Design of Online Teaching System for Financial Management Course Based on Cloud Platform

Min Luo(✉) and Zhen Li

SIAS University, Zhengzhou 451150, China

Abstract. The traditional online teaching system of financial management courses can only be two-way contact between teachers and students. It is difficult to realize the rich teaching resources shared in modern society, and it is also difficult to give play to the subjective initiative of students' learning, so the online teaching system of the financial management course is designed based on the cloud platform. Design the hardware of online teaching system of financial management course, including the main controller power circuit and analog-to-digital conversion module. Based on the cloud platform, the online teaching system software of financial management course is designed, the cloud platform database module in the system deployment is improved, and the courseware on demand system with cloud service as the center is designed. Design experiments to test the function of the online teaching system, and check the completion of its online management function, online teaching management function, authority management function and online examination function. And test the network data security of the teaching system, the ability of different numbers of users online at the same time, the response time in the process of login, communication and teaching.

Keywords: Cloud platform · Financial management course · Online teaching · Teaching system

1 Introduction

In order to enrich students' vision, increase students' learning resources, and give play to students' subjective initiative, the cloud platform is applied to the online teaching system of financial management course. Through the teaching system, teachers can share teaching resources, optimize the allocation of teaching resources and improve teaching efficiency. The system is built on the cloud platform, which combines private cloud and public cloud to provide stable services for students and teachers [1]. The system introduces database connection pool technology and video on demand cloud technology. Database connection pool technology can ensure that students and teachers can use the teaching system in PC, mobile devices or desktop computers; video on demand cloud technology can ensure the fluency and intelligence of courseware on demand on the website. The system provides teachers with system management, performance management, student management, class management, curriculum management, examination

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management, homework management, professional management, online Q & A and other functions, and provides students with online learning, online examination, online homework, online communication functions. According to the data information required by the whole digital teaching platform, the specific database table structure is designed to form a systematic and standardized relational database, which can record the changes of data in real time and complete the data persistence operation.

2 Design the Hardware of Online Teaching System for Financial Management Course

2.1 Design the Main Controller Power Circuit

In the main controller, using single-chip microcomputer as the power supply facilities of the power supply circuit has the advantages of short development cycle, small volume, strong control function, low power consumption, strong adaptability to the environment, flexible expansion and convenient use [2]. In this paper, the minimum system of single chip microcomputer is used as the system device of the main controller. Stc89 MCU minimum system mainly includes MCU, clock circuit, reset circuit and power supply. From the perspective of the design of the online teaching system, the understanding of the minimum system of a single chip microcomputer is the basis of learning a single chip microcomputer. Through the minimum system, we can understand the most basic principle of the system. The stc89 microcontroller and other compatible microcontrollers all have a function: after the microcontroller is reset, the program starts from the ooooh address of the internal ROM; when it is connected to the low level, the program starts from the ooooh address of the external ROM directly after reset [3]. Because when using this series of MCU, the user program of MCU is written in the ROM of MCU, so the pin is connected to high level in the minimum system.

SCM power supply is a very important module, the stable work of power supply is an important guarantee for the stable operation of SCM. Because there are many 220 V switching power supplies on the market and the price is low, in order to save the cost, the online teaching system design in this paper does not design the power circuit in the system, but through a 220 V power interface, as shown in Fig. 1.

Most single-chip microcomputer and related systems use regulated power supply, which can meet the needs of the stable work of the system. Therefore, it is very necessary to design a DC regulated power supply for single-chip microcomputer. For the online teaching system designed in this paper, the required voltage is 220 v. The online teaching system designed in this paper does not include the previous design of rectifier and 220 V voltage regulator, but this part of hardware facilities is essential in the real teaching process, otherwise there will be stuck, flashback and other phenomena [4].

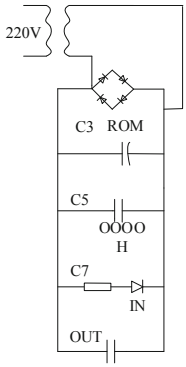

Fig. 1. Schematic diagram of power supply principle

2.2 Design A/D Conversion Module

The chip of A/D and D/A conversion in the online teaching system of financial management course designed in this paper is pcf8591. The hardware circuit of A/D and D/A conversion in this system is shown in Fig. 2.

