Research on College Mathematics Auxiliary Teaching System Based on Computer Platform

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Abstract
With the development and popularization of computer technology and the Internet, people have entered an information-based society, and the traditional teaching mode cannot meet the needs of teaching. Now online teaching has become a common education method. The long-distance real-time interaction function of online teaching allows students to study without restrictions on time and place. This paper builds a Web-based auxiliary teaching system, and builds a system platform for communication between students and teachers. In the system constructed in this research, the B/S three-tier structure is adopted, and the mathematical knowledge database is constructed by using the SQL database system, and the construction of the computer university mathematics aided teaching system under the .NET framework is realized. This system has strong practicability for university mathematics courses.

Keywords: *Computer technology; platform; university mathematics; teaching system*

1 INTRODUCTION

The teaching platform based on computer technology allows students to learn with pictures and texts through smart devices. Computer-assisted teaching has become an emerging teaching form in the world today. In the computer-aided teaching system, the teaching information resources are open and shared, which can provide all users with equal opportunities to receive education and save the cost of education. There are many teaching information resources on the Internet, which can provide users with opportunities for in-depth study and extended reading. Students have strong autonomy in the computer-aided teaching system, and can choose the most suitable learning content and learning methods, so that the teaching is more suitable for the actual situation of the students. As a relatively complex course in college teaching, mathematics teaching requires students to study and practice a lot after class. In order to improve the efficiency of mathematics teaching, the mathematics teaching assistance system allows students to learn mathematics in their spare time. This research uses Web technology to construct a mathematics-assisted teaching system, which provides a network education platform for students to learn mathematics.

2 THE THEORETICAL BASIS OF THIS RESEARCH

2.1 B/S structure

B/S architecture is a more popular system structure in recent years. In traditional computer system construction, C/S architecture is generally used [3]. The C/S architecture is composed of a client and a server, and the request sent by the user is completed by the client and the server. Due to the difficulty in developing and maintaining the C/S architecture, the pressure on the server is high, and the response is slow. Now the C/S architecture has gradually disappeared in computer development [13]. The B/S architecture is an upgrade to the C/S architecture. In the B/S architecture, the Browser and the www server use the http protocol. The browser sends a request to the server, and the server submits the corresponding page to the user. The pages generated by the B/S architecture can manage resources uniformly and provide the function of two-way communication. B/S architecture can bring users a good interactive experience. The B/S architecture can be integrated across platforms, supports a variety of applications, and is easy to develop, manage, and operate. The system uses the B/S structure, allowing users to access the Web server using a Web browser. After the user sends a request, the Web server

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and the database jointly process the information, and then send the processed information to the client [12].

2.2 HTTP protocol

The HTTP protocol is the basic protocol of the Web. Both servers and browsers use HTTP to transfer web documents. When a user needs to browse the Web, the browser exchanges information with the Web server through the HTTP protocol. In this system, the user makes a request on the client side, and the server responds to the request through the HTTP protocol [14].

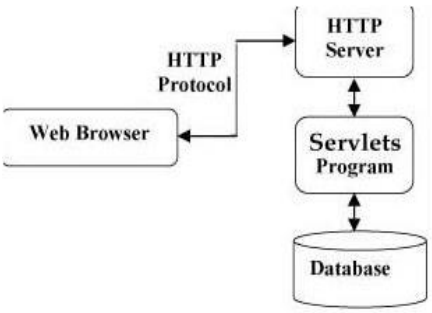

Figure 1: HTTP Protocol

2.3 HTML language

Hyper Text Mark-up Language (HTML) is a simple, powerful markup language. The HTML language can generate cross-platform hypertext documents that can be viewed by web browsers [2]. HTML is the lingua franca of the Web and a format for creating Web pages and publishing information. The hypertext hypermedia document generated by HTML language has a strong openness, which allows users to obtain the relevant information mentioned in the document while reading the information [1].

