



Design of Mixed Learning System of Tourism Planning Course Based on Mobile Terminal

Yu-xiang Liu¹(✉) and Zhi-li Sha²

¹ College of Tourism and Urban-Rural Planning, Xichang University, Xichang 615000, China

² School of Foreign Languages, Xichang University, Xichang 615000, China

Abstract. There are defects in the processing and allocation of teaching resources in the current learning system, which leads to the phenomenon that the teaching information display is stuck and collapsed when the number of concurrent users is high. Therefore, a hybrid learning system of tourism planning course based on mobile terminal is designed. The overall framework of the system is designed from hardware and software. In hardware, the circuit board of single-chip microcomputer is designed. The power supply between modules is realized and the communication network architecture is optimized by changing the starting mode by setting different step sizes. In software design, database, system encryption technology and file data allocation mechanism are designed and optimized respectively. This completes the system design. In the system test performance experiment, the system test environment is built in the laboratory to simulate the multi-user login system at the same time to test the system performance. Experimental results show that the designed system can effectively improve the number of concurrent users and reduce the stuck situation.

Keywords: Mobile terminal · Tourism planning course · Learning system design

1 Introduction

The application of network technology in the field of teaching has received increasing attention from the education community. The Internet provides a good application platform for it. Computer-assisted teaching, computer-assisted learning and information technology education have been universally recognized today [1, 2]. The same is true for the concept of E-learning (digital learning). It is a way to promote teaching by applying the concept of digital learning to the teaching design process. This has attracted the favor of the education community and set off a climax of application in the education field. However, any teaching method must undergo the test of time. In practice, instructional designers gradually find out the disadvantages of e-learning teaching mode. Therefore, instructional designers have been trying to combine the advantages of E-learning with the advantages of traditional teaching, to extract the essence and discard the dross and form blended learning. This learning approach includes the rational use of a variety of information technology combinations, including video and audio conferencing, networks, CD boxes and other media, as well as the rational use of knowledge technology,

online activities and learner support systems. However, the current learning system is only a single learning system, and there are some defects in the internal processing of teaching resources, which leads to the problems of teaching information display stuck and collapse when the number of concurrent users is high. Therefore, a hybrid learning system of tourism planning course based on mobile terminal is designed. Through a general LCD module interface lcd1 of M32 MCU and another OLED interface, the connection between OLED and MCU is completed, and the hardware design of the system is realized; Design the resource management module of the database, obtain the file information on the web server, optimize the file data allocation mechanism by using the system encryption technology, so as to complete the software design of the system. Through the design of hardware and software, realize the design of mixed learning system of tourism planning course based on Mobile terminal. Finally, the simulation results verify the effectiveness of the design system, improve the number of concurrent users, and reduce the situation of stuck.

2 Design of Mixed Learning System of Tourism Planning Course Based on Mobile Terminal

The use of hybrid learning system for mobile terminal network teaching does not mean that teachers give up the traditional face-to-face teaching method. The traditional face-to-face teaching method has many advantages, such as conducive to the play of teachers' leading role, conducive to the teaching of system scientific knowledge and the completion of teaching objectives, which are incomparable with network teaching. We should organically combine the traditional classroom teaching and students' after-school online learning, formulate corresponding teaching plans and programs for different courses, give full play to the advantages of blended learning, and achieve the optimal teaching effect [3, 4]. Further study the blended learning mode, try to integrate the idea of blended learning into the network teaching system, build the network learning platform of tourism planning course learning, and help teachers to carry out more effective teaching management and teaching. The overall design framework of the system is shown in the figure below (Fig. 1):

The mobile terminal learning function module designed in this research is a supplement and optimization to the existing teaching platform. The mobile phone mobile learning module is embedded into the existing teaching platform through related technologies to achieve the purpose of assisting teaching. In the application process, student information and course resources are managed uniformly through the background. Learners can access complete course learning resources through computers, and develop contextualized and personalized independent learning support through the mobile phone assisted teaching system.

