Research Article

Design and Application of English Online Learning Platform

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In order to solve the problems of the existing English online learning platforms, such as the single way of providing learning content and the unclear learning purpose, this article proposes to build a cloud computing online learning platform based on data correlation mining label distribution learning algorithm. With the help of distributed computing and virtualization technology, the software and hardware resource virtualization resource pool is integrated to build an open online learning system, which can change the defects of traditional English online learning system to the maximum extent. At the level of 10000 iterations, the average number of system requests is 2.17/s. The system runs steadily and can meet the English learning needs of student users; it can be popularized and applied in English teaching practice.

1. Introduction

With the deepening of globalization, English plays an increasingly important role in our real life. Nowadays, people are becoming more and more enthusiastic about learning English. With the continuous development of smart terminal devices and the upgrading of smart products such as mobile phones and iPads, English online learning is becoming more and more popular. At present, there are more and more English online learning platforms. However, from the overall situation of the development of the existing platforms, the English learning content provided by online learning platforms is relatively single. No matter what the audience’s learning purpose is, the learning content they eventually see is the same. The learning effect behind the single and solidified platform learning content can be imagined. Based on this problem, this study uses data mining algorithm to deeply explore the learning needs of the audience, develop an online learning platform based on user needs, further improve the knowledge structure of the online learning platform, and provide personalized English learning content selection for users [1].

In foreign online learning, the study of learners is mainly reflected in the study of learning support services, which can meet the needs of learners by providing a variety of services for learners and improve the quality of online learning. These support services are provided after a detailed analysis of learners. Online learning is the third generation of distance education. Learners learn through the Internet, with little teacher involvement and students learning completely on their own. So student learning support services are very important. Every online international learning center has great value for student support services. For example, it is true that some online courses have a model called “Educational Support Services” that outlines the content of the educational support services they provide on their platform and how people learn differently on their platform [2]. Educational programs for foreign scholars can be divided into research programs and non-research programs. In terms of academic support, foreign online learning platforms mainly provide services about problems encountered by learners in course learning, and their services in this aspect are very mature. In terms of non-academic support, foreign online learning platforms mainly provide learning consulting services, personalized daily management, online learning process monitoring services, technical failure services, emotional care services, etc. These services are very mature in foreign countries and have been recognized by many online learners [3].

In China, theoretical research on learner characteristics is emphasized, but the research results are seldom applied in practice. There are many theoretical studies on online
learner characteristics in China. For example, some scholars have conducted in-depth studies on learner characteristics from some aspects. Many other scholars have studied the characteristics of learners through empirical research and case studies and have achieved certain results. However, these research results are rarely used in the construction of online learning platforms. Many online learning platforms are similar to traditional classroom teaching, which is suitable for learners in classroom teaching but not at all suitable for learners in online learning. Online courses lack uniform norms and standards, and there is no dedicated development team for the courses. Unlike foreign countries, many countries have online education standards, and online education can develop content based on this standard. There is currently no such model in China. Many online college courses replace the traditional classroom concepts used on the Internet, and some of the training topics even include instructors. Online courses are not developed by a team of educators and, of course, do not have a clear development process [4]. For example, many online college English courses, which can be said to be electronic versions of college books, completely present the content of the books on the online learning platform, without any adaptation, such learning content can be seen on many learning platforms. Based on such online learning courses, of course, it is impossible to consider the correlation between learning content, and how the push of learning content should meet the actual needs of learners.

2. Marker Distribution Learning Algorithm
Based on Data Correlation Mining

2.1. Algorithm Framework. The main purpose of label distribution learning is to learn a mapping from input space Formula (1) to label distribution space Formula (2).

\[ X = [x_1; x_2; \cdots; x_n]^T \in R^n, \]  
\[ D = \{D_1; D_2; \cdots; D_n\}^T \in R^n. \]  

