

Retraction

Retracted: Intelligent Library Service and Management Based on IoT Assistance and Text Recommendation

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] K. Xu, "Intelligent Library Service and Management Based on IoT Assistance and Text Recommendation," *Journal of Sensors*, vol. 2022, Article ID 3660135, 10 pages, 2022.

Research Article

Intelligent Library Service and Management Based on IoT Assistance and Text Recommendation

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The services provided in the smart library stage include not only simple applications such as network creation and computing cloud, but also all-round immersive services through user behavior perception, scene combination, and space-time breakthrough. At the same time, there are also some problems in the existing intelligent library service and management research. This paper puts forward a solution for the intelligent library service and IoT-based management and takes into account the suggestions of atlas users. It is expected that it will provide new ideas and methods for the research in this field. The experimental results show that our smart library framework has higher library management efficiency, improves readers' borrowing rate, and reduces the cost of library daily maintenance.

1. Introduction

The value of a smart library is not only a single public reading service, but also a comprehensive embodiment of intelligent management and full service. The construction of a library needs to be supported by certain elements to be realized, namely, intelligent librarian, intelligent management, intelligent service, and intelligent form [1]. A smart library's work needs to be carried out based on smart services, using various management concepts to carry out specific work [2]. Once different types of readers enter the smart library, they can use its internal management system and self-service functions to meet their demands and achieve their purposes of searching for and obtaining information.

A library is an institution that collects, organizes, and collects books and materials for reading and reference. Libraries appeared as early as 3000 BC. The library has functions such as preserving human cultural heritage, developing information resources, and participating in social education. The library should do a good job of providing basic services and use its rich collection of resources to meet the individual needs of readers. The library is the main force to implement reading activities, and to meet the basic needs of teachers and students, it is also necessary to use intelligent equipment

to make comprehensive analysis of readers' reading interests and complete the integration of information, so as to enrich the collection resources. Furthermore, the interactive platform between the library and the readers is set up, through which the readers can complete the relevant communication work, for example, some books are not available in the library, and the readers can start the corresponding feedback work through the platform. After the library receives the readers' opinions, it starts to study which books should be purchased and then starts to practice. Finally, the library uses big data to complete the collection, calculation, and analysis of students' reading information, and according to the reading interests and reading characteristics of teachers and students, it strengthens the communication with teachers of different majors and develops different levels of intelligent reading programs to facilitate more in-depth communication between the library and students, focusing on the targeted characteristics of the intelligent library.

In order to reflect the special functions of smart libraries and promote the effective application of various types of resources, it is necessary to build a resource sharing platform and optimize the collection resources by using big data, but this does not mean that special digital analysis of resource types is required, but rather the content of resources in the

collection is mined and collected with the help of big data, which contains electronic versions of materials and visual analysis of relevant resources. After completing the collection of the established data, it is necessary to classify and utilize the types of collections and build a characteristic database by effectively organizing all types of resources to facilitate the borrowing needs of readers [3].

The IoT is built on the basis of the Internet and is an extension and expansion of the Internet, combining and integrating various technologies to make people and things talk intelligently and create an intelligent world [4]. The development of IoT technology involves almost all aspects of information technology, which is a kind of aggregation and systematic innovation application and development [1]. In retrospect, there are many single, highly repetitive tasks in traditional library management, such as regulating air conditioning exhaust, controlling lights, pushing temperature, and manual monitoring [5]. Libraries that adopt this traditional work model will invest huge human and financial resources, low staff challenge, mechanical work, and reduced work enthusiasm, thus reducing the quality of service and lack of humanistic care. According to the history of libraries, every development and growth of libraries has been made with the help of technology and intelligence [6], through the use of communication technology to connect various devices around and the use of intelligent algorithms instead of the traditional way to achieve cross-device cross-platform linkage and control unattended automated office. The integration of IoT technology will bring a new working environment [7–9].

Firstly, it is a complementary optimization of the traditional library service model, which helps library managers dynamically grasp users' interests and hobbies, predict their future interests and potential needs, accurately push resources matching their interests and needs, improve the information service capability of libraries, and promote the development of smart libraries. Secondly, through real-time portrayal of users' current state and characteristics, library resources are intelligently matched for users with different preferences and needs to enhance users' experience, while the recommendation system also allows users to customize interest modules to meet readers' personalized needs. Third, smarter matching of information resources can enable readers to make spontaneous use of library resources, greatly enhancing the utilization rate of resources. Fourth, doing research on user profiling and its application in the smart campus environment is the first exploration of using campus big data to solve practical problems, which greatly brings the value of campus big data into play [10].

