Application of Network Digital Media Interaction for Exhibition Using the Internet Technology

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With the advancement in science and technology, digital media interaction technology is increasingly improved and perfected. Computer models are continuously updated over time. Various new computers are launched to provide artists with much creative inspiration. At present, digital media interaction technology has become a significant technology in exhibition design and product design. It is widely used in the field of exhibition primarily. Nowadays, people put forward higher requirements for exhibition experience. Traditional exhibitions can no longer meet people's basic requirements. The rapid development of digital media interaction and its wide application have made exhibitions show new vitality, and the depth and breadth of information dissemination have also been expanded. Digital media interaction technology makes exhibition display more meaningful and feels like a new experience from audio, visual, and sensory perception aspects. Firstly, this article briefly introduces the network digital media interaction technology. Secondly, it analyzes the sound-raising equipment and sound-absorbing material structure used in the exhibition and uses this way to reduce the environmental noise of the exhibition. Finally, on-the-spot three-dimensional and spatial virtualization is used to examine the exhibition effect. The results show that the factors affecting the sound quality and other factors that lead to the inability to focus on the visit account for the highest proportion, 65.6% and 57.8%, respectively.

1. Introduction

The exhibition is a vital part for artists to demonstrate their artistic abilities. After all, the purpose of all creative exhibits is public education and the transfer of human knowledge. The exhibition is a charitable purpose for the public good, mirroring our period and reflecting our present aesthetic inclinations. With the rapid development of society, more and more people have begun to recognize the digital media interaction technology, which is widely used in people’s daily life, work, entertainment, and other aspects [1]. The traditional exhibition mode guides people from the visual aspect. People are too indifferent to properly appreciate the display effect on the exhibition stage. Therefore, digital media interaction technology is applied to the exhibition and display, which is used to judge our country’s exhibition and display ability. Formerly, exhibits focused heavily on literary, aural, and incredibly visual information to describe art and objects; hence, audience members are the most comfortable with gazing. However, as artistic exhibition and educational values alter, greater emphasis is placed on audience engagement, immersion, guided observation and reflection, and participant insight growth. Digitization, the Internet, and media interaction technologies have contributed to the current boundless trade and transmission trend.

The digital media interaction technology used in this article is one of the most cutting-edge technologies, which plays a guiding role in the application field of digital media interaction technology. “Artistic thinking” and “technical thinking” combine to create digital media interaction technologies. It should be completed with the support of technical force and artistic conception and put forward higher requirements for “art” and “technology.” Nowadays, digital media interaction technology is widely used in art galleries, museums, and large exhibition halls [2]. Explorations of essential topics in new media art have witnessed
significant development in the quantity of data acquired, suggesting that this discipline is evolving actively, from early creative media talks to contemporary speculative studies of aesthetics and art industry archive systems.

According to the analysis of the characteristics of new media interactive exhibitions, this article summarizes the interactive guidance of digital media interactive technology [3]. Exhibition materials aim at shaking up art and artefacts with new technology and media, ranging from still-life displays to dynamic interactive media. Items in an artistic show collection are no longer buried behind dust in the physical archives of an exhibition. The digital archive is considered the cornerstone for developing digital network technology into a world-class institution. The Internet's global reach will allow the essence of Chinese culture to disseminate worldwide, attracting more people to the art gallery. The main innovations in the research process of this article are as follows:

1. First, introduce the interactive technology of digital network media in detail to provide a theoretical basis for this research.
2. Secondly, study the exhibition sound-raising equipment to strengthen the three-dimensional sound field, analyze the sound-absorbing material structure laid in the exhibition, and take it as an essential factor to interfere with the exhibition effect.

After the introduction section, the literature review of the research paper is discussed in section 2. The network digital media interaction technology with the concept and new media technology has been explained deeply in section 3. After that, the applications of media interaction technology have been discussed in section 4. Lastly, the network media technology analysis and conclusion have been discussed in sections 5 and section 6, respectively.