Among which, \( x_i \) represents the \( i \)-th example, \( D_i \) represents the label distribution of the \( i \)-th example, \( n \) is the number of examples, \( d \) is the feature dimension, and \( l \) represents a total of \( l \) tags \( \{y_1, y_2, \cdots, y_l\} \). Given a training set, as shown in Formula (3):

\[ T = \{(x_1, D_1), (x_2, D_2), \cdots, (x_n, D_n)\}. \]

Formula (4) is as follows:

\[ D_i = [d_{i1}^y; d_{i2}^y; \cdots; d_{il}^y]. \]

\( d_{ij}^y \) is the description degree of the \( j \)-th marker to the example \( x_i \) and satisfies \( d_{ij}^y \geq 0, \sum_{j=1}^{l} d_{ij}^y = 1 \), indicating that all markers completely describe an example. The label distribution learning algorithm can learn a conditional probability function \( p(y|x) \) from it and then use the learned model to predict the label distribution for unknown examples [5]. Without loss of generality, we choose the maximum entropy model as the output model. Then, as elements of the predicted marker distribution vector, the degree to which each marker describes the example can be expressed as:

\[ d_{i:j}^y = p(y_i|x_i ; w) = \frac{1}{Z_i} \exp \left( \sum_{j} w_{j} x_{ij} \right). \]

\( w \) is the model parameter to be learned.

\[ Z_i = \sum_{j} \exp \left( \sum_{j} w_{j} x_{ij} \right). \]

Equation (6) above shows a regularization term that makes the sum of all descriptors of an example equal to 1. Some studies have shown that KL divergence is the most stable in the field of marker distribution [6, 7]. Therefore, we choose KL divergence as the most basic objective function, as shown in Formula (7):

\[ \min_{W} \sum_{i} D_{KL}(D_i \| \bar{D}_i) + \lambda_1 \| W \|_F^2. \]

In order to learn the global correlation of markers, this chapter constructs a marker correlation matrix \( S \). Potentially, marker correlation can be obtained through the low rank of constraint matrix [8]. In addition, we hope that the correlation learned can modify the predicted results of marker distribution. Then, we can obtain the following objective function, as shown in Formula (8):

\[ \min_{W, E} \sum_{i} D_{KL}(D_i \| \bar{D}_i) + \lambda_1 \| W \|_F^2 + \lambda_2 \| E \|_{2,1} + \lambda_3 \| S \|_*, \]

\[ s.t. D = \bar{D}S + E. \]

\( \lambda_2 \) and \( \lambda_3 \) are equilibrium factors. The regularization term about \( E \) controls the difference between the reconstructed label distribution \( \bar{D}S \) and the real label distribution \( D \).

In order to facilitate implementation, \( k \)-means method is adopted in this chapter to divide the samples into different clusters. In each cluster, Euclidean distance was used to measure the similarity of two markers. The smaller the distance between markers, the higher the correlation [9]. Then, the entire tag distribution learning framework based on global and local similarity of tags can be defined as shown in Formula (9):

\[ \min_{W, E} \sum_{i} D_{KL}(D_i \| \bar{D}_i) + \lambda_1 \| W \|_F^2 + \lambda_2 \| E \|_{2,1} + \lambda_3 \| S \|_* \]

\[ - \frac{1}{2} \lambda_4 \sum_{i=1}^{k} \sum_{m=1}^{l} \sum_{n=1}^{l} S_{m,n} \| D_{im}^y - D_{in}^y \|_2^2, \]

\[ s.t. D = \bar{D}S + E. \]
\( \lambda_4 \) is the equilibrium factor and \( k \) is the number of clusters. \( S_{mn} \) is the similarity between the \( nth \) marker distribution \( D_m \) and the \( nth \) marker distribution \( D_n \). Note that in the last term, \( S_{mn} \) is the correlation we need to learn, and \( \|D_m - D_n\|^2 \) can be solved from what we know. When \( \|D_m - D_n\|^2 \) is smaller, we expect \( S_{mn} \) to be larger \([10]\). So the symbol for the last term is “\( \rho \)”.

