Research on Museum Interactive Design in the Context of Digital Media Art

Lv Simin, Yang Ling*
Jingdezhen Ceramic University, Jingdezhen, Jiangxi, China
**Corresponding Author*

Abstract: With the rapid development of digital technology, digital media art has become a core driving force for innovating museum exhibition and communication methods. This paper focuses on "museum interactive design in the context of digital media art", systematically sorts out the development background and current situation of digital media art, explores its significance in museum interactive design, further analyzes the specific application strategies and design methods of digital media art in museums, and emphasizes the audience-centered interactive design concept. Driven by the continuous evolution of digital technology, the future of museum interactive design will show a more diversified, immersive and personalized development trend, injecting new vitality and cultural dynamism into museums.

Keywords: Digital Media Art; Museum; Interactive Design; User Experience

1. Introduction

In recent years, with the development of new technologies, the way of information dissemination has undergone a digital transformation, and museums are experiencing a paradigm shift from "physical display" to "perceptual narration". With its interdisciplinary, interactive and immersive media advantages, digital media art has become the core engine driving this transformation. Based on the context of digital media art, this paper focuses on museum interactive design, and explores how to construct a new field of in-depth integration of "human - exhibition - venue" through narrative space, multi-modal technology and ecological experience strategies, so as to provide a sustainable innovative path for cultural inheritance and technological integration.

2. Background and Current Situation of Digital Media Art Development

In the 21st century, the information technology revolution has made the computer technology rapidly develop and popularize. It provides technical conditions for the rise and flourishing of digital media art. Computer technology is making rapid progress and the internet and multimedia creation tools are being utilized, digital media art is now slowly turning into an expression form that combines visual art, sound art and interactive art. Its core feature is to break the boundaries of time and space in traditional art creation by means of digital technology, and to achieve an in-depth integration of artistic perceptual thinking and scientific technological rational thinking. This kind of technological transformation not only rebuilt the model of art creation, but also made a change to the former static display of exhibitions in museums into dynamic interactions. Virtual Reality (VR) and Augmented Reality (AR) were utilized in exhibits and they allowed the exhibitions to step beyond the confines of the physical world. They brought audiences into scenarios for an immersive experience.

Digital media art has been integrated into the museum field, making it a transformation from the "physical" to "virtual" and from "static" to "dynamic". traditional museums use a one-way communication method of flat display boards and physical objects, which are limited by time and space and cannot convey deep information But relying on entertainment, virtual and interactive, the digital media art turns cultural relics and cultural connotations into digital interactive dynamic narratives via some technologies like digital large screen, body feel device, 3D scanning, so as to greatly enhance the audience’s involvement and cognition.

Digital wave, the role of the museum has changed from collecting physical objects to building virtual knowledge. relying on network technology, big data and intelligent devices, digital media arts have constructed digital asset

management systems and online platform s to achieve cross temporal and cross spatial sharing of cultural resources . It has not only given birth to new forms such as "online exhibitions", but also innovated educational functions. create personalized visiting routes for distance, playing interactive games in order to satisfy all people. In the next day, with the iteration of the intelligent industry and immersion, digital media art will continue to promote the development of museum interactive design into smarter and more humane interactions, while becoming the key link in the connection between culture and modern people.

3. Application Strategies of Digital Media Art in Museum Interactive Design

3.1 Optimizing Spatial Narrative Presentation

In the exhibit of digital media art museums, narrative method has become a new way to communicate with the public. Museums provide audiences with an immersive experience through narrative exhibitions, valuing the differences in spatial structure and emotional rhythm, and create situational spaces and build various interactive spaces with digital media technology. Museums need to form a narrative thinking framework, to integrate the individual exhibits into the whole narrative space system framework of the venue, to integrate the exhibits and exhibit contents of different halls, and to seek the connection to achieve the narration and logic of the exhibition contents. And on the other side, in terms of content expressions, the narrative logic should also be simple, explaining the exhibition theme and narrative path from different aspects to guarantee the clear and coherent information transmission. Museum space combined with story, careful consideration of the spatial experience, tying stories to novel ways of presenting them, and museums as cultural legacies have all become increasingly important [1].