2. Related Work

With the development of digital media technology, more new exhibition methods are provided for exhibition, making people’s imaginative exhibition design a reality [4]. First, the definition of “media is an extension based on people” and “media is information” was put forward, which reflects the critical role of media technology in human life and culture. At the same time, it profoundly interprets the differences in media technology in different times and puts forward that being in the era of electronic media will break the restrictions of time and space and continuously shorten the space-time distance between humans [5]. It has been pointed out that in today’s information age, “information” is developing at high speed, changing the substitute material into the primary exchange material of society, and briefly explained the degree to which digital media technology based on digital technology and the Internet affects people’s daily work, study, and entertainment [6]. The impact of two-way information dissemination on human public power in the new media era was analyzed [7]. Nine new media application cases from the perspective of phenomenology were studied. Through analysis, it is concluded that digital media technology does not exist independently but changes human ability in various ways [8]. The works of current groups and artists that separated the immersion period and illusion art in the digital media era and studied how to create immersion illusion using IMAX, 3D, and virtual reality technology have been deeply analyzed [9]. It proposed using digital media technology to integrate touch, smell, and thermal feeling into media objects, strengthening traditional topics content and immersion [10]. Some experts study the use of various digital media technologies to establish an immersive display content with vital authenticity, to attract many tourists to integrate into the exhibition display content and find one with a stronger sense of experience [11]. The impact of digital media technology on the social environment was analyzed. It discusses the interactive role of this technology in intelligently regulating the atmosphere of family living space and interpersonal information exchange and studies the relationship between social life and digital media technology [12], a research based on the digital media application technology in the Internet era. The new era puts higher requirements for intelligent terminals, 4G networks, mobile apps, and interactive media to digital media application talents. It analyzes the digital media application technology in the mobile Internet era from the aspects of curriculum system, training objectives, and teaching staff [13].

3. Network Digital Media Interaction Technology

Digital media interaction is an information system that collects and maintains exhibit information in digital forms while achieving permanent preservation of exhibit material. This section explains the concepts of digital media technology and new inventions of media technology in the field of exhibitions.

3.1. Concept of Digital Media Interaction Technology. The main component of human interaction interface design is digital interaction technology, which is directly related to technology and people. Digital interaction technology refers to the use of computer input devices and computer output devices to realize the interaction and communication between computers when people interact with computers [14, 15]. Digital media interaction technology consists of two parts: first, people use input devices to input command information; and second, computers use commands to process information and then use displays to output processed information to feed back to people. Digital media interaction technology gives full play to artists’ exhibition design ability with the support of software technology and computer hardware. As the core part, the communication between humans and computers needs the efforts of both sides to achieve the goal. Therefore, the disciplines involved in interaction technology are computer science, ergonomics, and psychology.

The essence of digital media interaction technology is to use computer technology to form a technical form based on
interpersonal interaction. This effect can intuitively reflect virtual things and interpersonal interaction behavior. The emergence of this technology makes human beings better adapt to digitization, and computers can also develop towards the trend of intelligence [16]. The interaction between machines and people is the emphasis of this technology. At the same time, the interaction technology focuses on the active participation and enthusiasm of tourists so that the audience cannot appreciate the works as a bystander but jointly complete the works and interact with the works. With the help of this interactive behavior, the display form of the works is changed, and the audience begins to think and analyze the activity in this change.

3.2. New Media Interactive Exhibition Features. The form of new media interactive exhibition is mainly "virtual + reality" and "technology + art." Exhibits and people are the major components of traditional exhibitions, and the exhibition process is static. The new media interactive exhibition consists of exhibits, exhibitors, and the interaction between exhibits. The overall exhibition state is a combination of static and dynamic. The remarkable features of new media interactive exhibitions are multilevel, simple construction, and strong initiative.

The advancement of new media technologies has provided art exhibitions with various display formats. It comes with new cyberspace to present the space and enhance the exhibition’s space range, based on traditional “physical space.” Interactivity is the main feature of the traditional exhibition mode and new media interactive exhibition. The traditional exhibition is affected by the formation factors and composition methods, resulting in the passive acceptance of participants and no sense of active participation in the whole exhibition process [17]. The emergence of new media and interactive technology has changed the traditional exhibition mode. Exhibitors can better develop interactive communication with products by combining viewing with interactive mode, allowing them to better understand the impact of exhibitions. Figure 1 shows the interactive exhibition characteristics of the traditional exhibition and new media:

4. Application of Network Digital Media Interaction Technology in Exhibition

This section of this study describes the applications of digital media interaction technologies used in exhibitions. The methods of adaptive guidance of digital media technology have been explained deeply. Furthermore, the sound field used in the exhibitions has been discussed.

