



# The Application of Digital Media Technology in China's New Era Museum

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**Abstract.** Nowadays, the advancement of digital technology has brought about an information revolution, and the media of information dissemination has achieved digital transformation. People can obtain the information they need anytime and anywhere through various channels, which has changed the meaning of physical museums. Traditional physical exhibits' preservation and display functions are no longer attractive, and the on-the-spot experience has become the first appeal of people visiting physical museums. At the same time, it has been challenging to reconcile the contradiction between the vast display demand and limited space of museums worldwide, and the traditional protection and display methods have apparent limitations. Therefore, questions have been posed to museums: how can museums use modern technology and new media applications to expand communication channels? How to improve communication efficiency and achieve communication effects through disseminating visual information? How can practical strategies improve the audience's visual literacy and aesthetic ability?

**Keywords:** Digital Media Technology; Museum; Cultural Heritage; Interaction Design; Display space.

## 1 Introduction

Cultural heritage is the crystallization of the ancestors' wisdom, and it is a realistic carrier that carries historical and cultural knowledge. Its protection, restoration, and dissemination have always been society's focus. However, many precious cultural heritages suffer varying degrees of damage from artificial or natural factors. As the central unit of protection, collection, and display of cultural relics, museums are also places to provide appreciation and entertainment for the public. They are the backbone of cultural heritage protection and dissemination. Regrettably, limited by the traditional exhibition space and other realistic conditions, the vast display demand and limited space have always been the core contradictions of the museum. Many cultural relics are still buried

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in the warehouse without being displayed in public. At the same time, the content of traditional exhibition activities could be more exciting, the means are single, and the participants could be higher, which can no longer meet the needs of the public. The public expects to conduct experiential activities such as interactive experiences in physical spaces. Therefore, traditional museums have limitations in their core functions of preservation and display.

Today, many high-tech products are emerging one after another, and human-computer interaction methods are also being updated. Museums are facing significant opportunities and challenges. The concept of virtual museums, digital museums, and smart museums reflects the trend of interactive museum forms developing toward digital intelligence. At the same time, some interactive display content designed to cater to the superficial needs of the audience for entertainment has also appeared, which is interfered with by popular culture, fast food culture, and commercial culture. This interference will have a particularly negative impact on the public image of the museum. In the face of ever-changing new technologies, museums should take the initiative and make choices and should refrain from deviating from the purpose of scholarly communication to cause excessive entertainment in order to please the audience blindly. Today, some pioneering architects have begun to try to integrate multimedia technology, virtual reality technology, and interactive technology into architectural design, giving museum space a more robust experience. Without the constraints of time, space, and other factors, augmented reality and virtual reality allow the world to see the infinite possibilities of displaying and disseminating cultural heritage. Natural interaction technology can use multisensory stimulation to deliver complex and changeable display information to the audience. Through the superposition and fusion of physical and virtual scenes, it creates a realistic, immersive effect and provides a more convenient two-way information channel between museum knowledge dissemination and audience experience, blurring the boundary between reality and abstraction. Therefore, this technology is also called mixed reality, and it has a good effect on the digital protection and display of cultural heritage. However, in real life, the research on combining various technologies is still in the exploratory stage, and further efforts are needed. How to broaden the display space of cultural heritage, strengthen the effectiveness of its interpretation of information dissemination, improve the utilization rate and development of cultural heritage, and at the same time achieve the general educational significance of the public, is the function of museums and also the needs of cultural development in the future.

## **2 Literature Review**

### **2.1 Museum**

The International Council of Museums (ICOM) defines a museum as "an institution that serves society and its development. A permanent non-profit institution open to the public that collects, protects, researches, disseminates, and exhibits the material and intangible heritage of humanity and the human environment for education, research, and appreciation." From this, we can see there are three basic functions of museums:

acquisition, maintenance, and display of artworks, and the basic goals are education and aesthetics. In short, exhibition, collection and research, and public education constitute the three functions of museums [1].

The nature of the museum puts more emphasis on "democracy, inclusiveness, and diversity" based on "publicity" and "non-profit." Secondly, the practical purpose of the museum puts more emphasis on the concern for society. It proposes to "recognize and resolve current conflicts and challenges" from the macro level. Thirdly, based on the traditional thinking of "collection, protection, research, and dissemination," more emphasis is placed on providing equal space for dialogue, social functions, educational functions, interpreting multiculturalism, and protecting the memory of human diversity. Incorporate natural heritage into the scope of museum work. This article focuses on the profound changes that have taken place in contemporary museums under the diversified pattern of the world and the impact of the rise of natural interaction on museums.