2. Related Work

At present, in [11], they pointed out that from the perspective of "people-oriented" efficiency, interconnection and convenience are the keys to smart libraries, and under the concept of green development, digital benefits and smart reading are emphasized, and the development goal is to create an interconnected and integrated service model. In [12], they analyzed the contents closely related to the construction

of smart libraries from several dimensions, and the core keywords such as IoT, information services, mobile libraries, and cloud computing can be used as important directions for library research in the later stage, which can also highlight the role of "wisdom" and "informatization" in smart libraries. From this aspect, the important value of "intelligence" and "informatization" in the construction of smart libraries can be highlighted [13, 14]. In [15], they believed that the scientific development of the internal work of smart libraries should be further developed based on the corresponding core elements of library construction, which should focus on the needs of users and reflect the value of smart librarians. In [16], they summarized its connotation from a deeper perspective, arguing that smart services should reflect the service itself on the one hand and the deeper connotation of the concept of wisdom, i.e., intelligence, knowledge, and conceptualization, on the other. In the process of research work, in [17], they not only focus on the construction of service model, but also focus on the cultivation of quality talent team of librarians and discuss how to build a new talent team to meet the requirements of smart libraries. In [18], they describe the current technological practice of University Library, which has developed a technological, intelligent, and service-oriented book inventory robot with the assistance of the Department of Computer Science of University, which also provides a reference template for the intelligent development of other libraries.

In general, scholars at home and abroad have become more and more advanced in their understanding of smart libraries. The transformation of libraries from paper-based to networked and digital libraries can be considered the first transformation of libraries. The transformation of digital libraries to intelligent and wisdom libraries is the second transformation of libraries. Smart libraries are the third generation of libraries based on digital libraries and intelligent libraries [19].

The smart library in the IoT environment is a comprehensive library, academic resources, and information service center, and its main characteristics are complete, efficient, and convenient [20]. The smart library in the new environment mainly contains the following three features:

- (1) Communication wisdom: Using the IoT to interact with information, establish network links between library equipment, and construct a smart communication network. In the library wisdom system, not only can we better carry out documentary information services, but also realize the sharing of information resources in a wider scope
- (2) Building wisdom: Intelligent management of the facilities in the library building is carried out, and an intelligent building system is built. Among them, the air conditioning system can automatically detect the current air quality, analyze the content of harmful substances, and automatically turn on the ventilation system when needed to protect the health of the people in the library. The temperature-controlled lighting system can regulate the temperature,

humidity, and brightness of the library in real time according to the situation, providing a comfortable reading environment for readers. At the same time, the operation and maintenance of all kinds of equipment in the intelligent library tend to be automated. The intelligent building can reduce the operating cost of the library, save emission, and optimize the allocation of resources

- (3) **Service wisdom:** To build intelligent buildings and realize interconnection of devices and resource sharing, providing intelligent services for readers is the ultimate goal of intelligent libraries [21]. The staff can use the user data obtained by intelligent devices, combine the existing collections and shared resources, scientifically analyze the user needs, and prepare the information and knowledge services required by the users in advance so that the service is more humanized and wisdom

3. Smart Library Service and Management Solution

In this paper, we propose an innovative service model for smart libraries, as shown in Figure 1. Taking the difference of user needs as the guide, the users are divided into three categories: research scholars, general readers, and government and enterprise users. To meet the needs of users, we combine situational awareness to provide personalized services for each of the three types of users, such as scene experience, personalized customization, and accurate push services.

3.1. Auxiliary of IoT Technology

3.1.1. Lending System. As the most original and important function of the library, the lending system of this program adopts RFID technology. Each book has its own RFID code attached to it, and its location and other information is stored in the code. Readers can access the library's data via mobile app or website to check the location of a book. To borrow out of the library, just scan the reader card and the RFID code of the book in the self-service lending and returning machine to complete the borrowing of the book; if there is no scan code directly taken out of the library, the alarm device at the entrance of the library will beep and alarm. Due to the advantages of RFID technology, the return can be completed by scanning the book, so the library can set up 24-hour book return service, and borrowers can also be returned by others, etc., which greatly facilitate the process of returning books; the borrowing process is shown in Figure 2.

3.1.2. Book Sorting System. It will then perform the operation of taking out and changing the position. The workflow of the collation and circulation system is shown in Figure 3.

3.1.3. Self-Service Occupancy System. As a place to serve readers, libraries generally have public places such as lending rooms and study rooms, and the limited space naturally can-

not satisfy everyone, especially in libraries of colleges and universities, where the situation of occupying seats is more than forbidden every time when exams are approaching. However, such a system has the defect of relying too much on readers' self-awareness, so a credit score system can also be introduced, similar to the current Alipay "ant points." When a reader completes the act of occupying a seat well, he or she will get points, while leaving in the middle of occupying a seat or doing other acts that violate the library rules will subtract points. The level of points affects the functions of the library, for example, high points can be used to occupy a longer period of time by sweeping the code once; you can watch electronic books on the Internet, etc. The workflow of the self-help occupancy system is shown in Figure 4.

