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Research Article

Online Learning Support Service System Architecture Based on Location Service Architecture

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With the development of network, location-based service architecture is gradually applied to the learning support service system. The purpose of this study is to develop an online learning support system using allocation information service architecture. In this study, the 2019 year of this study was selected as a research material through an online learning support service system within six months. The system architecture of this study is the Browser/Server architecture. Based on this, we analyze the learning result data using the weight setting of the feature attribute and the learning evaluation algorithm. The results show that the improved algorithm based on location-based service architecture can get the best algorithm accuracy when the weight of the whole algorithm is about $\alpha = 0.4$. For the degree of demand for learning guidance, 16.2% thought it was absolutely necessary and 50.7% thought it was more necessary. And 70.6% of the learners thought that the learning system was not very accurate or generally accurate. It is concluded that the learning support service system of this study has a certain role. It provides a new path to improve the quality of online education learning support service and promotes the development of online education.

1. Introduction

Online education can be extended to all fields through the network, and it is very convenient to enjoy the same high level of education. Now, the education mode of "the same place at the same time" can be developed into the education mode of "different places and different times." Online education is one of the most influential computer technology applications in modern education to establish modern education system and realize learning society. This kind of network communication technology depends on the development of distance education, especially the distance education using network, which will become the direction of education development in the future. Vocational network education system is the development of network education, is the goal of modern education technology and our education system development, and is a main direction.

Based on the measurement, collection, and analysis of the learning process data of online learner, the location-based service architecture and the learning analysis technology establish the learner model and investigate the relation between the learner's learning characteristic, the teacher education design, and the educational performance and the data education process by establishing base. It provides a comprehensive, personalized, and efficient learning experience to the assessment, diagnosis, forecasting technology system, and learner. Learning center is a large network support and data learning process. The main purpose of this research is to establish a functional model and an evaluation system to provide intelligent and humanitarian support services from data obtained in the process of large-scale network learning and network learning.

In the research of online learning support service system, Wright M K thinks that the online course management software (OCMS) used in pure online undergraduate courses can not meet the needs of young immature students. Moreover, he believes that these students often lack the learning skills needed to succeed in such courses, and the popular open curriculum management system does not include a warning mechanism to guide these students to successfully complete the course without face-to-face humanized guidance. He extended the design theory of information system to the design theory of vigilance online learning system by combining the relevant literature such as design theory, learning theory, decision support, and vigilance. His research can help software developers and scholars to study how to design future online learning systems for immature students. The effectiveness of his method is low [1]. Sharma et al. establish a model to understand and predict the impact of personal characteristics and e-lms quality determinants on faculty's continued use of e-lms, which is critical to the success of e-lms. A total of 219 teachers who used Moodle in his study answered the survey. They used structural equation model (SEM) to test the proposed research model. SEM results show that system quality, PI, service quality, and te have significant influence on teachers' continuous use of e-lms. In addition, all the decisive factors of the research model are used as the input of neural network model to overcome the simplicity of SEM model. Their method is not stable [2]. Woo and Lee propose a mobile group based dynamic location service (mogls), which is a scalable VANET location service. It is robust to mobility in terms of reliability and overhead. The lower layer of its service function is composed of dynamic vehicle groups with similar tracks, and one vehicle in each group acts as the lower level positioning server. The higher level is composed of fixed servers based on cell area and infrastructure. For the location update from low-level server to high-level server, they adopt the way of information aggregation. They take advantage of the characteristics of low-level servers moving with their member vehicles and propose a mechanism to reduce signaling overhead and prevent service reliability degradation caused by aggregation location update. Their method is not practical enough [3].

Atat R introduces the CPS taxonomy {via}, which provides a broad overview of data collection, storage, access, processing, and analysis. Chiaraviglio proposed a 5G network specifically for rural and low-income areas and discussed its own conclusions in three representative cases of Italy, Cook Islands, and Zimbabwe.

This paper first introduces the function division of online learning platform and divides online learning into six subsystems. Then it introduces the structure of learning support service system and the evaluation of online learning support service. The innovation points of this study are as follows:(1) based on the relevant data of online learning in 2019, the functions of online learning system based on feature attribute weight, personalized evaluation support service system, and course recommendation system based on students' interests are analyzed. (2) We compared and analyzed the recommendation algorithm, system parameters, performance, and support services of the online learning system created in this paper with those of other systems. Students can also use the online learning system created in this article to analyze their own learning. (3) Through the analysis of the service architecture positioning of the learning system, it is found that the system can promote students' learning to a certain extent. To sum up, the online learning system created in this paper can improve the quality of online education learning support services and is conducive to the long-term development of online education.

2. Location Service Architecture and Online Learning Support Service System

2.1. Function Division of the Online Learning Platform

2.1.1. Online Learning Subsystem. The most basic educational systems include educational content, educational content, and educational content. Course focus is vividly animated in front of users. Let users understand important issues more deeply. Users can download reference materials and other information resources provided by educators [4].

2.1.2. Online Question Answering Subsystem. Users can send their questions to the system. If the answer to the question already exists in the system, it will be prompted to the user immediately. If there is no answer, the user question is first sent to the system, and the educator automatically feeds back to the user after the answer. Response mode can be 1 to 1. Only the user to question can be displayed. One to many modes can be configured and all users can view [5].