3.2 Optimizing Exhibit Interaction Experience

The digital media art has brought novelty to the museums; it has made the exhibits go from being just displayed one way into an interaction between two people instead. Starting from human feelings, the more abundant forms of display will be brought by advanced digital media art. The combination of exhibits and digital media art should pay attention to the interaction with people and choose suitable digital media technologies for different situations. A interactive designer is encouraging people to be active and participatory, and it allows people to discover and learn through exploration, so that they can have this knowledge actually spread, disseminated.

2.2.1 Application of Suspended Imaging Technology

Suspended display technology has various applications and is extensively adopted in museum exhibition creation. Also with the characteristics of smaller space used, easy movement and shorter preparation time. This kind of technology is based on accurate optical imaging principles with technical methods including audio-visual control and 3D animation productions. It simulates by way of modelling with software on cultural relics and controlling the position of the light emission, thus forming the simulation of 3D display of the real object. very appropriate for when we can't let the products be on show directly or very hard for people to show. It gives the audience a more intuitive and multi - angle viewing experience, improves the visual interaction between the audience and the exhibit, and makes it possible for the audience to understand the exhibit comprehensively and in depth [2].

2.2.2 Application of Dynamic Imaging Technology

Dynamic imaging tech gives off much more live and real looking visuals. It makes the images change over time, enhancing the dynamism and interactivity of the visuals and giving different feelings to people. The three application scopes of dynamic image application technology are digital 2D animation, digital plane interaction technology and film and television media technology. The display of ancient books, manuscripts, paintings and other artistic conception exhibits can be played with a greater effect. Take Zhejiang Museum's exhibition of "Dwelling in the Fuchun Mountains" as an example, use digital technology to restore the original appearance of the painting. By a giant screen and large area projection, the scale of displaying works has been changed, the details of display works have been magnified, the shape of the display works has been enriched, and the atmosphere has been created, which gives the audience more abundant and direct viewing

experience.

2.2.3 Application of XR Technology

Extended reality (xr) technology consists of virtual reality (vr), augmented reality (ar) and mixed reality (mr) technologies. Computer technology brings together the real and virtual world to create a virtual environment for interaction between humans and computers. Choose an XR technology suitable for the display of exhibits at the museum, showcasing the exhibits in various forms, thus bringing the "sensation of immersive experience" where the virtual reality and the real world convert seamlessly to the experiencers.

Virtual Reality (VR) is a simulation environment generated by a computer with computer technology as the core. Users can interact and influence with objects in the digital environment through necessary equipment, and can have an immersive feeling and experience. Taking the launch of the "Lion Forest · Metaverse Tour" project in Suzhou Lion Forest as an example, it innovates the new way of visiting classical gardens. On the basis of the traditional way of visiting the garden, this project uses digital media art means to provide tourists with an ultra-clear 360° overhead immersive experience of the garden. By introducing 5G network technology, with the help of UAVs and 360° panoramic high-definition VR glasses, it skillfully combines the traditional garden management method with high-tech products, and provides tourists with a more immersive real-time immersive experience of "5G technology Lion Forest VR tour experience". During the tour, automatic UAV route planning, obstacle avoidance, blind-spot-free omnidirectional perception and stable image shooting can be realized to ensure safe operation. An operation space can also be provided for audiences in the museum exhibition area. In this virtual space, a world related to the exhibits can be constructed for the audience, allowing the audience to search and explore in this world, tap the historical stories behind the exhibits, stimulate the tourists' desire to explore and actively learn Chinese culture.

Augmented Reality (AR) is a technology that overlays computer-generated virtual elements in the real world. Through wearing some equipment, people can see the phenomenon of computer-generated virtual images, videos or information in the real scene. AR adds virtual elements to the real world to enhance users' perception and interactive experience, allowing people to feel the combination of virtual elements and the real environment. For example, in the Paleomammal Exhibition Hall of the National Museum of Natural History in Beijing, the "support" of digital technology has made more specimens collected in the museum "come alive". When tourists wear AR glasses and aim at the specimens of two saber-toothed tigers and a large-lipped rhinoceros, the next second, the scene of the fight will be vividly presented in front of them. The combination of virtual and real makes them truly feel the charm of digital media art.

