Mobile Library Information Acceptance Adaptation and Scenario Recommendation Postprint

Authors: Wang Fu, Bi Qiang, Xu Pengcheng, Bi Datian

Date: 2023-08-27T00:00:00+00:00

Abstract

[Purpose/Significance] To resolve the conflict between information overload in mobile libraries and users' personalized information needs, effectively configure information acceptance contexts across different user scenarios, maximize fulfillment of users' information acceptance expectations, enhance user experience satisfaction, and promote innovation in mobile library services. [Method/Process] By introducing a scenario-based service concept and employing scenario elements, user information behavior, and information acceptance context as primary dimensions, this study constructs an information acceptance adaptation model for mobile libraries and designs the information acceptance process. [Results/Conclusion] Based on the mobile library information acceptance adaptation model, collaborative filtering algorithms are utilized to achieve scenario-based recommendation for mobile library information acceptance.

Full Text

Preamble

Mobile Library Information Acceptance Adaptation and Scene Recommendation

Wang Fu, Bi Qiang, Xu Pengcheng, Bi Datian
School of Management, Jilin University, Changchun 130022

Abstract

[Purpose/Significance] To address the contradiction between information overload in mobile libraries and users' personalized information needs, this study aims to effectively configure information acceptance contexts for users in different scenes, maximize fulfillment of users' information acceptance expectations, enhance user experience pleasure, and promote service innovation in mobile

libraries. [**Method/Process**] By introducing the concept of scene-based service and taking scene elements, user information behavior, and information acceptance context as primary dimensions, we construct a mobile library information acceptance adaptation model and design the information acceptance process. [**Result/Conclusion**] Based on the mobile library information acceptance adaptation model, collaborative filtering algorithms are applied to achieve scene recommendation for mobile library information acceptance.

Keywords: mobile library; information acceptance adaptation; scene recommendation
Classification Number: G250
DOI: 10.13266/j.issn.0252-3116.2018.15.003

Although the application of the "five forces of scene" (big data, mobile devices, social media, sensors, and positioning systems) in mobile libraries is gradually deepening [1], effective connections among users, context, and scene in existing mobile libraries have not yet been established [2]. Fundamentally, this stems from the lack of adaptation among user behavior, context, and scene, which may drive mobile libraries in two problematic directions: (1) a large gap between users' information demand expectations and actual information services, which will reduce user loyalty and willingness to continue using the service over time [3], leading to increased uninstallation or abandonment of mobile libraries; and (2) the current configuration of scene forces and mobile library contexts fails to deliver its intended effectiveness, resulting in disproportionate investment and output that has not yet gained widespread user recognition.

Specifically, the misalignment among scene, context, and user information acceptance [4] manifests in several aspects: (1) **Information disorientation**. Mobile library information disorientation occurs when users receive large amounts of disordered, fragmented information anytime and anywhere [5], leaving them trapped in the conflict between rapid information expansion and personalized information needs. (2) **Information pollution**. If rich interactive functions are abused [6], users become bombarded with information, lacking effective filtering mechanisms for their actual needs. (3) **Service coarseness**. Mobile library service models have not broken free from the constraints of mobile digital library service patterns, causing existing services to lag behind contextual configuration and scene function demands. (4) **Norm deficiency**. Mobile libraries should have clearly defined connotations and extensions, rather than simply being mobilized and socialized versions of digital libraries [7]. The absence of these norms inevitably results in poor user experience and affects user-platform stickiness. (5) **Scene recommendation**. Mobile libraries exhibit weak data mining capabilities, and their ability to recommend scenes for similar users urgently needs improvement to enhance users' continuous willingness to accept scene-based information and elevate their pleasure in information acceptance [8]. In the era of scenes, how mobile libraries can optimize information acceptance context configuration to guide and regulate user information behavior in line with user expectations, achieve good adaptation among "scene-user-context," and recom-

mend scenes to similar users represents a key challenge for future mobile library service innovation.