For museums and public cultural institutions, collections are the most critical dissemination content, carrying various information about human activities and natural changes. Media is one of the core concepts of communication studies. According to Professor Guo Qingguang's theory and concept definition of media, media affects not only people's cognition, values, and behavior through its content but also the emergence, use, and popularization of media and its formation. The media tool environment itself will change people's personalities and personalities to a large extent [2].

## **2.2 The Status Quo of Digitalization of Cultural Heritage in China**

Although domestic research on the digitization of cultural heritage started relatively late, it is progressing rapidly, trying to catch up with the international pace and generally showing a positive development trend. The launch of the National Digital Library Project in 1996 marked the beginning of China's digitalization of cultural heritage [3]. The advantages and functions of digital technology are mainly divided into four aspects: digital collection and storage of cultural heritage, digital restoration and reproduction, digital display and dissemination, and virtual product development [4]. So far, China has also made specific achievements in related digital projects, among which the well-known ones include the "Digital Old Summer Palace" reconstruction project, the "Digital Forbidden City" project of the Palace Museum in Beijing, and the "Digital Dunhuang" virtual cave resource library of the Dunhuang Research Institute.

## **3 Application of Digital Media Technology**

From the macro perspective of digital media technology, many scholars have discussed the impact of new digital media on the times and society. Marshall McLuhan put forward the concepts of "the medium is the message" and "the medium is the extension of the human" in "Understanding Media—On the Extension of Human Beings." The paper reveals that media technology significantly changes human culture and life by shrinking the temporal and spacial distance between people, thus forming a "global village" [5].

With its precise analysis and prediction, this work has become an enlightening theoretical basis in digital media. On the other hand, Ponti described in his publication "Digital Survival" that "information" is rapidly replacing matter to become the essential exchange of society. The study further examines the impact of digital media technology on human learning, working and entertainment, and it has then profoundly impacted the discussion and research on digital media technology since the publication [6].

In terms of specific technology application, Oliver Grau distinguished the immersion in the digital media era from the early forms of illusion art in "Virtual Art: From Illusion to Immersion" and drew on the actual works of contemporary artists and groups in the analysis of the question of how to use 3D, IMAX, virtual reality, and other technical means to create an immersive illusion and outline the influence of virtual reality on contemporary art concepts [7]. In his "Augmented Reality: A Guide to AR's Emerging Technologies," Greg Kiper provides an overview and discussion of information about augmented reality and its capabilities and introduces people to the value and use of augmented reality technology from various angles [8]. Edward Buckley proposed a new holographic image generation and display method through "Holographic Laser Projection," which overcomes complex calculation problems and poor picture quality and realizes high-quality real-time holographic projection for the first time. "Multisensory Media and Multimedia: Latest Technology and Future Trends," published by Sulaima explores how to use digital media technology to integrate the sense of smell, touch, and heat into media objects, thereby enriching traditional multimedia content and enhancing immersion.

### 3.1 Natural Interaction Technology

"Natural interaction" refers to the new generation of "human-computer interaction that makes users feel natural," while a natural user interface is a kind of intangible user interface. It does not require users to learn interaction logic and methods first but only demands users to interact with machines in the most natural communication. The practice of natural interaction in contemporary museum exhibitions is the core of this project, including the rise and development of natural human-computer interaction, natural user interface, and its characteristics.

Human-computer interaction in museum exhibitions can receive input data from the audience, use computer technology to complete media coding, information processing, and data storage, and then realize data output according to user requirements and established logic. With the development of natural human-computer interaction technology, today's museum exhibitions provide an excellent application environment and broad exploration prospects for human-computer interaction. Conventional museum display methods may not provide a convincing experience for a specific theme. However, using human-computer interaction in the exhibition can build a bridge for dialogue with the audience, provide the audience with a personalized experience, and change the user from an observer to an audience. In this information dissemination process, the museum has changed from a traditional single information disseminator to an information re-

ceiver who simultaneously receives audience information feedback and instruction input. The museum's audience has also transformed into an information transmission subject that can actively participate in the interaction.

As shown in Figure 1, supported by human-computer interaction technology in museum exhibitions, various technologies are integrated, and there is an interdisciplinary comprehensive application features. The form emphasizes interactivity, pays attention to the audience experience, and the information input and output are multi-channel and diversified. A specific technology should not represent human-computer interaction in museums. The interaction mode is a medium for solving problems, not the problem itself. New interaction modes will emerge with the wide application of new media. It is necessary to allow the numerous display screens, sensors, cameras, projectors, and other hardware devices in the museum to better coexist with the display environment.