2.4 Database Access Technology

The realization of interactive dynamic pages in computer systems requires a large number of data systems as the basis, and it is necessary to provide remote data access to the pages, so the support of database systems is very important [10]. In order to realize data sharing through the network, managing data information, and improving the efficiency of data access, database access technology is a part that must be paid attention to when building a computer system. The database used in this paper is constructed based on the SQL database system, which can make a strong connection between the database and the Internet [11].

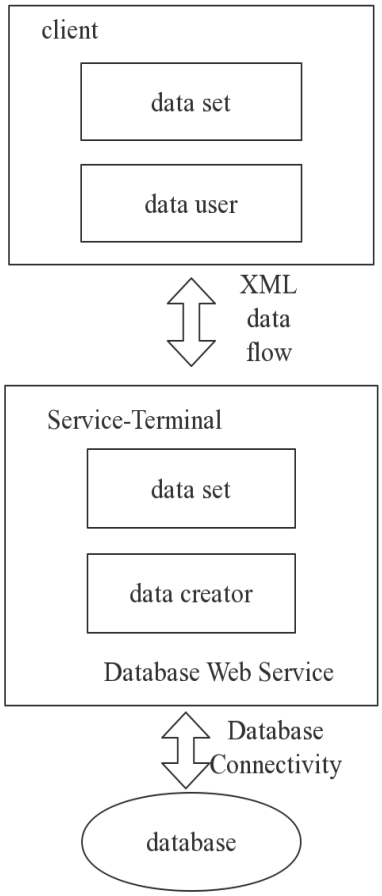

Figure 2: General structure of a distributed system using database web services

3 SYSTEM REQUIREMENTS ANALYSIS

The main users of the university data-assisted teaching system based on computer platform constructed in this study are university teachers and college students [4]. The goal of this system is to provide users with the function of network mathematics auxiliary teaching. This system should transfer the traditional mathematics teaching to the computer system, so that teachers can manage courseware, discuss with students, release homework, hold exams, guide study, correct homework and other teaching activities in the system [8]. The system should provide college students with teaching activities such as online learning, choosing and downloading courseware, asking questions and discussing, querying mathematical formulas, uploading homework, and taking exams.

Since the goal of this system is to provide mathematics teaching assistance to students and teachers, the particularity of mathematics teaching should be fully considered in the process of constructing the system. College mathematics courses have a large number of mathematical formulas and mathematical knowledge points, and the difficulty of college mathematics is

relatively high. Due to the requirements of university mathematics courses, the system needs to have a knowledge map function [9]. When students inquire about a certain knowledge point, the system should recommend relevant learning resources to users so that students can carry out consolidation or expansion of learning.

Due to the complexity of mathematical knowledge, the system needs to provide users with a communication channel, so that student users can communicate with each other, and student users and teacher users can communicate.

The system needs to have good scalability and security so that the system can be updated later. Security can ensure the safety of information data and prevent illegal users from invading the system.

4 THE OVERALL FRAMEWORK OF THE SYSTEM

4.1 System Architecture

The computer platform-based university mathematics auxiliary teaching system is a distributed application system based on the Internet, using a three-tier B/S architecture [7]. The system divides users into three roles, namely teacher user, student user and administrator user. The user completes the human-computer interaction through the client. The WWW server and the database work together to complete the interface with the user and process all kinds of information. The connection between the client and the server uses the HTTP protocol to transmit data in XML format [5].