2.1.3. Online Communication Subsystem. This system provides powerful interactive features. Educational staff can set topic discussion area or questionnaire for different types of users, publish learning resource information, and answer questions online. Personal mailbox modules and reference systems can also be implemented for real time or nonreal time communication between administrators, educators, and users [6, 7].

2.1.4. Online Homework Practice and Test Subsystem. Online homework practice and test systems include automatic test paper configuration, test process control, and test result analysis. During the process of creating test paper, you can generate questions randomly or generate different papers for each user. The control test process is to automatically control the test time and deliver the paper automatically. The locking system cannot read any user tests. You can further control the test environment by weighting several problems. Analysis of test results is usually based on each question's knowledge points and user answers. To provide a specific assessment result, to propose the next step, or to perform quality analysis based on the test statistics, provide automatic change of the instant feedback function, or provide personalized feedback content based on the user's response [8, 9].

2.1.5. User Learning Record Subsystem. The system can record the user's basic learning situation, including login time, learning time, test results, main reasons and problems, and main learning chapters. The staff can query the students' learning progress and the number of times they have participated in the course [10].

2.1.6. Information Management Subsystem. The information management subsystem includes two modules: user management and learning resource management. User information management is mainly responsible for user account management. Account management sets various access rights and access levels for various types of users (managers, educators, and users). Administrators and educators can use the information resource management subsystem to manage learning resources [11, 12].

2.2. Composition of Learning Support Service System. As a subsystem of the educational system, the learning support service system itself is an organic whole and can provide learners with learning support services, in other words, to achieve effective guidance, support, and promotion of student self-discipline in order to meet the needs of students in learning. Learning together can improve the quality and effectiveness of students' learning. This is an organic whole consisting of interconnected interactive information, resources, personnel, facilities, and other support elements [13].

Information support: it points to push or release of education and consulting information related to course learning, including new courses of push, class start notices, distribution, testing, credit acquisition, authorization, and other related information. In addition, various types of consultation information are included, including course and expert selection [14, 15].

Personnel support: specifically, it mainly refers to teachers, education administrators, technical service personnel, and other subjects that have a positive impact on learning activities (guidance, answering questions, and learning consultation) in the online course learning process [16].

Resource support: here, resource support mainly refers to learning resources. This refers to all the conditions shown to learners or potentially available in the learning environment established by an education or learning system.

Support facilities and learning environment: only complete learning facilities can create an excellent learning environment. Facility services are other types of learning support services in various hardware facilities such as computers, learning spaces, and platforms for online courses such as information, resources, personnel, educational practice, and evaluation services; the material base also provides technology-based learning support [17, 18].

Learning management support: this refers to various teaching management activities, such as admission requirements, evaluation, and evaluation methods, to ensure effective learning [19].

2.3. Evaluation of Online Learning Support Services

2.3.1. Resource Click through Rate. In the process of online learning, the proportion of users of resources often reflects the degree of users' attention to specific types of resources. It counts the clearance rate of users of various types of resources in different periods of time, sorts out multiple statistical results, and forms the clearance rate time characteristic curve of specific type of resource users. Observe the number of user clicks on a specific learning resource at a specific time or the clearance rate at a specific time interval. There is a great possibility within the scope of click. For example, if the number of hits at a particular time is too low, it may be caused by the network. Users are not familiar with environmental barriers of online learning process, or users may not be interested in the learning resources provided. If the clearance rate is high, users may be very interested in learning such resources, which is very useful for users. In this way, we can provide feedback information to the information departments of medical libraries and medical literature and know what kind of education strategy to adopt in the online learning support service and know what kinds of learning resources are initially provided [20, 21].

2.3.2. Statistical Time of Online Learning. The user's learning time can reflect the user's attention to the learning support service provided in the macroview if the user clauses of the learning resources can reflect the user's attention to a particular type of learning resource. For a period of time, there is less access to the learning support service and there is no significant change in the user's online learning time. Users may not be able to enjoy online learning support because they do not pay enough attention to the service in the absence of network environments. On the other hand, learning resources are too old to help users solve the problem of using information resources. This feedback helps medical information resource providers further improve online learning support services [22, 23].

2.4. Weight of Feature Attributes in the Online Learning System

2.4.1. Establish Judgment Matrix. Consult with experts to request an evaluation of the importance of the functional attributes of the situation framework. The relative importance of the two attributes is compared in pairs. The weaker attribute is 1/9, the weaker attribute is 3/7, the weaker attribute is 4/6, and the equivalent attribute is 5/5. The shell function attribute set $A = (a_1, a_2, \ldots, a_n)$, T represents the decision matrix. a_{ij} represents the relative importance value of feature attribute a_i to feature attribute a_j. Then the case feature attribute importance comparison matrix is shown in the following formula:

$$T = \begin{Bmatrix} a_{11}, a_{12}, \ldots, a_{1n} \\ a_{21}, a_{22}, \ldots, a_{2n} \\ \cdots\cdots \\ a_{n1}, a_{n2}, \ldots, a_{nn} \end{Bmatrix}. \quad (1)$$

2.4.2. Weight Calculation. Using the knowledge of linear algebra combined with the above matrix, the eigenvector corresponding to the maximum eigenvalue of T is the relative importance of each characteristic attribute, and the corresponding weight is normalized. In this system model, the total product method is used to solve the problem, and solutions are shown in formulae (2)–(4).

