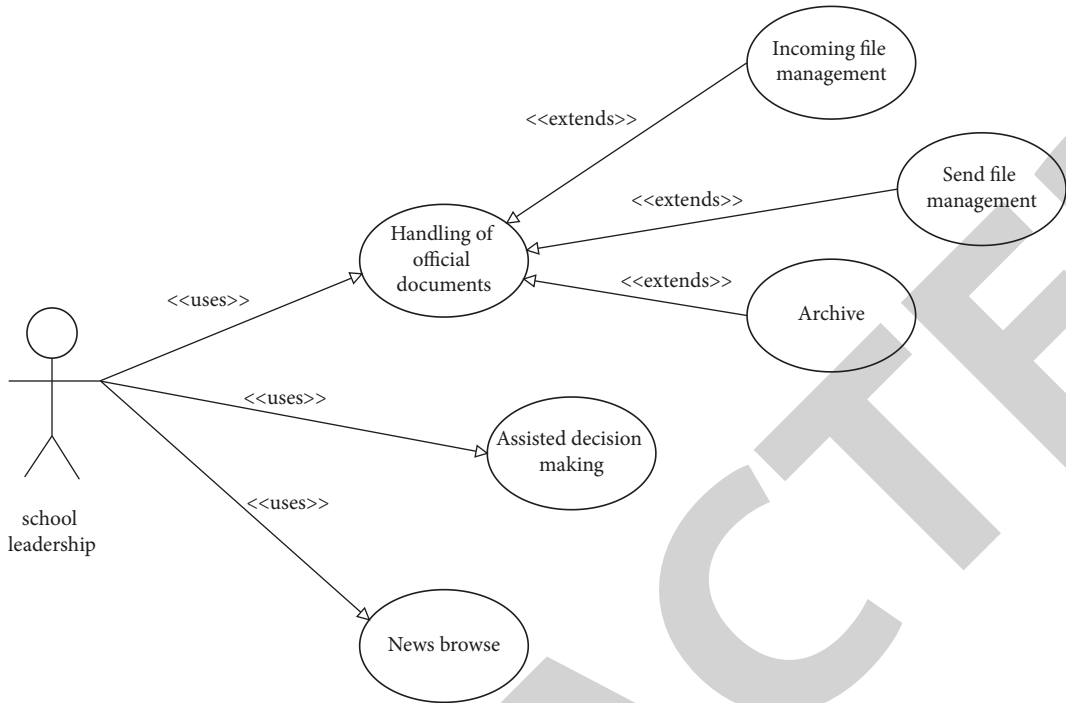


FIGURE 2: School leadership use case diagram.

