

Research on the precise recommendation service system of digital library

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Abstract. With the continuous development of big data technology, the service mode of library has changed greatly. This paper proposes a method for building a digital library precise recommendation service system based on user portraits, which improves the recommendation accuracy and efficiency of the digital library. Firstly, systematically sort out the research status of the application of user portrait technology in the field of library and information. Then, the needs of precise recommendation of the digital library under the user portrait technology in terms of recommended content, service positioning, user functions were analyzed. Finally, introduce the construction method of the recommendation service system of the digital library from the three aspects of data module, recommendation module and user module. This research aims to explore an effective transformation and development path for the precise recommendation of digital library.

Keywords: Digital library; precise recommendation; user portrait; library and information.

1. Introduction

With the development and application of big data technology, various user behavior data will leave traces on the Internet, and enterprises can obtain massive user data from the Internet, which provides a favorable way for enterprises to accurately understand the real needs of users and implement precise services.

Precise recommendation refers to taking the user of the product as the core, accurately dividing according to user needs and preferences, and recommendation the product to users in a "personalized" specific way. The precise recommendation of digital library is a personalized service process based on the concept of "freedom, openness and sharing", which accurately pushes the users' needs and contents to the users with the advantages of the big data. The precise recommendation of digital library is conducive to maximizing the value of library collection resources. In this context, user portrait technology emerges as the times require. As a favorable tool for precision service, user portrait technology provides a new idea for digital library to understand and predict user demand and realize precise recommendation of digital library [2]. Therefore, this paper introduces the user portrait technology into the precision recommendation service, builds a precise recommendation service system of digital library based on user portraits, and realizes precise and high-quality resource service content.

2. Related research progress

The user portrait was first proposed by the American scholar Alan [3]. He positioned the user portrait as the motivation for exploring users. It is a user model for describing target users, not for describing users who really exist. With the progress of science and technology and the advent of the era of big data, the connotation of user portraits has also been updated. Teixeira [4] believes that the user profile is a model that extracts user-related data from a large amount of data to describe user preferences and interests. Yu [5] believes that the user portrait is an abstracted and labeled user model mined from the users' attributes, behaviors, interests, hobbies and other information. In terms of the precise recommendation of digital library, the user portrait is to analyze the large amount of data left by the user in the Internet space under the condition of full investigation of the user, refine the key

indicators of the users' needs to achieve the precise matching of the content recommended by the digital library and the needs of users.

In recent years, the application of user portrait technology in the field of library and information has achieved many research results. Liu[6] proposed a new model of reading therapy in college libraries based on user portraits under the background of big data, which innovated the practice of reading therapy; Liu[7] introduced the situational recommendation method into the personalized service of big data knowledge of the library from the perspective of user portrait, which improved the digital service level of the library to a certain extent; Guo [8] built user portraits of digital libraries based on user portraits and scenarios, reconstructed digital library application scenarios to analyze the service characteristics of different users; Wang[9] and Yuan[10] respectively take the library of Jilin Institute of Technology and science net blog as examples to study the scene construction of knowledge service of intelligent library through the theory of user portrait; Liu[11] mainly analyzed the dilemma of user portrait in mobile library, and proposed the use of block chain underlying support technology to promote the practical application of user portrait in mobile library; Mao[12] analyzed in detail the importance of applying user portrait technology in library reading promotion; Yang[13] analyzed the construction process of library user portraits in detail; Dong[14] studied the precise service strategy of medical university library in the perspective of user portrait.

In summary, the user portrait technology can comprehensively analyze the users' behavior characteristics and predict the users' current needs, providing strong support for the precise recommendation service of digital library. However, most of the existing research on precise recommendation services of library analyzes the possibility of application of user portrait technology, which has the defects of popularity of recommendation results and low accuracy. Therefore, this paper focuses on how to precisely match the needs of users and digital library resources, and build an precise recommendation system for digital library based on user portraits.