Normalize each column of judgment matrix:

$$\overline{a}_{ij} = \frac{a_{ij}}{\sum_{k=1}^{n} a_{kj}}, \quad (i, j = 1, 2, 3, \ldots, n). \quad (2)$$

The normalized judgment matrix of each column is added by row

$$\overline{w}_i = \sum_{j=1}^{n} a_{ij}, \quad (i, j = 1, 2, 3, \ldots, n). \quad (3)$$

The vector $\overline{w} = (\overline{w}_1 \overline{w}_2, \ldots, \overline{w}_m)^T$ is normalized:

$$u_i = \frac{\overline{w}i}{\sum_{j=1}^{n} \overline{w}j}, \quad (i = 1, 2, 3, \ldots, n). \quad (4)$$

The $U = (u_1, u_2, u_3, \ldots, u_n)^T$ obtained in turn is the eigenvector, that is, the weight value of each feature attribute of the case.

2.5. Personalized Evaluation of the Support Service System

2.5.1. Collect Record Vector. Each knowledge point can be evaluated with $(e^j | j = 1, 2, \ldots, n)n$ cognitive ability. In the question test, in order to correctly evaluate the specific cognitive ability of this knowledge point, it is marked as "1," the cognitive ability unrelated to the question is marked as "O," and the cognitive ability is not marked as "−1." Learners can collect the record vector of each knowledge point by testing m exercises. The calculation formula is shown in the following formulae:

$$E^{mn} = \left(e^{ij} | i = 1, 2, \ldots, m; j = 1, 2, \ldots, n\right), \quad (5)$$

$$E = \begin{pmatrix} e_{11}, e_{12}, \ldots, e_{1n} \\ e_{21}, e_{22}, \ldots, e_{2n} \\ \cdots\cdots \\ e_{m1}, e_{m2}, \ldots, e_{mn} \end{pmatrix}, \quad e^{ij} = \{1, 0, -1\}. \quad (6)$$

2.5.2. Cognitive Ability: Correct Usage Rate. The correct usage rate of each cognitive ability was calculated by the following formula:

$$r\left(e^j\right).r\left(e^j\right) = \frac{\text{Num\_}e^{ij}(1)}{\left(\text{Num\_}e^{ij}(1) + \text{Num\_}e^{ij}(-1)\right)}, \quad (i = 1, 2, \ldots, m). \quad (7)$$

$\text{Num\_}e^{ij}(1)$ and $\text{Num\_}e^{ij}(-1)$ indicate the number of correct or wrong uses of the j-th cognitive content, and then get the vector $R, R = (r^1, r^2, ..., r^n), r^j = e(e^j) \in [0, 1]; r^j$ to represent the percentage of students' correct utilization of the j-th cognitive content. Generally speaking, this percentage should be in the range of [0, 1]. When $r^j = 0$, it means that the students have not mastered the j th cognitive ability of this knowledge point; when $R = 1$, it means that the students have completely mastered the j th cognitive ability of this knowledge point.

2.5.3. Comprehensive Evaluation of Students' Knowledge Points. According to different learning quality requirements, students can be divided into the person in charge of application, the person in charge of technology, and the person in charge of management. In the narration points, because there are various requirements for the cognitive aid skills of students in various positions, various weights can be set, and the weight matrix is used to represent the weight required by students in each position. Row I and column I indicate the weight required by the i-th student for this cognitive aid skill, as shown in the following formula:

$$W = \begin{pmatrix} W_{11}, W_{12}, \ldots, W_{1n} \\ W_{21}, W_{22}, \ldots W_{2n} \\ \cdots\cdots \\ W_{m1}, W_{m2}, \ldots, W_{mn} \end{pmatrix}. \quad (8)$$

The weighted average value is used to reflect the learning of students' knowledge points, and the excellent membership degree of all tests can be obtained within the knowledge points, as shown in the following formula:

$$\text{KA} = \sum\left(a_j \times W_{ij}\right). \quad (9)$$

2.5.4. Evaluation of Knowledge Mastery. In addition to learning the corresponding knowledge points, students also need to improve the ability to fully use knowledge points, so they need to learn the evaluation of knowledge learning in each chapter. Here, in order to evaluate the region as a whole, the vector evaluation can be carried out through the membership relationship degree of q knowledge points, as shown below, forming an excellent $q \times n$-dimensional evaluation matrix e: the degree of membership relationship of the q-knowledge points is shown in the following formula:

$$E^{q\times n} = \begin{pmatrix} a_{11}, a_{12}, \ldots, a_{1n} \\ a_{21}, a_{22}, \ldots, a_{2n} \\ \cdots\cdots \\ a_{q1}, a_{q2}, \ldots, a_{qn} \end{pmatrix}. \quad (10)$$

In this evaluation matrix e, due to the different importance of each knowledge point, the teacher places the weight of each knowledge point in the area and creates the weight vector p which is dominant in the knowledge point. The calculation method is shown in the following formulae:

$$P = \left(p^1, p^2, \ldots, p^n\right), \tag{11}$$

$$\sum_{i=1}^{q} p_i = 1. \tag{12}$$

The weighted average algorithm is used to obtain the comprehensive average membership vector, and the calculation method is shown in

$$\text{A\_chapter\_node}^j = \sum\left(a_{ij} \times p_j\right), \quad (j = 1, 2, \ldots, n). \tag{13}$$

In learning, when completing the exercises, the students accumulate more times, and the accuracy will also be improved. Every time we study, the average membership value of cognitive ability will change accordingly. According to the evaluation, the membership value of students' cognitive ability is close to the correct value.

