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Visualization Digital System of Digital Museum Based on Big Data Technology

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***Abstract*—In order to overcome the difficulties faced by traditional museums in the era of big data, this paper proposes a novel visualization digital system of digital museum based on big data technology. The system fully combines the advantages of big data technology, according to the characteristics of Museum big data to the museum data perception, collection, processing, analysis and storage process. Based on this, the system also makes full use of advanced visualization technology, and can present the processing results and analysis results of Museum big data to users in various forms. The results show that the system can accelerate the transformation and upgrading of traditional museums, and improve the economic and social benefits of museums.**

Keywords-Big data technology; Digital museum; Visualization technology; Digital technology

I. INTRODUCTION

At present, with the continuous application and development of science and technology, all kinds of advanced science and technology are constantly combined with traditional industries, such as cloud computing technology, Internet of things technology, etc. these high-tech also provide a variety of emerging services for human society.

At the same time, it is worth noting that in the process of the continuous application and development of high-tech, tens of thousands of data are produced every minute. In the face of a variety of data types and huge data scale, the era of big data is coming. At this time, the traditional data processing tools have been difficult to deal with massive data, so big data technology is born. Obviously, in the era of big data, how to manage and use big data scientifically and efficiently has become a concern of all walks of life. Therefore, the traditional data management mode has been eliminated in the era of big data, and the new data management mode based on big data technology is gradually applied and developed [1].

Obviously, with the advent of the era of big data, the traditional museum has undergone earth shaking changes, which is gradually transformed into a digital museum, so as to meet the needs of the current background and people's aesthetic needs. At the same time, with the application and development of various science and technology, visualization technology is also widely used in the construction of digital museum, which provides a more advanced and management mode for the museum [2].

After decades of information construction and accumulation, the current digital museum has rich data resources and huge data scale. If you want to make full use of these valuable data and store valuable data information, you should build a visualization system of digital museum based on big data technology, which is also an important way to manage and use Museum data resources path [3].

II. BIG DATA TECHNOLOGY AND MUSEUM BIG DATA

A. Big Data Technology

When it comes to big data technology, we must first understand what big data is. Big data refers to massive data information. Usually, people think that the amount of big data should be at least "terabytes". When the data reaches this level, it is difficult to perceive, collect, manage, analyze and store these data within the specified time by using the current information science and technology and conventional data processing tools.

Therefore, in this case, in order to meet the needs of the era of processing massive data information in a short time, scientists have researched and developed new data Management tools to deal with massive data, this is big data technology [4].

Big data technology is not a kind of technology, but a collection of data processing tools and technologies [5].

B. Museum Big Data

For the digital museum, the service object of the museum is mainly tourists. At the same time, tourists are also the foundation of the museum business operation. Therefore, most of the big data of museums come from tourists. Before tourists enter the museum, data information related to the museum has been generated. For example, tourists use the Internet platform to search the location of the museum, tourists buy museum tickets (or tourists get free tickets for the Museum), tourists visit the exhibition outside the museum, and tourists participate in the activities related to the Museum held outside the museum Information about the event. For different tourists, they come from different regions and are in different age groups. Therefore, they come to the museum for different purposes [6].

These data information related to tourists will be generated and stored in the information system of digital museum. Through the use of various science and technology and data processing means, we can effectively use and play the value of these data, and then produce economic and social benefits [7].

Figure 1 clearly shows the composition of Museum big data from four dimensions, namely big data acquisition, big data fusion, big data processing and big

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data analysis. It can be seen that digital museum is inseparable from big data and big data technology.

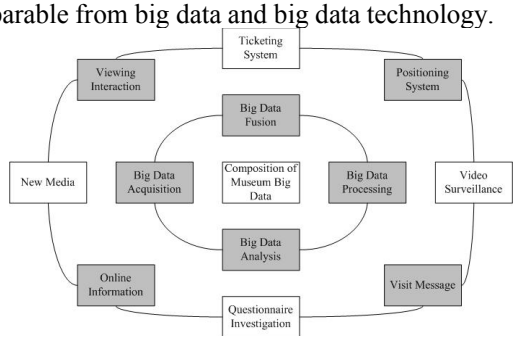

Figure 1. Composition of Museum big data

III. BIG DATA TECHNOLOGY AND VISUAL DIGITAL SYSTEM

With the continuous development of economy and society and the improvement of people's living standards, more and more people visit museums in their spare time. Therefore, with the increasing number of tourists year by year, the amount of business data of the museum is also rising rapidly, which undoubtedly brings severe challenges to the current operation and management mode of the museum [8].

The visualization digital system of digital museum based on big data technology designed in this paper is a new way to deal with this severe challenge. Specifically, it is to make full use of big data analysis technology and visualization technology to collect, analyze, store and present valuable information in massive business data, and dig out the internal relationship between these data Couplets. This can not only help Museum managers discover problems in the museum's operation in time, but also improve the intelligence and advanced nature of digital museums.

