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Characteristics & Application Analysis of Digital Experience Display Design

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Abstract: The display design of digital experience starts from the fundamental demand of display design development, combined with digital display technology, to bring a new energy to display design. Digital experience display design is a combination of rational and emotional thinking. This article analyzes the characteristics and expression techniques of digital experience display design, and explores the ways and means of digital experience display design. Taking the Forbidden City of Beijing in "Beyond Time and Space" as an example, it explains that more experiences should be put into the process of display design, such as scene production, atmosphere creation, interaction methods, scheduling between display space environment, and the use of narrative methods. In a digital experiential display environment, comprehensive control of music, ambient sound, and vocals can be achieved, using the ambient sound brought by the audio system to create an immersive sound environment for the audience, and transmitting richer information through sound. Technological innovation has brought full surround stereo sound field, Dolby Atmos and reasonable broadcast scheme design. Taking the "Panoramic Palace Museum" - Taihe Hall as an example, it is demonstrated that all the displayed content and route are arranged at the most central position of the visual, and unnecessary content such as decorations around are all cleared. This display method effectively guides the audience's visual center towards the exhibits. By utilizing experiential digital display methods and utilizing digital spatial display technology, new ideas for display design are broadened, interest in digital display spaces is enhanced, and the public and more designers are encouraged to participate in digital display design.

1. Introduction

Digital media display technology originated in the 1960s. In April 1965, Dr. Michael Noel, a famous digital engineer and artist who has studied in the field of computer graphics and images for 50 years, held the world's first digital art exhibition focusing on digital media art forms in New York, USA. Although the exhibition at that time only had animations composed of simple graphics and images, it was still a milestone in the history of digital media art. From then on, digital technology began to have a profound impact on the development of display design. In the 1970s, the theme idea of combining technology, media, art, and large-scale public events was proposed at the Osaka

World Expo in Tokyo, Japan. The virtual water cup and beetle model at the Siggraphi exhibition in 1973 showed the technology and achievements of computer graphics. Computer Animation technology was also recognized by a large number of display designers after this and began to try to use it. In the 1980s, digital media technology and its artistic forms were gradually applied to display design, and display space designers opened up a new digital display world for the audience[1,2]. Nowadays, with the continuous upgrading of science and technology and the strengthening of hardware facilities, more and more display designs are attempting to use digital expressions and new digital forms of presentation. In the face of the emergence and development of emerging technologies such as 5G networks, big data, and cloud platforms, the current situation of digital display space design demand and the need for Chinese culture to spread globally are particularly important. In the trend of diversified development in the world, digital exhibitions have become an indispensable part of diversified exhibitions in exhibition halls. In the exhibition hall, the hub of knowledge, the arrival of digital technology has not only changed the upgrading of communication technology and forms, but also brought about changes in the form of information dissemination[3,4]. This article combines the production of 3D models, the construction of virtual digital frameworks, and the design of interactive platforms to discuss the advantages of digital display technology in terms of information resources, visual community, interactive experience, cognitive communication, educational practice, and other aspects in the current experience economy environment. By utilizing experiential digital display methods and utilizing digital spatial display technology, new ideas for display design are broadened, interest in digital display spaces is enhanced, and the public and more designers are encouraged to participate in digital display design.

2. Overview of Digital Experience Display Design

2.1. Design Concept of Digital Experience Display

Digital experience display is a virtual experience created through headworn display devices (HMDs) or displays, projectors, mobile phones, tablets, etc. The experimenter is like being in the virtual environment where the display is located, controlling the changes in virtual perspective through changes in body movements. The display form can be divided into fully immersive digital experience display design and semi immersive digital experience display design.

The fully immersive digital experience display design utilizes a headworn display device (such as HTC VIVE Pro) for a fully immersive digital interactive experience. The experimenter interacts with the help of three-dimensional virtual glasses and characteristic handles, as if in a three-dimensional virtual display environment. The semi-immersive digital experience display design utilizes display devices such as monitors, projectors, mobile phones, tablets, etc., combined with gestures to achieve interactive experiences. Viewers can only interact with exhibits through the screen and cannot fully immerse themselves in the virtual environment.