2. Mobile Library Scene-based Service Elements and Configuration

2.1 Mobile Library Scene-based Service Elements

Mobile libraries can only win the future by understanding and occupying scenes [9]. In real life, Baidu connects people with information, JD.com connects people with goods, Meituan connects people with daily life, while mobile libraries connect people with scenes. As the five forces of scene become deeply embedded in mobile libraries, the integration of mobile social media and cloud technology couples mobile library contexts in novel ways, manifested across three dimensions:

1. **Scene elements**. The five forces of scene embody characteristics where product equals scene, technology equals personalization, service equals connection, channel equals sharing, and terminal equals perception [10]. Scene serves as the driving force for mobile library information acceptance, and scene recommendation can maximize information acceptance value.
2. **Context elements**. Mobile library contexts primarily include resource context, technical context, service context, mobile context, social context, and terminal context [11]. How to adapt scenes based on users' information acceptance expectations forms the foundation for scene recommendation.
3. **User elements**. Mobile libraries capture users' information acceptance preferences, frequently visited locations, and lifestyle habits to intelligently provide scene-specific information [12]. Mobile libraries should quickly understand each user's background, personality traits, and information behavior habits while thoroughly grasping existing contexts to select the most suitable context combinations from the context repository and recommend the most appropriate information acceptance scenarios to users.

2.2 Mobile Library Scene-based Element Configuration

Scene-aware computing has attracted attention in recent years, but most discussions remain limited to academia, with context discovery and scene search still under development. This paper proposes a fusion configuration approach based on three dimensions—"scene-user-context":

1. **Sensor configuration**. Sensors mimic human sensory organs to achieve configuration. By "sharing" users' historical behavioral data through sensors, we can predict the likelihood of users' next-scene information demand expectations and proactively develop service strategies for upcoming scenes [13].

2. **Mobile device configuration**. Mobile devices evolve rapidly, with wearable devices already applied in many fields. Mobile devices are crucial for capturing users' information demand expectations and serve as carriers for scene experience, providing appropriate search strategies for scene-based user information needs and guiding users to gradually fulfill their information acceptance expectations.
3. **Social media configuration**. Through mobile social media, mobile libraries can understand users' information acceptance expectations and shorten the emotional distance between libraries and users, transforming mechanical interaction into emotional interaction while avoiding abuse and misuse of social media [14].
4. **Positioning system configuration**. Positioning systems locate users' real-world positions through digital maps, analyze possible scenes, and customize personalized scene services based on user behavior habits.

3. Mobile Library Information Acceptance Context Connotation and Configuration

3.1 Mobile Library Information Acceptance Context Connotation

Mobile library information acceptance context has evolved from mobile digital library contexts through several stages: (1) **Digital library context**, which includes resource context, technical context, and service context [15]; (2) **Mobile phone library context**, which adds mobile context to the above three [16]; (3) **Mobile digital library context**, which includes resource, technical, service, and mobile contexts, though the mobile context here far surpasses that of mobile phone libraries with better location awareness, larger data transmission capacity, and increased bandwidth; (4) **Mobile library context**, which adds social context to the previous four, tightly linking offline and online interactions and enabling self-information publishing through self-media functions, as well as forwarding and sharing other users' information, thereby improving functionality to align with current user information behavior habits. Thus, the contexts of digital libraries, mobile phone libraries, and mobile digital libraries represent the result of gradual evolution and ecological selection that increasingly aligns with changing user information needs [17].

3.2 Mobile Library Information Acceptance Context Configuration

Mobile library scene-based information acceptance context configuration requires integrating and merging the contextual advantages of digital libraries, mobile phone libraries, and mobile digital libraries. The following path must be followed to meet user information acceptance expectations [18]:

1. **Scene construction**. Scene equals product, and the purpose of scene construction is to better satisfy users' information acceptance expectations across different scenes.

2. **Scene solution**. Solution equals refinement, where scene refinement makes the touchpoints between scenes and user information needs, information search, and information acceptance increasingly specific. Scene solutions embody the value and utility of refined scene-based information acceptance.

3. **Scene channel**. Channel equals sharing. The purpose of information acceptance is both utilization and sharing. Scene channels represent the integration of information flow and context flow during user scene transitions.

4. **Scene traffic**. Popularity equals traffic. Popularity enables mobile library scene-based information acceptance to develop proactive search capabilities, generating popularity indices for information acceptance.

