ISSN 2616-5783 Vol.8, Issue 8: 8-12, DOI: 10.25236/AJHSS.2025.080802

Research on Optimization of Smart Archive Cloud Services Based on Mobile Context Awareness

Li Ming

Archives of Hubei University of Science and Technology, Xianning City, 443700, China

Abstract: *With the rapid development of information technology, smart archive cloud services have become an important development direction in the field of archive management. This paper delves into the optimization strategies of smart archival cloud services based on mobile context awareness. By analyzing the current application status of mobile context awareness technology in archival cloud services and combining relevant theories and practical cases, it proposes optimization measures in multiple aspects such as context awareness model construction, personalized service improvement, and security guarantee strengthening, aiming to enhance the quality and efficiency of smart archival cloud services, meeting the growing diversified needs of users, and provide theoretical support and practical guidance for the intelligent development of archives management.*

Keywords: *Mobile Context Awareness; Smart Archives; Cloud Services; Optimization Strategy*

1. Introduction

In recent years, driven by national vision goals such as Digital China[1], Smart cities[2], and Digital government[3], the level of social intelligence has been continuously enhanced, while the volume of archival information has grown explosively, and users' demands for archival services have become increasingly diverse and personalized. Driven by relevant policies and social demands, archival institutions have gradually become aware of the necessity of integrating advanced technologies with archival work. The National Archival development Plan for the 14th Five-Year Plan emphasizes the need to "strengthen the application of new-generation information technology in the construction of archives (rooms)"[4]. In the digital age, smart archival cloud services, as an emerging archival service model, integrate advanced technologies such as cloud computing, Internet of Things, and big data, bringing new opportunities and changes to archival management and services. The emergence of mobile context-aware technology has further expanded the application scenarios of smart archival cloud services, enabling archival services to perceive user needs more accurately and provide personalized services. Through research on the optimization of smart archival cloud services based on mobile context awareness, it helps to enhance the intelligence level of archival services, increase user satisfaction, and promote innovative development in the field of archival management. At the same time, this is in line with the national strategic requirements for digital transformation and smart government construction, and is of great significance for promoting the efficient use of information resources and the digital development of society.

2. Research status of Mobile context Awareness and Smart Archive Cloud Services

2.1 Research status at home and abroad

Research on mobile context-aware technology and smart archive cloud services started earlier abroad and has achieved a series of results. Some archives in developed countries have used advanced sensor technology and data analysis algorithms to achieve precise perception of users' location, behavior and other contextual information, and provide personalized archive recommendation services accordingly. In terms of cloud services, foreign archive cloud platforms have a high level of data storage, processing capacity and security.

Research on smart archival cloud services has also increased in China in recent years, mainly focusing on the construction of cloud service models and the security of archival data. Research on the application of mobile context-aware technology in archival services is still in the exploratory stage, with relatively few related theories and practical cases. However, it is developing rapidly, and archives in

ISSN 2616-5783 Vol.8, Issue 8: 8-12, DOI: 10.25236/AJHSS.2025.080802

some regions have begun to try to introduce mobile context-aware technology to improve service quality.

For example, Zhuhai Smart City Construction Archives has established a smart city construction archive resource management system centered on intelligent perception and information processing, focusing on core businesses such as archive acceptance, transfer and filing. The archive is capable of proactively perceiving users' information and pushing corresponding information. It can also utilize functions such as knowledge graphs and visual GIS queries to provide diversified and multi-level urban construction archive information resource services for urban planning, construction and management.

2.2 Principles of Mobile Context-aware technology

Mobile context-aware technology mainly collects contextual information such as the user's location, time, device status, and behavioral habits through sensors, positioning technology, data analysis algorithms, etc. Sensors can sense the environmental information around the user, such as temperature, humidity, light, etc. Location technology can precisely determine the user's geographical location; Data analysis algorithms process and analyze the vast amount of contextual information collected to uncover users' latent needs and behavioral patterns. For example, real-time location information of users can be obtained through the GPS positioning function of mobile phones; Using accelerometers and gyroscopes, the user's motion status can be perceived, and it can be determined whether the user is walking, running or stationary. The collection and analysis of this contextual information provide the basis for personalized services.

2.3 Smart Archive Cloud Service model

A smart archive cloud service is an archive service platform built on cloud computing technology, which stores archive resources in the cloud and provides users with access, query, and utilization of archives anytime and anywhere through the network. The cloud service model has advantages such as resource sharing, elastic scalability, and low cost, which can effectively integrate archival resources and improve service efficiency.

With the continuous development of cloud computing, cloud storage and virtualization technologies, the existing cloud services mainly include three models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS)[5]. The IaaS model provides archival institutions with basic computing, storage and network resources; The PaaS model provides a platform for application development and operation, facilitating archival institutions to develop customized archival management applications; The SaaS model provides users with a variety of archival service software directly, which can be used through a browser without the need for complex installation and configuration. SaaS providers put services, data, etc. in the cloud, and users can access these services[6] at any time and place using connected devices.