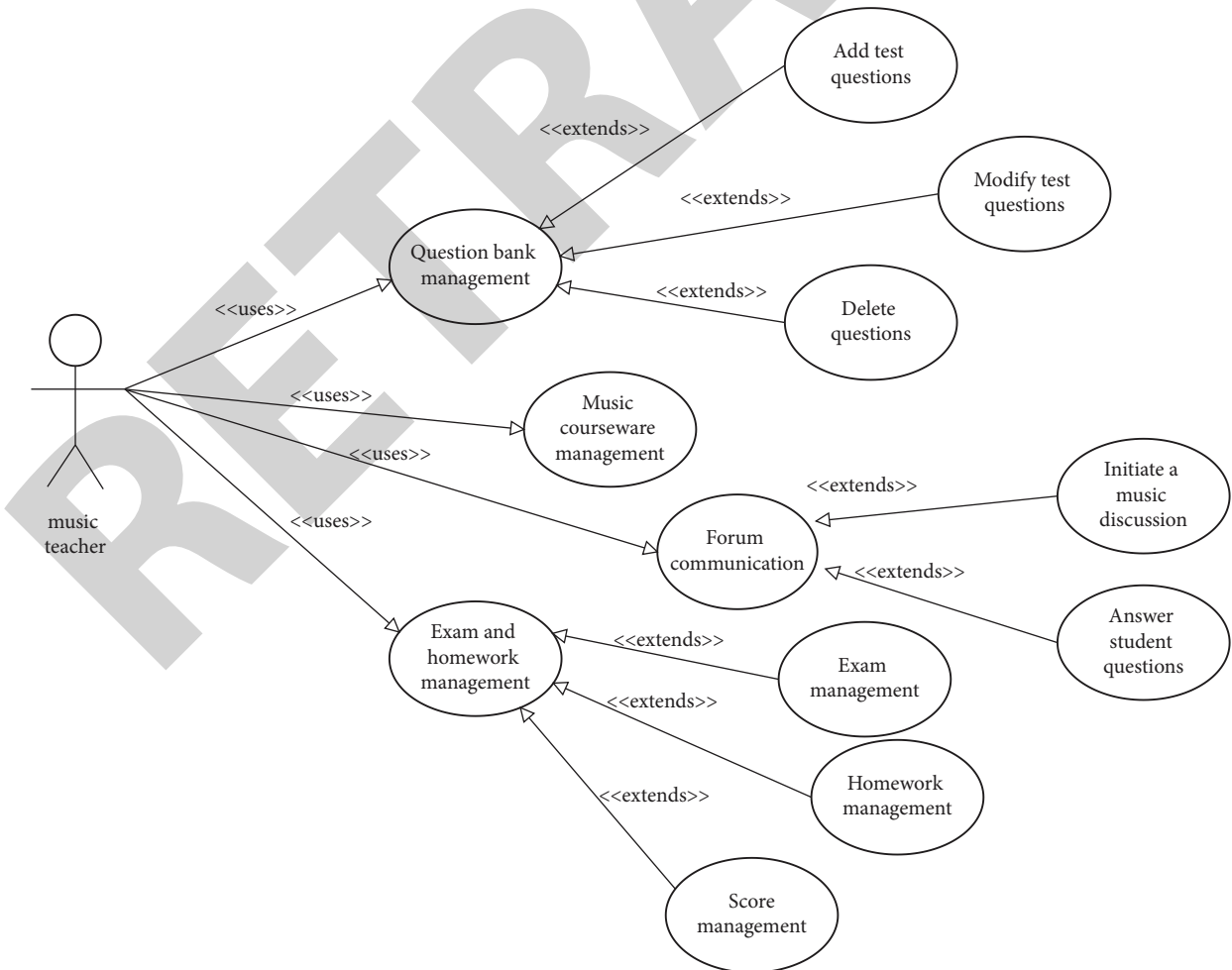


FIGURE 3: Music teacher use case diagram.

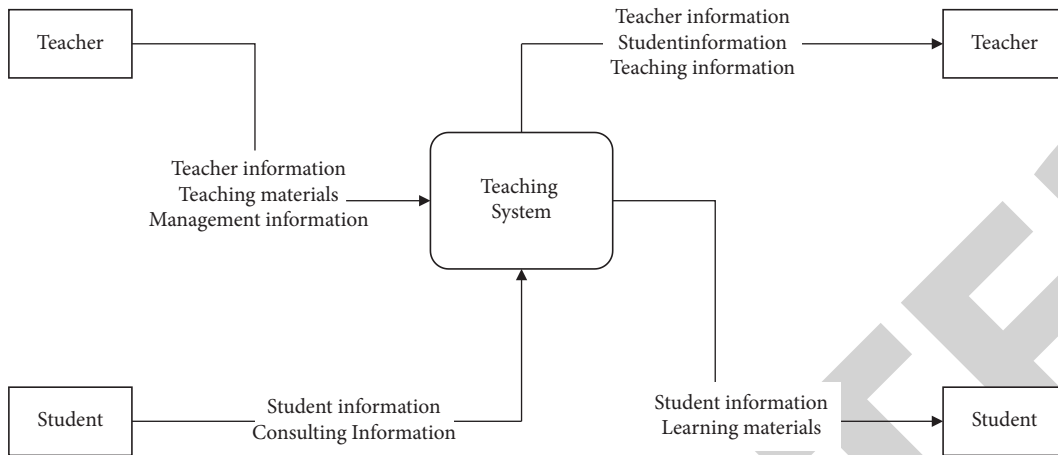


FIGURE 4: System top-level data flow diagram.