3. Demand for precise recommendation of digital library

3.1. Precision of the recommended content.

The precision of the recommended content refers to the two-way matching of the recommendable resources of the digital library and the user needs to achieve the degree of precision. In the face of diversified recommendable resources, users expect the digital library to accurately match resources and form a user-centric two-way fusion recommendation system to reduce the distance between users and services. The precise recommendation service of the digital library requires precise control of its own resources. Through the meticulous mining, reorganization and labeling of the resources, the resource portrait of the digital library is formed. And then, through the integration of the users' full data of digital library, a comprehensive user portrait is formed. Through the obtained user portrait, we can accurately predict the behavior rules of users, obtain the existing needs and possible needs of users. With the assistance of user portraits, users can discover content autonomously and the system can deliver the content to every user in time.

3.2. Precision of the service positioning.

The precision of the service positioning refers to the precise recommendation service of the digital library to accurately locate each user. The diversity of user status data will directly lead to the diversity of user needs. Different scientific research levels, different needs for library, different task stages, different identity positioning and other groups have large differences in the demand for digital library. In order to achieve the precise recommendation of different users and different needs, the precision recommendation service of the digital library collects and analyzes the status data of different user groups, label the user status data. Then use data mining, statistical analysis, clustering and other technical methods to obtain the user's clear consciousness needs and fuzzy consciousness needs. Finally, according to the different demand of degree and time period, recommendation service can be accurately positioned to users. In addition, the digital library can also calculate the similarity between

user states to build a user group with prominent characteristics and accurately distinguish the target group.

3.3. Customization of recommendation service.

The customization of recommendation service refers to the resetting of service situations of the digital library to meet the deep-level needs of customers and perfectly fit the user-centric service concept. The needs of users are limited to the resources and services of the digital library, which directly affects the utilization rate and influence of digital library, and makes users slowly lose interest in the digital library. The transformation from resource-driven to user-driven is the fundamental driving force for the sustainable development of the digital library, making digital library maximum fit with user needs.

4. Construction of precise recommendation system of digital library

The precise recommendation system of digital library based on user portraits is mainly composed of data model, recommendation module and user module. The main function of the data module is the perception and acquisition of user behavior data. The main function of the recommendation module is data sorting, demand prediction, and resource matching. The main function of the user module is to complete the accurate recommendation of related resources. The precise recommendation system is shown in Figure 1.

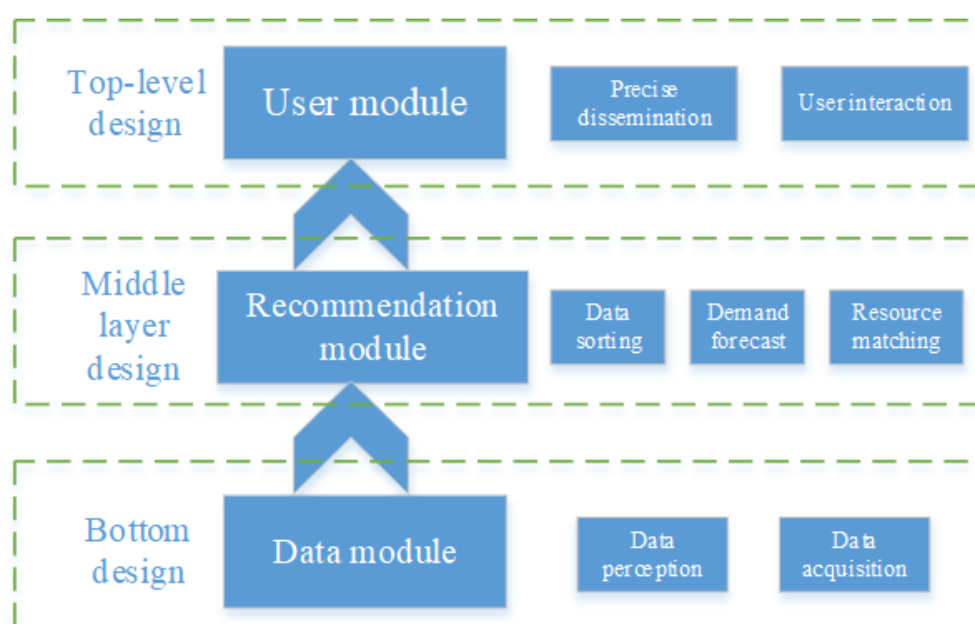


Fig 1. Precise dissemination system.