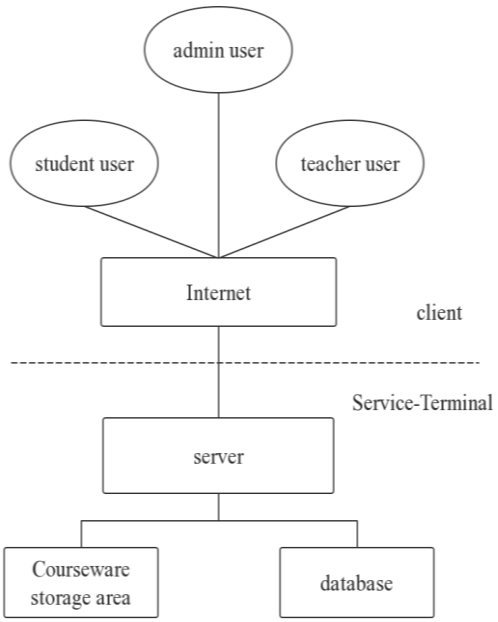

Figure 3: System Architecture Diagram

4.2 System function module structure

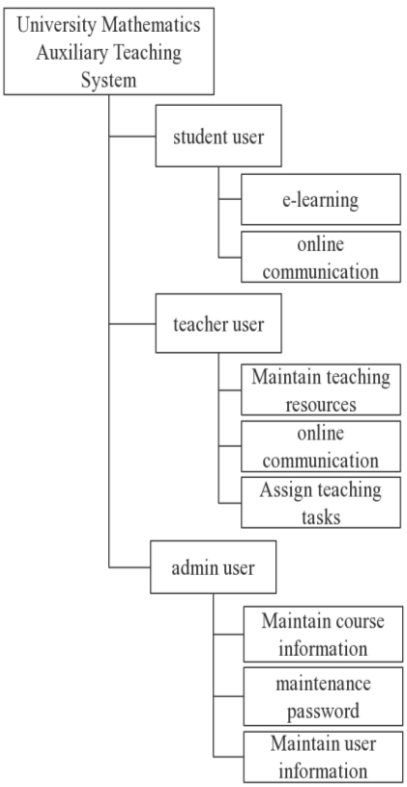

Figure 4: System function module structure

The main activities of student users in the system are learning and communication. Students can inquire and download study materials, upload assignments, take online exams, and initiate discussions in the discussion board in the system. The main activity of teacher users in the system is to maintain learning materials and network communication. The learning materials that teachers need to maintain include homework, test papers, question banks and knowledge point data. Administrator users mainly maintain data information in the system, including user information and teaching material information [5].

5 PERSONALIZED RECOMMENDATION OF TEACHING RESOURCES

When a user browses a teaching resource, the system will automatically recommend information related to the teaching resource or information that the user is interested in, helping the user to conduct extended and in-depth learning. This paper uses a personalized recommendation method that integrates user interests and resource characteristics. In traditional personalized recommendation systems, collaborative filtering algorithms are generally used. In the collaborative filtering algorithm, the correlation characteristics of resources are not calculated, so the calculated similarity of users is not high. This system introduces resource correlation into user similarity calculation. In order to improve the accuracy of the algorithm in calculating the dynamic changes of user interests, the system introduces a time function into the prediction of unrated resources [6].

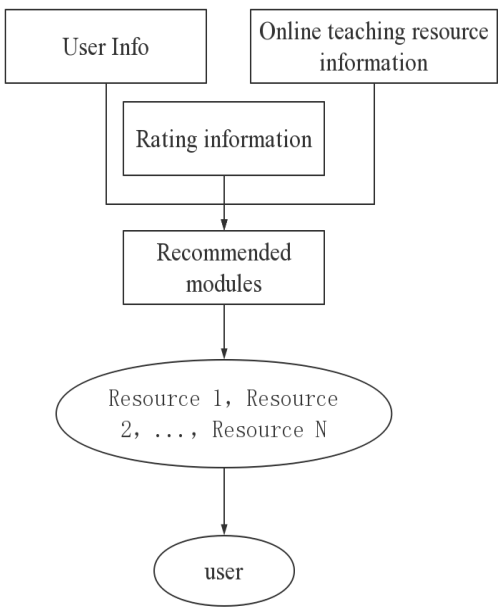

Figure 5: Personalized recommendation process for teaching resources

The algorithm transmits user information, rating information and teaching resource information to the recommendation module through the input interface. The recommendation module uses the personalized recommendation method in the Spark platform to recommend teaching resources to users. The calculated recommendation result will be sent to the user through the output interface.