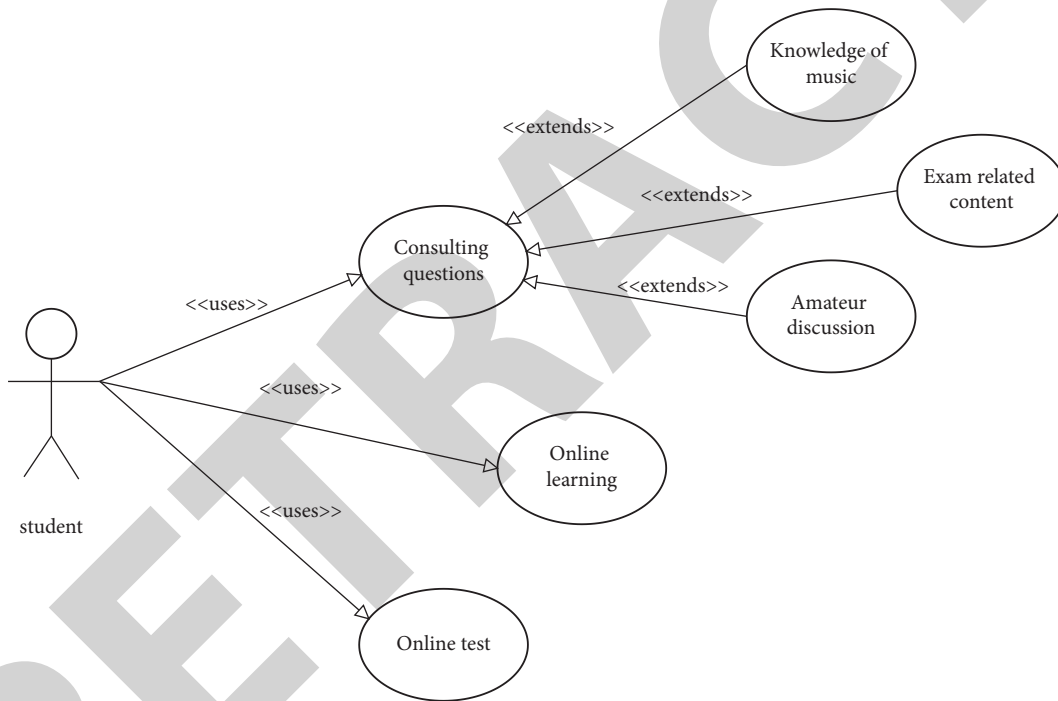


FIGURE 5: Student use case diagram.

misoperation, the system must have good fault tolerance capabilities, such as error prompts and automatic rollbacks, and both security and reliability must be guaranteed during the fault tolerance process.

Versatility: the system cannot be limited to a specific browser access form to meet the needs of learners and operators' operating habits;

Openness: the system adopts a standardized processing form and provides a good extension interface in the research of music teaching curriculum setting to ensure that the system can be used in multiple platforms and environments.

Timeliness: as long as there is a network, the learning and management of music-related courses and knowledge can be carried out at any time.

Stability: we use a data management system to achieve data management, use J2EE technology and MVC design pattern to achieve system development, and ensure the stability of system operation.

The music teaching assistant management platform has the characteristics of real-time communication, functional versatility, and object openness.

4. Design of the Music Teaching System

4.1. Overall Design. The overall design of the system includes functional structure design and architecture design, which can generally be simplified as a modular design. When carrying out modular design, not only should the entire system be divided into components, but also the

communication between modules, module continuity, module protection, module solvability, and module combination should be designed. If you want to improve the continuity principle, you need to maintain the black box characteristics between modules, which are transparent to other modules. If the protection of the module needs to be improved, it is necessary to protect the variables inside the module to prevent the misuse of other modules, and special consideration should be given to the exception handling of the module.

