Design and Realization of Cultural Resources Display System Based on Computer

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Abstract—There are many kinds of Chinese traditional cultural resources and a long history, which has very important research significance and commercial value. With the rapid development of modern information technology and the increasingly extensive and complex demand for social information, the display and dissemination of cultural resources are also changing with each passing day. Based on computer technology and GIS technology, this paper conducts cultural resource sharing research, designs and implements a scalable and easy-to-update cultural resource visualization system, and uses historical and cultural resource data in a certain area for display and data analysis. The results show that the system is effective It is of great significance to promote the dissemination and development of cultural resources.

Keywords-cultural resources; computer technology; vue.js; gis; visualization

1 INTRODUCTION

Many cultural resources have been produced during the historical development of human civilization, and these cultural resources have paramount research significance and commercial value. Cultural resources are the commonwealth of human society. In today's Internet era, digital cultural resources play a significant role in promoting urban tourism development [1]. The protection and inheritance of historical and cultural resources have always been an

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essential subject. The digitization of cultural resources has become a vital element of the national cultural development strategy [2].

There are many types of historical and cultural resources and rich content. Various cultural resources, such as ancient tombs, ancient ruins, historical celebrities, and cultural relics in collections, should be effectively classified, managed, and displayed. This article uses network technology, database technology, modern computer technology, and GIS technology to design and implement cultural resource management and display system based on WebGIS. The use of an open user interaction platform enables the public to browse the cultural resources of various regions efficiently, quickly, and intuitively. It allows more people to participate in the protection and dissemination of traditional cultural resources.The visual display of historical and cultural resources in a certain area has been completed. Data analysis shows that the system has a certain role in promoting the dissemination and development of historical and cultural resources.

2 SYSTEM OVERVIEW

2.1 demand analysis

1) Visual display of spatial location information. To develop a cultural resource information display system, the intuitive browsing of information is not only an important task, but also the basis of the system. The past electronic record materials and forms cannot combine the images and detailed descriptions of cultural resources with the spatial location. The network-based method can conveniently query various cultural resource information based on attributes and space.

2) Friendly interaction and use. For system users, users in different industries want to get started quickly when using the system. The design of the system interface must be simple and intuitive, and place the functions frequently used by users in a convenient location for browsing. This requires that the user's operating habits and main needs should be fully considered when designing the system interface.

3) System stability and data security. Ensuring the security of cultural service resource data is a prerequisite for system operation. Many cultural service resource data have certain confidentiality requirements, so the system should prevent hacker attacks and data leakage. Coupled with the complexity of the network, attention should be paid to the security of the system, and only personnel with specific permissions can use the system. After the system is online on the Internet, under the premise of ensuring the good operation of the platform, the system should have self-protection capabilities for malicious attacks and other data damage to the database and a regular backup mechanism for the database.

2.2 Design principles

The cultural resource management and display system mainly abide by the following principles in the structure and function design:

1) Scalability[3]. Considering future system upgrades, maintenance and expansion, fully consider the problems of many system users and the complex amount of cultural resources data [4].

2) Economy. Use as little economic investment as possible to improve the performance of the system, and use existing technical means and resources to reduce the user's use cost. The design and implementation of the system should save the economic investment of system development as much as possible. In the case of fully considering the investment of all parties, the system should have excellent performance and good cost performance. The design should be realistic, pay attention to practical results, adhere to the principles of practicality and economy, and make full and reasonable use of existing equipment and information resources to help users save investment.

3) Ease of operation. Through a simple and easy-to-operate interactive interface, users can browse various cultural resources conveniently and intuitively. In the system design, fully use advanced and mature technology to meet construction requirements, closely combine scientific management concepts and advanced technical means, propose advanced and reasonable business processes, and adopt advanced and mature technical means and standardized products to make the system have a high Performance, to meet the current technological development direction, to ensure that the system has strong vitality and long-term use value.

