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Research on Online Education System of Network Classroom based on Computer Artificial Intelligence Technology

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Abstract

With the rapid development of online education, the number of platforms and students has grown rapidly. The online education system is a network system based on the B/S model, which is mainly divided into a foreground subsystem and a background subsystem. Students at the front desk can learn online according to their hobbies, or download course-related information. Teachers can spread and teach courses through the background. At the same time, there are administrators in the background to manage basic information and maintain the system. The article elaborates the system's function analysis and design, database design and system implementation technology in detail. The system test results show that the college education online management system can meet the management needs of different types of users such as students, teachers, and system administrators. The throughput rate of the college education online management system is high, and it can meet the requirements of modern college education online management.

Keywords

Computer; Artificial Intelligence; Online Classroom; Online Education System.

1. Introduction

The rapid promotion of online education has changed the traditional education method, especially the source of education information—from traditional passive acquisition to active collection of online education. In the process of data collection, due to the differences in data collection strategies and decisions, it is necessary to pay attention to the quality, accuracy and reliability of the data. Traditionally, data collection methods include methods based on emails, telephone calls, and personal interviews. At the same time, different tools such as fax machines, Electronic Data Interchange (EDI) are used for communication between homogeneous environments. The development of ICT technologies and tools has led to changes in the way data providers collect data. With the use of ICT, data collection is getting faster and faster, there are still many issues to deal with, such as fast internet connection, cost, time and heterogeneity, etc. Cloud computing technology is a distributed processing technology for massive data, which has high dynamics and scalability [1]. It realizes the computing method of virtualized resources through the network, uses the browser to realize functions such as application and storage, and converts a large amount of data, applications and other services. provided to users. A cloud platform is a platform that adopts cloud computing technology, which evenly distributes massive computing tasks using resource pools. Users can obtain different services such as storage space and computing results according to different application requirements. It has large scale, high versatility and high reliability. Advantage. In order to improve the teaching management level and teaching quality in colleges and universities, this paper proposes a cloud platform for college education online management system, and tests its performance.

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2. Functional Analysis and Design of Online Education System

2.1. Functional Design

The online education system is a network system based on the B/S model. It is mainly divided into a Front-end subsystem and a back-end subsystem. Students can register a new account on the front page or enter an existing user name and password to log in to the website. After logging in, they can log in at any time at any time. According to their own interests and hobbies, online learning can be carried out, and course-related information and downloads can be obtained directly from the website, and online discussions can be conducted, thereby avoiding the limitations of traditional teaching in terms of time and place [2]. Through this system, teachers can more easily spread and teach educational courses, and answer students' questions in a timely manner, so as to make better use of computer resources to manage courses. For ease of management, an administrator user is set. Administrators can manage a large amount of information in their daily work, including teachers, students, courses and other information. Therefore, the system needs to meet the needs from three aspects, the three aspects are students, teachers and administrators. The needs of students are to view course information, view assignments, download documents, play online on demand, and ask questions online. Teachers can operate assignments, documents, and videos of related courses, and modify passwords; administrators have the most complex functions, including maintenance of students, teachers, courses, documents, assignments, and videos, and password modification. Through the above analysis, the main functions of this system include:

1) Students can browse courses, download documents, view homework, watch videos, and ask questions online. 2) The teacher's course browsing, posting assignments, uploading videos, uploading documents, and changing passwords. 3) The administrator manages teachers, students, course-related information, assignments, documents, and videos, as well as password modification and database backup functions.

2.2. Front-end Functions

The Front-end subsystem is operated by students, mainly to realize member registration, course browsing, viewing assignments, downloading documents, on-demand, online questioning, etc.

2.2.1. Member Login and Registration Function

Each website has its own members, and the website can only provide corresponding services after confirming the identity of the login person. Function description: member login, register and modify registration information, function input: member name, password login or register and fill in the details of the member, operation sequence: log in first, if you have not become a member, please register first, fill in personal information, output: successful Log in or become a member, or fail to log in. Supplementary note: Member rights are monitored by the administrator.

2.2.2. Course Browsing

The online education system provides students with the function of browsing course information. It is expected that members can learn about the course information on the website in the shortest time, so as to achieve the purpose of online learning. Functional Description: In different ways, students can browse the courses they are interested in, and their basic information [3]. Input: The member's known information about the course. Output: Browse the database for information about the course.

2.2.3. Student Download

While browsing the course information, students can download the courseware and examination papers of the courses they are interested in to the local computer at any time, so

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as to study at any time. Function description: After students log in, they can download the selected course test paper or courseware and lesson plan. Operation sequence: Select the courseware and test paper of the course, and download as needed. Output: After confirming the download information, the download operation is completed. Supplementary note: During the whole download process, no modification will be made to the database.

2.3. System Background Function Design

The background subsystem of the online education system can be divided into teachers, namely ordinary administrators and super administrators. The ordinary administrators can view teachers' courses, upload assignments, upload videos, publish academic news, change passwords, and upload documents; the super administrator module realizes Manage and change passwords for students, teachers and courses.