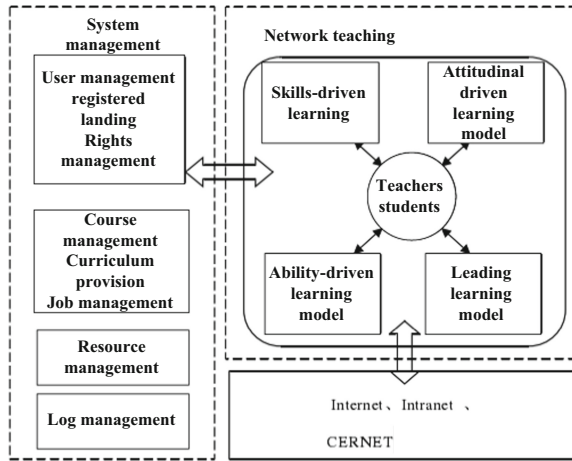


Fig. 1. Overall design of the system

2.1 Hardware Design

In the hardware design of the system, the microcontroller is mainly used as the core of system control. Since the display part of the system designed in this paper mainly uses a metal capacitive screen, the system includes four major components: website, server controller, client controller, and playback program. In the hardware part of the system, it is mainly composed of the main circuit board, control module, interface module and wireless transmission module of the ALIENTEK MiniSTM32 microcontroller. The main circuit board of single chip microcomputer mainly includes micro control unit (MCU). In the process of setting the control unit, M32 single chip microcomputer constitutes the core component of the control system. Under the expansion, the control circuit needs to be expanded and set before the main circuit module can be configured through $BOOT_0$ and $BOOT_1$ [5, 6]. The configuration mode is shown in the table below (Table 1):

Table 1. System boot mode configuration settings

$BOOT_0$	$BOOT_1$	Startup mode
1	1	SRAM start
0	X	User flash mode
1	0	System storage mode

In SRAM boot mode, it is mainly used in debugging code in SRAM. In system storage mode, after the system's built-in memory is started, hardware will download the source program code by serial port, and can be used for downloading serial port. When $BOOT_0$ is 0 and $BOOT_1$ is any value, pressing reset key can start the system's program and start user's flash mode, mainly depending on user flash memory. To complete the

startup of flash [7, 8]. In the interface design of SWD and OLED, through a general LCD module interface LCD1 of M32 single-chip microcomputer and another OLED interface, it is possible to realize SWD and OLED interface to supply power to the display module, and realize the connection between OLED and MCU. And designed the communication network structure of the system, as shown in the figure below (Fig. 2):

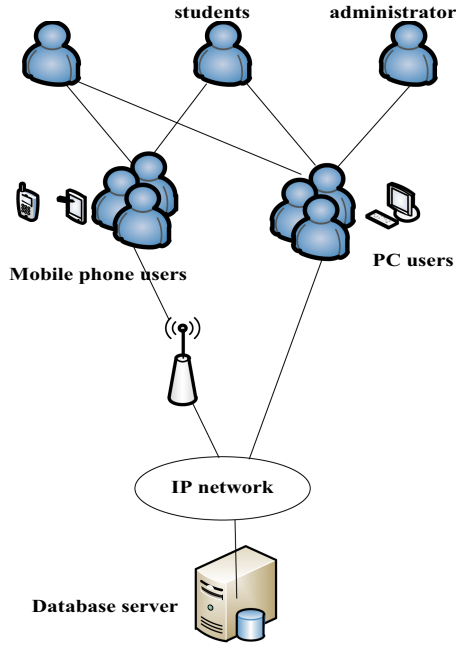


Fig. 2. Communication network design

So far, the hardware design of the system is completed.