5. **Scene marketing**. Marketing equals experience. Scene marketing is the process of promoting brand formation through experiences in mobile library scene-based information acceptance, representing the core of scene-based information acceptance and demonstrating its expansion and extension capabilities.

Based on this, context reorganization is performed according to contextual dimensions to achieve scene-based context configuration, thereby fulfilling user information acceptance expectations. The mobile library scene-based context configuration model is shown in Figure 1 [Figure 1: see original paper].

As shown in Figure 1, mobile library scene-based information acceptance context configuration must first consider different contextual dimensions and realize contextual value through: (1) **Context fragmentation**, involving the richness and refinement of measurable dimensions, such as fragmenting service context into contextual units of pertinence, timeliness, appropriateness, coordination, and adaptability; (2) **Context extraction**, which involves extracting various contextual dimensions based on users' scene-based information needs, such as the location flexibility and temporal arbitrariness of mobile context; (3) **Context association**, which functionally links extracted contexts according to user information acceptance expectations; and (4) **Context fusion**, which achieves the scene-based configuration process of mobile library information acceptance contexts based on users' scene-specific information acceptance expectations. Building upon this, through scene construction, scene solution design, scene channel planning, and scene marketing implementation, the contextual fusion effect based on user information acceptance expectations is ultimately realized [20].

4. Mobile Library Information Acceptance Adaptation Mechanism Model

4.1 Mobile Library Information Acceptance Multi-dimensional Adaptation Mode

Mobile library scene-based information acceptance adaptation manifests across several dimensions: (1) **On-demand adaptation**. In actual context configuration, adaptation should follow principles of pertinence, appropriateness, and timeliness; otherwise, invalid contexts may emerge [21]. (2) **Relationship adaptation**. Relationships include opposition, juxtaposition, inclusion, intersection, overlap, reversal, nesting, immersion, and ablation among contexts. According to scene function objectives, different contextual relationships are fused to form contexts adapted to scenes [22]. (3) **Dynamic adaptation**. The measurement of dynamic adaptation is timeliness, coordination, and adaptability. Dynamic adaptation provides real-time context configuration adjustments during users' scene transitions, representing a seamless and flexible adaptation in time [23]. Among the three adaptation types, on-demand is the foundation and source, relationship is the process and path, and dynamic is the harmonization. The mobile library information acceptance adaptation model is shown in Figure 2 [Figure 2: see original paper].

As shown in Figure 2, mobile library scene-based adaptation is essentially functional and utility adaptation of "scene-user-context." User information demand stimulates context transformation [24], and user scene transitions stimulate optimization of scene settings. Since existing scene setting conditions and levels, as well as current context levels, constrain the evolution of user information demand expectations, adaptation of information search habits, and harmonization of information acceptance preferences, the entire information acceptance adaptation process requires interaction and feedback among different elements to lay a solid foundation for mobile library service development and innovation, demonstrating the ecological evolutionary nature of mobile library scene-based information acceptance context configuration.

4.2 Mobile Library Information Acceptance Adaptation Mechanism Model

Mobile library scene-based information acceptance includes the following aspects: (1) **Scene users**. Under scene thinking, target users are often focused on different segmented scenes to meet information acceptance expectations during scene transitions [25]. (2) **Scene switching**. Mobile libraries can provide basis for users' next-scene context settings by mining historical scene information acceptance data [26]. (3) **Scene-based contexts**. Mobile library scene-based information acceptance contexts have close associations with mobile library scene functions. (4) **Scene functions**. Mobile library scene-based information acceptance needs to perceive users' spatial changes through positioning systems and mobile terminals, and perceive users' information acceptance expectations

through mobile terminals. Actual scene-based information acceptance configuration achieves ecological iteration of the three-dimensional association and coupling relationship of "scene-user-context" based on user information acceptance preferences [27]. The mobile library information acceptance adaptation mechanism model is shown in Figure 3 [Figure 3: see original paper].