2.4 The advantages of the integration of mobile context-aware and smart archive cloud services

In the cloud computing environment, user scenario information is dynamic and changeable, and this scenario information contains a large number of personalized demands of users. Integrating mobile context-aware technology into smart archive cloud services can make the services more precise and personalized. By perceiving users' contextual information, the cloud service platform can parse and construct scenarios based on real-time data such as users' activity trajectories, usage behaviors, and interest preferences, thereby determining the current contextual status of users (such as work scenarios, entertainment scenarios, etc.)[7], and proactively push relevant archival information to improve the efficiency of users obtaining information. For example, when the system detects that the user is near a tourist attraction, it can automatically push historical archival materials related to that attraction to provide the user with a richer travel experience.

This integration can also enhance the intelligence level of services, predicting users' needs based on their behavioral patterns and historical records, and preparing services in advance. At the same time, mobile context-aware technology can monitor users' usage in real time, providing data support for the optimization and improvement of cloud service platforms and continuously enhancing service quality.

ISSN 2616-5783 Vol.8, Issue 8: 8-12, DOI: 10.25236/AJHSS.2025.080802

3. Current status and problems of Mobile Context-aware applications in Smart Archive Cloud Services

3.1 Analysis of Application Status

At present, some advanced smart archive cloud service platforms have begun to experiment with the application of mobile context-aware technology. For example, some archives have developed mobile applications that can use the sensors on the user's mobile phone to obtain the user's location information and automatically push information about exhibitions and recent activities in the archives when the user enters the area near the archives. In terms of archival search, some platforms can analyze users' interests and preferences based on their historical search records and browsing behaviors, and provide personalized archival search results for users.

Mobile context-aware technology has also been introduced in the archive management cloud platforms of some large enterprises. By perceiving employees' work scenarios and needs, provide them with work-related archival materials to enhance work efficiency. For example, when an employee is on a business trip, the system can push relevant contract files, project materials, etc. based on the employee's location and business requirements.

There are also universities in China that are building intelligent recommendation systems based on user profiling technology, innovating the utilization of university student records through data mining and analysis. For example, Hubei University of Technology determines whether students need to reissue their transcripts based on historical file search records and educational administration data[8].

3.2 Problems and Challenges

Although mobile context-aware technology has been applied to some extent in smart archive cloud services, there are still many problems. First, the accuracy of context awareness needs to be improved. Due to sensor precision limitations, environmental interference and other factors, there may be errors in the obtained scenario information, which affects the accuracy of the service. For example, bias in location information may cause the pushed file information to not match the actual needs of the user.

Secondly, the depth and breadth of personalized services are insufficient. Most of the current personalized services remain at the level of simple information push, and there is insufficient exploration of users' complex needs and deep interests. Moreover, the coverage of services is limited and cannot meet the diverse needs of all users.

Furthermore, data security and privacy protection face challenges. Mobile context-aware technology involves a large amount of users' personal information and behavioral data, which poses a serious threat to users' privacy once leaked. At the same time, the security protection system of cloud service platforms also needs to be further strengthened to prevent hacking and data tampering.

In addition, the lack of information sharing and collaboration among different archive cloud service platforms has led to obstacles in the cross-platform application of mobile context-aware technology, which cannot provide users with a comprehensive and unified service experience.

4. Optimization strategies for Smart archive cloud services Based on mobile context awareness

4.1 Build precise context-aware models

To enhance the accuracy of situational awareness, it is necessary to construct a precise situational awareness model. Firstly, appropriate sensors and positioning technologies are selected to improve the accuracy of scene information collection. For example, high-precision GPS positioning chips and advanced inertial sensors are used to reduce positioning errors and motion state perception deviations.

Secondly, big data analysis and machine learning algorithms are used to deeply mine and analyze the vast amount of contextual information collected. By establishing user behavior models and interest preference models, precise predictions of user needs can be achieved. For example, deep learning algorithms are used to analyze data such as users' historical query records, browsing time, and dwell locations to dig out potential points of interest for personalized services.

In addition, a real-time update mechanism for scenario information should be established to reflect changes in user scenarios in a timely manner. By monitoring sensor data and user behavior in real time,

ISSN 2616-5783 Vol.8, Issue 8: 8-12, DOI: 10.25236/AJHSS.2025.080802

the context-aware model is dynamically adjusted to ensure the timeliness and accuracy of the service.

4.2 Enhance the level of personalized services

Based on the accurate context-aware model, the personalized service level is further improved. In terms of file recommendation, the most relevant file resources are recommended to users according to user interest preferences and current scenarios. For example, for users who study history and culture, when the system perceives that the user is near a historical and cultural site, it pushes information related to historical archive exhibitions, relevant historical research reports, etc.