2.6. Recommendation of Courses Based on Students' Interests. Information based learning courses can be determined according to several instructions in the domain, with different focuses. Therefore, it is more natural to establish interest model based on fuzziness. Students' learning actions are explored and students' family interaction mode method is applied to the learning platform.

2.6.1. Establishment of Attribute Membership Function of Curriculum. Firstly, the membership function of curriculum attributes is established. For each attribute of the course, it is described by fuzzy numbers in [0, 1] interval and determined by the teacher evaluation rules: let the domain of attribute set of curriculum C be $X = \{X_1, X_2, \ldots, X_n\}$, and ask m teachers, each teacher to make the estimation of membership degree for each attribute X^i $(i = 1, 2, \ldots, n)$. Let the j-th teacher make an estimate of $S_j(X_i)$ $(i = 1, 2, \ldots, n;$ $j = 1, 2, \ldots, m)$.

Membership can be expressed as the following formula:

$$S(X) = \frac{1}{m} \sum_{j=1}^{m} S_j(X_i). \tag{14}$$

2.6.2. Set Up Students' Interest Set. The collection of learning records of the course reflects the students' interest to a certain extent, which can be constructed to collect students' interest simply. Suppose that students have seen a certain kind of course in their interest. According to the course category, students' interest in this kind of course can be obtained. C is the collection of students' course learning. The calculation method is shown in formula (15), where I_k represents the student's primary interest in the k-attribute:

$$I_k = \frac{\sum_{I=1}^{p} \left(S_{Ik}\right)^2}{p}. \tag{15}$$

3. Online Learning Support Service System Design for Location Service Architecture

3.1. Subjects. The experimental subjects are 32 students in the 19th class of digital media majors in this course and are suitable for the second semester of 2018-2019. A 19-year class 1 (32 students) is divided into eight research groups according to the direction of practice. The average number of people in each group is four (because the platform design includes a link), and four groups have been selected for experimental analysis. At the same time, all experimental subjects specialize in digital media. They have high information literacy and are easy to accept the learning methods used in this experiment.

3.2. System Design Principles. The network protocol used in the selective network distance education system of the network protocol directly affects the operating mode of the network distance vocational education system. The goal of online education design using different structures of currently used network protocols is to create an Internet based web system using the TCP/IP protocol.

The choice of cross platform operating systems has nothing to do with the platform implementation selected from the operating system platform and the choice of network online teaching. Since the most extensive and effective platform of Java technology is not dependent on applications and is an interconnection service on the Internet, system design uses Java technology development to ensure system applications between platforms.

3.3. System Work Flow. Students who want to register for the course should register through the structure of online learning support service system and become online learners after successful registration. The learners who have successfully registered their personal information need to log in to the corresponding learning online teaching login after being approved by the online teaching system. Course selection has entered online teaching, and members need to select the required learning courses. According to the different teaching arrangements, teachers can choose to browse the courseware, discuss the meeting or test in class, and start the corresponding system application program. Exit the system.

3.4. System Architecture Selection. C/S architecture has many advantages and development space in system security and reliability. The server side and application side of C/S need to design program framework. Therefore, the vulnerability of various systems is inevitable. Like other browsers, designers can use a more robust operating system on the client side. This is indeed a very good choice of network remote vocational education system, but all customers need to install client programs; installation and maintenance will become inconvenient.

In a sense, the system structure is different from C/S. First of all, the system structure of online learning support service system is usually the general structure of BS browser.

It is not the best choice to use the structure of connecting client and server in online learning support service system. Online learning support service system can help students learn online courses at different times. It is impossible to help students to learn online courses at school. It is impossible to provide a completely unified browser. In order to install and maintain the client program system, the form of developing and constructing Internet service is decided. In order to meet the needs of practical application, the network mode of BS architecture is established.

4. Online Learning Support Service System Analysis

4.1. System Parameters and Performance

4.1.1. Setting of α Coefficient Weight. In order to improve the recommendation of α value, by continuously adjusting the value of α value between [0, 1], different comprehensive recommendation sets are calculated, and finally the final α coefficient weight is obtained. The algorithm evaluation under the change of α coefficient weight is as shown in Table 1.

The algorithm evaluation under the change of α coefficient weight is as shown in Figure 1.

It can be seen from Table 1 and Figure 1 that the weighted coefficient of α in the improved algorithm is 0.4. In the improved hybrid filtering algorithm, the similarity of user's location preference and distance plays an important role in the final recommendation result. After measuring MAE, the final conclusion will be drawn, in other words, location-based services. If the weight of the improved algorithm is about $\alpha = 0.4$, the best algorithm accuracy can be obtained under the framework of this paper.