As shown in Figure 3, mobile library scene-based information acceptance is divided into three dimensions: (1) **User dimension**. The spatiotemporal dimension, represented by element in Figure 3, is perceived through mobile library positioning systems and mobile terminals to detect users' spatiotemporal transitions. (2) **Context dimension**. The context dimension includes various contexts shown as in Figure 3, where contexts are adapted specifically to users' scene-based information acceptance expectations. (3) **Scene dimension**. Mobile terminals are used to perceive users' information acceptance expectations [28], big data is used to mine user information acceptance preferences, positioning systems are used to perceive users' real-time status, social media is used to enhance social atmosphere, and sensors are used to understand users' lifestyle habits. Through the adaptation principle of "scene-user-context," context based on users' information acceptance expectations is configured for users' current scenes to enhance their scene-based information acceptance experience and perceived pleasure [29].

5. Mobile Library Information Acceptance Scene Recommendation and Simulation

5.1 Mobile Library Information Acceptance Scene Recommendation Foundation

Mobile library scene-based recommendation is completed based on the multi-dimensional adaptation model of "scene-user-context" for scene-based information acceptance. Its essence is to recommend scenes to users with the same information acceptance expectations [30], with the purpose of enhancing users' pleasure in information acceptance. The multi-dimensional adaptation of mobile library scene-based information acceptance is shown in Table 1 . Table 1 displays the configuration of resource context, technical context, service context, mobile context, social context, and terminal context when users accept information in different scenes such as classrooms, dormitories, campuses, libraries, and cafeterias [31].

Yunzhou is a knowledge space service system newly launched by Beijing Superstar Group, representing a technology, a platform, and a concept that embodies accumulation and enrichment, communication and mutual assistance, and sharing and innovation [32]. As shown in Figure 4 [Figure 4: see original paper], Yunzhou is used as an example to illustrate the context adaptation and scene recommendation process. Assuming users conduct information acceptance in different scenes such as classrooms, dormitories, campuses, libraries, and cafeterias, if we denote User as U, Context as C, and Behavior as B, different scenes

require configuring different dimensions and strengths of contexts due to varying user information acceptance expectations [33][34]. If U1 and U2 both exhibit behavior B1 in context C1 and behavior B2 in context C2, they are considered similar users. Similarly, if U3 and U4 both show behavior B2 in C2, B3 in C3, and B4 in C4, they are also similar users. Another example: if U6 and U7 both demonstrate behavior B1 in C1, B3 in C3, B5 in C5, and B6 in C6, they are considered similar users as well.

For measuring user behavior Bi (i = 1, 2, 3, … n, n N), we mine users' information demand expectations through historical behavior data, mine their information search habits through behaviors like clicking, page sliding, navigation, and retrieval, and mine their information acceptance preferences through the themes of browsed and downloaded information. The mobile library scene-based context configuration is shown in Figure 4.

In Figure 4, U1 and U2 share the same contexts C1 and C2. If U1 has high experience pleasure when conducting information acceptance in Scene 1, Scene 1 can be recommended to user U2 based on U1. Similarly, U3 and U4 share contexts C2, C3, and C4, and if U3 has strong continuous usage intention when conducting information acceptance in Scene 2, Scene 2 can be recommended to U4. Likewise, U6 and U7 share contexts C2, C3, C5, and C6, and if U6 has both high experience pleasure and strong continuous usage intention in Scene 3, Scene 3 can be recommended to U7.

The specific method for mobile library scene recommendation involves using the UCB (User-Context-Behavior) matrix, applying random walk models for scene mining to form different scenes, creating scene element sets through different element configurations, using collaborative filtering algorithms to mine users with similar contexts in the same scene, and finally achieving similar scene recommendation through the URI evaluation matrix. Particularly, based on users' historical data from previous scenes, scene recommendations for similar users can be realized by analyzing behavioral data from their current scenes [36], thereby providing targeted services. The process is shown in Figure 5 [Figure 5: see original paper].