Different students need to study different courses and are interested in different learning directions. In order to make the system more pertinent, the system uses model algorithms to make personalized recommendations for users. Using the model to recommend personalized algorithms to users is to use the model algorithm to record and analyze the user's behavior data, and automatically generate an interest model. The result of the interest model calculation is applied to the system's recommendation interface. The personalized recommendation function can save the user's time in browsing and querying data in the system, and optimize the user's experience in the system [15].

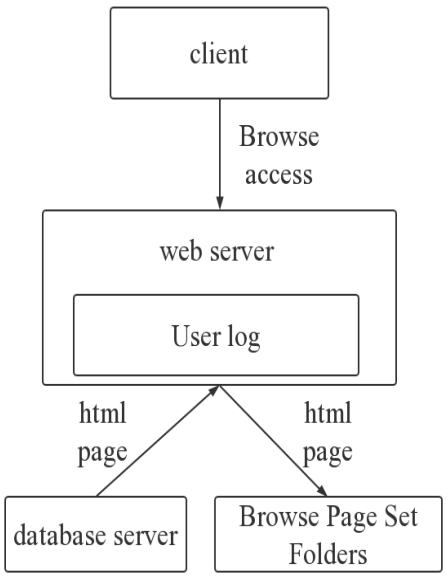

Figure 6: Metadata acquisition process of user interest model

The user interest model can be represented as a vector of the following structure:

$$\begin{aligned} &\text{InterestModel} \\ &= \{(L1, c1, hI, T1), (L1, c2, h2, T2), \ldots, \\ &(L1, cm, h3, Tm)\} \end{aligned} \quad (1)$$

Among them, (Li, ci, hi, Ti) is the ith interest topic node of the user in the direction of Li. Ci is the topic name, and hi is the user's interest in this topic. Ti is a list of interesting terms of class ci.

The user interest model classifies users' interests into long-term interests and short-term interests. Users will have different directions of interest in different time periods. In order to make the personalized recommendation algorithm closer to the user's needs, the user's interests are classified in this system.

The long-term interests store large category tags that users are interested in, and the tags correspond to the secondary categories of commodities in the database, such as "geometry", "Olympic number" and so on. The algorithm assigns a certain weight to the user's long-term interests.

Short-term interest is a user's interest in a certain category of information in a short period of time. The system divides short-term interests into a one-week time period and a one-month time period. Taking the time period of one week as an example, the user is interested in "sequence" during the week, and its hierarchical structure is as follows:

categoryname: "Digital"

weight: 5.6

tags: [(name, weight)]

brands: [(name, weight)]

behaviors[(name,weight)] ##Auxiliary, can be deleted

The system records the user's long-term interests as $\text{Interest}_{(0)}$ and Interest_{new}. Both of these data are data obtained by counting the user's behavior types and behavior times in the system over a period of time. The formula for combining the two quantities is as follows:

$$\text{Interest}_{\text{now}} = (1-\theta)\text{Interest}_{\text{old}} + \theta \times \text{Interest}_{\text{new}} \quad (2)$$

The value of θ is related to the activity of the user at the most recent time and the activity of the overall user.

Using the user interest model, the user's interest in different types of content can be calculated. When users query and browse in the system, the system will sort the teaching resources according to the degree of interest of the users, so as to realize the recommendation of teaching resources for different users.

6 CONCLUSION

This research constructs a college mathematics teaching assistant system that can be given to college students and teachers. Teachers of students can teach in the system. The system can also make personalized recommendations for students to help students carry out extended learning. The personalized recommendation method of teaching resources used in the system is calculated using the user interest model. This paper lists the core formula of this algorithm in detail. This system can effectively improve students' mathematics learning efficiency and learning quality, and has strong practicability for college mathematics teaching.

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