4.1.2. System Encryption Performance Test. The encryption efficiency and the decryption efficiency of the three-bit plaintext encryption algorithm are tested. It can be seen from Figures 2 and 3 that, after many tests, if $e(x)$ and $E(y)$ are known, the Paillier encryption algorithm can find the $E(x + y)$ time through the additive homomorphism of Paillier public key encryption system. The consumption is small, the time consumption of encryption and decryption algorithm is similar, and the experimental data is almost unchanged, basically stable. According to the above analysis, Paillier's isomorphism is relatively stable, and the time of encrypting text operation is relatively short, which is also an advantage. The two privacy preserving schemes in this paper provide many addition and subtraction operations for encrypted text, which make full use of Paillier's advantages in encrypted text operation. The encryption algorithm performance test chart is as shown in Figure 2.

In order to evaluate the overall performance of this scheme, we test the efficiency of calculating the average center point and the efficiency of one round iteration of geometric intermediate point. These two algorithms mainly encrypt plain text and perform sum operation on encrypted text. The average central point test chart of privacy protection is shown in Figure 3.

As can be seen from Figures 2 and 3, there is no significant difference in the trend and amplitude of the two changes. As the number of users increases, the execution time increases, but it is not as important as the previous plan. If the number of users joining the two algorithms increases, the sum of the encrypted text needs to be calculated and the sum of the encrypted text needs to be decrypted. Because the number of decrypted texts remains the same, it will not take more time to decrypt. Encrypting and adding password text will take more time. In the last test of Paillier encryption algorithm, the conclusion is that the efficiency of adding cipher text is very high, so even if the number of users increases, the operation efficiency of the two schemes is very low. It is affected by the efficiency of Paillier encryption. These costs are consistent with the theoretical results; the solution will use more encrypted text to maintain the number of decodes, greatly reducing the complexity of users and cloud server computing.

4.2. Comparison of Recommendation Algorithms for Students' Online Learning Courses. Absolute error calculation algorithm is used. The smaller the MAE value, the higher the accuracy of the algorithm. In the MAE scoring standard, the algorithm is used to solve the deviation between the predicted score and the actual score.

After the location service is imported, the user's similarity calculation results become more accurate. In the personalized recommendation results, with the increase of distance similarity and distance similarity, the overall MAE calculation results can draw more accurate conclusions in the experimental results. The MAE test results of different recommended algorithms are as shown in Table 2.

The MAE test results of different algorithms are as shown in Figure 4.

As can be seen from Figure 4, with the increase of the number of users, the performance of the improved recommendation algorithm improves when performing MAE detection. Therefore, the quality of recommendation results will be improved. In other words, the recommendation results are in line with our expectations: user's prediction results. The reason why some of the middle performance is not as good as the traditional recommendation algorithm is that many users have high similarity in a specific user group, which far exceeds the impact of location-based services on individual user differences. After importing location service data, the final recommendation result is not as good as the original algorithm. Of course, this situation can be effectively improved by constantly expanding the user base.

There is a better analysis project, better than the existing algorithm. The reason for this result is that if the data sample is insufficient, the influence of user's location information on the final result will not be reflected. A small sample of users in the same region may show very random patterns of

Table 1: Algorithm evaluation under α coefficient weight change.

α value	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Traditional algorithm	1.41	1.33	1.21	1.20	1.11	1.06	1.01	1.06	1.20	1.21	1.40
Improved algorithm	1.61	1.51	1.11	1.01	0.91	1.01	1.01	1.11	1.22	1.31	1.56

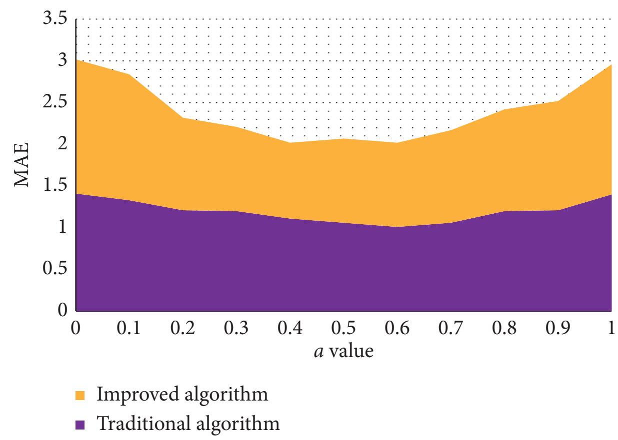

Figure 1: Algorithm evaluation under α coefficient weight change.