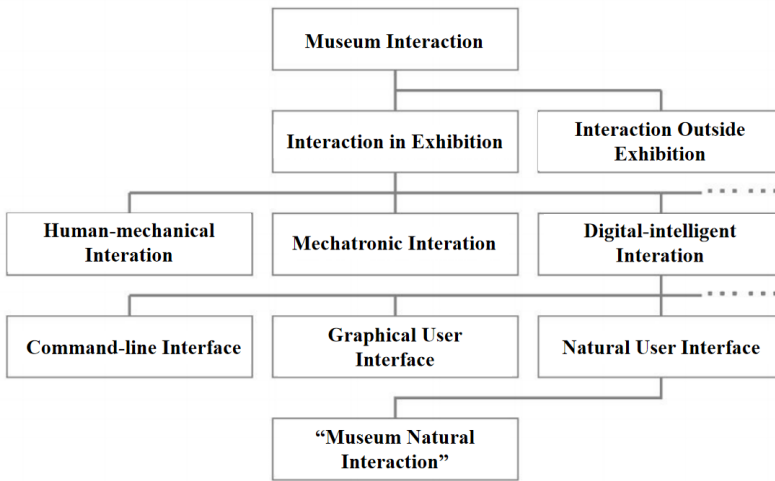


Fig. 1. The Scope of the Concept of “Museum Natural Interaction”

### 3.2 Augmented Reality

As the name implies, so-called virtual reality (VR) is the fusion of virtual and reality and refers to the simulation technology that can create and enter the virtual space. The computer will give feedback according to the audience's operation, immersing them in the virtual environment and gaining an immersive and comprehensive sensory experience.

Augmented reality technology also belongs to the digital media technology of virtual reality, which seamlessly connects real and virtual information. Augmented reality supplements and superimposes the content that cannot be obtained or does not exist in a specific actual space area under normal circumstances into the natural environment in the form of digitalization through computer technology. The technology aims to make people feel both virtual and natural at the same time with the support of equipment. The existence of "the world" is to give people a cognitive experience beyond reality.

Domestic museum-related AR applications are mainly divided into three categories regarding available content, namely, 3D cultural relic model display interaction, attractive cultural relic stickers for group photos, and exhibition route guidance. Most domestic AR experiences are implemented based on two-dimensional image recognition in marked AR. Users use mobile phones and other devices to scan pre-made two-dimensional codes or two-dimensional plane pictures to present content such as cultural relics models. A small number of them use recognition based on the LBS positioning method of geographic location. Among them, the image recognition method based on computer vision has the characteristics of low cost, fast speed, and simple and stable operation, so it is the most widely used at present. At the same time, Chinese museums are working hard to promote cultural heritage into the daily life of the public, such as using AR to recognize human body postures for virtual dressing, recognizing facial features when wearing virtual headgear, and attracting users to take photos with cultural relics and share them.

Regarding the selection of AR display equipment in domestic museums, mobile devices such as smartphones are in the leading position, and projection screens present other more oversized experience items in the exhibition halls. The domestic AR experience display platform is mainly based on mobile applications. Several lightweight applications based on WeChat applets have also appeared in the past one or two years. Although the content richness and user experience of WeChat mini-programs are not as good as those of mobile apps, they are superior in that the development cost is low, the cycle is short, and the functions are relatively refined, which can meet the basic functional requirements. It can be used immediately after downloading and quickly gather traffic with the help of the WeChat platform.

## 4 Conclusion

The museum is a city's business card, the epitome of a region's history and culture, and contains a rich history and cultural resources. In the face of consumers' ever-increasing demand for cultural consumption, how can museum cultural and creative products break through the current situation of single design methods, homogeneous products, low cultural connotation, and poor experience to better spread culture and meet people's spiritual and cultural needs?

Today's audience enters the museum not only because it is a treasure trove of human civilization memory, which can meet the basic needs for learning and cognition. It is also due to its capability of providing more emotions, memories, participation in interaction, experience, social interaction, and even entertainment and relaxation. The rapid development of digital technology has created conditions for the practical application of natural interaction in museum exhibitions, which has brought revolutionary changes to contemporary museum exhibitions. With the development of natural interaction technology, natural interaction modes such as face recognition, voice interaction, and multi-touch are often used in consumer products and public facilities in people's daily life. In museums, the multisensory, multi-dimensional, and intelligent nature of the natural

user interface fit with the multi-dimensional, interactive, and perceptual needs of contemporary museum exhibitions and interpretations. Curators also favor it for its direct, efficient, and immersive interactive methods. They are sought after by people and audiences. With the help of natural interaction, viewers can explore ancient ruins, play movie roles, talk to historical celebrities, and swim in the virtual world. The immersive interactive experience reduces the gap between the audience and the device as much as possible, brings more prosperous and pleasant feelings to the audience, and enables the audience to enjoy a smoother interaction between man and machine.

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