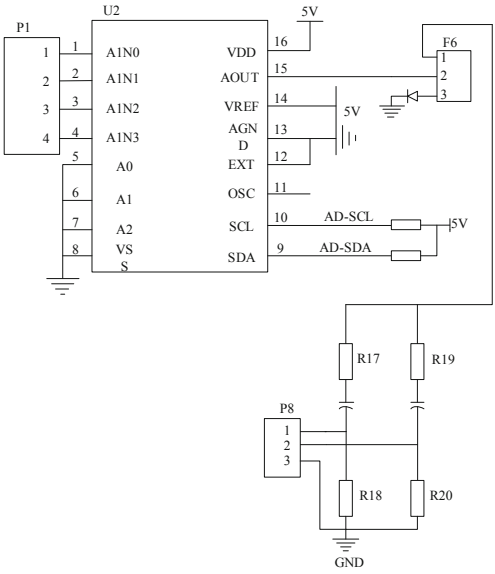

Fig. 2. Schematic circuit diagram of pcf8591

As shown in Fig. 2, pcf8591 is a chip with two functions of A/D and D/A conversion. In the experiment of A/D module, the analog voltage input in the schematic diagram is not connected, so the potential within the acquisition range can be connected for acquisition. The results of A/D acquisition can be observed through LCD and other

display devices. The LED light and audio output connected to the D/A output port can verify the experimental effect. The single chip microcomputer system can't read the analog signal directly, but there are many analog signals in engineering projects [5, 6]. In order to read analog signal, it is necessary to convert analog signal into digital signal which can be read by single chip microcomputer. The purpose of A/D conversion is to convert analog quantity into digital quantity through a certain circuit. This paper uses pcf8591 chip to realize A/D conversion function. The chip has four 8-bit A/D conversion inputs. A/D converter adopts successive approximation conversion technology, which has the characteristics of fast conversion speed and high precision. The speed of A/D conversion is determined by the maximum speed of IIC bus communication. In A/D conversion operation, a1n0-a1n3 is the input port of A/D, which can simulate the change of analog voltage through potentiometer. The VREF reference voltage of the chip is directly connected to the power supply, so the resolution of A/D is 220 V/256. The interface of SDA and SCL is connected to MCU I/O to realize the communication between A/D conversion chip and IIC bus of MCU.

In order to control some analog parameters, MCU needs to output analog parameters. In order to solve this problem, we need to use D/A conversion technology. In this paper, the D/A conversion function is also realized by pcf8591 chip, which has one 8-bit D/A conversion output. About is the D/A conversion output port of the chip. The hardware configuration of related implementation is the same as A/D conversion. In the D/A output experiment, the output is connected to the LED lamp, and the output change is observed through the lamp change.

3 Design Online Teaching System Software of Financial Management Course Based on Cloud Platform

3.1 System Deployment Design

In order to make it convenient for students and teachers to use the system to manage learning and teaching resources, the system adopts B/S architecture design, and users can use PC browser or smart phone to access the system [7–9]. The whole server is located in the cloud, the system is deployed uniformly, the reusability is good, and the coupling degree of business data and page display is low. The system deployment design is shown in Fig. 3.

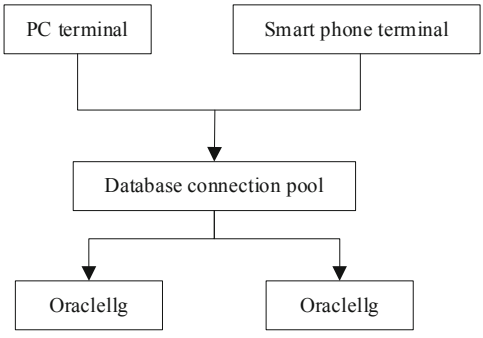

Fig. 3. System deployment design

As shown in Fig. 3, the system can be deployed and designed, including database connection pool. This system uses Oracle LLG database, with 119 database tables, which stores organization information, function information, permission information, role information, student information, teacher information, class information, course information, courseware information, examination information, homework information, professional information, etc. With auth_ The first table stores function information, permission information, role information, user role and authority information_ The table at the beginning stores class related information; KC_ The table at the beginning stores the information of courses, courseware and handouts_ The table at the beginning stores the information of exam, paper, question and student's exam result_ The table at the beginning stores the information of students' learning process_ The table at the beginning stores user information. The system adopts connection pool technology to manage database to cope with high concurrent access [10, 11]. In order to optimize the concurrent access processing capability of the database, the server dynamically adjusts the maximum and minimum connections of the connection pool to ensure the optimal performance of the system. The minimum and maximum connections are two important parameters of the database connection pool technology.