2.2. Optimization Method. Formula (9) is an optimization problem with equality constraints. This kind of problem should be transformed into an unconstrained problem before it is solved. In addition, Formula (9) contains two non-smooth items, so we first introduce redundant parameter \( Z \) to separate the non-smooth items, as shown in Formula (10):

\[
\begin{align*}
\min_{W,E,S,Z} & \sum_{i} D_{KL}(D_i||\tilde{D}_i) + \lambda_1 \|W\|_F^2 + \lambda_2 \|E\|_{2,1} + \lambda_3 \|Z\|_* \\
& - \frac{1}{2} \lambda_4 \sum_{i=1}^{l} \sum_{m=1}^{l} S_{mn} \|D_m/D_n\|^2, \\
\text{s.t.} & \quad D = DS + E, S - Z = 0.
\end{align*}
\]

Then, we use the augmented Lagrange multiplier method to transform the equal-constrained problem into an unconstrained problem, as shown in Formula (11):

\[
\begin{align*}
\min_{W,E,S,Z} & \sum_{i} D_{KL}(D_i||\tilde{D}_i) + \lambda_1 \|W\|_F^2 + \lambda_2 \|E\|_{2,1} \\
& + \lambda_3 \|Z\|_* - \frac{1}{2} \lambda_4 \sum_{i=1}^{l} \sum_{m=1}^{l} S_{mn} \|D_m/D_n\|^2 \\
& + \frac{\rho}{2} \|D - DS - E\|_F^2 + \frac{\rho}{2} \|S - Z\|_F^2 \\
& + \left< \Gamma_1, D - DS - E \right> + \left< \Gamma_2, S - Z \right>.
\end{align*}
\]

\( \Gamma_1 \) and \( \Gamma_2 \) are Lagrange submatrices, \( \rho \) is a penalty factor, and \( \langle \cdot, \cdot \rangle \) is the Frobenius dot product \([11]\). At this point, Formula (11) can be solved by using alternate directional multiplier minimization method, that is, the fourth variable can be minimized by fixing the other three variables. Specifically, during each iteration, we fix other variables and update one of the variables in \( \{W,E,S,Z\} \). First, fix \( \{E,S,Z\} \) and update \( W \), then Formula (11) can be simplified as Formula (12) below:

\[
W = \arg \min_{W} \sum_{i} D_{KL}(D_i||\tilde{D}_i) + \lambda_1 \|W\|_F^2 + \frac{\rho}{2} \|D - DS - E\|_F^2 \\
+ \left< \Gamma_1, D - DS - E \right>.
\]
Formula (12) can be directly optimized by L-BFGS quasi-Newton method, whose basic idea is to avoid the calculation of inverse Hessian matrix [12]. This optimization method is mainly related to the first derivative of the objective function. The first derivative of Formula (13) below:

\[
\nabla W = X^T (D - DX) + 2\lambda_1 W - X^T (\bar{D} - \bar{\bar{D}}^2, \Gamma_1) S^T - \rho X^T (\bar{D} - \bar{\bar{D}}^2, D - DS - E) S^T.
\]

Similarly, fixed \{W, E, Z\} updates S, so Formula (11) can be simplified into the following form, as shown in Formula (14):

\[
S = \arg \min_S - \frac{1}{2}\lambda_4 \sum_{i=1}^{k} \sum_{m=1}^{I} \sum_{n=1}^{l} S_{m,n} ||D_{m} - D_{n}||^2_2 + \frac{\rho}{2} ||D - BS - E||^2_F + \langle \Gamma_1, D - BS - E \rangle + \langle \Gamma_2, S - Z \rangle.
\]

Formula (14) can also be solved by L-BFGS quasi-Newton method, and the first derivative is shown in Formula (15):

\[
\nabla S = -\Gamma_1^T D + \Gamma_1^T S + \rho(S - Z) - \rho D^2 (D - DS - E) - \frac{1}{2} \lambda_4 \sum_{i=1}^{k} \sum_{m=1}^{I} \sum_{n=1}^{l} S_{m,n} ||D_{m} - D_{n}||^2_2.
\]

Similarly, E and Z can be obtained by solving the following two subproblems: Formula (16) and Formula (17):

\[
E = \arg \min_E \frac{1}{2} ||E||^2_F + \frac{\rho}{2} ||D - BS - E||^2_F + \langle \Gamma_1, D - BS - E \rangle,
\]

\[
Z = \arg \min_Z \frac{1}{2} ||Z||^2_F + \frac{\rho}{2} ||S - Z||^2_F + \langle \Gamma_2, S - Z \rangle.
\]
3.2. Functional Module Design of Cloud Computing Online Learning Platform. This article divides the online English learning system into user management module, learning resource management module, test module, and interactive communication module, as shown in Figure 2.

