

Online Learning Management System

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ABSTRACT

With the rapid development of computer science and technology, Computer Aided Instruction(CAI) has been playing a more crucial role in modern teaching management and education itself. While in the teaching modules related to the art of programming, the position of human graders can be well taken by automated programming assignments graders such as Online Judge(OJ). At present, a large proportion of universities and institutions have adopted OJ program which were developed by themselves in programming modules, which leads to huge cost of human resources in its development and maintenance.

In this paper, the author proposed an online teaching management system, also called Tsinghua University Online Judger(THUOJ), which is public and universities oriented, to address the above issue. Besides some basic management functions, the system mainly focuses on the programming assignment grading and program assessment customization for various programming courses, which makes the system be suitable for diversities between different modules and can provide personalized programming grading services. In this article, the author made his design according to the potential users of the system, and proposed a design of the system's structure on the basis of the frame using Linux+Apache+MySQL+PHP(LAMP). Especially, the author adopted C and PHP to program the online judge module. Finally, there is a simple website demo has been implemented on the basis of OJ module, in order to demonstrate the usage of proposed system and online judge module.

Keywords: Computer Aided Instruction; Online Judge; LAMP

1. Introduction

Background and Significance

Computer Assisted Instruction Introduction

With the development of computer technology and promotion, computer technology plays in modern teaching an increasingly important role, which is mainly reflected in the use of information technology to the management of teaching and teaching itself in the form of teaching, this new forms of teaching is called computer-assisted instruction (Computer Aided Instruction). On the one hand, in the course of daily teaching, teaching teachers through the use of multimedia, the Internet and other technologies to create a colorful and lively and interesting learning environment for students to interact and so to promote the quality of teaching and learning efficiency. On the other hand, in the management of education, the rational use of computer technology to efficiently and accurately curriculum management, teaching assistance, job submission and marking and other work, will be freed from these complex human work better enhance the quality and efficiency of teaching.

Common computer-assisted teaching mode there are five, the five most comprehensive method to simultaneously use computer technology to teaching and teaching management, and assisted in its implementation of innovative forms of self-teaching aid in an active role. The first mode is professor of computer technology and knowledge in the demo link binding, it will focus on teaching knowledge and incomprehensible through multimedia technologies for presentations, this approach can use intuitive, appropriate images, videos to show, again Teachers explain the proper combination, allow students a more intuitive understanding of abstract knowledge. The second auxiliary pattern is exercise evaluation: This method uses computer technology to build

an online exercises for students to practice and correcting the platform, and students will be able to improve their ability to practice the exercises on the platform, such mode not only provides students with a platform to test their learning level, compared to manual job correcting, this model is in the teachers' workload greatly reduced, while improving the accuracy and fairness of the marking of. The third auxiliary mode is introduced into the teaching of multimedia educational software, since the multimedia teaching software can simultaneously use a variety of forms, including audio, image, video, text, etc., to demonstrate specific knowledge of the content. At the same time, the use of educational software for students to interact with the educational software in order to gain knowledge of this model can to a greater extent to improve students' interest in learning. The fourth mode is called knowledge teaching aids simulation, this model through computer technology to simulate physical phenomena, industrial processes, chemical reactions, and many other kinds of knowledge, and to visualize presented to students, and students can By observing the process simulation and intuitive understanding, acquire knowledge. The fifth mode is called "Socrates" teaching mode that computer technology to build a platform for exchange students to acquire knowledge on the platform of dialogue by asking questions. Several more computer-assisted teaching mode, although there are significant differences, however, in essence, is to make computer technology computer aided instruction throughout all aspects of teaching, from professors to detect knowledge of knowledge, consolidate, from teaching management to demonstrate teaching.

In many curriculum category, teaching teaching IT related courses and other courses there is a considerable difference, giving computer aided teaching has brought great

difficulties. IT not only focus on theoretical knowledge, learning and consolidation, more focus on programming, software operation and hardware experiments practical ability. Therefore, in this paper, the authors designed an online learning management system for information technology courses teaching aids, the system in the realization of the foundation of the basic curriculum management, online evaluation of the program to function as the main function, and through its open, for all colleges and universities to provide teaching aids in the form of services, to achieve the sharing of teaching resources.

Introduction 1.1.2 Online Reviews

Program Online evaluation system (Online Judge) initially because ACM-ICPC International Collegiate Programming Contest and the emergence of a more equitable and efficient in order to compete in the sub-sub program online evaluation system was developed out of the program as a match referee. Today, more and more online evaluation system is still active in the major programming events.