3.2. Auxiliary of Text Recommendation Technology. In order to better realize the recommendation of library resources, it is necessary to establish a system to maintain user portrait and realize recommendation. The system is docked to the unified identity authentication of the university, and readers can enter the system to view and customize their own parameters, and the system mainly contains four modules: user portrait calculation, resource feature extraction, recommendation result prediction, and recommendation result sending, and its overall architecture is shown in Figure 5. The user portrait calculation module is responsible for processing data to generate user portraits and setting the period to update them periodically; the resource feature extraction module is responsible for identifying resource samples to be recommended and extracting their attribute features; the recommendation result generation module is responsible for matching user portraits with resource features and writing the successfully matched resources into the user's recommendation list; the recommendation result sending module automatically sends the recommendation results to each user according to the user's customization by calling the school message center. The recommendation result sending module automatically sends the recommendation results to each user's WeChat or email according to the user's customization and completes the personalized recommendation of resources.

3.3. Recommendation Result Generation Module. After the resource features are extracted, the attributes of the resource are matched with the reader's custom interests, dynamic user profile, and static user profile, and if the resource has the same attributes as the user, it means that the user has a high probability of liking the resource, and it is output in descending order of comprehensive weight, and the one with high weight will be recommended first. The recommendation algorithm is as follows: For each item in the resource, perform.

The specific recommendation flow chart is shown in Figure 6.

- (1) **Connect to the system database:** First check whether the reader has custom interests; custom interests include the reader's current book reservation and user-defined interest tags. The system matches

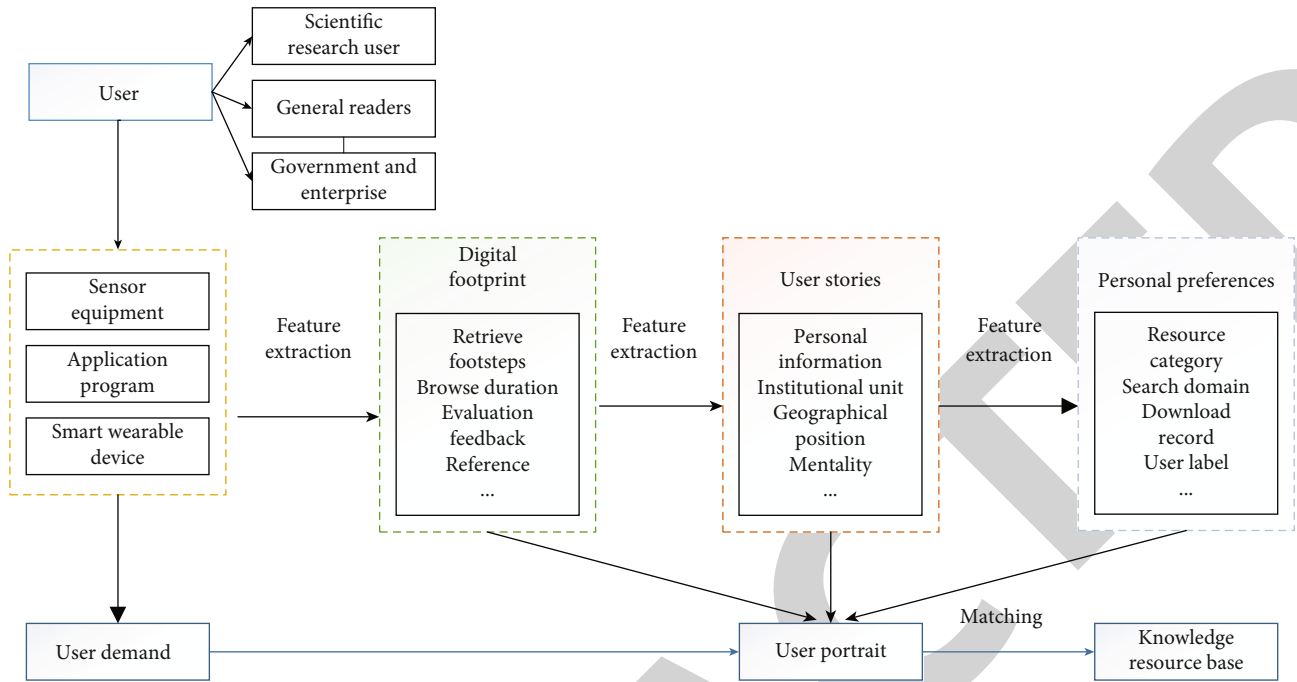


FIGURE 1: Framework of smart library service model.