4) Integrity and openness. The system design considers the organic integration of different cultural resources and pays attention to sharing cultural resources and other cultural-related information[5]. It is necessary to consider both security and openness, and grasp the relationship between information sharing and information security.

2.3 Design ideas

Due to the complexity of the Web system business, the system is also oriented to many types of target users, and it is necessary to allocate user management permissions [6] reasonably. The system is divided into ordinary users, registered users, and system administrators according to user rights. The overall design ideas are as follows:

1) Ordinary users support online browsing of all cultural resources, including classified browsing and precise search of cultural resources.

2) Registered users support online browsing of cultural resources and can log in to the system to download and save cultural resources and their attachments.

3) The system administrator supports password modification and assignment of permissions for users, is responsible for the batch entry of cultural resources, and at the same time classifies, adds, edits, and deletes cultural resources.

3 KEY TECHNOLOGY

3.1 Vue.js

This article uses Vue.js technology to develop the interactive front-end interface. Vue.js technology is a lightweight and efficient progressive (Model-View-ViewModel) Java Script framework [7]. The current popular JavaScript frameworks mainly include Angular.js, React.js, etc. The core idea of Vue.js is to build a "data-driven component system," which uses a bottom-up development method to make user interaction interfaces with high performance and flexibility. Solid and other characteristics.

The Vue framework was first proposed by You Yuxi. After seven or eight years of continuous maintenance and development, it has become one of the three most popular front-end frameworks. In addition, vue3.0 was released on September 18, 2020. Except for the content of the API of the presentation function and the syntax of the scope slot, the other content is basically unchanged. Vue3 is basically compatible with the previous version of vue2. In addition, major changes have been made to the top-level API. The latest framework also brings many improvements, such as node tagging, event cache response proxy and other functions. Vue is a progressive framework for building user interfaces. The reason for its popularity is not only because it is easy to use, but also because of the better ecological environment of Vue. At the same time, Vue can be integrated with third-party libraries or existing projects, which greatly increases the flexibility of use.

3.2 Ajax technology

The full name of Ajax technology is Asynchronous Javascript and XML, which uses an asynchronous method to read data between the client and the database. This article adopts Ajax technology to realize the communication service between the database and the front end, reducing the server's burden. At the same time, there is no need to refresh the page when requesting data, which improves the user experience. The browser completes Ajax technology compilation and execution to apply Ajax technology to WEB systems developed in any language. The advantages and disadvantages of Ajax technology are shown in Table 1.

TABLE 1. ADVANTAGES AND DISADVANTAGES OF AJAX TECHNOLOGY

Advantage	Shortcoming
1) The function of refreshing part of the page can be realized	1) There may be a network delay problem.
2) Provides a lot of auxiliary functions in object-oriented mode	2) More complicated than building classic WEB applications
3)Commonly used server-side programming languages can implement Ajax server-side	3) The security of Ajax applications is low because all files are downloaded on the client

3.3 Node.js

Essential website development includes server, front end, operation, maintenance deployment, etc. Node.js technology is a JavaScript runtime environment. Based on the Chrome V8 engine, it provides a way to run JavaScript on the server-side. The browser is the JavaScript code parser, and Node.js is the server-side JS code parser. The JS code stored on the server-side is parsed and applied by Node.js. It is wholly built on an event-driven, non-blocking model, making it easier to write high-performance Web services, applications are fast in response and easy to expand, and can unify the programming languages of front-end and back-end development, reduce development difficulties, and save development costs.

3.4 Service Oriented Architecture (SOA)

SOA is an "abstract, loosely coupled, coarse-grained software architecture." From a business perspective, the key to SOA is "reuse" and "interoperability." It encapsulates IT resources into operational, standards-based services that can be recombined and applied. SOA can achieve rapid construction and application integration. The current implementation form of SOA is Web services, based on the open W3C and other recognized standards. Based on its unique flexibility and business relevance, SOA has successfully been widely used in practice. SOA provides a good solution for the contradiction between business development needs and IT support capabilities.