In order to perform a good sub-sub-task programming competitions, traditional programs online evaluation systems generally need to support multiple source code compilation (for example: C, C ++, JAVA, Pascal, VB, etc.). In actual use, the players through the game client to view the contest topic and write game code, and then write the source code uploaded to the online evaluation system. After the online evaluation system to obtain the source code of the contestants through the network will compile the source code, and then to make by redirecting input and output to read pre-configured test case input entry program, and outputs the result of the pre-set The answer given detailed comparison. Any exception or error in compilation, execution and answers comparison process will be online monitoring and evaluation system detailed

records. It is worth mentioning that, in order to more equitable, secure code written judgment players performance advantages and disadvantages, safe or not, you need to compile and run the program set very strict limits: as the largest compilation time, maximum execution time, the maximum available memory, system call rights restrictions, etc., to ensure the implementation of the security and the stability of a reliable evaluation system program. And when the online evaluation system executed a complete evaluation process, the final result will be in the form of scores, or text back to the user.

In programming related courses, online evaluation system again using a computer-aided teaching effective way. For this reason, almost all colleges and universities have set up their own Web site to assist teaching management teaching management. However, for most colleges and universities for programming related courses still needs to develop their own specific curriculum program evaluation system, or by the use of teaching a way to artificially modify the program evaluation. Within the scope of the country, a few public online evaluation platform is aimed primarily at the use of computer programming competition, and which has adopted a fixed exam. Since these public online evaluation platform does not allow users to freely edit the university exam and new content, the evaluation process can not be customized, so they can not do in many universities and information technology courses teaching aids programming job evaluation the work.

Therefore, in this paper, the authors propose a method to solve the problem well: the development of an open, facing the university, information courses teaching aid management platform, and this platform in addition to the basic teaching aids curriculum management functions The main support program developed online evaluation of personalized, efficient and

stable online evaluation, and shared across the inter-high school program curriculum teaching resources. The main author of the work is to design an open can personalize evaluation processes, and has good functional expansion of the online evaluation system framework and on the basis of the framework on the realization of the program evaluation function modules, as well as A simple evaluation of the teaching site customization and program evaluation online demo. In the next part of this article, the concept of online evaluation system starting from the detailed description of the detailed design developed by the authors of such a teaching management system to achieve the innovation process and the evaluation module.

Related researches

In the relatively well-known domestic online evaluation system developed by Peking University Program Online Evaluation System (POJ), this system is designed mainly for the development of training to participate in the International Collegiate Programming Contest North team. Zhejiang University Program Online Evaluation System (ZOJ) also has considerable fame. Zhejiang University and Beijing University Program Online evaluation system similar to the online evaluation system is open online programming questions. In the exam of the system, saving more than 3,000 multi-channel previous ACM International Collegiate Programming Contest of the original title for the user to practice. In foreign countries, with more well-known online review sites. For example, the University of Valladolid, Spain online evaluation system (UVA), on to question the amount is huge, diverse kinds of questions, is extremely difficult and famous.

Program evaluation systems can play a significant role in programming related courses. Its only can relieve the pressure of artificial sub-sub-program to increase the fairness of procedures and the accuracy of the evaluation, can enhance the results of the evaluation by the

feedback to the user's efficiency and greatly increase the efficiency of program learning and fun.

On Based on this design idea, to achieve a complete evaluation of the function module, and based on the module, making a simple online system demonstration.

2 System Design

System Requirements Analysis

In order to design the entire online teaching management system, we need infrastructure and technology selection, the code frame design, first, before detailed algorithm detailed needs analysis, and the analysis to understand the following issues:

1. Our users are mainly divided into several categories, each category of users for the online learning management system in the function have what needs?
2. In order to improve the stability and performance of the system is running, we should choose what kind of system architecture is most reasonable? In order to clarify this question, we first need to analyze the performance of the online evaluation system, limiting conditions and other operating platforms, and has been evaluating system performance requirements for online analytical results.
3. In order to provide better service and more free Reviews Reviews customization features, we need to review the online teaching management system function module detailed analysis, to understand the needs of the evaluation function modules in functionality to design a more stable performance, evaluation efficiency and good compatibility evaluation modules.
4. Taking into account the future development of the online learning management system needs to be more improvements in functionality, operational safety, etc., so the system frame designed for scalability with high demand, so

we need the system of the future Possible expansion needs analysis in order to fully consider the design.

Performance requirements analysis framework

Since the intent of this paper proposes an open, nationwide colleges and universities, an online program evaluation as the main function of the online learning management system, therefore, when the introduction of such a teaching management system, our system may face a challenge on the following properties:

1. Site Visits huge: If the online evaluation system to obtain the majority of teachers and students authorized users, a huge number of college students will become a major challenge in the stability of the system.
2. Views volatility huge presence peak: Since most universities curricula usually concentrated in the daytime, so many elective courses of the program students will be in the evening program evaluation. In addition, the deadline for programming operations also will make the online evaluation system periodically to be a lot of access and use.
3. Database access large: since the system for online reviews after a public website, most user-related, reviews relevant data needs to be stored in the database, so the huge traffic also indirectly led to a huge amount of database access.

In summary, the structure of the online evaluation system requires reasonable allocation to be able to calmly deal with the challenges of the three types of performance, demand for architectural choice, we can conclude the following:

1. The selected web server needs to be able to cope with the huge stable of visits.
2. The choice of system platforms need to be able more efficient use of hardware resources, and to stabilize the web server running
3. Database server selected to guarantee stability in a multi-user access, and can stably

handle large queries.