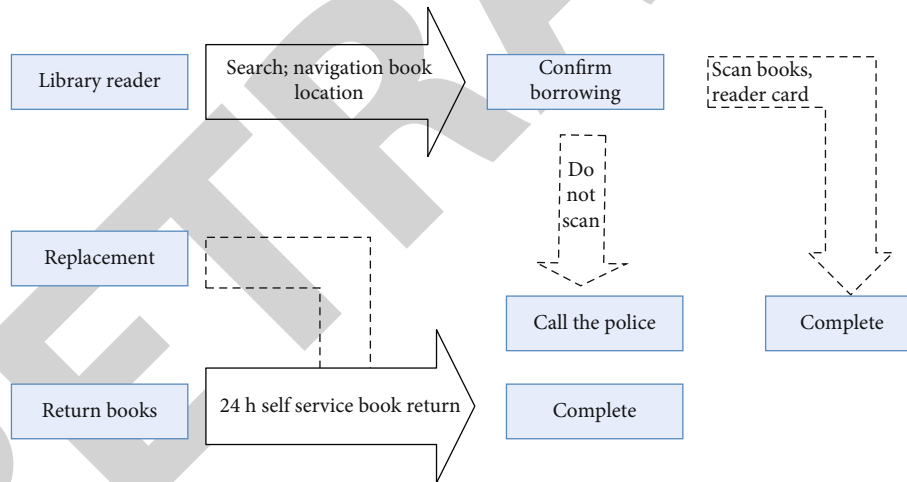


FIGURE 2: Borrowing process.

similar books according to the properties of the book reservation and recommends related books and lectures according to the user interest tags filled in the system by the user. The user-defined interests are written to the list of recommendation results for temporary storage after matching with the characteristics of the resources to be recommended

(2) With the automatically collected data of book borrowing, participation in lectures, activities, clubs, retrieval, messages, reviews, etc., the user portrait is automatically generated by mining the user's real interests, which is directly matched with the features

of the resources to be recommended and written into the user recommendation table if the match is successful. The user dynamics and the characteristics of the resources to be recommended are matched with each other and then written to the list of recommendation results for temporary storage

(3) If the user is not active (no interest filled in, no book borrowing, no lecture activity), the user can only be recommended based on the static user portrait generated by the basic information. The teachers and students in school must have the basic information and the portrait generated by the course reference

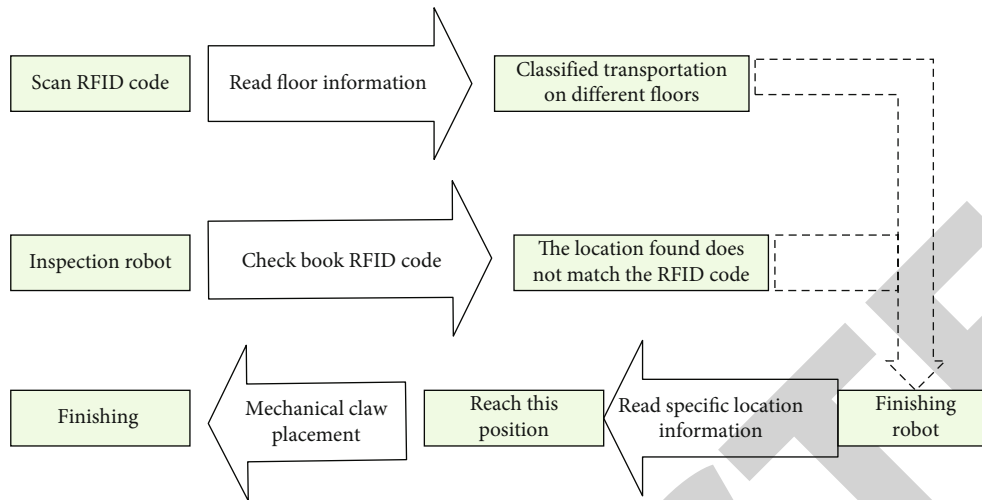


FIGURE 3: Workflow of the collation and circulation system.

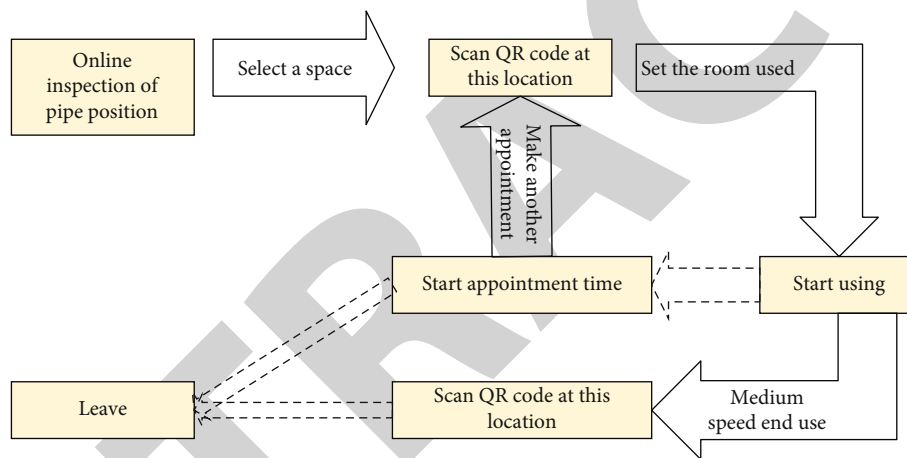


FIGURE 4: Workflow of self-help occupancy system.