4.1. Interactive Guidance of Digital Media Interactive Technology. Under the traditional exhibition mode, the relationship between visitors and space guidance forms belongs to one-way communication. In this environment, tourists can only accept passively, resulting in a lack of enthusiasm for visitors after a long time. It results in a dull heart and unwillingness to continue to visit the exhibition. At the same time, the traditional exhibition model will reflect the guidance information in a fixed form in the spatial environment and cannot guide and respond to the behavior of exhibitors, resulting in poor exhibition effect and low efficiency. The significant advantage of digital media technology is interactivity. When designing spatial guidance, make full use of interpersonal interaction technology to continuously capture the behavior data of exhibition visitors. After data analysis, it will generate guidance data according to the dynamic behavior of the human body and generate a spatial guidance system with a behavior feedback function. As shown in Figure 2, the interactive guidance diagram of digital media interactive technology enables visitors to independently select and actively control the guidance information, to enhance their interest in the system and improve their psychological feelings of visitors during the exhibition.

The use of space and technology “interaction” and the integration of interactive devices into the spatial interface structure is the central expression of digital media interactive technology using spatial guidance. When the exhibition visitors pass through the sensing area, the sensors collect the visitor’s body behavior information and feedback to the interactive device, which controls the spatial interface and reflects the digital information image change [18]. Visitors will readjust the way of visiting according to the route of changing the composition of interface information and continuously cycle the activity related to the spatial interface to form a real-time dynamic spatial guidance based on digital media.

4.2. Exhibition Sound-Raising Equipment to Strengthen Three-Dimensional Sound Field. The essential equipment to be designed and installed in the exhibition is the spatial sound field, which cannot be separated from the electro-acoustic reverberation system. Today, digital media exhibitions show that a stereo reverberation system is the primary mode of sound source transmission used in the event. This system can arrange the combination of transmission channels, generators, and speakers to form an acoustic system according to a specific rule. Compared with the effect of a mono system that transmits sound in one direction, this stereo system enables visitors to experience the sound system more effectively. The spatial distribution of multiple sound sources in the exhibition environment is based on the principle of the human ear theorem, thereby better matching the sound source direction and sound effect of the picture, integrating the potential space-time information in the sound in the real space, and creating a unique association in the exhibition space for visitors to experience the immersive space.

The effect of a stereo environment is affected by many factors. These factors have a very vast impact on the environment of the exhibition. Mainly, different constituents such as the quality of sound transmission equipment, audio technology as hardware factors, and the layout of channel loudspeaker equipment in a spatial environment will interfere with its effect. An unreasonable channel layout pattern will result in an uneven distribution of sound fields,
weakening the sense of sound space and affecting the environment’s quality. Therefore, it is necessary to scientifically design and layout the sound transmission equipment during the layout of the exhibition display space stereo environment. Also, adjust the tilt angle and installation height to ensure that the sound field is evenly distributed in the display space. The direction of sound wave radiation shall be very reasonable so that the visual effect of the stereo field is enhanced.

For the main channel, install the channel at the height of \( H \) from the edge of the exhibition screen, which is 1/2 to 2/3 of the height of the H screen. By adjusting the vertical inclination of the speaker, the sound axis tends to be in the center of the visitor’s activity area. You do not need to raise the secondary low-frequency channel speaker of the main channel to place it on the spatial ground.

Relative to ground distance \( h_2 \) when installing surround channel system \( \theta \) angle,

\[
h_2 = \left( W \sqrt{W^2 - 16} + \frac{90}{6W} \right),
\]

where \( W \) represents the width of the auditorium (m). If the space height cannot meet the requirements of the exhibition, it can be adjusted again, but the height shall not be less than 3m. \( E \) is the inclination angle of the loudspeaker around the sound field on the side wall, which can make the loudspeaker point to the bottom of the opposite side wall axially. It is shown in Figure 3, and its calculation formula is as follows:

\[
\tan \theta = \frac{h_2}{D}.
\]

In Figure 3, \( l_0 \) represents the length of the area that can be visited by exhibition visitors (m).

4.3. Exhibition Laying Sound-Absorbing Material Structure.

The reverberation time in the exhibition is the specific time required to reduce the sound pressure level to 60 dB after the sound source in the space pauses. In the process of designing space sound quality, a core is to master the reverberation time. In order to achieve different auditory and visual effects, each space puts forward certain requirements for the length of reverberation time.