3.2.1. Design of User Management Module. Online learning platform users can be divided into three types: students, teachers, and system administrators [15]. By logging into the online English learning platform, students can learn courses online, download courseware, exercises, and other learning materials, take self-tests, or exchange problems with teachers or classmates through the forum. Teachers use online English learning platforms to guide students through courses, assign homework online, and communicate with students online, while the system administrator is responsible for English learning platform of user information.
management, curriculum information management, BBS management, and other related work. The actual situation of the specific business process of this module is shown in Figure 3.

3.2.2. Resource Management Module Design. The resource management module realizes the system administrator and teachers to upload resources. During the resource uploading process, the cloud English learning platform adds specific resource information one by one according to the English learning resource information table of the MySQL database. The process of uploading learning resources is shown in Figure 4:

The resource management module can provide students with the function of browsing the historical traces of downloading and learning resources and can save the specific information that students feedback to teachers through the system in the system database. When students enter the download interface of learning resources through the system interface, they can select specific resources to learn and download corresponding resources to enter the system browsing interface. The cloud English learning system updates resources and statistics on the reading time and reading times of database tables [16], as shown in Figure 5:

3.2.3. Design of Public Information Module. Public information module includes website overview, news center, and announcement of three types of information release. Overview of the website describes the information about the English learning website, including the services provided by the website and the website dynamics. The press center is used to release hot English academic news or current events. Announcements and notices are information such as teaching plans and educational affairs notices issued to students, teachers, or administrators [17]. Different user identities have different operation rights. Students only have the permission to view information content, teachers can browse, publish, and delete information, etc. Administrators can also maintain English information classification in addition to having all the above operation permissions.

3.2.4. Interactive Communication Module Design. The interactive communication module is designed to allow students to interact with students, students and teachers, teachers, and teachers in three forms of information exchange. In terms of email and instant messaging, Google’s third-party email service Gmail and instant messaging software Google Talk can be applied. The actual use case analysis of the interactive communication module is shown in Figure 6.

3.2.5. Data Model Design. This article is based on the Google App Engine development environment. GAE does not support traditional data storage, namely, relational database storage. But for the sake of convention, we describe the data model information in tables and then port it to a data store model that GAE can recognize using the data store described below. The main data tables involved in the system are shown in Tables 1–8.

3.3. Research on Concurrency Control Algorithm

3.3.1. Classification of Transaction Concurrency Control Algorithms. So far, various methods such as timestamp, optimistic, and lock-based database concurrency control have been proposed, such as Priority Inheriting (PI), Priority Ceiling (PC), and high-priority aborting [18]. The traditional transaction concurrency control algorithm is shown in Figure 7. Concurrency control is a key design link in cloud management service system database, which can maintain data consistency and orderly transaction concurrency. When multiple transactions are executed simultaneously in the database, the system must require the concurrency control protocol to control the interaction between them. The task of concurrency control is to ensure and coordinate the orderly execution of each transaction, so that the operation of these concurrent read and write transactions can be carried out under the condition of maintaining data consistency and integrity, so as to ensure that the N concurrent transactions can normally output the conclusion of the pair. Traditional database concurrency control algorithms cannot meet the requirements of cloud systems, and transaction scheduling of cloud service database systems must ensure the orderly consistency and stability of big data concurrent transactions [19].