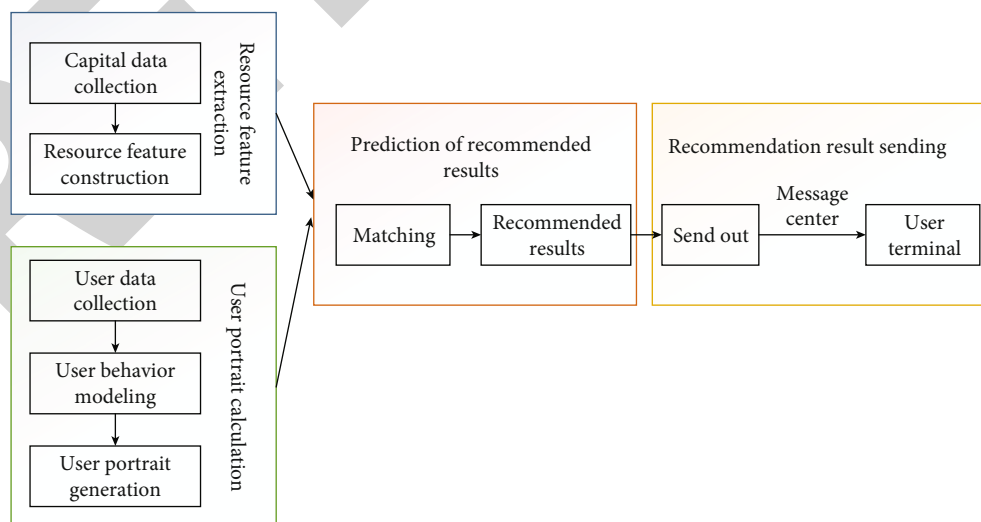


FIGURE 5: Overall architecture of recommendation system.

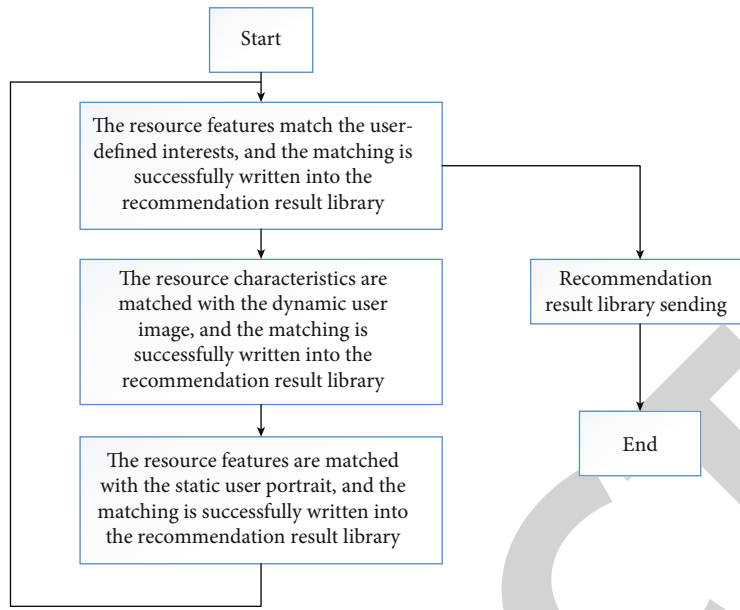


FIGURE 6: Recommendation process.