4.1. Data module.

The data module is the bottom design of the precise recommendation system of the digital library, which is the basis of the entire precision recommendation system. The digital library operation department obtains the explicit data of users from the registration information, published content, and comments on the digital library website through the technology of web crawlers. Compared with the explicit information of users, the implicit information of users more accurately reflects the real state of users. The implicit information is not provided by customers, but a series of traces left by customers on the Internet. The operation department of digital library mainly perceives and obtains the implicit data of users through log mining, platform database collection. After acquiring the user data, the data module needs to filter and clean up some redundant data irrelevant to the user characteristics, so as to reduce the noise for the data module. The architecture of the data module is shown in Figure 2.

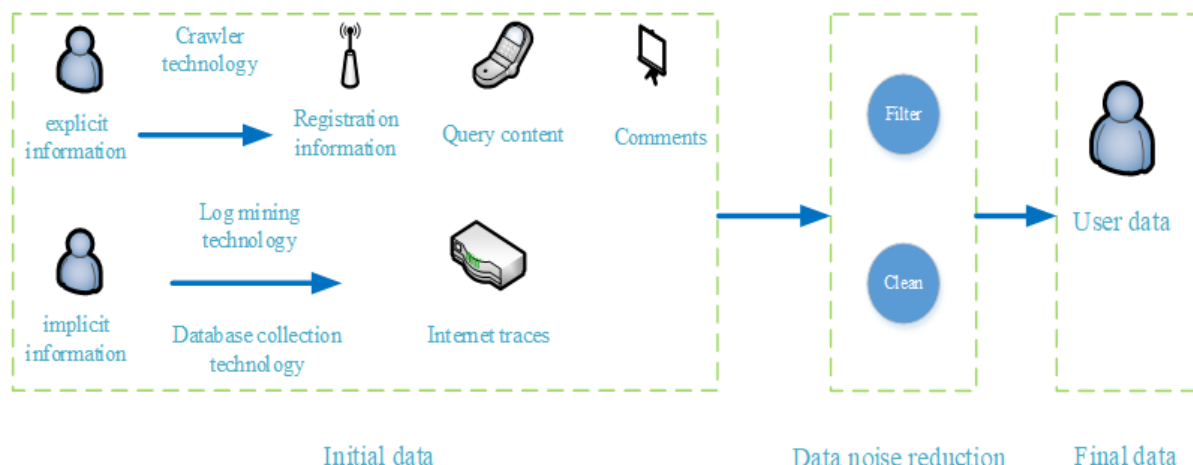


Fig 2. The architecture of the data module.

4.2. Recommendation module.

The recommendation module serves as the middle layer design of the precision recommendation system of the digital library. It inherits the next layer of data modules and the upper layer of user modules. The recommendation module uses clustering algorithm, statistical analysis, topic model, Bayesian network and other technologies to extract feature labels and prediction labels of users from a large amount of user data obtained by the data module. In different application scenarios, using logical reasoning and business rules to flexibly combine the extracted feature labels and prediction labels to complete the construction of user portraits in digital library. In addition, the recommendation module performs fine-grained processing on the digital library resources, extracts the attribute content of its resources, and labels the resources to obtain the resource portrait of the digital library. Finally, the recommendation module uses a recommendation algorithm to accurately match user preferences based on user portraits and resource portraits. The architecture of the recommendation module is shown in Figure 3.