2.2 Software Design

Database Design

The user management function is the most basic function in each online learning system. Its main purpose is to manage all registered personnel who use this website, confirm user roles, assign corresponding permissions, and effectively manage the entire online teaching process from all aspects. The registered personnel include administrators, teachers and students. The administrators can use all the functions of this website. The identities of teachers and students are assigned by the course administrator. Teachers have the authority to manage course content, monitor student learning, and judge student performance. Students can use any learning resources provided on the website for online learning activities. In the system of this article, the user data table format in the database is as follows (Table 2):

Table 2. User data sheet

Field name	Data type	Is it empty	Length
Number	Int	N	10
User name	Varchar	N	100
Use password	Varchar	N	32
Personal email	Varchar	N	100
Name	Varchar	N	100
Surname	Varchar	N	100
City	Varchar	N	20
Country	Char	N	2
First login time	Int	N	10
Last login time	Int	N	10
Login IP address	Varchar	N	15
Modification time	Int	N	10

Visitors must register as a user before performing various operations. Each visitor can create his own account in the educational technology learning community and participate in online courses. If the registered user does not participate in activities for a period of time, the administrator will have a record. The system supports arbitrary electronic documents, PPT, Flash animation, video and sound files, and the system administrator can upload and manage files. The list of files uploaded by users and the operation of existing files are realized through directory functions and file system functions.

In the resource management module of the database, we can not only view and obtain the information related to the directory, but also obtain the information of the files on the web server and interact with these files.

System Encryption Technology

In this system, the encryption technology is MD5 technology. The full name of MD5 is message digest algorithm 5 (message digest algorithm). Its function is to “compress” a large amount of information into a secret format before signing private key with digital signature software (that is, transforming a byte string of any length into a large integer number of a certain length). The implementation process of one-way MD5 encryption algorithm is to add the security. CS class to the system card project, and define the security. Encrypt () method in the class. When we register users, we call the Security. Encrypt (passtex. Text) method in the Regist Click event to encrypt the cipher, and finally form a fixed length string stored in the database. The user registration information is shown in the following figure (Fig. 3):

The verification code is generated to prevent attackers from using harmful programs to register a large number of Web service accounts in vain, and then use these accounts to cause trouble for other users, such as sending spam or repeatedly logging in to multiple accounts at the same time to slow down the service [9, 10]. The verification code

ResIssuerID	UserID	Pwd	SchoolID
13	0506410136	9CE853EB7EE8E362E1D121EB4DF2DC91	2
16	123456	E10ADC3949BA59ABBE56E057F20F883E	1
18	0506410137	1BAE47CA9A88FCEB827E926DFE9FF70B	1
19	51.aspx	E10ADC3949BA59ABBE56E057F20F883E	2
20	111	698D51A19D8A121CE581499D7B701668	1
21	1001	202CB962AC59075B964B07152D234B70	1

Fig. 3. User registration information

technology is used to prevent users from using robots to register, log in, and fill water in vain. The so-called verification code is to generate a picture from a string of randomly generated numbers or symbols. Add some interfering pixels to the picture (to prevent OCR). The user can visually recognize the verification code information, enter the form and submit it to the website for verification. After the validation is successful, you can use the function [11, 12].

Optimize File Data Allocation Mechanism

In the research and development of tourism planning course learning system, we found that with the growth of the number of users, the amount of data in the system will increase greatly. In order to meet the requirements of high concurrent read-write, high-efficiency storage, high scalability and high availability, the file system of this system adopts mongodb file processing mechanism. Mongodb is a kind of relational database in theory, but it contains some characteristics of non relational database, but its function is more powerful than non relational database. The data structure stored in mongodb database is relatively loose, and the data is stored in bson format. Therefore, mongodb can easily face complex data types. Mongodb adopts sharding mechanism, which is a method of mongodb to extend load. Sharding can add more hardware devices to meet the data requirements without affecting the program running. The basic concept of mongodb sharding is to divide the collection into smaller chunks. These chunks are distributed on sharding. We don't need to know which sharding the data is stored on, we just need to run mongos, which knows where all the data is, so the application can normally connect to the database and make a request. When there is a request, you only need to know the storage location of chunks through mongos, which collects data and sends it to the application. As shown in the figure below (Fig. 4):

Separate sharding from application programs. Under this mechanism, users can expand the system without changing programs. When the amount of data and load change, fragmentation mechanism can automatically balance the changes of load and data distribution, and flexibly add new hardware devices. And its scalability is strong, and the fragmentation mechanism can be extended to one thousand nodes. The sharding mechanism can achieve no single point of failure, even if there is a failure, sharding can realize automatic failover.