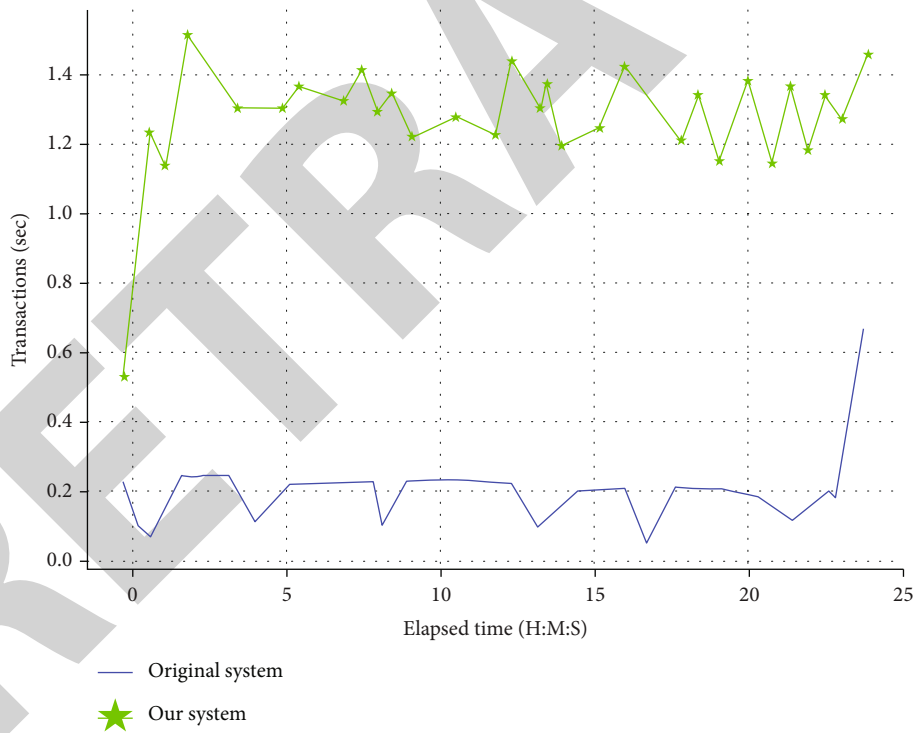


FIGURE 7: Response time test on the server side of the system.

and professional textbook, and the static user portrait is matched with the features of the resources to be recommended, and the successful match is written to the user recommendation list for temporary storage

- (4) Collate the recommendation list and send it. Using SQL statement to achieve matching, the classification

number (or subject word) of the selected resource is matched with the classification number (or subject word) of the user portrait, and if the two attributes are equal, the matching is successful, and each attribute of the resource is output as the recommendation result according to the ascending order of the reader ID number and the descending order of the tag weight

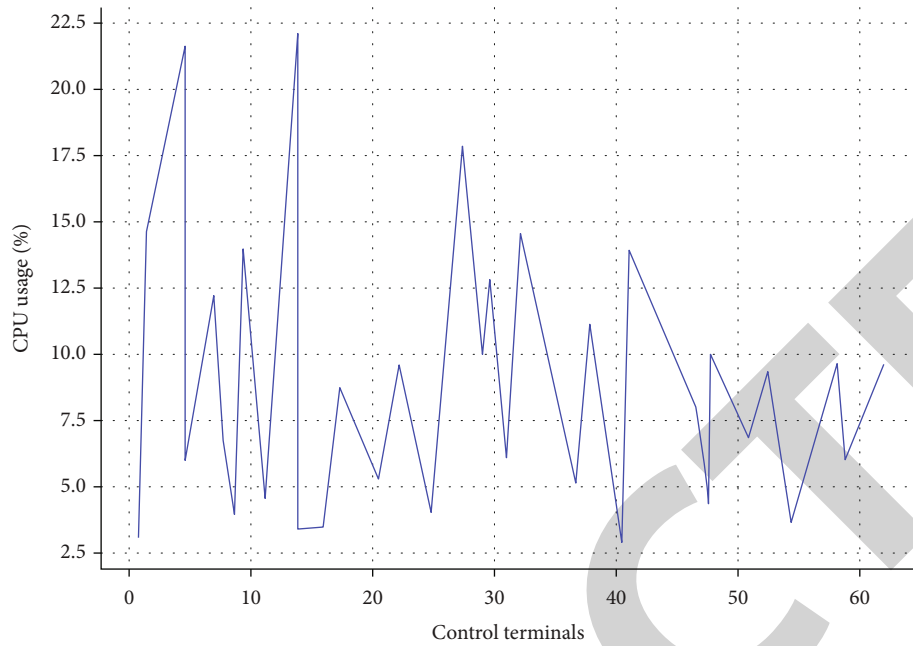


FIGURE 8: CPU usage of different control terminals.

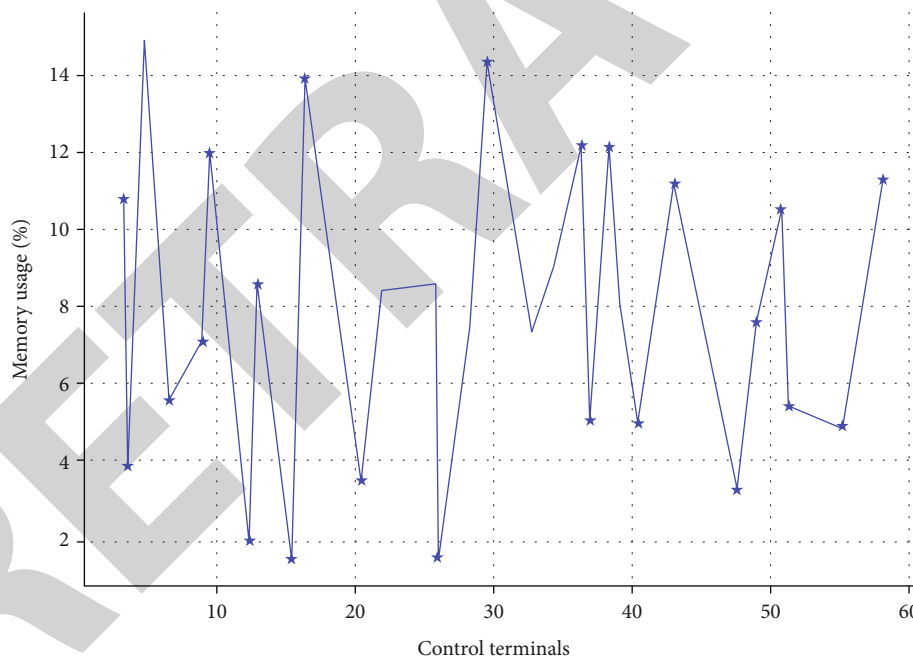


FIGURE 9: Memory usage of different control terminals.