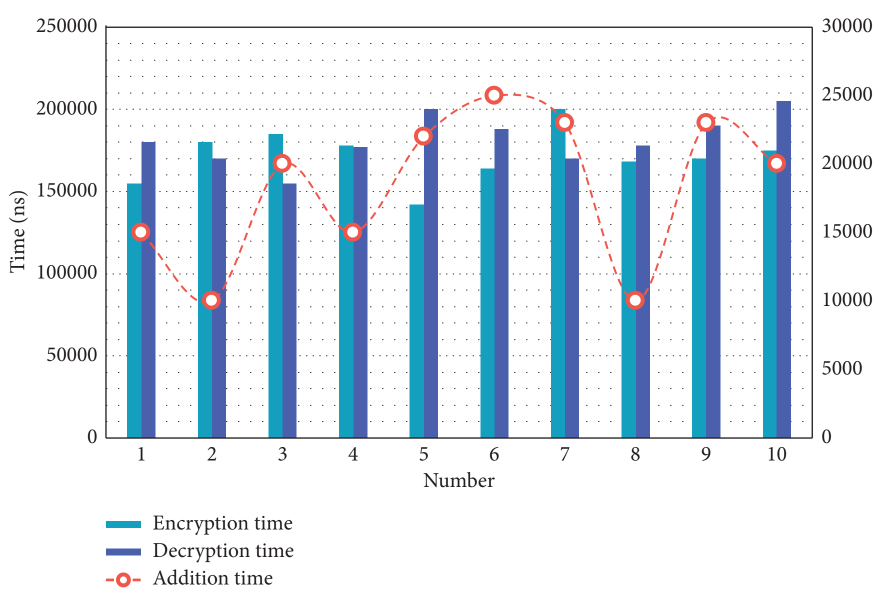

Figure 2: Performance test chart of encryption algorithm.

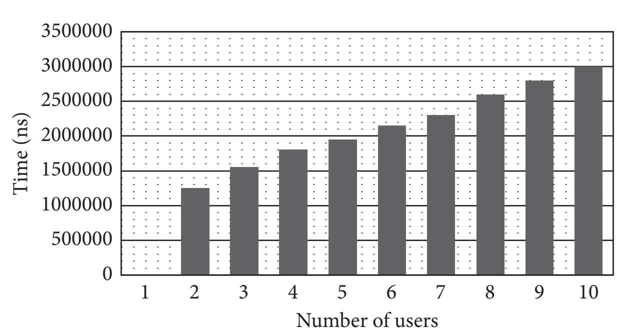

Figure 3: Test chart of average center point of privacy protection.

Table 2: MAE test results of different recommended algorithms.

Location-based service	1.41	1.38	1.37	1.38	1.40	1.31	1.28	1.22	1.02	0.88
Traditional collaborative filtering	1.31	1.26	1.21	1.10	1.02	1.02	1	0.86	0.85	0.72
Collaborative filtering of location services	1.22	1.37	1.31	1.13	1.1	1.04	1.01	0.81	0.82	0.56

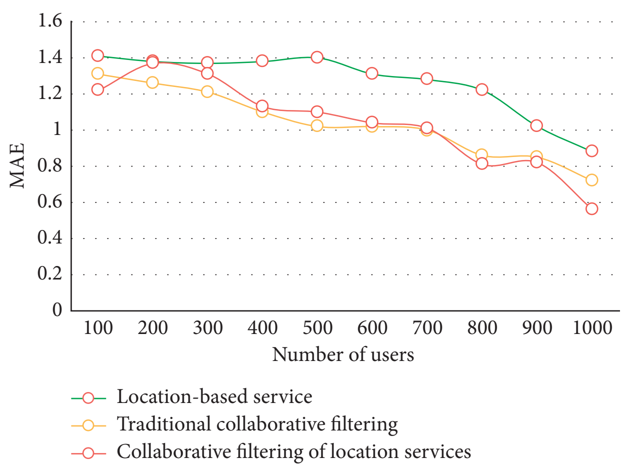

Figure 4: MAE test results of different algorithms.

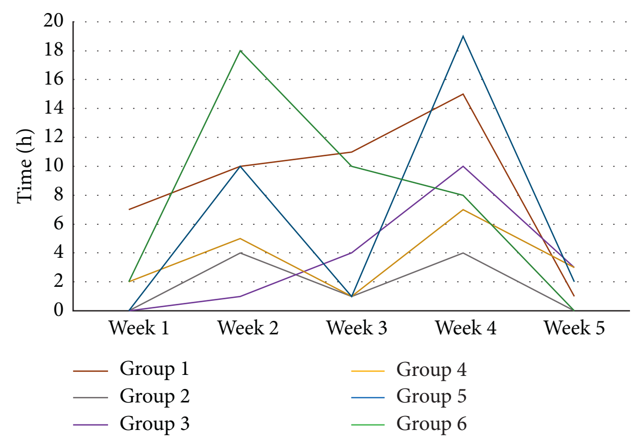

Figure 5: The change of students' online learning behavior in the practice cycle.

activity over time. With the increase of users, the trajectory and mode of action represented by users as a group will become more intuitive and predictable. Therefore, when the location-based information is used as the benchmark to influence the final result, and the reliability of the algorithm is improved.

4.3. Learning Situation of Students Using the Online Learning Support Service System

4.3.1. Analysis of Students' Online Learning Behavior on the Platform. On the platform, the subjects' off campus online learning behaviors are mainly asking questions, looking for resources, and learning together. The change of the number of questions put forward by the group in the experimental cycle can reflect the changing law of the students' participation in the practice outside the campus, which is helpful for the teacher to determine the stage in which students are prone to cause problems in the process of practice. The changes of students' online learning behavior in the internship cycle are shown in Figure 5.