Mixed Reality (MR) is a technology that combines the real world and the virtual world into one. In the MR environment, physical objects and digital objects coexist and interact in real time, creating a state where the real world and virtual objects coexist harmoniously. Through superposition and supplementation, MR technology enables users to obtain different information while perceiving the real world, thereby obtaining a better interactive experience. Taking the MR holographic cultural relic publicity and exhibition activity with the theme of "Protecting and Inheriting Intangible Cultural Heritage · Continuing the Historical Context · Writing a Magnificent Chapter of the Times" held by Shaanxi History Museum as an example, using advanced MR technology, tourists can freely turn their heads, adjust their perspectives, and even interact with cultural relics through gestures. It opens an unprecedented historical and cultural interactive world for the public, allowing ancient art forms to be reborn in the digital world. Between the interweaving of light and shadow, the audience seems to have a dialogue with history. Every interaction is a touch of cultural memory, and every experience is a continuation of the cultural bloodline.

3.3 Constructing an Ecological Experience Model

Digital media is an important medium between exhibits and audiences, which promotes the communication and feedback between them, builds an interactive platform, attaches importance to the interactive relationship in the scene, and constructs an ecological interactive experience journey. At present, when applying digital media art, museums in China should

encourage audiences to use their own devices to participate in the interaction, creating new needs and new experiences. Transform digital technology from back-end maintenance to providing high-quality experiences for audiences. For the design of museum space, it is necessary to make full use of transition areas, break inherent cognition, and build innovative spaces with cultural attributes. As individual individuals, during the audience's visit, museums should reasonably use interactive technology, not only to output knowledge and culture, but also to obtain feedback on audience information. By stimulating the personalized participation of the audience, museums promote the in-depth integration of the audience with the museum's values at the emotional and cognitive levels, thereby expanding the coverage of the exhibition and enhancing the wide influence of art communication.

4. Design Methods of Digital Media Art in Museum Interactive Design

4.1 Reconstruction: Constructing New Narrative Logic and Experience Paths

As a design approach, construction is manifested in Museum Interactive Design through the recombination and construction of exhibitions, spatial areas, and visitor routes, breaking away from the original linear narrative form and creating an experience space with multiple entries and levels.

In digital media art, reconstruction is manifested in the reconstruction of narration. The traditional museum exhibition is usually arranged in a linear manner based on time line or theme classification. But the reconstruction method is enabled by digital media technology to allow curators establish a networked narrative structure. for example, for the “Digital Palace Museum” project of the Palace Museum, build a large cultural relics database, so as to carry out digital reconstruction of cultural relics which originally exhibited in different rooms and in different eras. Audience could enter the exposition via entrances like topic keywords, timelines, geographical information, and then independently choose their own visiting route. This kind of reconstruction not only broke away from the limitations of the physical space, but also turned the audience into the leader of the story, making it go from “author logic” to “reader logic”.

Secondly, Reconstruction is shown in the reconstruction of spatial experience. Digital Media Art blurs and defies the boundaries museums have. In the case of the Shanghai Astronomical Observatory museum "Cosmos" exhibition hall, combine the physical architectural spatial body of the construction with digital projection and VR technology to reconstruct the traditional spatial perception method. The audience seems to be wandering around in an endless universe as they meander through in the real-life space. this kind of reconstruction of virtual and real creates a unique immersive experience. In the same manner, it is responsive. The system will change the visual environment and sound effects in real-time according to the distance from the public, the speed at which they move, and how long they stay, so that every person who visits has their own unique experience.

The third reconstruction is the combination of sensory experience. Digital media art breaks through the visual dominance in the museum’s perceptual sensory, and redefines viewers’ sensory mode with multi-ways of perceptual interaction. For example, in the "Ancient China" exhibition of the National Museum of China, in addition to the physical display, AR technology, spatial sound fields, smell devices, etc., are used to reshape the audience's sensory reception methods. Audience can see the casting process of Shang and Zhou bronze waste through AR when the audience saw Shangand Zhou bonze wares. In the meanwhile, you could hear its corresponding forging sound. and even the special scent of the bronze age could be felt. It’s not only the appeal of the exhibition will be enhanced through the multi-sensory restoration, but also create a sense of three-dimensionality for the people.