As shown in Figure 5, mobile library scene recommendation includes: (1) Using role mining algorithms to identify roles from the UCB matrix and measuring the correlation between each role and different contexts using the adaptation mechanism model. This work will be completed offline. The UCB matrix is the "scene-user-context" matrix, where rows represent different users and columns represent different contextual dimensions, with each element representing a user's selection behavior in a specific contextual dimension. (2) Building a role-based trust model to calculate similarity between users. An effective collaborative filtering algorithm will be used to find similar users for user Ui. (3) Based on the role trust model established for each user, predicting users' evaluations of different items and recommending items with high evaluations to users.

5.2 Mobile Library Information Acceptance Scene Recommendation Algorithm

The Item-based collaborative filtering algorithm [37] was proposed by B. Sarwar et al. in 2001. The basic idea is to analyze item similarity based on user rating information and recommend items most similar to the target user's historically preferred items. B. Sarwar et al. [37] demonstrated through experiments that item-based collaborative filtering provides more accurate recommendations than user-based collaborative filtering in some cases. For example, in real-world e-commerce, associations between items are more stable than those between users. A comparison of user-based and item-based collaborative filtering algorithms is shown in Table 2 [38].

Given these considerations, the item-based collaborative filtering recommendation algorithm is selected for implementation. To discover users' preferred scene patterns from their behaviors and preferences and provide recommendations accordingly, collecting user preference information becomes the most fundamental determinant of system recommendation effectiveness. Users can provide preference information to the system in many ways, and different applications may vary significantly. This study uses users' experiential and perceptual evaluation scores as the basis, limiting scores to [0, n] where n is typically 5 or 10. User preferences for scenes can be obtained through their scene ratings.

5.3 Mobile Library Information Acceptance Scene Recommendation Simulation

Mobile library user information acceptance scene recommendation is based on scene similarity. Currently available similarity measures include Euclidean distance, Pearson correlation coefficient, and Cosine similarity [39]. These three algorithms are used to recommend scenes that meet users' information acceptance expectations. The study employs a context creation experimental method, randomly selecting 21 users in Jilin region through Yunzhou, grouped in threes, and having them complete identical tasks in dormitories, classrooms, campuses, library reading rooms, studios, and electronic reading rooms—specifically, searching for information resources on a certain topic and creating special collections. Using the specific measurement indicators for different contextual dimensions discussed earlier, seven scene evaluation values were obtained using a five-point Likert scale, as shown in Table 3 .

Using MATLAB R2010a, an item-based collaborative filtering algorithm was implemented. To find the scene most similar to Scene 3, CosSim, PearSim, and EcludSim were used to calculate similarities between different scenes, with ranking results shown in Figure 6 [Figure 6: see original paper].

By assigning different weights to the three similarity calculations (0.2, 0.5, and 0.3 respectively), the final ranking is: similarity between Scene 3 and Scene 1 is 0.517158; between Scene 3 and Scene 2 is 0.31197; between Scene 3 and Scene 4 is 0.369144; between Scene 3 and Scene 5 is 0.74607; and between Scene 3 and

Scene 6 is 0.721282. Based on comprehensive consideration, Scene 6 is most similar to Scene 3, so Scene 6-related applications should be recommended to users in Scene 3.

5.4 Mobile Library Information Acceptance Scene Recommendation Analysis

The integrated approach using CosSim, PearSim, and EcludSim with weighted user similarity achieves scene-based recommendation for mobile library information acceptance. Implementing scene recommendation for mobile library user information acceptance [36] holds the following significance: (1) **Theoretical significance**. Recommending scenes based on user information acceptance similarity with different weights can address insufficient context configuration when users first employ mobile libraries for scene-based information acceptance, providing a theoretical basis for dynamic context adaptation. (2) **Practical significance**. Feedback from users' perception and experience of scene-based recommendations provides basis for dynamic adaptation of mobile library scene-based information acceptance, while also enabling regulation and guidance of users' mobile library scene-based information acceptance to enhance their pleasure in scene-based information acceptance perception and experience.

In summary, mobile library information acceptance scene-based recommendation involves the organic integration of numerous elements. Through three algorithms—CosSim, PearSim, and EcludSim—scene recommendation can be accurately implemented, enriching practical applications of mobile library scene-based information acceptance.