TABLE 1: Test results.

Dimming level	Voltage (V)	Current (A)	Actual power (W)	Luminous flux (lm)
1	0	0	0	0
2	52	0.026	1.428	130
3	113	0.058	7.132	982
4	165	0.087	13.045	2600
5	210	0.132	22.155	3600

4. Experiments

4.1. *System Performance Test.* In the trend of constantly improving the intelligence of the relevant equipment in the smart library, it is significant for the users of the system to realize simple and fast operation of the intelligent equipment, which requires not only timely and effective control of the equipment, but also requires the whole system to be responsive and easy to operate by the users. Therefore, the system testing of the performance test is also relatively high.

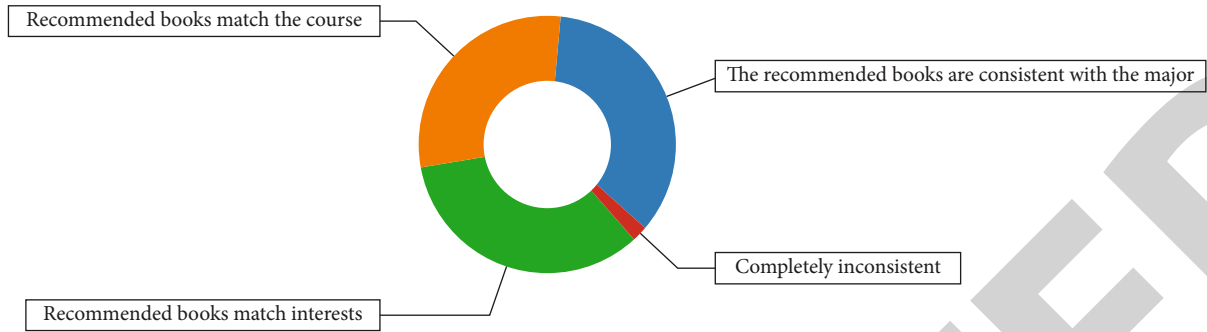


FIGURE 10: Graph of students' feelings after seeing the recommended results.

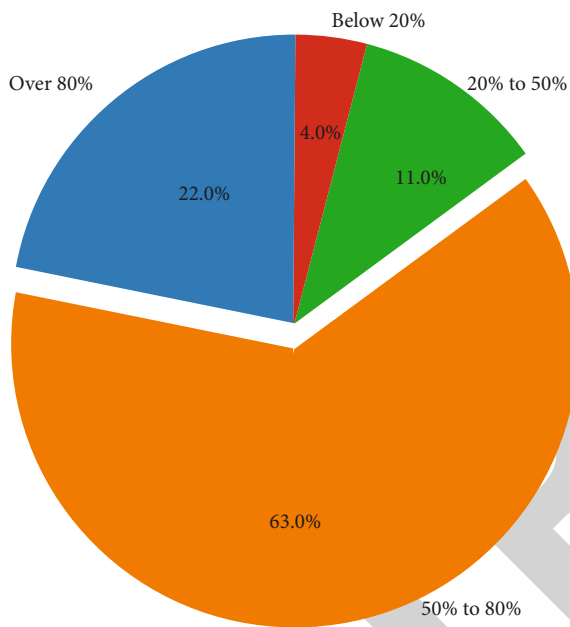


FIGURE 11: Suitability of recommendation results for students.

Achieving stable server-side operation and ensuring that the server-side can provide timely access services to accessing users are the first tasks required. These tasks are related to the success of the system design and implementation and to the user's satisfaction with the system. Therefore, the server-side testing of the system was carried out first in the system testing session.

In the server-side testing session, the system was tested by simulating a scenario of user access in order to evaluate the system service capability in a more illustrative way. The server-side operation was observed and recorded by setting the number of accesses at 200 people, and multiple tests were conducted at certain intervals (30 s), with each test period being 24 hours. The corresponding server-side transaction log curves were formed. In this paper, the test situation is illustrated by capturing the record situation as shown in Figure 7.

Through the analysis of the test volume and test curve in Figures 8 and 9, as the number of simulated access users at the system server side increases, the record processing at the server side is also changing, which is a dynamic process,

and the corresponding server-side responsiveness is also changing at the same time. With the increase in the number of times, some small changes will occur each time, especially in the late changes are less obvious; after a number of times the server-side response time for comprehensive statistics can be derived, the average response time of the system server-side is 0.865 s. The server response time is 0.315 s. Overall, the transaction processing capability and response time of the server side meet the expected design.