4.2 Deconstruction: Breaking Traditional Visiting Paradigms and Cognitive Frameworks

As an important design method, deconstruction overthrows the traditional exhibition way, leading people to take on reflection of the exhibition content, helping people to get deeper understanding. On the content level, deconstruction is about challenging official narratives. Traditional museums are usually authoritative when it comes to telling history. But the digital media art deconstruction is supported by the deconstruction of the multiple

narratives that can break this single narrative with the multi-angle presentation. Nanjing Museum's 'Six Dynasties Style' exhibition is to present different versions of the same event with digital technology. Interactive desktop: through the interactive desktop, the audience could see some different stories such as the official history of the history; the folk history and the discovery of the ruins at the same time, and make his or her own understanding of them after comparing them. This method can not only make the exhibition more academic, but also cultivate the audience's thinking.

In terms of formal aspects, it is embodied in the disassembly and recombination of exhibition elements. Using digital media technology to display cultural relics with a multi-layered and multi-angle disassembly form. take the Mawangdui Han tomb exhibition of Hunan museum as an example, use high precision scanning and digital modeling technology to display the plain yarn garment in deconstructive way The audience uses the interactive equipment to view the material and garment's structure and other weaving techniques and decorative patterns from various depths, even the "disassembly" viewing mode, to see the structure inside the clothing and the audience can learn from many aspects, such as the production technology and society and other aspects

From the experience level, it manifests as the redefinition of the visiting process. Visiting traditional museums is a rather passive acceptance process. Deconstruction method breaks out of this frame and adds interactive elements like game element challenge tasks. For example, in the "Treasures of the Tang Dynasty" exhibition of Shaanxi History Museum, the guided tour mode can be dismantled, and the process of visiting the exhibition is made into a game exploration. Audience need to search clues and solve puzzles by various digital interactive device to uncover the exhibition content progressively. It can not only make the visit more interesting, but also let people have a deeper understanding of exhibits through active exploration.

4.3 Collage: Creating a Dialogue Space for Diverse Cultures

As a postmodern design technique itself, collage has a different cultural tension for museums' interactive design. It is the juxtaposing and combination of the fragments of different times and spaces as well as different textures that the collage method achieves the dialogue and exchange of cultures, times and spaces. Temporal and spatial collage is one of the most unique forms of using digital media art in museums. it's can put the different period things in the same place, making time and space feel mixed up together.

Media Collage is the embodiment of digital media art's integration. To creatively combine the traditional display media and digital technology so as to give a lot of sense of hierarchy for the exhibition of the museum and thus cultural collage is now one of the main means adopted by cultural dialogue in digital media art. By placing together and rearranging elements from different cultural backgrounds, a kind of intercultural communication space is created by the collage way. In "Silk Road" digital exhibition of China National Silk Museum, a big projection collage is used to compare relics with different civilizations, such as China, Persia, and Rome. The audience can use hands to interact and virtually "dress up" and combine costumes from different civilizations and patterns, and have an intuitive feeling of how cultural exchanges occurred as they interact. This is not only a vivid representation of the cultural collision on the Silk Road, but also lets us see the diversity and commonality of all civilizations participating.

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5. Conclusion

Currently, the continuous development of digital media technology has produced new media of information transmission and ways of expressing art. In the field of museum interaction, digital media art also affects traditional interactive design and changes people's aesthetic thoughts and lifestyles. the practicing of digital media art in museum interactive design can't be separated by the science and systematical design methods. According to the application strategy described above, the integration path of digital media art and museum interactive design can be constructed from three core aspects, which are reconstruction, deconstruction and collage, so that digital technology can truly serve the essential aspects of cultural communication and not chase the dazzling presentation of technology. As digital media art keeps developing in the future, the interactive design

of museums will come up with new trends and new forms. In the collision and interaction of digital technology, people, exhibitions and space, museums will be re-invented with new vitality.

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