Mongodb's data storage function is extremely powerful. It combines capability extension with many of the most useful features of relational databases, such as sub index range queries and sorting. Mongodb also has powerful fragmentation functions, such as built-in support of style aggregation and spatial index. However, mongodb still belongs

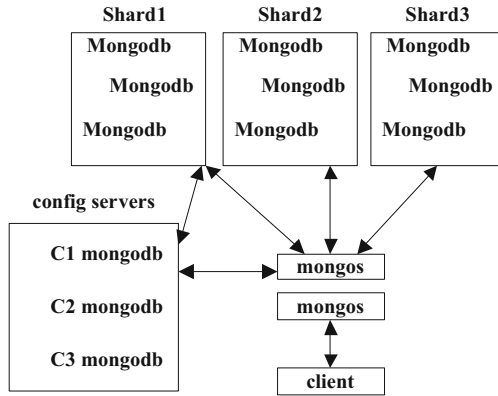


Fig. 4. Auto-sharding architecture diagram

to NoSQL in mechanism, but NoSQL's lack of experience and excessive CPU share also restrict the development of mongodb.

The hash algorithm is generally carried out in two steps. First, find the hash value of the cache. Then calculate the hash value of the object. If the hash value of the object matches the hash value of a certain cache, it is mapped to the cache.

The storage objects on Cache A are object 1; the storage objects on Cache B are object 2, object 3; the storage objects on Cache C are object 4, objects, and object6; the storage objects on Cache D are There are object 7, object8, object9, and object10; when Cache C is deleted, the object originally stored on Cache C will be transferred to Cache D, causing the load of Cache D to be too high. Similarly, when Cache E is added, because the hash value of the newly added Cache E is uncertain, the newly added Cache E may fall between Cache A and Cache D with less load, making the load of Cache A zero, resulting in resources Waste.

In view of the shortcomings of mongodb, the system uses hash algorithm to allocate data, so as to avoid the problem that mongodb takes up too much space. Therefore, in the process of optimization, we need to sort the cache according to the number of objects on the cache and the size of its object access. When a cache is deleted, the object located on the deleted cache is transferred to the smallest cache. When a cache is added, the cache is added to the largest cache to balance the load. When cache C is deleted, the objects originally located on cache C are transferred to cache a according to the cache sorting size to avoid excessive load pressure.

When a cache is added or deleted, the hash value of the rest of the cache will change due to the change in the number of caches, and the hash value of the storage object will also change. Object a is transferred from cacehA to cacheB due to the change in the hash value. Object b may be transferred from cacehC to cacheB for the same reason. Since there is no query priority judgment between a and b, the storage of objects a and b in cacheB is random, which is detrimental to the query performance of the system.

The optimization scheme proposes sorting the query probability of storage objects. When the cache changes, the conflicting objects determine the storage location according to the query probability. Through this measure, the query speed of the system is improved.

Add the improved storage object to the hash algorithm. When Cache C is deleted, the object originally located on Cache C will be transferred to Cache A. There are four objects located on Cache A. According to the frequency key carried by the object element itself, the storage location of the object is determined according to the size of the frequency key. Through this improvement, the speed of data query can be optimized.

Although mongodb has high throughput performance, when massive data is read, the CPU occupancy is too large, which directly affects the performance of the system. Through the improved hash algorithm, the stored data can be evenly distributed on the nodes, and the real sense of data is evenly partitioned, reducing the system's share of CPU and optimizing the system. The system can better realize the storage of massive data and provide strong support for learning system.