3.2 Design Courseware on Demand Program Based on Cloud Platform

The system adopts B/S structure, and users can access the system by PC browser, mobile phone, iPad and other devices. Due to the diversity of access channels, in order to ensure that the courseware can be played smoothly on various devices, it is necessary to decode the uploaded courseware. The decoded courseware can be played smoothly on various devices, and users can choose different definition videos to play according to their own network conditions. Due to the different amount of user visits in each period, the network bandwidth occupied by on-demand courseware is different. When the user visits are very concentrated, the bandwidth will be occupied. In order to ensure the fluency of user play, the system adopts the technology of on-demand automatic cloud. To ensure that the courseware can be played on various devices, the system needs to use the courseware decoding technology to transcode the audio and video uploaded by teachers into a format suitable for playing on PC or mobile terminal. Because the decoding speed depends on the playing time of the courseware, the decoding speed is relatively slow, so the system is equipped with three video decoding servers and one learning record server, which are respectively used for audio and video decoding and recording the learning time of students. Courseware decoding is divided into super clear, high-definition, standard definition of these three kinds of definition of video, in the play interface, students choose the definition according to the current network environment [8]. In the case that users do not have centralized access to the system, the bandwidth is sufficient; however, when major activities are held, the bandwidth will be occupied, and the later login users will not be able to order the courseware. Considering the existing resources and user experience, the strategy of on-demand automatic cloud is adopted. According to the preset strategy, the students' learning requests are automatically scheduled to provide the fastest route and on-demand service. First, the system needs to judge the user's network operator,

then obtain the corresponding line occupation, and judge the platform used by students when applying the teaching system according to the set network conditions. The whole process flow chart is shown in Fig. 4

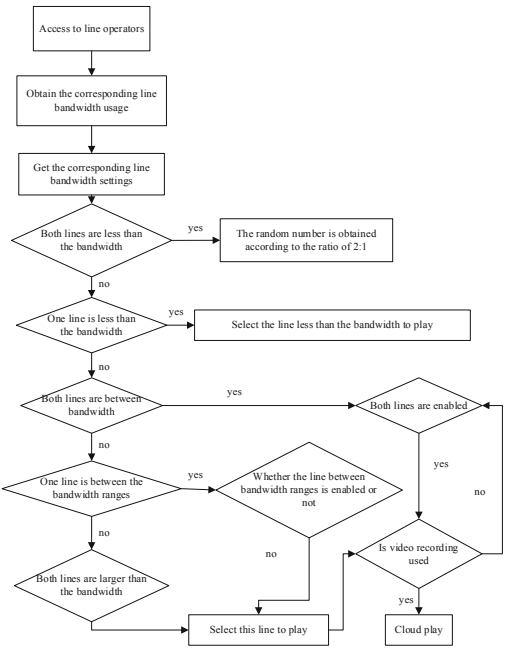

Fig. 4. Flow chart of courseware on demand system strategy

As shown in Fig. 4, through the courseware on demand strategy, we can determine whether an audio or video belonging to the current cloud platform in advance can be played by the courseware on demand system. If it can be played, we can choose the appropriate line. If it cannot be played, we will give a prompt [12, 13].

4 Experimental Study

4.1 System Test Environment

Before the system test, the hardware facilities and software environment of this experiment need to be set, and the specific parameters are shown in Table 1.

After setting up the above experimental environment, we can start to test the systems' function and system performance (Table 2).