The super administrator plays a very important role in the website. He is not only responsible for maintaining the website, but also a member of the website [4]. Function description: The responsibility of the administrator is not only to publish information for the website, but also to monitor the information in real time for the entire website. Once errors are found, they will be corrected in time. Input: course information, courseware or document information, video information, student information, administrator information. Operation sequence: Enter information and verify. Output: Fill in successfully, write to database. Supplementary note: The administrator's position can be said to be at the core of the entire website.

In the background of the system, the administrator can operate all the information of the entire website, which can be divided into two categories according to the operation objects: one is course information operation, which is the basis for the existence of the entire system and the focus of the entire website; the second is user information Operation, there are two types of users: students and administrators, who play the roles of participants and administrators in the website respectively, and administrators can be divided into ordinary administrators and super administrators according to their permissions. Ordinary administrators are Class teacher, super administrator is the system administrator.

3. University Network Online Education System Architecture

3.1. The Structure of College Education Online Management System

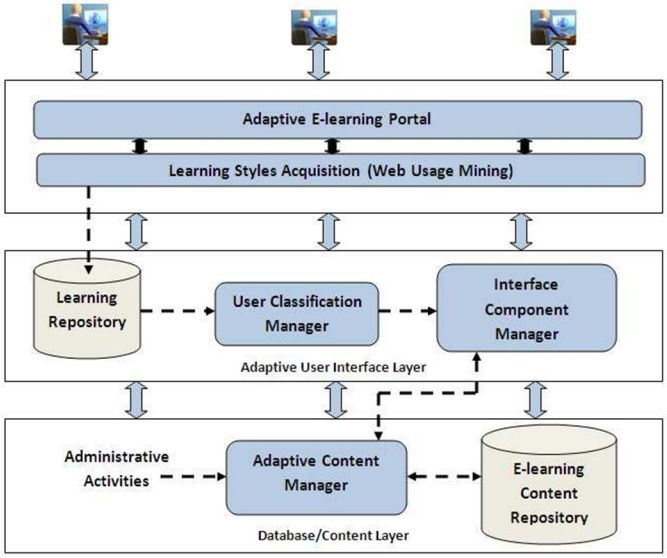

Fig 1. Overall structure of the system

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The online management system of college education can improve the management efficiency and education quality of colleges and universities, realize the informatization and standardization of college education management, and students and teachers can realize many functions such as examination result query, online teaching, attendance management and so on through the designed system [5]. The structure of the college education online management system of the cloud platform is shown in Figure 1 (the picture is quoted from Acquisition of User's Learning Styles Using Log Mining Analysis through Web Usage Mining Process).

The college education online management system of the cloud platform realizes the online management of college education. The system includes three parts: the application service layer, the educational resource layer and the infrastructure layer. After the infrastructure layer deploys the cloud platform of the system using the cloud platform deployment method, students, teachers and other users The service request is sent through the application service layer, and the system sends the user request to the education resource layer [6]. The education resource layer uses the data clustering algorithm of cloud computing to mine educational resources. After the data mining is completed, the resources required by the user are sent to the user display interface. The details of each layer are as follows.

3.2. Cloud Platform Deployment

The cloud platform deployment scheme is shown in Figure 2 (the picture is quoted from A survey of mobile cloud computing: architecture, applications, and approaches).

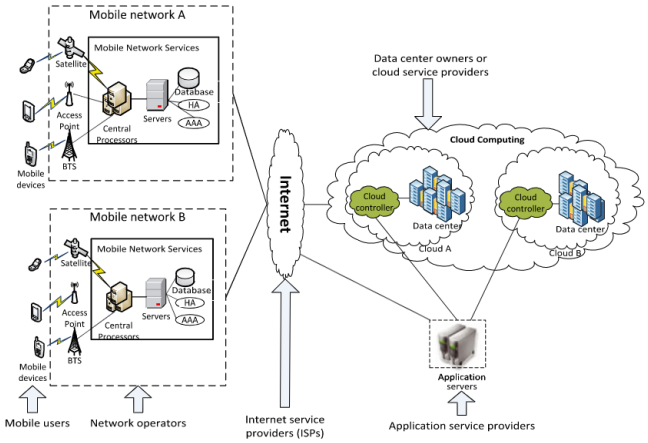

Fig 2. Cloud platform deployment scheme

Two load balancers are used to make the system meet the access requirements of too many users, achieve load balancing, and distribute users' access to the system by using the minimum number of connections priority strategy. The monitoring and scheduling server is used to dynamically adjust the virtual resources of the cloud platform [7]. The monitoring and scheduling server can collect operating parameters related to virtual machines, databases, and servers. The cloud platform uses the collected parameters to allocate resources to meet the access requirements of high concurrent users.