References

[1] Peng Lan. Scene: A New Element of Media in the Mobile Era [J]. Journalism Review, 2015(3): 20-27.
[2] Zhu Jianliang, Wang Pengxin, Fu Zhijian. Scene Revolution: The New Business Pattern in the Internet of Everything Era [M]. Beijing: China Railway Publishing House, 2016.
[3] Li Ran. Research on Factors Influencing Continuous Intention to Use Mobile Shopping [D]. Chengdu: University of Electronic Science and Technology, 2014.
[4] Baeks J. Dynamic Reconfiguration Based on Goal-Scenario by Adaptation Strategy [J]. Wireless Personal Communications, 2013, 73(2): 309-318.
[5] Liu Xingjun. Research on Weibo Users and Their Information Transmission Influencing Factors [D]. Wuhan: Central China Normal University, 2013.
[6] H-P Ken W, Fuchs M, Zanker M, et al. Context-based Adaptation of Mobile Applications in Tourism [J]. Information Technology & Tourism, 2010, 12(2): 175-195.
[7] Li Jiaqi. Research on Mobile Library Service Innovation Based on SOLOMO Model [D]. Dalian: Liaoning Normal University, 2016.
[8] Zhao Q Y. Replica Selection Strategy Based on Similar Scene Recommendation in Data Grid Environment [J]. Microelectronics & Computer, 2012, 29(9):

23-25.
[9] Wang Dongbo. Analysis of Library Scene Service Elements and Content Implementation [J]. Library Science Research, 2017(1): 60-64.
[10] Duan Chunlin, Yan Jimin. Mobile Scene-based: The New Revolution of Digital Publishing in the "Internet Plus" Era [J]. China Publishing, 2016(5): 54-56.
[11] Vongjaturapat S, Chaveesuk S. Mobile Technology Acceptance for Library Information Service: A Theoretical Model [C]//International Conference on Information Society. Toronto: IEEE, 2013: 290-292.
[12] Chaveesuk S, Vongjaturapat S, Chotikakamthorn N. Analysis of Factors Influencing the Mobile Technology Acceptance for Library Information Services: Conceptual Model [C]//International Conference on Information Technology and Electrical Engineering. Yogyakarta: IEEE, 2013: 18-24.
[13] Wopfner M, Bricl J, Hochdörfer S, et al. Mobile Manipulation in Service Robotics: Scene and Object Recognition with Manipulator-mounted Laser Ranger [C]//ISR 2010 (41st International Symposium on Robotics) and ROBOTIK 2010 (6th German Conference on Robotics). Munich: IEEE, 2011: 1-7.
[14] Khan S A, Bhatti R. Application of Social Media in Marketing of Library and Information Services: A Case Study from Pakistan [J]. Webology, 2012, 9(1): 1-8.
[15] Castelli D, Pagano P. OpenDLib: A Digital Library Service System [M]//Research and Advanced Technology for Digital Libraries. Berlin: Springer, 2002: 1-7.
[16] Wang Fu. Research on the Mechanism of Mobile Library Information Acceptance Context on User Information Behavior [J]. National Library Journal, 2018, 27(1): 19-30.
[17] Wang Fu, Bi Qiang. Research on Context Recombination for Mobile Library Scene-based Information Acceptance [J]. Library Development, 2017(12): 39-45.
[18] Ma Zhuo. Research on Digital Library Microservice Context Interaction Function Evaluation [D]. Changchun: Jilin University, 2017.
[19] Wu Sheng. Scene Revolution: Reconstructing the Connection Between People and Business [M]. Beijing: China Machine Press, 2015.
[20] Ma Hongli. Research on Continuing Education Model Innovation Based on "Yunzhou" [J]. Continuing Education Research, 2016(7): 83-84.
[21] Hu Muhai, Cai Shuqin, Tan Tingting, et al. Context-sensitive Recommendation Model for Mobile Digital Library [J]. Computer Science, 2011, 38(8): 92-95.
[22] Orsini G, Bade D, Lamersdorf W. CloudAware: Empowering Context-aware Self-adaptation for Mobile Applications [J]. Transactions on Emerging Telecommunications Technologies, 2017(18): e3210.
[23] Piao J C, Cho C W, Kim C G, et al. An Adaptive LOD Setting Methodology with OpenGL ES Library on Mobile Devices [C]//International Conference on IT Convergence and Security. Beijing: IEEE, 2014: 1-4.
[24] Sama M, Elbaum S, Raimondi F, et al. Context-aware Adaptive Ap-