4 Functional Requirements Analysis Review

As the core module online learning management system, the evaluation function module implements the source code is compiled, according to the evaluation requirements for the implementation of the program to generate the results, and the last sub-sub-function three-part process. Therefore, we need to support the evaluation function module what functionality:

1. In the compilation, the process of implementation, the need to limit the time-related operations, when the user source code compiler too long or timeout, the corresponding information feedback.
2. During the execution, the program submitted by the user may invoke excessive storage resources, therefore, the need for appropriate restrictions in the evaluation function module, and an error message back to the user.
3. In the compilation, execution, program submitted by users due to improper operation may produce excessive build file or output files. In the evaluation of functional modules, we need appropriate means to prohibit this from happening, and feedback to the user.
4. Since the user may add malicious code in the source code on-line evaluation system damage, or through malicious actions carried out in the code, such as modification work performance and other vicious acts. Therefore, in designing the online evaluation system, the need to fully consider the safety of the system, it prevents users from making obtain system privileges through code, illegal system calls and other malicious behavior.

Architecture scalability needs analysis

Because during the system architecture design, the need to fully consider the future expansion and carry out the convenience function system code maintenance, and therefore, we need a needs analysis for subsequent developers of the system, and strive to design a highly scalable,

easy to maintain online Learning Management System framework, specific needs are:

1. Possible future needs for online teaching management system migration.
2. Consider possible future function additions, such as: support for more programming languages, choose different sub-sub-modules and so on.
3. You may need to support the future course of the job evaluation experiment hardware.

3.2 System Design of the Framework

System software architecture

On demand by the system architecture for performance analysis, we were able to select the right software and hardware platform architecture inspired more time. As the demand for system operation stability, portability and other aspects of the system, the software platform architecture writer uses a typical Linux + Apache + PHP + MySQL classic combination, commonly known as LAMP.

Evaluation function module code frame design

Overall evaluation by the evaluation function module foreground, reviews the background of two parts, and the interaction of the front part of the background, we do use XML language standard front and back office interactions.

Backend modules using C ++ language, the main function modules need to implement all the features of evaluation.

Reception module mainly written in PHP language, the main achievement of an online evaluation system libraries.

Interaction module between the front and back of the main uses XML technology.

3 Reviews the concrete realization function module

Evaluation Module Front implementation

Reception evaluation module, not review sites end in the traditional sense, but teaching management site site itself and reviews the

background of the code to connect function modules. In this issue, the authors used the fore consistent with site scripting languages PHP language to write the system, and the front desk encapsulated into a simple-to-use PHP module code calls for the site.

Implementation evaluation system background

As the core of the evaluation function module, the module needs to be responsible for evaluating the background to achieve the most important evaluation functions. In implementing the background, we use the C / C ++ language as to achieve functional programming language, mainly because of the high C / C ++ language runtime efficiency, it has a very rich system function calls available, can more easily achieve the evaluation function module must monitor system resources, as well as a sandbox and other functions.

A typical evaluation process functions performed by the interface is a call back from the front desk and the corresponding interaction XML file is sent to the background when starting the interface functions.

Process a - Profiling preprocessing section

This part is responsible for compiling the preparatory work before the execution, the whole can be made: read parameter, file check, the command generates three parts.

Process two - Profiling compilation section

This part is mainly responsible for the user to upload the source code is compiled, and decide the next step based on the compilation results. Detailed flow chart shown in Figure 4.4 shown below:

Process three - the operative part of the evaluation function

Enter this code need to first create a sandbox environment for user code execution, while the measured example of the input file to redirect a user code and then call the user code to execute the generated output file output the result. Detailed flow chart shown in Figure 4.9 shown

below:

Process four - Profiling answer judgment section

This part is mainly responsible for the user to upload the source code is compiled, and decide the next step based on the compilation results. After completion of the evaluation process, the user code is compiled, the user code execution steps, through the standard output redirection function of generating an output file, in answer judging section, the structure is provided by a function call, the output file and answer the final test cases detailed comparison, and compare the results returned.

4 summarizes

In this article, the authors focus on specialized online learning management system used to assist teaching, proposed to build a program based on LAMP platform architecture online learning management system, and through the current research as well as many mainstream network technology research, design and implement an open, mainly for IT-related courses teaching aids online learning management system.

The online course evaluation system to support management, and evaluation and implementation of custom programming job in the evaluation function module, use the C language as the module background, responsible for specific code compilation, execution monitoring, the answer contrast, etc., can make full use of C language efficiency of the implementation and realization of a strong library more secure, and accurate code reviews. The reception of the online learning management system evaluation module using PHP dynamic scripting language, since the powerful PHP compatibility and platform portability, the front desk can be more convenient to connect with a variety of mainstream architecture of the site, greatly enhancing the online evaluation system

compatibility. At the same time, the authors used the XML document as a foreground and interactive bridge, greatly enhancing the scalability and flexibility to maintain the efficiency of the interaction and the entire evaluation system framework.

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