3.5Web Map Service

Web Map Service (WMS) uses data with geospatial location information to make maps. The map is defined as a visual representation of geographic data, and the map itself is not data. Maps are usually expressed in image formats, such as PNG, GIF, or JPEG, and sometimes described as vector-based graphics, such as scalable vector graphics (SVG) or network computer graphics metafiles (WebCGM). The OGC pointed out that the map service is dedicated to sharing map data. Specific user requests provide map images, element information of designated coordinate points, and function description information of the map service.

3.6WebGIS

WebGIS (Network Geographic Information System) refers to a geographic information system based on the Internet platform. The client application software adopts a network protocol and is applied to the Internet. It can be understood as the network representation of GIS, which is generally composed of multiple hosts, multiple databases and multiple clients connected to the Internet in a distributed manner, including the following four parts: WebGIS browser, WebGIS server, WebGIS editor, WebGIS information acting. Using WebGIS, people can find the required GIS data information, visually display the spatial data information of geographic entities, and can effectively collect, process, store, query and analyze the spatial data of geographic entities. The emergence of WebGIS technology makes GIS more abundant. Users can apply their GIS functions through a web platform through a browser. With the continuous development of Internet technology and GIS technology, the combination of the two is getting closer and closer. Based on the B/s architecture, the system builder publishes local GIS services through the network and anywhere. Users can browse GIS spatial information services at any

system node on the network, and enjoy remote GIS functions based on web tools such as browsers.

4 Design and Implementation

4.1 System Architecture

The overall system architecture is divided into five layers: the primary layer, the data layer, the service layer, the application layer, and the user layer in sequence. The data layer mainly stores various cultural resources and their attachments and provides data support for the system. The data storage uses a PostgreSQL database. The service layer uses Node.js technology to obtain various data from the database and includes front-end display retrieval, query, and data analysis services [8]. The application layer is the primary function of the system design under the support of the data layer and the service layer, including map visualization, GIS essential functions, attribute query, cultural resource classification display, cultural resource management, etc. The overall system architecture is shown in Fig.1.

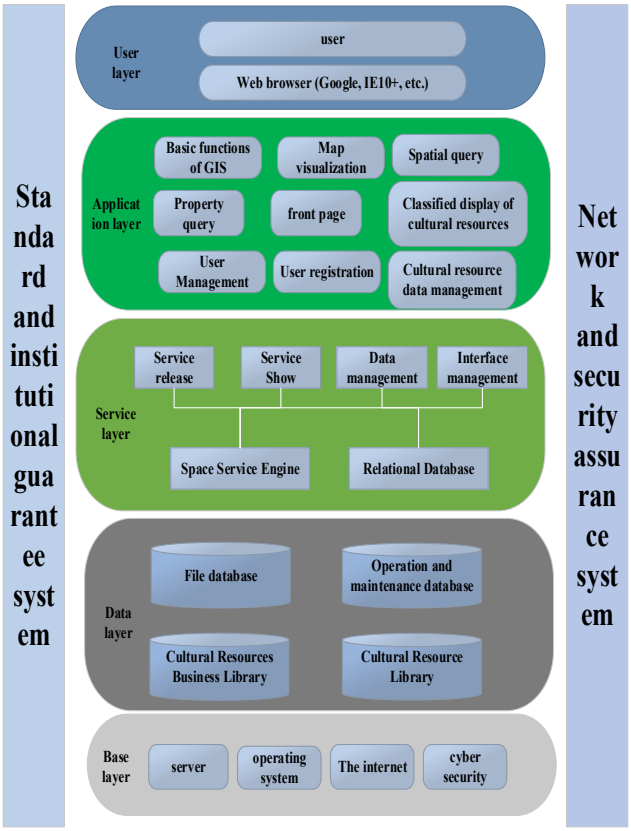

Figure 1. Overall system architecture

4.2 database design

The amount of cultural resource data is enormous, and there are many types. For more convenient and effective data management, it is necessary to design a particular database table for storage. PostgreSQL is an open-source object-relational database that supports all commonly used operating systems and has strong reliability and data integrity. Therefore, this article uses the PostgreSQL database to store and manage cultural resources and mainly establishes a location table, a cultural resource table, a user table, a link address table, a resource and classification relationship table, and a book table.