plications: Fault Patterns and Their Automated Identification [J]. IEEE Transactions on Software Engineering, 2010, 36(5): 644-661.
[25] Lo D, Mao Z S. Mining Scenario-based Specifications with Value-based Invariants [C]//ACM SIGPLAN Conference Companion on Object-oriented Programming Systems Languages and Applications. New York: ACM, 2009: 755-756.
[26] Zhou K, Varadarajan K M, Zillich M, et al. Web Mining for Similar Scene Recommendation [C]//IEEE International Conference on Robotics and Biomimetics. Karon Beach: IEEE, 2011: 2824-2829.
[27] Axelsson J, Hees P V. New Data for Sandwich Panels on the Correlation Between the SBI Test Method and the Room Corner Reference Scenario [J]. Fire & Materials, 2005, 29(1): 53-59.
[28] Liu Jian, Bi Qiang, Liu Qingxu, et al. Research on Digital Document Resource Content Service Recommendation—Based on Ontology Rule Reasoning and Semantic Similarity Calculation [J]. Modern Library and Information Technology, 2016(9): 70-77.
[29] Zhu H, Chen E, Xiong H, et al. Mining Mobile User Preferences for Personalized Context-aware Recommendation [J]. ACM Transactions on Intelligent Systems & Technology, 2014, 5(4): 1-8.
[30] Biancalana C, Gasparetti F, Micarelli A, et al. An Approach to Social Recommendation for Context-aware Mobile Services [J]. ACM Transactions on Intelligent Systems & Technology, 2013, 4(1): 1-31.
[31] Perera C, Jayaraman P, Zaslavsky A, et al. Dynamic Configuration of Sensors Using Mobile Sensor Hub in Internet of Things Paradigm [C]//IEEE Eighth International Conference on Intelligent Sensors, Sensor Networks and Information Processing. Melbourne: IEEE, 2013: 473-478.
[32] Ma Hongli. Research on Continuing Education Model Innovation Based on "Yunzhou" [J]. Continuing Education Research, 2016(7): 83-84.
[33] Sun Yingyue. Research on Extending University Library Knowledge Space Service Based on "Yunzhou" [J]. Library Science Journal, 2017, 39(2): 8-12.
[34] McLaughlin M R, Herlocker J L. A Collaborative Filtering Algorithm and Evaluation Metric that Accurately Models the User Experience [C]//Proceedings of the 27th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval. New York: ACM, 2004: 329-336.
[35] Wang Fu. Construction of Ecological Adaptation Model for Mobile Library Context and Information Behavior [J]. Information Studies: Theory & Application, 2017, 40(11): 80-85, 95.
[36] Ye W, Lin K, Zhang L, et al. Optimized Collaborative Filtering Algorithm Based on Item Rating Prediction [C]//International Conference on Instrumentation. Harbin: IEEE, 2013: 648-652.
[37] Sarwar B, Karypis G, Konstan J, et al. Item-based Collaborative Filtering Recommendation Algorithms [C]//International Conference on World Wide Web. New York: ACM, 2001: 285-295.
[38] Zhou Kun. Research on User Similarity-based Collaborative Filtering Recommendation Algorithm [D]. Chengdu: Southwest Jiaotong University,

2016.
[39] Said A, Jain B J, Albayrak S. Analyzing Weighting Schemes in Collaborative Filtering: Cold Start, Post Cold Start and Power Users [C]//Proceedings of the 27th Annual ACM Symposium on Applied Computing. New York: ACM, 2012: 2035-2040.

Author Contributions

Wang Fu: Responsible for topic selection, paper writing, and revision;
Bi Qiang: Responsible for guidance on theme selection, research framework design, and content modification guidance;
Xu Pengcheng: Data collection and organization;
Bi Datian: Responsible for algorithm design guidance and optimization in the paper.

Note: Figure translations are in progress. See original paper for figures.