In the aspect of file retrieval, the retrieval algorithm is optimized to provide personalized retrieval result ranking according to user context information and historical retrieval records. At the same time, intelligent retrieval functions such as voice retrieval, image retrieval, etc. are provided to facilitate users to quickly obtain the required archival information.

In addition, customized services can be provided to tailor exclusive file service plans for users based on their specific needs.

For example, we provide customized archive management solutions for enterprise users to meet their specific requirements for archive services across different business scenarios.

4.3 Strengthen the security assurance system

To address issues related to data security and privacy protection, a robust security assurance system shall be established. Specifically, during the data collection process, users must be clearly informed of the purpose, scope, and intended use of the data being collected, and their consent must be obtained. Additionally, encryption technology shall be applied to encrypt and transmit the collected data, thereby preventing data leakage.

In terms of data storage, reliable cloud storage technology is used for multi-copy storage and backup of data to ensure the security and integrity of the data. At the same time, we will enhance the security protection for cloud service platforms by deploying security devices such as firewalls and intrusion detection systems (IDS), thereby preventing hacker attacks and unauthorized data tampering.

At the same time, we will further strengthen the security protection of cloud service platforms by deploying critical security devices—including firewalls, intrusion detection systems (IDS), and other complementary tools—to prevent hacker attacks and unauthorized data tampering.

In addition, a sound data security contingency plan should be developed so that measures can be taken promptly in the event of a data security incident to minimize losses.

4.4 Promote information sharing and collaboration among platforms

In order to achieve effective application of mobile context-aware technology among different smart archive cloud service platforms, it is necessary to promote information sharing and collaboration among platforms. Unified data standards and interface specifications shall be established to ensure the effective exchange and sharing of data across different platforms. For instance, a unified archival metadata standard shall be formulated, which ensures that archival information from various platforms is mutually recognizable and interpretable.

We will develop a cross-platform information sharing and collaboration platform to enable the interconnection of different archive cloud service platforms. On this platform, users can access archival resources from multiple platforms with a single login and enjoy unified services based on mobile context-aware.

In addition, cooperation and communication among different archival institutions should be strengthened to jointly promote the development of smart archival cloud services. Through the establishment of cooperative alliances, project cooperation, and the creation of cross-regional information sharing platforms, we have achieved resource sharing, intercommunication and mutual use, and complementary advantages to jointly enhance the overall service level.

ISSN 2616-5783 Vol.8, Issue 8: 8-12, DOI: 10.25236/AJHSS.2025.080802

5. Conclusion

The integration of mobile context-aware technology with smart archival cloud services is of great significance, enhancing the precision, personalization and intelligence of archival services, while also injecting new vitality into the digital and intelligent development of archival management.

In the future, with the continuous development of information technology, the application of mobile context-aware technology in smart archival cloud services will be more in-depth and extensive. We will further study how to improve the accuracy and efficiency of context awareness, expand the dimensions of context information collection, and at the same time, strengthen the research on cross-platform and cross-domain information sharing and collaboration, promote the deep integration of smart archives cloud services with other related fields, and provide users with more convenient and efficient services.

Acknowledgements

Project: Philosophy and Social Sciences Research Project of Hubei Provincial Department of Education "Research on the Architecture of Smart Archive Cloud Service Based on Mobile Context Awareness" (Project Number: 22Y155)

References

[1] The Central Committee of the Communist of China and The State Council issued the Overall Layout Plan for the construction of Digital China [N]. People's Daily, 2023-02-28 (1).
[2] National Informationization Plan for the 13th Five-Year Plan [N]. Posts & Telecom,2016-12-30(5). https://www.gov.cn/zhengce/content/2016-12/27/content 5153411.htm
[3] Big Data Era: Digital Government Construction Becomes a New Trend [N]. Social Sciences Today, 2019-06-13(1).
[4] My state printing (the "difference" national archives career development plan [EB/OL]. [2024-03-01]. https: //www. saac. gov. cn/daj/toutiao/202106/ecca2de5bce44a0eb55c890762868683. shtml.
[5] Liu Jinfu. Design and Implementation of Elastic Scheduling System for Live Cloud Platform Based on Docker [D]. Beijing University of Posts and Telecommunications,2018.
[6] Shi Liyan Research on Cloud-Based Response to Olympic Situations in Local Government Networks [J]. Northern Economic and Trade,2016
[7] Li Ming. Research on Context-aware Cloud Service Model for Smart Archives [J]. Archival Memory,2025,(05):59-62.
[8] Zhang Li. Construction of Utilization Services for University Student Records Based on User Profiling: A Case Study of the Archives of Hubei University of Technology [J]. Archives of Mechanical and Electrical Ships,2025,(02):71-74.