As can be seen from Figure 5, except Group 8 and Group 4, the peak of online learning in other groups appears in the fourth week. This shows that most groups only start to use the platform after internship. In the off campus internship, the peak of online learning action occurs in the second week, so this situation is not ideal. In addition, there was almost no difference in the number of open resources in the second, third, and fourth weeks of group 8, and the total number of open resources was the largest. Group 8 participated in the whole process of online learning. According to the previous data analysis, Group 8 of the off campus online learning action is the most ideal.

4.3.2. Analysis of Students' Access to Learning Resources through the Platform. It is similar to the change curve of students' online learning action. It can be seen that the peak of the six groups of resource access occurred in the fourth week. This shows that most groups began to invest a lot of time and energy just a week before the end of the internship. This shows that the eighth group put more energy into the whole learning process. Therefore, the group with excellent performance in joint learning thinks that it is easy to obtain resources at different stages of the group life cycle, and the difference between different stages is very small. The number of times the group visits resources changes during the learning process was as shown in Figure 6.

As can be seen from Figure 6, the fourth group has the largest number of visits to learning resources in the first week and continues to decrease in the following stages. Therefore, the off campus internship lecturer must know why to meet the members of the fourth group, thus losing the enthusiasm of the team members.

4.4. Impact of Support Services of the Online Learning System

4.4.1. Provide Learning Guidance Information Service to Guide Learners to Learn Independently. According to the survey, among the main difficulties faced by learners, 55.2% of the learners think that the learning guidance is not perfect, and 65% of the learners think that they can not make an effective learning plan. According to the survey on the realization of guidance needs, 28.8% of learners hope to provide learners with appropriate learning resources, and 24.8% of learners hope to provide clear and detailed learning objectives and timely course guidance information. The types of learning guidance are shown in Table 3.

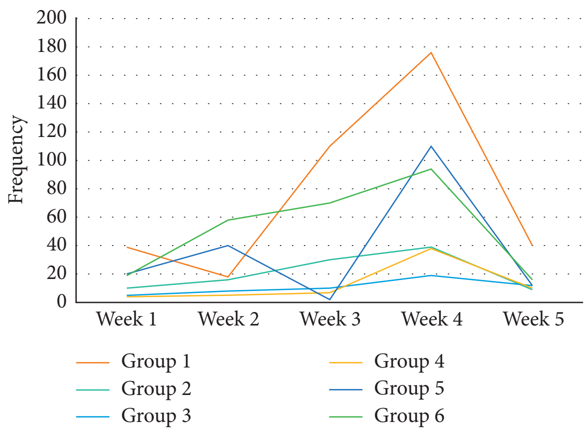

FIGURE 6: Changes in the number of times the group visited resources during the learning process.

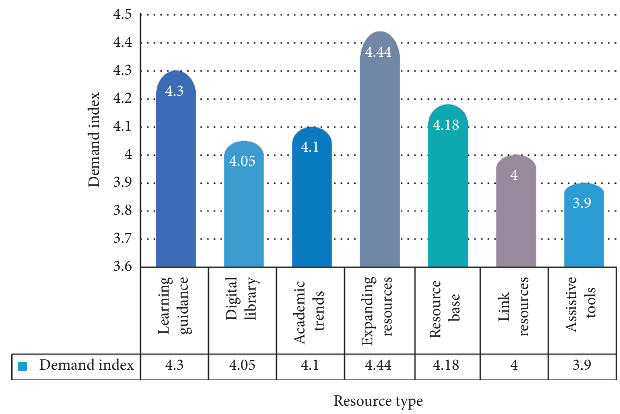

FIGURE 7: Demand for learning resources.

TABLE 3: Learning needs of guidance type.

Guidance mode	Response number	Response percentage	Percentage of cases
Provide learning objective courses	85	24.8	61.9
Suggestions on learning strategies	77	23.0	57.5
Learning and retrieval guidance	76	22.3	55.2
Push appropriate	96	28.8	71.4
Other	6	1.1	3.0
Total	340	100	249

Table 3 can provide learners with learning objectives, learning strategies, and learning plans in a timely manner, help learners find out the puzzles in the learning path reasonably, and push appropriate learning resources to learners, provide portable learning guidance, and understand that the recommended items can effectively support learners to complete self-discipline learning.

4.4.2. Provide Resources and Services to Effectively Support Learners' Learning. This survey investigates various learning resources W and various demonstration forms of learning resources. Learners are mainly at the level of "comparative demand" for various learning resources. The most needed resources are originality display resources, learning guidance resources, teaching plan resource library, link resources, academic trends, and auxiliary tools resources. The demand for learning resources is as shown in Figure 7.

As can be seen from Figure 7, there are also various requirements for various forms of resource demonstration. The main types of resource presentation that learners (University Learning Group) like are video, animation, and graphic presentation, but the demand for pure text and pure audio is relatively low. As shown in Table 4, the preferred forms of learning resources are presented.

It can be seen from Table 4 that providing learners with rich, diversified and easy-to-use learning resources is the key to ensure effective learning. Therefore, the design and development of the platform should pay attention to the provision of resources to meet the learning needs of learners.