Table 1. Hardware parameters

	Name	Parameter
Processor	CPU	Intel Core I3 CPU M 390@2.67 GHz (dual core 4 threads)
	A main board	HP 1667 (Intel HM55)
	Memory	2 GB, DDR3
	Graphics card	Intel HD graphics (ironlake), 256 MB
	Hard disk	Wdsooobevt-60aort0400 rpm, 500 GB
Peripheral	Monitor	TLC6
	Network card	Rising semiconductor RTL8101/2/3 family fast Ethernet NIC
	Sound card	Intel 5 Series/34x0 chipset PCH audio device controller

Table 2. Software environment

	Software	Name
Data	System platform	Windows 10
	Web server	Apache
	Database server	MySQL
	Database management tools	SQL Manager for MySQL and phpMyAdmin
Beautify	Web art and image processing	Adobe Photoshop
	System diagram drawing tool	Microsoft Office Vision

4.2 System Function Test

Function test is the most basic test in system test. No matter how the software is implemented internally, it only verifies whether the functions of the product meet the requirements according to the requirements specification and test requirements list. It mainly tests the following aspects: first, whether the functions are fully realized and whether there are omissions; second, whether the functions meet the needs of users and the hidden needs of system design. Third, whether the input can be correctly accepted and the correct results can be given [10]. It mainly includes students' learning and teachers' management of classes and courses. For students and teachers online management function, teaching online management function, authority management function, online examination function, the specific test situation is shown in Table 3, 4, 5 and Table 6.

As shown in Table 3, 4, 5, and Table 6, the test results show that each function can be used normally, and the function is perfect, the interface is friendly, and the interaction is good.

Table 3. User management function test

	View user information	Edit user information
Process	Click user management to view user information	Add, modify and delete user information
Expect	Display user information, including: user name, user's gender, user's phone, user's picture information	Add, modify and delete user information according to relevant operation
Result	Success	Success

Table 4. Online teaching function test

	View online information	Edit online information
Process	Click online teaching management to view the relevant information about online teaching	Add, modify and delete online teaching information
Expect	Display online teaching information, including: course name, teacher name, teaching interface, student information, etc	Add, modify and delete online teaching information according to relevant operation
Result	Success	Success

Table 5. Function test of authority management

	View permission information	Edit permission information
Process	Click authority user management to view the relevant information about authority	Add, modify and delete permission information
Expect	Display permission information, including permission name, permission content, permission specific meaning and other information	Add, modify and delete permission information according to relevant operation
Result	Success	Success

4.3 System Performance Test

As a web system of B/S architecture, the network teaching system not only needs beautiful page, practical function, but also has strong security requirements, otherwise it will lead to data loss and system paralysis. Because the system is directly facing Internet users, it may be threatened by more network attacks, so it is necessary to test its security. The goal of security testing is to find out the security defects of the system design as much as possible, and then repair them as necessary. The security test of the system includes testing whether there are security vulnerabilities in the login of the system,

Table 6. Function test of online examination

	View test information	Edit exam information
Process	Click online examination management to view the relevant information of online examination	Add, modify and delete online examination information
Expect	Display the online examination information, including: examination name, examination subject, examination content, examination score setting and other information	Add, modify and delete online examination information according to relevant operation
Result	Success	Success

testing whether there are security vulnerabilities in the script program of the server, testing whether the system management code is secure, preventing users from bypassing the program to directly access the background program, testing whether the security settings of the Tomcat system server platform are appropriate, etc.

Taking security as the evaluation index of a teaching system and the basis of analyzing system performance, this paper carries out a system classification performance test and analyzes the integration ability of different systems for information resources. The formula for computing the security of online teaching system of financial management course based on cloud platform is as follows:

$$P = \sum_{t}^{N} a_t(i) \tag{1}$$

Where, P represents the probability of the teaching system being invaded by malicious data; N represents the number of samples in the data set; a_t represents the number of data samples currently running. If we want to extract the characteristic quantity of the security performance of the teaching system, we need to go through the following calculation:

$$G_{m,n} = \begin{bmatrix} C_r^b(q_{k+1}) & 0 \\ 0 & C_r^b(q_{k+1}) \end{bmatrix} \begin{bmatrix} r_a \\ r_m \end{bmatrix} + \begin{bmatrix} v_{k+1}^a \\ v_{k+1}^m \end{bmatrix} \tag{2}$$

In the formula, $C_r^b(q_{k+1})$ is the sequence probability value of the illegal intrusion of the online teaching system of financial management course based on the cloud platform; q_{k+1} is the matching coefficient of the security performance of the online teaching system; in the above formula, the influence of the running module and the non networking data is usually divided into 2 * 2 boards, and v_{k+1}^a and v_{k+1}^m are expressed as the coefficient components of the network dynamic characteristics. According to the above calculation formula, we can get a schematic diagram of the evaluation results of cloud and local data security performance with the increase of the number of data operations in the process of teaching system interconnection.