In essence, the visual digital system designed in this paper is an intelligent data integration operation platform, which can not only provide various convenient services for museums, but also provide emerging services for various cultural venues, such as libraries and science and technology museums. Specifically, the visual digital system designed in this paper can collect and analyze all kinds of operation data, and present them with visual technology [9].

At the same time, the visual digital system designed in this paper takes the data analysis mode and index system of the first level museum evaluation operation as the core, and can collect data through various channels, such as internal system, micro environment data, website, social platform, public opinion network, etc. In addition, the system can also analyze the relevance of tourists, museums, objects and other elements from multiple dimensions, and provide accurate services for tourists, provide accurate evaluation for staff, and then present visual data in various forms.

IV. OVERVIEW OF VISUALIZATION DIGITAL SYSTEM OF DIGITAL MUSEUM BASED ON BIG DATA TECHNOLOGY

In the process of building a digital museum, it is very important to build a visual digital system based on big data technology, which can help the digital museum store and analyze all kinds of data resources, so as to provide convenient services for the operation and management of the museum [10].

The visualization digital system of digital museum based on big data technology designed in this paper adopts the mode of integrated design. Its function can be divided into three parts: data acquisition, data analysis, data visualization and data display.

At the same time, the visual digital system designed in this paper is also equipped with data visualization device, so that the system can match the data scale of digital museum. At the same time, the visual digital system also adopts the multi-modal perception data acquisition mode to replace the traditional centralized and static data acquisition mode of digital museum, and then constructs a comprehensive, efficient and interactive system to realize the interconnection of data and information, eliminate the information island, and realize the collaborative work between people, people and things, and things and things.

V. FUNCTION DESIGN OF VISUAL DIGITAL SYSTEM OF DIGITAL MUSEUM BASED ON BIG DATA TECHNOLOGY

A. Software and Hardware Design

1) Large screen display technology

The digital display equipment is the main equipment of the visual digital system designed in this paper. It adopts the LCD high-definition digital display technology and splicing screen hardware, and has strong scalability.

At the same time, the system also combines advanced splicing technology, multi screen image processing technology, with multiple advantages, such as high brightness, high definition, high intelligence.

2) Background system

The design evaluation indicators of the background system (as shown in Figure 2) mainly include the weight, attribute and data of the exhibition hall, exhibition, collection, tourists, activities, micro environment and other indicators. Therefore, the background system of the visual digital system designed in this paper is mainly divided into two parts, namely, the tourist accurate analysis system and the big data display and release system. At the same time, the visual digital system of digital museum based on big data technology designed in this paper also makes full use of wireless positioning engine technology. TABLE I shows the indicators of wireless positioning engine technology and the specific functions of its indicators in detail.

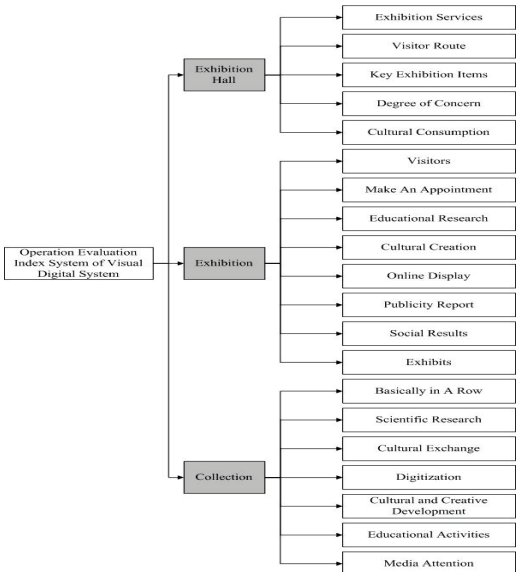

Figure 2. Operation evaluation index system of visual digital system

TABLE I. TECHNICAL INDEX OF WIRELESS LOCATION ENGINE

Index Item	Description
Support real-time synchronization with certified tourists	Support real-time synchronization of tourist information with certified products, ≤ 3 meters
Support real-time positioning display	Support real-time positioning display, real-time positioning of each visitor's position in the exhibition hall
Analysis services	Heat map, track, fence in and out statistics, residence time, user classification statistics, VIP identification
Configuration	BI system positioning engine

On the one hand, the target objects of the tourist accurate analysis system include groups, individual customers, VIP, students, volunteers, event bookers, network visitors, APP users, etc.

The function of tourist accurate analysis system is to analyze the basic attributes of tourists, and analyze the content of tourists' feedback and topics of interest, such as stay time, attention content, sharing content, forwarding content, comment content and like behavior. In addition, the tourist accurate analysis system can also accurately locate the tourists' location, track the tourists' action track, and present the regional hot spot map and key booth map of the digital museum.