TABLE 4: Presentation of preferred learning resources.

Resource type	Response number	Response percentage	Percentage of cases
Word/PDF	61	18.2	44.2
Image/graphics	72	21.6	52.3
Audio frequency	33	9.3	23.6
PPT	58	17.3	42.0
Video/animation	112	33.6	81.7
Total	336	100	243.8

4.4.3. Provide Assessment Services, Mobilize Learning Enthusiasm, and Objectively Evaluate Learners from the Perspective of Development. Evaluation is an indispensable part of the learning process. For large-scale pure online learning, excellent learning evaluation support is indispensable. In order to evaluate learning effectively, learners hope to have more evaluation methods. In the survey, 27% of the learners want the learners to evaluate each other (through the display of the works), 21.4% of the learners want to get the teacher's evaluation (due to the topic upload, etc.), 19% of the learners want to be evaluated by the computer (online test system), and 12.2% of the learners hope to provide the evaluation of the process record. Table 5 shows the evaluation method needs analysis.

Figure 8 shows evaluation method requirements.

As can be seen from Figure 8, in online learning, mutual evaluation is a method to solve many evaluation problems, and it also enables learners to learn more knowledge. However, using online surveys, the validity of the questionnaire cannot be guaranteed. Generally speaking, the cumulative proportion of incorrect learners is 70.6%. Learners think that mutual evaluation is a valuable evaluation method, and it is not advisable to use it as an evaluation method, but the correctness of evaluation is not optimistic.

Table 5: Demand analysis of evaluation methods.

Evaluation method	Response number	Response percentage (%)	Percentage of cases (%)
Computer evaluation	65	19.0	47.2
Mutual evaluation	92	27.0	67.0
Self-evaluation	39	11.3	28.0
Teacher evaluation	73	21.4	53.0
Electronic portfolio	33	9.1	23.6
Record evaluation	42	12.2	30.2
Total	344	100	249.0

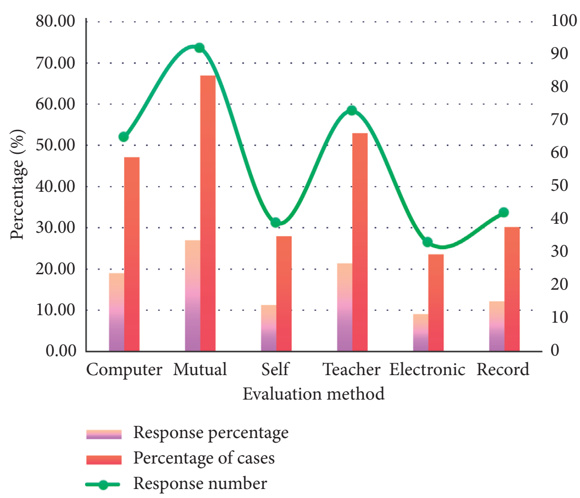

Figure 8: Evaluation method requirements.

Summary of methods to improve the accuracy of mutual evaluation: after mutual evaluation, teachers will randomly check, which will not only promote students' deep evaluation, but also become a good check for learners' evaluation. It can be used because the rating of evaluators is inconsistent. A group of students will evaluate it and get the average score. At the same time, the number of evaluation of learners should not be too much, so as to avoid fatigue. Before the formal evaluation, the simulated mutual evaluation is carried out, and then the learners who can evaluate each other are selected. Make detailed scoring standards, guide the details of evaluation, and make measurement benchmark. This can improve the accuracy of learners' evaluation. The platform should pay attention to anonymity and avoid improper evaluation when learners are engaged in mutual intelligent work.

5. Conclusion

In this survey, we combine the location-based service architecture with the online learning support service system, describe the data source and operation rules of the learning system, explain the data generated by the location-based service architecture and user behavior, and use the model as a new data source. It is combined into the previous recommendation algorithm. Therefore, the application of location-based service architecture becomes more extensive, and learning system is introduced into a new research direction. The algorithm of this survey improves the content-based recommendation algorithm and uses the weighted recommendation results to increase the user's action mode weight in geographic information, location preference, and user decision making. In order to verify the weight of geographic information, this paper will compare with the traditional algorithm based on MAE method and investigate and explain the advantages and disadvantages of the new algorithm with different weights.

The system uses the real-time tracking records of students and the system and the log mining of previous visits, updates the information database of student models in time, makes decision guidance for learning process, and effectively improves the monitoring of learning progress and students' proficiency. Personalized learning system needs to objectively evaluate the basic learning situation of students and understand the learning personality of students and the ability and level that can be achieved in the learning process. In order to better combine students' learning and practical abilities, the system comprehensively considers students' various achievements in the evaluation process, so as to make a scientific evaluation of students' abilities and, at the same time, give full play to the system's personalized service function.

The learning support service system established in this paper takes learners as the center, uses big data, learning analysis, and mobile Internet technology to obtain learning process data from online education network learning platform, establishes learner characteristic model and evaluation system, and provides intelligent and humanized support services. The application of location-based service architecture in learning evaluation provides a new evaluation method and teaching evaluation method for learners. This can not only quantify and visualize the learning state of learners, but also comprehensively and objectively reflect the learning effect.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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