Spatial interface structure is an interface that enables user activities, the line between virtual and physical environment is becoming progressively blurred, and some socio-physical interactions have been fully supplanted by new digital paradigms. At present, the sound transmission mode...
used in the digital media exhibition activities carried by the exhibition center is electro-acoustic. The sound heard by the audience in the exhibition space is the space situational sound simulated in advance. If the reverberation time is too long, the sound clarity and sense of space will be reduced. Therefore, the exhibition center should use the short reverberation method to display the electro-acoustic three-dimensional effect. If the reverberation time is short, the electro-acoustic effect will be dry, so the short reverberation must have a lower limit:

$$T = \frac{KV}{S\ln(1-\alpha)}$$

(3)

where $V$ represents the volume of the convention and exhibition center (m$^3$); $K$ represents various constants related to sound velocity, and the constant value is 0.162; $S$ representing the total indoor area (m$^2$). The average indoor sound absorption coefficient is expressed by $\alpha$. There is a positive correlation between space volume and space reverberation time. When different volume spaces use the reverberation time in the same interval, there will be various disadvantages, such as small space and large reverberation, small reverberation, and large space.

At present, most convention and exhibition centers design digital media display spaces according to the acoustics in stereo cinemas, and its calculation formula is as follows:

$$0.0329V^{0.3333} \leq T_{60} \leq 0.7654V^{0.2014},$$

(4)

where $V$ represents the space volume, m$^3$; and T60 represents reverberation time, S.

After calculation, the sound reverberation time interval of 500 Hz under the specific space volume based on the relationship diagram can be obtained, and the reverberation time of different frequency bands can be determined by using Table 1. According to the reverberation of other frequency bands shown in Table 1, a smooth reverberation curve is obtained, as shown in Figure 4.

Without sound absorption treatment in the exhibition space, its average sound absorption coefficient is difficult to meet the space requirements, forming an ideal reverberation time [19]. Therefore, when designing the acoustic environment of the exhibition space, it is necessary to combine the sound absorption status of different frequency bands, the space volume, and the sound absorption characteristics of the material structure, reasonably lay the sound absorption structure and materials, make the sound absorption of different frequency bands in the space sufficient, reasonably control the reverberation in a certain interval, reduce the impact of strong reflection on the stereo sense of space, and improve the sound field restoration quality.

5. Application Analysis of Network Digital Media Interaction Technology in Exhibition

This part of this article addresses the use of media technology in display and exhibition and emphasizes the need to take a reasonable approach to the use of media interaction technology in display and exhibition, as well as selecting media interaction technology based on different show kinds and exhibition topics.

5.1. Analysis of Three-Dimensional Exhibition. The exhibition display is the main "container" for displaying different types of activities, which accommodates the sensory experience of different visitors in digital media display activities. Whether convention and exhibition visitors can experience a deep impression during their visit is related to the exhibition display mode, as well as the effect of the audience in the space core information and intermediate media information, and its transmission effect is reflected in the aspects of hearing and vision.

Based on the Internet background, this article studies the application of network digital media interaction technology in exhibitions and measures the effect of the exhibition through on-the-spot three-dimensional analysis. Here, we choose an exhibition center using digital media interaction technology as the research object. To analyze the data, the exhibitor randomly selects 100 visitors to the exhibition center to interview their evaluation of the sound effect experience of the exhibition center. The evaluation results are shown in Table 2.

According to the data shown in Table 2, 65.6% of people reduced their sense of experience due to poor sound quality
when participating in the exhibition, 27.3% of people had not encountered the problem of poor sound quality affecting the experience effect, and the remaining 7.1% said they did not pay attention to such problems. The results show that the current use of digital media interaction technology in exhibition display is only analyzed from the perspective of people's vision and does not pay attention to the sound quality experience.

In addition, in the evaluation of the impact of different spatial factors on the experience of digital display activities, the highest score is an excellent sound quality effect, with a score of 1.37, followed by reasonable spatial organization, with a score of 1.32, the artistic spatial image below 1, and a spatial decoration below 0. The details are shown in Figure 5, which shows that the spatial sound quality effect is the main requirement for people to carry out exhibition activities.

Therefore, there are differences in the content and theme of activities in the process of exhibition. It is not just a simple visual space. It is to fully meet people’s hearing and visual requirements and improve the quality of visual perception. At the same time, this space acoustic design enables exhibitors to feel the dual experience of hearing and vision [20].