3.3.2. Traditional Concurrency Control Protocol Algorithm—Two-Phase Locking (2PL). Blocking is the most commonly
used method to avoid read/write conflicts in database operations. Among them, two-stage locking is the most common and popular method [14]. The lock specifies that the transaction is processed in two phases: the first phase is to acquire the lock. During this time, a transaction can acquire any type of lock on any data item, but it cannot release any lock. The second stage is the unconditional release of the blockade. It is not possible to request a reopening of the exchange at this time. All operations are closed prior to access to data equipment. If the file is closed by another exchange, you must wait for the exchange to complete and open before the exchange can run. The size of the lock case is what we often refer to as the accuracy of the lock. Locking precision is the most common type of locking material.

### Table 1: Basic user information. User data table.

| Field name | Data type | Note |
|------------|-----------|------|
| userID | Long | The ID that marks the uniqueness of the user |
| userName | String | The user name |
| password | String | The user password |
| email | String | Email (Google account) |
| roleID | Int | Users’ roles |

### Table 2: Role data table.

| Field name | Data type | Note |
|------------|-----------|------|
| roleID | Long | Marks the ID of the role entity |
| roleName | String | Including students, teachers, and administrators |
| roleType | Int | 1 (student), 2 (teacher), 3 (administrator) |

### Table 3: Data model design of announcement classification category.

| Field name | Data type | Note |
|------------|-----------|------|
| categoryID | Long | The ID that marks the uniqueness of the classification |
| categoryType | String | Category name (news, announcements) |
| Description | String | Category description |

### Table 4: Design of notice data model.

| Field name | Data type | Note |
|------------|-----------|------|
| noticeID | Long | The ID that marks the uniqueness of the announcement |
| title | String | The announcement title |
| content | Text | Announcement details |
| categoryID | Long | Announcement classification |
| userID | Long | ID of the bulletin publisher |
| publishTime | Date | Announcement time |
| updateTime | Date | Announcement modification time |

### Table 5: Resource information File data model design.

| Field name | Data type | Note |
|------------|-----------|------|
| fileID | Long | The ID that marks the uniqueness of the resource |
| filename | String | The resource title |
| filecontent | Long | Resource content |
| username | String | User name of the resource publisher |
| userEmail | Email | Resource publisher email address |
| uploadDate | Date | Resource upload time |
| description | String | The resource description |
| courseID | Long | Course of resource |

### Table 6: Course data model design.

| Field name | Data type | Note |
|------------|-----------|------|
| courseID | Long | The ID that marks the uniqueness of the course |
| courseName | String | Course name |
| courseInfo | String | Course introduction |

### Table 7: Design of post data model.

| Field name | Data type | Note |
|------------|-----------|------|
| postId | Long | The ID that marks the uniqueness of the post |
| posttitle | String | Post title |
| postcontent | String | Post content |
| username | String | Post publisher |
| adddate | Date | Post date |
| commentID | Long | Comments on the post |

### Table 8: Data model design of comments on posts.

| Field name | Data type | Note |
|------------|-----------|------|
| commentID | Long | ID that marks the uniqueness of the comment |
| commentcontent | String | Comment on the content |
| username | String | Comment publisher |
| commentdate | Date | Comment time |

3.3.3. Distributed Collaboration 2PL Improved Protocol Algorithm. As the number of users and the cost of data increase, so does the data. Technological processes to improve the reliability and functionality of data entry are to separate written data from textual data. In order to meet the requirements of the system, this system was optimized according to the 2PL parallel control protocol. The author studies an improved 2PL protocol algorithm that can achieve real-time performance and relatively high security. In addition to reading and writing separation, we need to pay more attention to storing data correctly and consistently. Different
from traditional transactions with conflicting and mutually exclusive access, the coordination and consistency requirements of cloud information management system can be operated on the design object, that is, the design activities according to certain principles can operate on a certain resource or object in the same time [20].
Simulation system is used to evaluate the concurrency control performance of the algorithm. Transaction data is distributed evenly across tables in the database, with priority determined by the earliest deadline. We use the Application Center Test tool provided by Microsoft Visual Studio.NET to compare the performance of the two algorithms on the server when testing large-scale access. 1000 read and write transactions accessing the database were simulated and started. The experiment was carried out in several times and different read and write ratios were set [21]. The time for each transaction to run independently is set to 0.6 s. The time taken to complete the analysis transaction execution is compared at the same time. The results are shown in Figure 8.