On the other hand, big data display and release system mainly uses information visualization technology to provide personalized display services, such as tourist analysis report, collection statistics report, equipment operation report, etc. At the same time, the big data display and release system can also present in detail the visual reports of tourist flow, website access, collection data, IOT monitoring and equipment operation.

B. Background System Design

1) Release of comprehensive data

According to the National Museum evaluation system and international cultural assets evaluation elements, the visual digital system designed in this paper mainly analyzes the comprehensive data of exhibition data, activity data, tourist data, comprehensive data, micro environment data and collection data.

Specifically, the data analyzed by the visual digital system designed in this paper include scientific protection and restoration of cultural relics detection data, cultural relics index evaluation data, people flow density data, activity exhibition data, equipment operation data, micro environment monitoring data, etc.

2) Visualization of collection data

The visualization digital system based on big data technology designed in this paper can also present collection data. Specifically, the collection data presented by the system mainly includes classification data, grade data and model data of important cultural relics. In addition, the system can also display the basic data and storage information, location information, pattern structure, popular stories, related videos, related research trends, related evaluation indicators of different collections.

These collection data can help tourists quickly find the location of the collection they want to browse, and also help tourists understand the research trends of the collection. Moreover, for museum staff, collection data can also help staff better introduce different collections to tourists, and help staff organize and store collections more efficiently.

3) Visualization of exhibition data

The visualization digital system based on big data technology designed in this paper can also present exhibition data in detail and clearly. Specifically, the exhibition data includes offline visit data (weekdays, real-time number, students, etc.), online visit data (web browsing, website reservation, wechat browsing, wechat attention, APP download, etc.), index analysis, number of visitors in the special exhibition, exhibit level, reservation level, exhibit level Education research, cultural creation, online display, publicity and reporting, etc.

Through the analysis of the exhibition data, the manager can constantly optimize and adjust the exhibition activities, and also can continuously improve the application of digital museum, so that the digital museum can meet the personalized needs of different tourists.

4) Visualization of exhibition hall data

The visual digital system based on big data technology designed in this paper can also show the detailed data of the exhibition hall from many aspects, such as the current number of museum visitors, dynamic visit route.

At the same time, the system designed in this paper combines a variety of science and technology, such as wireless monitoring technology, face recognition technology, so as to accurately identify the number of visitors' stay time, stay exhibition area and other data. By

analyzing the data of the exhibition hall, the managers can continuously optimize and adjust the visit routes and exhibition area settings of the exhibition hall, so as to improve the economic benefits of the museum.

C. Technical Route

As shown in Figure 3, the visualization digital system of digital museum based on big data technology designed in this paper uses crawler software to capture web content, and uses distributed parallel processing technology to process and analyze data.

After that, ETL uses the current mainstream Hadoop and Storm processing platform and framework, and adopts a variety of big data processing technologies, such as batch processing technology and stream processing technology, for data extraction, data cleaning, real-time data mining and analysis.

At the same time, in the process of data extraction, data cleaning, data conversion and data mining, the system also combines complex event processing technology and thinking.

On the one hand, it not only processes the data analysis results efficiently and in real time, but also displays the big data processing results in a timely manner according to the needs of users. On the other hand, it can also store the analysis results and processing results in HBase database in time for further analysis, mining and processing of the data.

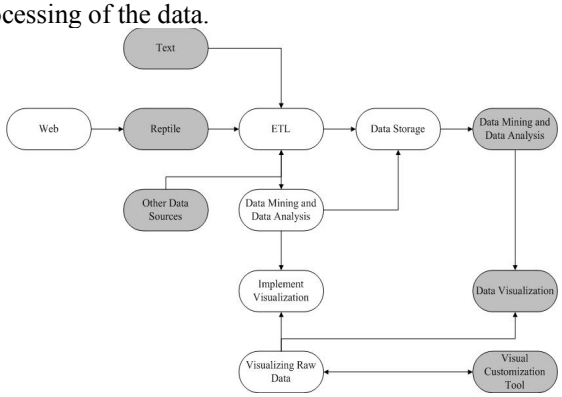

Figure 3. Technology roadmap

VI. CONCLUSION

To sum up, in the era of big data, with the application and development of big data technology, big data technology will continue to be organically combined with many fields, and visualization technology, as an important means of intuitively and clearly presenting data, will be widely used. For digital museum, visual digital system will become the core part and important cornerstone of its main business in the future. Through the display device in the visual digital system, it can realize multi-screen interaction, data communication, data cooperation, data sharing, data storage and other functions, thus breaking through the traditional operation mode of the museum and eliminating the information island between people, people and things, and things and things, which not only makes the digital museum meet the personalized needs of tourists in the era of big data, but also improves the decision-making level and management level of the digital museum.

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