5.2. Analysis of the Virtuality of Exhibition Space. Exhibition space refers to a certain area that is licensed to the exhibitors by the organizers for the purpose of the exhibition. The advantage of exhibition space is that it can support a wide range of exhibition activities and give more comprehensive, accurate, and high-quality exhibition content to visitors. In the digital media era, the rapid development of interactive technology has changed the information carrier in exhibition and exhibition activities, changing the traditional material mode to nonmaterial digital, so as to form a virtual spatial scene to display information [21]. This article analyzes the exhibition effect from the virtuality of the exhibition space.

It is difficult for visitors to immerse themselves in the virtual scene of the exhibition order to make it difficult for visitors to enter the exhibition center under the guidance of digital technology, which will lead to a lack of attention from the audience. This article randomly interviewed the visitor’s sense of experience in the exhibition center using digital media interaction technology and stored all the collected data and evaluation information in Table 3.

According to the data in Table 3, 57.8% were unable to focus on the experience due to other contents or factors in the exhibition space, 26% had never encountered interference, and 16.2% were unclear about such things. According to the data, other interference factors in the exhibition space will directly affect people’s visual experience, and people cannot concentrate on browsing and appreciating exhibition products.

When evaluating the importance of various factors of the exhibition, most people said that highlighting their own image factors is not the main condition to strengthen the sense of digital display experience. The current new demand for exhibitors is to reduce the sense of the physical environment, which is shown in Figure 6. Therefore, the

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>63</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_{60}/T_{60}^{500}$</td>
<td>1.00–1.76</td>
<td>1.00–1.52</td>
<td>1.00–1.26</td>
<td>1.00</td>
<td>0.86–1.00</td>
<td>0.71–1.00</td>
<td>0.56–1.00</td>
<td>0.42–0.92</td>
</tr>
</tbody>
</table>

Table 1: Frequency characteristics of reverberation time.

<table>
<thead>
<tr>
<th>Option</th>
<th>Encountered (%)</th>
<th>Never met (%)</th>
<th>Unclear (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor sound quality affects the proportion of experience</td>
<td>65.6</td>
<td>27.3</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Table 2: Proportion of People Whose Experience is Affected by the Poor Sound Quality of the Exhibition.
exhibition space is a space for spreading information. As the main development trend in the later stage, the virtual physical space is also an important content of the design space.

The virtualization principle is an important principle for architects to design space and weaken the scene’s sense of physical space. First, special material interface, environmental brightness, and color processing methods can be used to indirectly blur the material space at the visual level, making it difficult for people to define the space environment in the space, and more difficult to determine the direction and positioning. Secondly, the virtual boundary is established by using digital photoelectric technology, and the materiality of different elements in the physical space is eliminated by technology. By virtualizing the space environment of the exhibition center, it can significantly eliminate the problems that the material form in each physical space affects the attention of exhibitors, let people focus all their energy on the digital information entropy of exhibition activities, achieve the purpose of immersive experience, and enrich the material space by using digital information, and replace the elements in the physical space by virtual elements, reflecting the advantages of space and place.

6. Conclusion

With the rapid development of science and technology and the comprehensive popularization of network technology, the media’s continuous renewal and iteration promote digital media technology’s rapid development and application to various industries. The unitary exhibition form of the traditional exhibition model has been unable to meet people’s needs. There is an urgent need to seek new technologies to realize the innovation and development of the exhibition. Based on the network environment, the application of digital media interaction technology in exhibition can strengthen the interaction between visitors and exhibition and attract visitors to focus on the products of exhibition from the aspects of vision, hearing, smell, and so on. This article first focuses on the analysis of network digital media interaction technology, that is, the basic concepts and characteristics, and studies the structure of sound-absorbing equipment and sound-absorbing materials used in the exhibition to reduce the noise in the exhibition environment through the rational use of sound-absorbing materials and sound-absorbing equipment. Finally, the exhibition effect is analyzed from the aspects of on-the-spot three-dimensional and spatial virtualization. The results show that the factors affecting the sound quality and other factors that lead to the inability to focus on the visit account for the highest proportion, 65.6% and 57.8%, respectively. This study can be a base for future work on media interaction technology. Digital media interaction involves many aspects of the environment, which can be used negatively and positively. The digital media interaction technology for exhibitions can also be used for human welfare.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors have no conflicts of interest regarding the publication of this work.

References