3.4. Content Organization System Based on Genetic Algorithm. According to the system requirements, the author defines the structure of the process, which includes four stages: the content library layer, the student data layer, the process of explaining the layer process, and the process detail. Figure 9 is an overview of the organization's content created by the author.

The English learning content library is a system database that consists of four tables: the listening library, the speech library, the reading library, and the writing library. The four tables have the same structure, as shown in Table 9, respectively.

The content organization system is divided into three functional modules, namely, data input, data organization, and data output [22]. The data organization module adopts genetic algorithm. Figure 10 shows the functional structure of the content organization system.

The data input module is to set the basic information of learners, including learners' English level, learners' learning purpose, and the amount of learning content. The English level of learners is determined in the result of cluster analysis. In the system, only one level can be selected. Learners' learning purpose has been obtained when they register for learning, and most adult learners' learning purpose is to work. Therefore, the theme of learning content designed in the system is that the number of various vocational learning content is determined by teachers. They set the specific amount of learning content to be presented according to the level and learning purpose of learners, including the proportion of listening, speaking, reading, and writing.

4. System Performance Test

System testing process is the application of testing software for the entire computer system for computer hardware, software, external equipment, data, personnel, and other system factors fusion. In the actual implementation process, specific system testing process is carried out for the computer system [23]. The purpose of system testing is to find system defects and evaluate the quality of software system, and perform the testing process according to the system function and performance requirements. The ultimate goal of system testing is to check whether complete software configuration items can be correctly connected with the system by comparing with the requirement definition of the system in the real system working environment, and find the inconsistencies or contradictions between software and system/subsystem design documents and software development contracts. Whether the internal operation of the system is performed according to the specification constraints, the program is tested according to the internal structure of the program and whether each software flow path of the system program can complete the correct work according to the expected requirements. White box testing methods mainly include basic testing and logic driver. White box testing is mainly used for software verification operations. Black box test is also known as functional test and data-driven test. Black box test is to test whether each specific function can be used normally by using test methods on related functions of existing products.

During testing, the application can be considered a black box that cannot be opened regardless of the user's dimensions, internal structure, and internal characteristics in the application interface. It only verifies that the operating functions specified in the special requirements have been used. However, the software can access data to generate accurate version data and manage the integrity of external data (databases, data, etc.). Black box testing procedures typically
Common system testing methods include unit testing, white box testing, and black box testing. Unit test is to test the smallest unit module in the system. The test is usually carried out in the process of system development, mainly including the normal operation of each part of the code, whether the functional module according to the design requirements of the correct execution. White box testing and black box testing are complementary ways; it is precisely through testing software or system each module of the internal code to achieve the purpose of testing the system. White box testing can be viewed as a transparent box, requiring an understanding of the logical structure within its program. Black box testing is sometimes called "functional testing." Its main testing principle is to test whether all functions involved in the system run normally or not. During the testing process, it is not necessary to be familiar with the specific situation inside the program, but only regard it as a black box that has been packaged and only detect whether each function of the system is correctly implemented according to the design requirements.

System test can be divided into white box test method and black box test method. White box testing method is also known as structural testing method or the logical test method, white box testing through the master system within the specific implement workflow to products to be detected by testing, QTP is a software program that is widely used in the test tools, the main characteristic is a functional test automation, the current commonly used software development can use this to test, and test cases are reusable [24]. QTP focuses on the GUI, which is based on the things on the page, which is generally the controls on the interface, which are the objects that QTP captures. The working principle of QTP is to record people's manual operation, mainly record the object and order of people's manual operation, and then carry out some automatic tests according to the recorded operation and order. During testing, the focus was on the controls on the interface, such as a basic login interface with text boxes, labels, and buttons. These are the targets captured by QTP, and then a library is formed by capturing the objects. Then, the properties and methods of the corresponding objects are listed, and then, the properties and methods of the corresponding objects are called during recording, and the related operations of QTP are carried out.

