The Design and Development of Student Electronic Homework Management System

Yun Cheng, Fenglin Liang, Yanli Wang*, Xiumei Liang, Xue Chen and Yuanyuan Tian

School of Education, HuangGang Normal University, HuangGang 438000, China
Email: 71262569@qq.com, 495478984@qq.com, wylecnu@126.com, 2635612084@qq.com, 543705146@qq.com, 690717012@qq.com, *Corresponding author, associate professor, wylecnu@126.com.

Abstract. With the continuous development of information technology, computers and networks have been deeply integrated into the basic process of teaching and learning. In order to solve the basic problems of the traditional homework management mode, on the basis of demand analysis, this paper designs and develops a student electronic homework management system, which provides teachers and students with a convenient and efficient electronic homework online management platform. The system adopts a three-tier architecture system of B/S mode, with clear navigation, convenient use, high operating efficiency, and strong security. It implements user management, course management, job management, announcement management, link management, communication management, system management, etc. The function has solved the collection, management, review, communication and other problems of students' electronic homework, and can effectively improve the efficiency of electronic homework management in the teaching and learning process.

1. Introduction

With the continuous development of information technology and the widespread application of Internet technology, education informatization has become one of the main themes of education reform and development in the 21st century. With the deepening of education informatization, computers are becoming more and more widely used in teaching and learning. As a kind of teaching and scientific research resource, electronic homework is more and more used in teachers' teaching activities by virtue of its characteristics of easy preservation, easy modification and strong interaction. However, while electronic work brings us convenience, it also brings us new problems—when faced with a large number of operations, the problems of electronic work collection, correction and management are particularly prominent. Therefore, it is necessary and meaningful to research and design a practical electronic operation management system.

2. The Requirement Analysis and Design of the System

2.1 Demand Analysis

First, in the traditional mode, the submission and review for electronic homework are mainly based on e-mail sending, local area network delivery, physical copy and other methods to carry out, which are susceptible to time and space limitations, complicated operations, time-consuming and labour-intensive, and inconvenient communication. Therefore, the use of the system should not be restricted by time and region. The B/S (Browser/Server) architecture is undoubtedly a preferred choice. Based on the client-side browser and supported by the network environment, teachers and students can
submit and review assignments anytime and anywhere, achieve instant feedback and communication, and effectively solve problems existing on the traditional mode.

As an auxiliary tool for the teaching process, the student electronic homework management system can be divided into three types: system administrators, teachers and students. In terms of functional requirements, the system administrator is mainly responsible for the basic management functions of the system such as basic settings, class management, course management, and user management; Teachers mainly use the system to complete the functions of maintaining, publishing, reviewing, and online reviewing of personal information and homework; Students mainly check basic information such as teachers, courses, assignments, etc., to realize the functions of maintaining personal information, submitting assignments online, and reviewing teacher approval results.

2.2 Overall Structural Design of the System
According to demand analysis, the system adopts the thin client mode of B/S three-tier architecture, can easily achieve distributed management. Flexible system architecture, as well as the full use of Internet technology, ensure the independence of business logic, interface presentation, so that the system has high availability, scalability and easy to expand. The system is mainly divided into three layers: presentation layer, business logic layer and data access layer, as shown in figure 1.

In practice, the presentation layer is equivalent to the client's browser, which is responsible for the session processing with the user. After receiving the user's session request, the corresponding business service on the business logic layer is invoked for data processing, and the processing result is returned to the user. The business logic layer is equivalent to the web server, which is used to encapsulate the business service of the system. After receiving the incoming request from the presentation layer, the logical judgment of the business processing is performed on it. Once the logical judgment is passed, the contents of the database are invoked, the data is processed, and the processing results are returned to the presentation layer. The data access layer is equivalent to the database management system (DBMS) running in the background of the Web server. The interface between the data access layer and the database server layer is used to process the data of the corresponding system, realize the functions of inserting, modifying, deleting and querying the data, and provide the call to the business logic layer.

2.3 Design of Main Functional Modules
According to the demand analysis, the system can be divided into 7 basic function modules: user management, course management, assignment management, announcement management, link management, communication management, system management. The user management module is mainly used to realize the management functions such as adding, deleting, checking and changing of
users, including user registration, login, logout, password retrieval, personal information maintenance, user approval and permission setting. The course management mainly manages the basic information of the courses, and realizes the functions of adding, editing and deleting the course information. Homework management is the core module of this system. Teachers can release, view, review and manage students' homework through this module. Students view and submit assignments through this module. Announcement management provides a platform for administrators and teachers to publish public information, and all users can view the published announcement information after logging in. The link management module mainly provides teachers with the function of recommending learning resources, provides students with extension resources, and helps students to complete their assignments. The communication management module provides an online communication space with functions such as column management and message management. System management module to achieve the maintenance of the entire system management function. Including system basic information maintenance, home page information maintenance, data backup, security management, performance management, system configuration management, etc.