3 System Test

3.1 Build a System Test Environment

After the system design in this article is completed, the performance of the system needs to be tested, and the system's test environment is set up in a laboratory environment. The configuration of the test host is shown in the following table (Table 3):

Table 3. Test host environment configuration

Classification	To configure	DESCRIPTION
Hardware	CPU	Pentium4, 4G memory,
	Monitor	Resolution 1024*768, color recognition 36 bits
	Sound card	The number of quantization bits is 32 bits
	Optical drive	40 times faster transmission rate
Software	Windows 7	Microsoft Corporation

In the above-mentioned system test environment, the system designed in this paper and the original system were tested separately, and certain teaching information was randomly selected for viewing and access. In order to meet the requirements of the number of concurrent users in the experiment, this article constructed the following experimental network in a laboratory environment (Fig. 5):

The simulation and attack of multi-user concurrency is realized by using the structure of the above figure, and the same test is carried out with the original system under the same experimental environment. Record and analyze the test results.

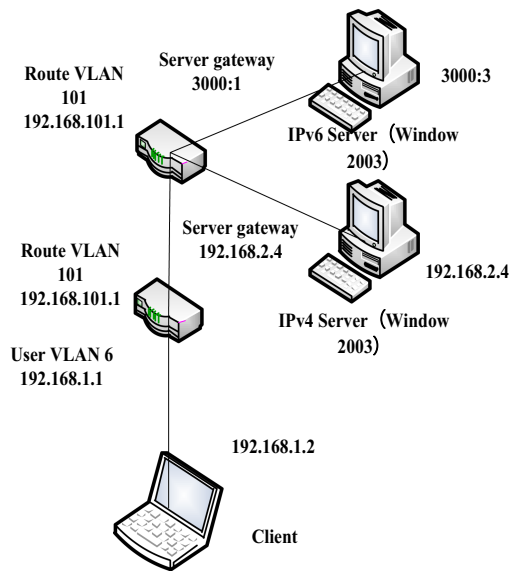


Fig. 5. Experimental network topology

3.2 Test Results

Under the above experimental environment, the test results obtained are shown in the following table (Tables 4 and 5):

Table 4. Test results of the original system

Number of concurrent users (persons)	Can you access normally	Is it stuck?
100	Yes	No
500	Yes	No
1000	Yes	Have
5000	Yes	Have
10000	No	—
20000	No	—
50000	No	—

According to the data test results in the above table, it can be seen that the original system is stuck when the number of concurrent users is 1,000. When the number of concurrent users is 10,000, the system crashes and cannot be accessed normally. The system designed in this paper can still work normally when the number of concurrent users is 50,000, but when the number of concurrent users is 20,000, the teaching information display is stuck. In summary, the system designed in this paper can improve system

Table 5. Test results of the original system

Number of concurrent users (person)	Can you access it normally	Is it stuck?
100	Can	No
500	Can	No
1000	Can	No
5000	Can	No
10000	Can	No
20000	Can	Have
50000	Can	Have

performance to a certain extent, increase the number of concurrent systems, and reduce the occurrence of jams.

4 Conclusion

The advantage of this system is that it can be directly operated and used, the interface is simple, easy to use, and does not require installation or debugging; it realizes a flipped classroom with the help of public platforms for learning; it provides convenience for students to study after class; and enhances students' travel planning The learning interest of the course.

The disadvantage of this system is that the mobile learning resources mentioned in this paper are only relatively simple and scattered learning materials compiled to meet the needs of students, which should be more purposeful, systematic, structured and integrated in the later stage; the answering function can only realize the fixed test questions, but can not realize the function of uploading the test questions from the background randomly; the system can only interact through the establishment of a group, but cannot realize the function of an interactive community through the system; although the mobile terminal learning is realized, learning in the classroom can not be completely idealized and face-to-face communication can not be avoided. With the development of mobile terminal equipment and the corresponding supporting environment, we believe that mobile terminals will be further popularized, and its application in education will be further deepened. I believe that in the near future, we can be more widely used in the teaching process. To conduct learning and teaching activities through mobile terminals, the mobile terminal-based learning and teaching model we advocate will also be practiced and promoted.

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