It can also be seen from the analysis in Figure 9 that with the continuous increase of the number of users, the resource consumption of the system is also rising. Therefore, when the intelligent library system is opened, the load of the server-side resources of the whole system will also increase. The test results are shown in Table 1.

The test was conducted on the control of the lighting brightness mainly by using the buttons on the switches, and the test results proved that the system can automatically make corresponding adjustments according to the user's real-time requirements for the lighting level. Thus, the internal network of the system can realize the communication function and achieve the desired effect on the lighting control, and the design solution has shown the test results within the expectation.

Therefore, through the overall statistical analysis, it can be seen that the cell phones that can achieve better operation effect during the use of the intelligent library system can basically cover the mainstream cell phone brands and configurations in the current market test. Not only is the operation and use situation quicker, but also the users experience better results in the process of using the terminal.

4.2. Analysis of Recommendation Effect. In order to verify the effectiveness of user portrait based resource recommendation, a total of 197 undergraduate and graduate students majoring in educational technology were selected as recommended objects. They were recommended once a week, and 4 times in total.

Two weeks after the push, a questionnaire was designed and distributed to users to investigate their satisfaction. Among the 172 questionnaires, 48 people said they had not browsed the recommendation list because they did not follow our WeChat Enterprise, did not see the news push, or did not have time or interest to see the news. 35 out of 48 people said that they were interested in further

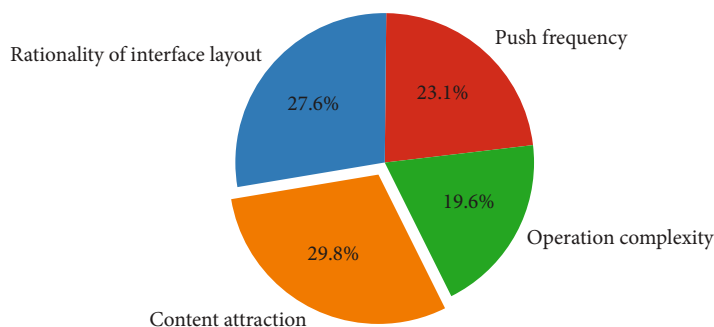


FIGURE 12: Influencing factors affecting the sense of user experience.

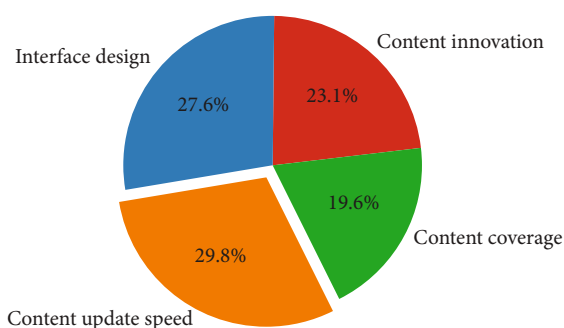


FIGURE 13: The aspects of this recommendation that students are more satisfied with.

understanding and could inform the readers of this new function by other means later to encourage them to check the recommended content and give feedback. For the remaining 124 viewed results, they were asked to describe their feelings after seeing the recommended results, and almost all of them indicated that the recommended resources had different degrees of correlation with their course study, professional study, and their own interests (see Figure 10). The suitability of the recommended results for students is shown in Figure 11. 22.47% of them think that the proportion of books suitable for them is more than 40% and 64.31% think that 50%-80% of books in the recommended catalog are suitable for them, so more than 87% of them say that at least half of the book list is completely suitable for them, and the accuracy rate is 66.7% according to the accuracy formula, and the overall satisfaction level is as high as 83%. The questionnaire also investigated the influencing factors affecting their satisfaction, and the feedback results are shown in Figure 12 that 12.95% of them said that the attractiveness of the content is an important factor affecting the sense of user experience and objective factors such as the layout of the recommended interface, the complexity of operation, and the frequency of pushing are also more concerned by users. The most satisfying thing for students in this recommendation is the update speed of the content, while the coverage and novelty of the content are relatively slightly lacking, probably because the user borrowing data is relatively sparse, relying heavily on the static user portrait generated by majors and courses, resulting in the recommended content being mostly study books, which

are more monotonous. We are proud of the fact that all of them are willing to continue to receive resource recommendations. The aspects of this recommendation that students are more satisfied with are shown in Figure 13.

5. Conclusion

The construction of intelligent library is the new direction and hotspot of modern library construction. The self-service and management system of intelligent library is the infrastructure of intelligent library construction. University libraries should make full use of the opportunities provided by institutions of higher education and institutions of higher education to establish self-service systems through smart libraries and smart libraries to provide users with more valuable information on the use of resources. In addition, they should provide users with better library services to assist in the construction of universities and colleges.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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