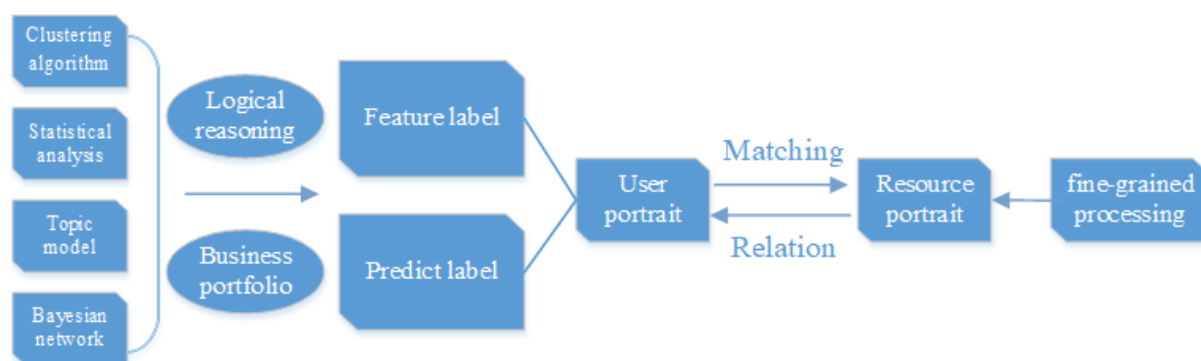


Fig 3. The architecture of the recommendation module.

4.3. User module.

The user module is the top-level design of the precision recommendation system of the digital library, and it is the application module of the precision recommendation system. After users follow, register, and log in the digital library, the user module divides the users into groups according to the obtained user information, and provides differentiated and precise recommendation services for different user groups. The user module realizes the interaction between the user and digital library, records the user's behavior in the digital library, feeds back the obtained user behavior data to the user database for real-time update. Adjust the system recommendation content in real time to maximize the precise recommendation to users. The architecture of the user module is shown in Figure 4.

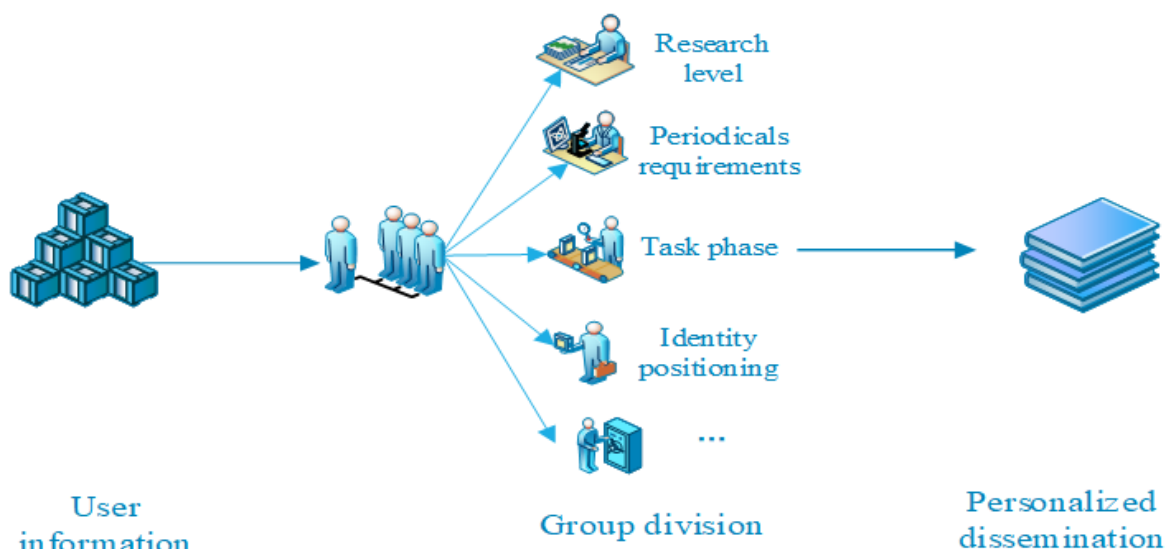


Fig 4. The architecture of the user module.

5. Conclusions

The arrival of the era of big data has brought new challenges to the precise service of libraries. Using digital libraries to provide personalized recommendation services according to user needs can improve the utilization rate of library resources. However, the complex and diverse data of users has brought certain troubles for the precise recommendation of digital library. With the advancement of data mining, prediction and other technologies, user portrait technology has brought a new solution perspective to precise recommendation services.

Based on the user profile technology, this paper introduces the construction method of the digital library precision recommendation service system from the data module, the recommendation module and the user module under the requirements of precision of recommended content, precision of service positioning and customization of recommendation service to realize digital books High-quality, efficient and accurate recommendation service. Based on the user portrait technology, this paper introduces the construction method of the precise recommendation service system of digital library from the data module, recommendation module and user module, so as to realize the high-quality, efficient and precise recommendation service of digital library.

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