When carrying out the modular design of the system, it is necessary to meet the loose coupling between modules and the high cohesion characteristics within the modules. Modules must be able to function independently to complete the design, but the size of the modules needs to be controlled. The nature of modules can be summarized as interchangeability, pluggability, and boundedness, which mainly include three aspects: (1) When the internal requirements of a module change, the changes do not affect the normal operation of other modules; (2) When a module needs to be deleted, only the functions handled by this module are affected; (3) If a new module implements the same function and has the same operation interface, it will not affect the operation of the entire system after replacement.

4.1.1. Functional Structure Design. The music-assisted teaching management system is mainly composed of modules such as information release, official document management, teaching resource management, auxiliary teaching management, and system management. The information release module is further divided into school news, notice announcements, and BBS. Document management, document receipt management, and filing management; teaching resource management includes courseware management such as music videos, homework management, and music knowledge management; auxiliary teaching management is divided into course management, online examinations, Q&A discussions, and performance analysis; system management is divided into teachers student management, system settings management, log management, and auxiliary decision-making management. The functional structure of the music-assisted teaching management system is shown in Figure 6.

4.1.2. Architecture Design. The design of the music teaching assistant management system adopts a three-tier system structure. The architecture of the system is mainly divided into three layers: Web Server layer (display layer), Application Server layer (control layer), and Database Server (data access layer). The display layer is mainly composed of the Web UI Layer and Web Service Layer, using JSP and other technologies to achieve interaction with the client; the control layer mainly uses the core frameworks such as Spring to complete the business logic processing of the auxiliary teaching system, calls the data access layer to process the business request sent by the client, and displays the processing result to the user. The specific form of interaction is displayed to the client for users to view and browse; the data

access layer mainly realizes the interaction between the business logic layer and the database, preventing business requests from directly accessing the database, causing data inconsistency, and ensuring data security and integrity.

4.2. Database Design. In the process of information service, information management, and resource development, system users and design developers have concluded an important experience that database technology is the most effective way to manage data. With the advancement of network technology and computer technology, data management through databases has become an important consensus. In order to complete the sharing, integrity, and consistency of system data, both large-scale management systems and small-scale transaction processing are using database technology to complete data management. At present, the important criteria for measuring the degree of a country's informatization construction are the frequency of database use, the amount of database information, and the scale of the database.

4.2.1. Database Design Principles. The database design of the music-assisted teaching management platform mainly serves the business knowledge base of music-assisted teaching management. Through the management of the database, the processing of knowledge data and business data is optimized. When designing a database, the following aspects are considered important criteria:

- (1) Verification is based on database design specifications, and data structure design is carried out in a standardized form to ensure the consistency and normal operation of data operations.
- (2) Normative naming: the naming specification is helpful for unified management and upgrades maintenance in the later stage. Therefore, when designing databases and tables, the naming must strictly follow the normative standards and annotate all column information.
- (3) Data redundancy and the standardization of data paradigms will affect the retrieval speed of later data. Therefore, when designing data tables, it is necessary to master various degrees in order to achieve the highest value of retrieval and reduce system response time.
- (4) Security: strict identity authentication management is implemented, and users with different permissions have different degrees of access to data and operations to improve data security.
- (5) Concurrency control: through the use of triggers and stored procedures, the simultaneous operation of the table is strictly controlled to ensure the control of simultaneous modification access, and reduce data inconsistency, and the query can be exempted from this control. Through the above analysis, it can be seen that when designing the database of the music teaching assistant management platform, in order to