4.3 Main functions and realization of the system

After analyzing the system's needs, the system's primary functions are realized by using web-related technologies. The system mainly includes user registration and login, role authorization, cultural resource classification management, cultural resource data update, cultural resource retrieval, display, etc.

4.3.1 Home page: Realize the classified browsing of historical and cultural resources, including carousel display, cultural resource search query, artistic help classified display, etc. At the same time, it contains the particular recommendation function of cultural resources, which displays brief information of cultural resources for users and enhances the user's browsing experience.

4.3.2 System login and registration: The system user module can perform user registration and system login. By setting permissions for different users to achieve different needs, administrator users can maintain and update cultural resource data, including batch entry of cultural resources, and classify, add, edit, and delete cultural resources. At the same time, system administrators can create the permissions of each user are set. Ordinary users support online browsing of all cultural resources after logging in and browsing cultural resource information.

4.3.3 Detail page display: Display detailed information about specific cultural resources, such as source introduction, map location, age, etc., and support links to cultural resources. At the same time, all historical and cultural resources are displayed in the form of pictures so that users can intuitively browse the information of various cultural resources, click on the image to enter the picture view page, and perform operations such as zooming in and out.

4.3.4 Log management: The log management module can record the operation time, operation type, and operation content of the system user, which is convenient for system maintenance.

4.3.5 Map display: The map display module can display information such as the location and description of each specific cultural resource on the map and supports keyword search, distance measurement, circular and rectangular queries, and other functions.

5 CONCLUSION

The rapid development of Internet technology has made the construction of resource informationization the future development trend of the world today [9]. The number of cultural resources is huge, the variety is wide, and the content is rich. This article implements a management and display system of cultural resources based on computer technology design. The system has the characteristics of low cost, advanced technology, and easy to update. It realizes the classified management and online search and browsing of cultural resources, and completes the system homepage, login and registration, detail page display, log management and online map browsing. A visual display of historical and cultural resources in a certain area has been carried out. Data analysis shows that this article has certain reference value in promoting the protection, dissemination and sharing of historical and cultural resources. However, this article is more about the visualization of cultural resources in two dimensions, and further research is needed in the three-dimensional display of historical cultural resources.

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REFERENCES

[1] Chen Shuo, Shi Yuheng. "One Belt One Road" cultural heritage information system design based on webGIS[J]. Library Theory and Practice, 2017(11):99-101.

[2] Niu Wenyuan, Zheng Jianghua, Han Linzhi. Research and development of the protection system of folk cultural heritage based on Tiantu Web API——Taking the Xibe migration to the west as an example[J]. Bulletin of Surveying and Mapping, 2015(11): 96-101.

[3] Hu Hongbin, Dang Yatian. Exploration and Analysis of the Development and Utilization of Digital Cultural Resources from the Perspective of the Internet [J]. Journal of the Open University of Yunnan, 2017, 19(1): 25-30, 44.

[4] He Ziti. Analysis and design of Dongba minority memory and cultural resource management system [D]. Yunnan University, 2015.

[5] Zheng Guojin. Application of Cultural Service Resources Based on WebGIS [D]. Guizhou University, 2017.

[6] Chen Baiyu. Design and implementation of cultural resources information management system in Kaiyuan City [D]. Dalian University of Technology, 2016.

[7] Wang Tong. Design and implementation of a book-sharing platform based on Node.js [D]. Beijing University of Posts and Telecommunications, 2018.

[8] Zhang Shuhong. Design and implementation of Qilu cultural resources retrieval system [D]. Shandong Normal University, 2014.

[9] Wei Siyang "Internet +" under Harbin cultural industry innovation and development countermeasures[D]. Harbin Institute of Technology, 2018.