Application and Research of User Portrait in Digital Library

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Abstract. The library service system based on user portraits, through the personalization of knowledge services, and the utilization of library information resources and user experience. The article discusses the research status of user portraits in the field of libraries at home and abroad, and elaborates on three aspects: necessity, feasibility and model construction. Drawing on the development experience of user portraits in the field of e-commerce and foreign libraries, this paper proposes building a model of user profiling in domestic library application.

Domestic and Foreign Research Status of User Portraits

Foreign Research Status of User Portraits

Alan Cooper first proposed the concept of user portrait, which is the virtual representation of real users and the target user model based on a series of real data \(^{[1]}\). Due to the different goals, opinions and behaviors of users, they can be divided into different types of users, and then extract typical user characteristics for each user type and give them specific descriptions such as name, photo, scene and some demographic elements. Forming a user portrait \(^{[2]}\).

To construct and improve user portraits in practical applications, specific algorithms and techniques are needed. Therefore, the algorithm of user portrait technology is one of the main research contents of foreign scholars and experts. Such as vector space model algorithm, naive Bayes classification, weighting algorithm, filtering algorithm and so on. In the process of constructing a user's portrait, when describing a user's portrait with a specific label vector or label group, due to the uniqueness and uniqueness of the user, the label has different importance to different users, so the label needs to be weighted. Billsus D and Pazzani MJ proposed that the nearest neighbor classification algorithm should be used for short-term preferences of users, while the naive Bayesian classification method should be used for long-term preferences.

Domestic Research Status of User Portraits

The initial application of user portraits was in the precision marketing and personalization services of modern computer information systems and e-commerce. In the field of e-commerce, such as Ctrip.com, through the collection of user experience evaluation, and based on this, a user portrait model based on user evaluation is constructed to analyze the user's satisfaction with the product, so as to provide reference for improving user service.

Library information services can draw on the experience of user portraits in e-commerce and other fields, reveal the portraits of different users in the development stage of digital libraries, collect their usage behaviors and analyze their psychology and inclinations to the main audience. The precise positioning of features to improve the marketing level of digital library promotion services, thereby improving the user maintenance and innovative service level of the library. Although domestic and foreign libraries have many differences in service types and user groups, when constructing user portraits, they can learn from foreign application experience, pay attention to differences, adjust models, analyze user needs, and truly achieve accurate and effective service.
The Necessity of Studying User Portraits in Digital Library

Providing Scientific Decision-making for Digital Library Services

By applying user portraits to digital libraries, by collecting, analyzing, and portraying user behavior data, we can better understand the user's need for book resources and lay the foundation for accurate push service information. By obtaining a label for the analysis of user behavior, the digital library uses these tags to collectively restore the user's borrowing behavior. In summarizing the work of the next phase of the digital library, we can find the gap between digital resources, information services and user portrait data, provide guidance for future work, and provide scientific decision-making for digital library information services.

Help Digital Libraries Provide Accurate Service

The digital library uses user portraits to "visualize" user needs. Even if the user's search term is not accurate enough, according to the existing user portrait data, the system can still feed back the user with higher relevance to the user search, and use the association principle of the user portrait and the clustering algorithm to recommend the personalized service. The information is accurately pushed according to the user's attribute information and behavior information, thereby facilitating the digital library to provide accurate services.

Feasibility of Researching User Portraits in Digital Libraries

China's libraries are in the stage of rapid development in the application of information technology. While providing information resources to meet user needs, building user portraits in the digital library system can provide users with accurate information services. User portraits have been widely used in the field of e-commerce, providing powerful technical support for the application of library user portraits. The application of user portraits in foreign libraries has matured. Typical applications include service information push, information filtering and personalized service design. Through the user portrait to understand the real needs of users, and provide users with accurate information services.

Model Construction of User Portrait of Digital Library

Collect User Data

The statistics and analysis of user data is the basis for building a user portrait model. User data mainly consists of two parts, one is attribute data, and the other is behavior data, that is, static data and dynamic data. User attribute data, also known as static data, mainly refers to the reader's student number, name, gender, department, major and other basic information. User behavior data is information based on various behaviors of users, also known as dynamic data. The purpose of collecting user data is to maximize the recovery of user information and behavior. Since the user attribute data and user behavior data required for the user portrait exist in different systems or databases, it is necessary to construct user data through integration.

Analysis and Process User Data

In the user portrait data, the user's attribute data and behavior data need to be preprocessed by data mining technology classification, clustering, association analysis, etc. to obtain valid data of the user portrait. Since the collected user data contains some redundant information that is not related to the user characteristics, it is necessary to analyze and process this part of the information. Only the effective data filtered by the information filtering system can guarantee the validity and authenticity between the user's portrait and the user. Finally, you can summarize the user's "portrait" by combining all the valid data.
Construct User Portrait Model

The collected user attribute data and user behavior data are marked after analysis and processing to form a classification and multi-level label user portrait label structure. On this basis, you can "visualize" the user portrait model. The user portrait model is different from traditional data statistics. The user portrait is a data analysis around the user, which can intuitively reflect the user's needs, and can dynamically analyze user behaviors and habits to achieve accurate and personalized services. The user's portrait can reflect a large amount of information from the multi-dimensional tags and classification tags and user changes, "visualize" them and transform them into portraits, which can represent the user's portrait data structure. At the same time, update, optimize and improve existing user portraits based on dynamic user behavior. The user portrait frame model is shown in Figure 1.

![User portrait frame model](image)

Figure 1. User portrait frame model.

Conclusion

Building user portraits can accurately describe the reader's reading preferences, behavioral habits, and attribute characteristics, and mark this information. Through the description of the user's portrait and the identification of the label, it provides a scientific basis for the reader's personalized recommendation, improves the utilization of information resources, and is conducive to the improvement of digital library services. Therefore, studying the digital library user portrait has important practical significance. Building a user portrait model in a digital library can also enable librarians to understand the real needs of users, guess the potential needs of users, and recommend personalized services to improve service quality.

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