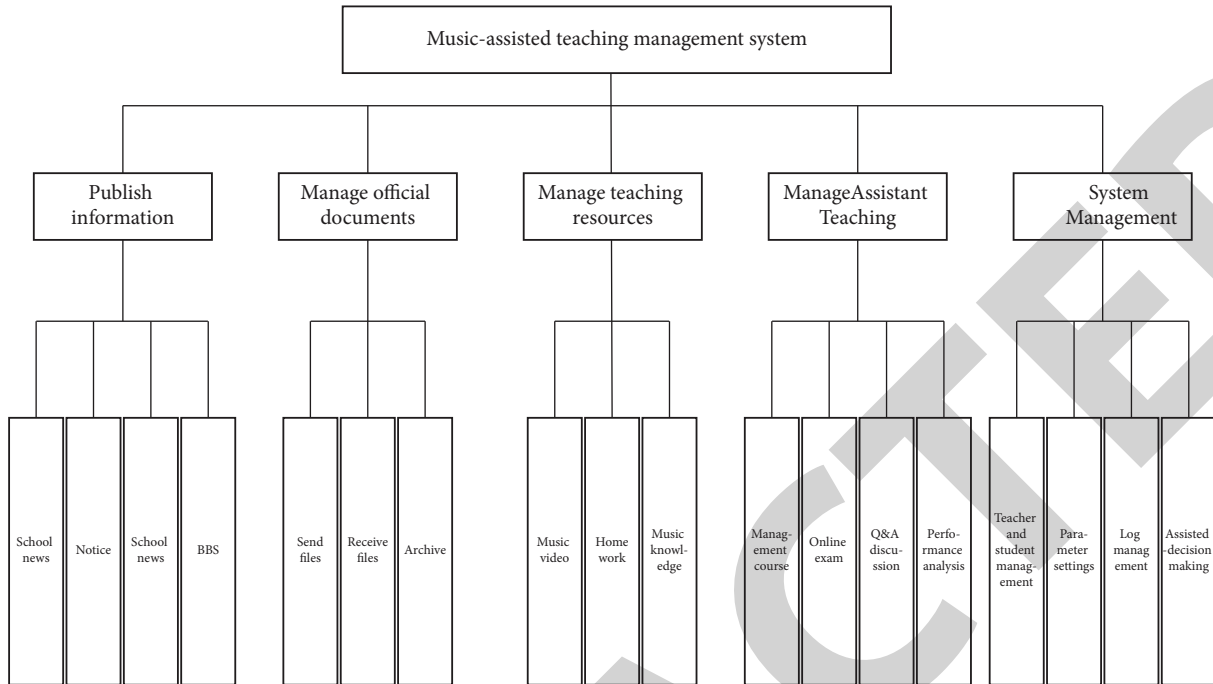


FIGURE 6: System function structure diagram.

realize the BC paradigm mode, the third paradigm should be used as the main basis.

4.2.2. *Conceptual Structure Design.* The conceptual schema design of the database is to abstract the existing data. Abstraction refers to the man-made processing of concepts, affairs, and relationships between people, extracting common features that are needed, and ignoring unnecessary parts. The extracted features are described in detail and finally form a certain model structure. This system adopts SQL Server2005 as the database development tool to realize the design and realization of a relational database.

5. Summary

This dissertation mainly studies and expounds on the design and development of the music teaching assistant system. First of all, this thesis analyzes the development significance, application, and development feasibility of the interactive multimedia network teaching system from the background and feasibility analysis. In the requirement analysis stage, the analysis of the system needs and the compilation of related manuals is to list all the requirements of the user for the system to be designed, to establish the model of the music teaching assistant system to be developed, and the design and implementation of its functions to facilitate the development of this system. Let our software design team have a very thorough knowledge of the functions to be completed by the entire software so that we can know what to do when developing and designing, which is beneficial to software development and development progress control and quality control. In addition, it also provides a basis for further upgrades in the future, so that the corresponding

deficiencies can be quickly located during the upgrade, and the development cycle of software upgrades can be improved. The development of this system has reached a good level in function and technology, but it still has its own defects. First of all, it is not perfect in terms of module functions, and secondly, some functions are not considered enough, but I believe that through the continuous improvement of our team, this system will eventually be put into practical use.

Data Availability

The dataset can be accessed upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

The authors thank Xuzhou Science and Technology Key Project, “The Remote Intelligent Interactive Music Teaching System” (no. KC19246).

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