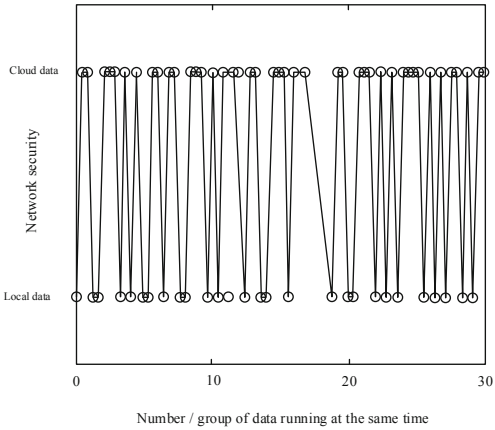

Fig. 5. Data security performance evaluation conclusion

As shown in Fig. 5, with the increase in the amount of running data, the network security of the teaching system fluctuates to a certain extent. Compared with cloud data, local data is more secure. But in general, before the number of data running does not exceed 15 groups, the risk is still within the scope of affordability, so the same user needs to ensure that the data opened at the same time does not exceed 15 groups when using the teaching system.

Besides the security, it can also test the response time of teaching system and the ability of users to be online at the same time. Testing the online ability of the users of the teaching system at the same time is to provide guarantee for the big classroom, while the response time of the teaching system ensures the synchronization of data transmission. After testing, we can get the schematic diagram of the online capability test for different numbers of users at the same time, as shown in Fig. 6.

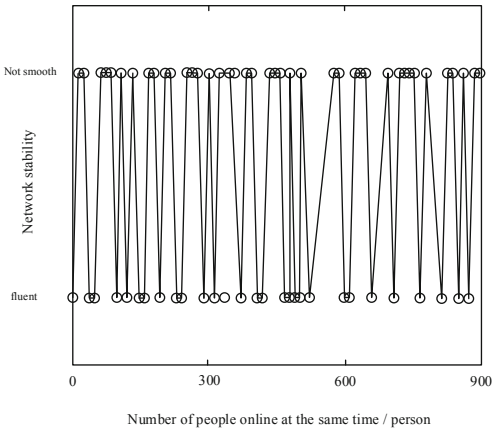

Fig. 6. Online capability test for different number of users at the same time

As shown in Fig. 6, if the number of online users is less than 600 at the same time, the online teaching system of financial management course based on cloud platform can ensure smooth operation. But when the number of people online is more than 600, the whole online teaching system of financial management courses based on cloud platform will become stuck with naked eyes.

The response time of the teaching system can be tested by increasing the number of concurrent data. The test can be divided into three aspects: login, online communication and online teaching. The specific test results are shown in Table 7.

Table 7. Response time test results

Operation	Concurrent number	Maximum business time (s)	Average network usage
Login online	10	1.02	69
	20	1.23	75
	30	1.35	88
	40	3.14	93
Online communication	10	1.21	102
	20	1.42	134
	30	1.69	159
	40	4.15	177
Online teaching	10	2.35	314
	20	3.56	456
	30	4.97	728
	40	12.38	1034

As shown in Table 7, the maximum time consumption of the three operations with the same number of concurrent services is different. The larger the average network traffic, the longer the time consumption. With the increase of concurrency, business time and network traffic are also increasing. When the concurrency number reaches 40, the increase rate suddenly becomes larger, then we can know that the system can achieve maximum business efficiency when the concurrency number is less than 40.

5 Conclusion

This paper designs an online teaching system for financial management course based on the cloud platform, and through the test of the teaching system in the experimental link, it proves that the software has complete design function, a friendly man-machine interface and simple use. It is safe and reliable in the running process, and has good use effect. It can be accessed with different mainstream browsers. It has good cross platform security, and basically achieves the expected goal. However, due to the limited time and

energy, some of the design functions of the system are not perfect, which will continue to improve in the later stage. In addition, the interface needs to be further beautified to meet the needs of students in each stage.

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