3. System Implementation

3.1 Basic Environment Configuration for System Development
System development uses Windows 7 64-bit operating system and IIS 7 as a web server; Microsoft Visual Studio 2012 is adopted as the main tool of system design and development, and C# language is the development language of the system; SQL Server 2012 is used as the server-side database development software.

3.2 System Core Project Creation
In the Solution Explorer, there are a total of eight projects, one of which is a Web site project and seven are class library projects. A Web project is a Web site of a website, including ASP.NET files, user controls, various materials, configuration files and so on. The IDAL, DALFactory, and SQLDAL projects use simplified abstract factory patterns and dependency injection technology to implement data access functions. The IDAL project defines multiple interfaces, and each interface defines member methods created by application requirements. The DALFactory project is used to implement factory classes. The SQLDAL project is aimed at the SQL Server database and is used to implement multiple concrete classes in the abstract factory pattern. These classes implement the member methods of the corresponding interfaces in the IDAL project. The DBUtility project includes a help class that implements SQL Server data access functions. Classes in the Model project are used to implement business entities. The classes in the Logic project are used to implement application business logic. The WebDAL project is used for page display assistance. [2]

3.3 Database Production
According to the basic requirements of the system, the system database involves a total of 10 data tables. The user table Member is used to store basic information of various users; the course table Course is used to store basic course information; the homework task table CourseHomework is used to store homework information issued by teachers; the homework resource table StuHomework is used to store student submission Assignment information and teacher's approval results and other information; Announcement table Placard is used to store published public information; Resource Link table ResourceLink is used to store extended resource link information provided to students; Message column table BColumn is used to store column information of communication module; Message reply table Bbsspost is used to store the message reply information of the communication module; message content table BContent is used to store the message content information of the communication module; system information table System is used to store the basic information of the system.

3.4 Implementation of System Security Management Mechanism
In addition to basic hardware protection such as network firewalls, the system also provides triple security guarantees. First, encrypt sensitive information such as database, user account information,
and database connection string through encryption technology. Through encryption technology, the sensitive information is stored in the form of encrypted strings, which enhances the security of the system; encryption can be decrypted, but the two processes must be executed on the same computer, thereby effectively guaranteeing the security of the connection string. Figure 2 shows the partially encrypted connection string information. Secondly, through the design of the layered architecture and the use of classes, messages are passed through the interfaces between the various layers. All functions are finally encapsulated as DLL class libraries. The back-end functions are directly called on the front-end page. Finally, the system has a perfect user rights management function. The rights of different types of users are mainly set by setting the Power field of the user information table. The administrator rights are set to 2, the teacher is 1, and the students are 0. After the user logs in, by calling related functions of the CSession class, the user's authority identification, function differentiation and management are realized, thereby ensuring the security and integrity of the data resources.

3.5 Implementation of Core Functional Modules

The job management module is the core functional module of the system. To realize the functions of job viewing, uploading, downloading, and reviewing, it is mainly realized through the CHomework classes as the SQLDAL project. This class implement the specific data interaction functions required for job placement, viewing, submission, review, management, etc. Students can submit homework anytime, anywhere, and teachers can download the review at any time, so that teachers can timely understand the students' homework and guide the students' work. Learning, and students can also get feedback on the learning process and the assessment of teacher assignments in a timely manner, which strengthens the supervision of students outside the classroom, is more conducive to fully mobilize the initiative and enthusiasm for students to learn, and strengthen the communication between teachers and students, to achieve a win-win situation of teaching and learning.

4. The System Testing and Trial

After the development of the system was completed, on the premise of ensuring the stability of the system operation, functional tests and user trials were conducted. Functional testing is the best way to verify whether a software has achieved its intended goals and whether it can be put into trial. After the development of this system is completed, the development team first performs functional tests of each module of the system, including user management, course management, homework management, message management, and system management. In addition to the functional testing of each module, the testing process also focused on testing the usage status of users without authority on the system. After rigorous testing and modification, it is finally confirmed that the functions of each module of the system can be achieved, and the expected design requirements are met. After completing the functional test, multiple users are invited to log in to the system with different roles, the system navigation is clear, the functions of each part are operating normally, and the overall evaluation is good.

5. Conclusion

The student electronic work management system adopts a three-layer structure of B/S structure, with clear navigation, convenient use, high operating efficiency, and strong security. It provides a convenient and efficient electronic work online management platform for teachers and students, which is a good solution. The collection, management, review and communication of students' electronic work can effectively improve the efficiency of teaching and learning process management.
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