3.3. System Resource Recommendation Algorithm

The accumulation of different behavioral operations of learners on learning resources can be represented by the dynamic interest preference matrix $T_{m\times l}$. The degree of preference of learners to resources reflects the difference between learners. An increasing function whose calculation formula is

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$$F_{utk}^{op} = exp\left(\frac{g_{uk}}{v_{utk}} - \lambda\right), 1 \le k \le l \tag{1}$$

In the formula: $g_{uk}\left(1 \le k \le l\right)$ is the cumulative value of the learner's interest and preference on the learning resource, and is the sum of the cumulative behavior of the learner u on the tag tk of the associated resource; v is the average value of the learner's interest and preference; λ is the cumulative learner's behavior The minimum value of the sum is used to eliminate the bias of interest preference among different learners. The learner's interest and preference characteristics will shift with the deepening of learning. The adjustment of dynamic interest and preference characteristics includes the characteristic representation of various behaviors and time factors. The characteristics of the time parameter are calculated using the time decay function. The calculation formula of the learner's dynamic interest preference characteristic time factor is:

$$F_{utk}^{time} = \theta + (1-\theta) exp\left[-\left(t_{now} - t_{utk}\right)\right], 1 \le k \le l \tag{2}$$

In the formula: t_{now} is the current time; it represents the latest value in the time set marked by the label tk of the learner u; the hyperparameter $\theta \in [0,1]$ can affect the calculation of the dynamic interest feature by the time factor, and the two show a negative correlation . The behavioral feature and time weight feature are synthesized to obtain the learner's dynamic interest preference feature:

$$F_{utk} = F_{utk}^{op} F_{utk}^{time}, 1 \le k \le l \tag{3}$$

4. System Check

Figure 3 shows the effectiveness analysis of the personalized recommendation algorithm (the picture is quoted from DeGNN: Characterizing and Improving Graph Neural Networks with Graph Decomposition), where the horizontal axis represents the number of iterations of the personalized recommendation algorithm, and the vertical axis represents the value of the evaluation index [8]. It can be seen from Figure 3 that the personalized recommendation algorithms converge rapidly under both datasets. Among them, the personalized recommendation algorithm converges after 100 iterations under the sub-dataset "Given15" of the smaller ML10m dataset, and after 120 iterations under the sub-dataset "Given30" of the larger Netflix dataset, the personalized recommendation algorithm converges the algorithm converges. The experiments in this section demonstrate the effectiveness of the objective optimization function of the personalized recommendation algorithm and its optimal solution algorithm.

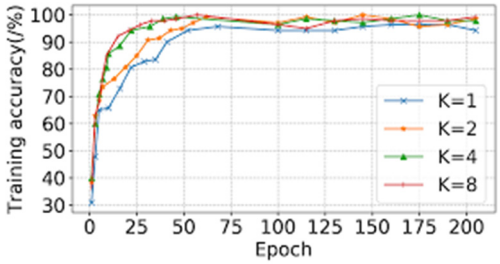

Fig 3. Effectiveness analysis of personalized recommendation algorithm

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Figure 4 presents the scalability analysis of the personalized recommendation algorithm (picture referenced in DeGNN: Characterizing and Improving Graph Neural Networks with Graph Decomposition). The vertical axis represents the running time of the algorithm in seconds. The horizontal axis represents the proportion of users in the training set to the total number of users when training the personalized recommendation algorithm. The experimental results on 3 sub-datasets of the Netflix dataset: "Given10", "Given20" and "Given30" are given respectively. As can be seen from Figure 4, with the linear increase of the proportion of users in the training set to the total number of users, the training time of the algorithm personalized recommendation in each sub-data set also increases linearly. That is to say, when the number of average rating points of users is fixed, the iteration time of each round is close to the linear relationship with the number of users. Therefore, the time complexity of the personalized recommendation algorithm proposed in this paper is the same as that of the observed rating points in the dataset. The numbers have a linear relationship. This further proves the scalability of the personalized recommendation algorithm proposed in this paper.

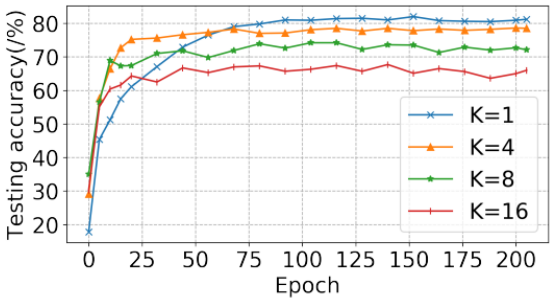

Fig 4. The impact of the change in the proportion of users in the personalized recommendation algorithm on the running time of the algorithm

5. Conclusion

This paper proposes an online education data system based on Web services, which can provide online education data with a means of collecting data online. Through the use of Web service interfaces, data exchange between heterogeneous computing systems is possible. The XML-based architecture can realize the integration of hardware or software of heterogeneous systems. After uploading the data to the website, educational data users can easily collect data.

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