The main purpose of the performance test is to ensure that the functions of the system can be fully realized as expected, and there are enough security guarantees in the process of realization. The main test items, expected results, and actual test results are shown in Table 10.

| Test project                                      | Expected results                  |
|--------------------------------------------------|----------------------------------|
| Registered user enter the user name and password | Login user account               |
| Registered user input user name and wrong password| Error message                    |
| Enter a user name that does not exist            | Error message                    |
| Empty username or password                       | Error message                    |
| Change user information legally                  | Message changed successfully      |
| Change user information illegally                 | Stop change                      |
| Illegal bank card binding                         | Message binding failed           |
| Recharge the account through certificate verification | Prompt top-up success           |
| Account recharge without passing certificate verification | Prompt top-up failure           |
| Order payment made through certificate verification | Prompt payment success          |
| Order payment without certificate verification    | Prompt payment failure           |
| Viewing learning records                         | Display transaction records correctly |
| Viewing order information                        | Display order information correctly |
| Refund through certificate verification           | Refund success                   |
| Refund without certificate verification           | Refund failure                   |
| Viewing logistics information                     | Display logistics information correctly |

Table 11: System test table.

| Test name          | Search test          |
|--------------------|----------------------|
| Run name           | Report-search test   |
| Start time         | On January 20, 2016, 3:50 p.m |
| Duration of time   | 04:10                |
| Number of iterations | 04:1500             |

Table 12: System test results table.

| Test type                        | Dynamic |
|----------------------------------|---------|
| Number of concurrent browsers    | 10      |
| Number of concurrent browsers    | 15      |
| Preparation time (s)             | 00:04:10:04 |
| Number of iterations             | 10000   |
| Whether to generate test results | Yes     |
| Abstract                         |         |
| The total number of requests     | 10000   |
| The total number of connections  | 10000   |
| Average requests per second      | 2.17    |
After the system test, the specific test results are shown in Tables 11 and 12.

Test run graph, as shown in Figure 11.

5. Conclusion

The popularity of online learning has triggered profound changes in the field of education. Universities and other educational institutions have established their own digital libraries, online learning platforms, and other modern educational information infrastructure. People no longer just rely on traditional classroom teaching methods for learning. As long as you have a computer or other terminal equipment connected to the network, you can enter the network learning platform to achieve learning behavior. As a convenient and flexible way of learning, online learning has promoted the level of education informatization in China to a new height. The role of online learning platform in online learning environment should not be underestimated. It should be rich in training services and be effective in meeting customer needs. With the advent of the internet and the rapid growth of information technology, more and more people are choosing online training. It is also an expanding use of cloud computing to create online learning platforms, which have advantages such as high security, high power consumption, and multiple storage space. This article utilizes the advantages of cloud computing to create an English online learning platform and provides detailed information on cloud computing-based online English learning platform design concepts, design, and terms used. There is an opportunity to build a cloud English learning platform in the future. The special tasks performed in this paper can be summarized as follows.

(1) Through the analysis of the current construction mode of online English learning platform, it points out that the system construction is independent, the regional information resource allocation is uneven, and there are information islands between English learning platforms and other problems. In view of the shortcomings of the current online English learning platform construction, combined with the services and characteristics of cloud computing, this article proposes a research scheme to build online English learning system based on cloud computing.

(2) Combined with the actual needs of the current English online learning system, detailed analysis, and design of the data model and business process of each functional module of the online English learning system. This article analyzes and discusses the division of the architecture of online learning platform based on cloud computing and analyzes the responsibilities of each layer from top to bottom in combination with the three-layer service form of cloud computing.

(3) This article describes the system testing process of online English learning platform based on cloud computing. This article introduces the purpose and principle of the system test and describes the process of the system test in detail. At the level of 10000 iterations, the average number of system requests is 2.17/s. The system runs steadily and can meet the English learning needs of student users.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.
Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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