Kinect tactile interaction technology is an XboxOne based tactile interaction technology released by Microsoft in 2010, which was quickly applied in various exhibition halls. In the 2012 Etruscanning project in Italy, in order to allow viewers to experience the excavation of the Regolini Galassi tomb, the tomb environment, and the placement of items, they used Kinect's body posture recognition technology combined with the 3Danity unit virtual engine, Restoring the excavation of ancient tombs at that time, the exhibits have become more vivid with Kinect interactive technology, making the audience feel like they are in an underground ancient tomb.

2.2. Development Requirements for Digital Experience Display Design

After people's material lives are enriched to a certain extent, they need to pursue higher levels of

spiritual satisfaction, and experience economy has become the mainstream of the times. The concept of "experience economy" was first proposed by renowned American scholar Alvin Toffler. In his book "The Impact of the Future"[5], he divided economic development into four forms: agricultural economy, industrial economy, service economy, and experiential economy. He pointed out that the future trend of economic development must be the era of experience economy, where enterprises and designers are engineers who create experiences. Manufacturing experience has become one of the important ways for enterprises to create profits. In Joseph and James H. Gilmore's book "The Experience Economy," they believe that when "enterprises use services as the stage, goods as props, and consumers as the center" to create and leave profound memories for consumers, this experiential activity must be unique. Not replicable. The demand of consumers for such a unique experience model has become the main driving force for the development and profitability of enterprises.

The connection between display design and economic development is inseparable, and the change in economic methods also affects the development of display design. From the primitive pure ecological form of display channels, to the industrial era that emphasizes ergonomics and consumption habits, to the service economy era that emphasizes the display image and unique services of exhibits, and finally to today's experience economy era that applies technology and design to better experience forms[6-8]. The development of science, technology, and economy is constantly driving the continuous transformation of display design forms. The form of display design is gradually breaking away from standardization and shifting towards more unique and creative personalized experience forms.

3. Characteristics and Applications of Digital Experience Display Design

3.1. Integration of Dramatic Narrative Techniques

Compared with traditional exhibition forms, digital experiential display design not only has the audio-visual language of traditional display design, but also integrates more interactive elements and dramatic features, that is, the joint effect of display design, dramatic elements, and interaction [9]. Due to the infiltration of interactive forms, the audience has become participants in the exhibition hall, breaking away from the display form of being merely immersed in the experience of visitors and actually staying out of it. The design of the exhibition hall thus possesses certain characteristics of electronic games. During the visit, the audience can freely choose their environment and gain a certain degree of freedom in choosing the route. Apply narrative mode to the arrangement of the scene, using narrative to guide the audience in choosing the route instead of traditional exhibition halls following the exhibition line arranged by the display space designer. This arrangement endows the exhibition with a certain degree of cinematic viewing experience, while also giving a certain degree of drama to the display space. Together, the two reflect the main characteristics of digital experiential display design.

Designers should not only design and plan the exhibition of the display design, but also consider the overall narrative mode of the exhibition hall, which means that the space design incorporates narrative expression. By expressing this demand, enriching the audience's listening language and improving the narrative structure while guiding them to visit has become an important content that cannot be ignored by designers of display spaces. The collaboration between the Forbidden City and IBM in "The Forbidden City Beyond Time and Space" (as shown in Fig.1) involves the audience role-playing in a completely virtual environment, with 9 identities to choose from, including princesses, generals, eunuchs, and others. Each identity is arranged with a different narrative mode, allowing the audience to experience different stories brought by different identities while also experiencing the trivial events that occur in the Forbidden City. By immersing oneself

and visiting every place, the system will annotate important cultural relics and buildings with text or display them in pictures, allowing the audience to participate in the display with different identities and experience the lives of characters from different social classes and identities. In the process of display design, it is not only necessary to simply consider the relationship between the exhibition and the exhibition hall. More experiences should be put into the production of scenes, the creation of atmosphere, the scheduling of interaction methods and display space environment, the use of narrative methods, and even more linear narrative techniques such as montage in film can be considered, using the expression form of sound and light, By utilizing theatrical stage elements and interactive means to increase audience interest, a digital exhibition hall is presented that is different from traditional exhibition halls.

(http://smb.zol.com.cn/topic/1085731.html)

Figure 1: "The Forbidden City beyond Time and Space"

3.2. Expression of Subjective Perspective

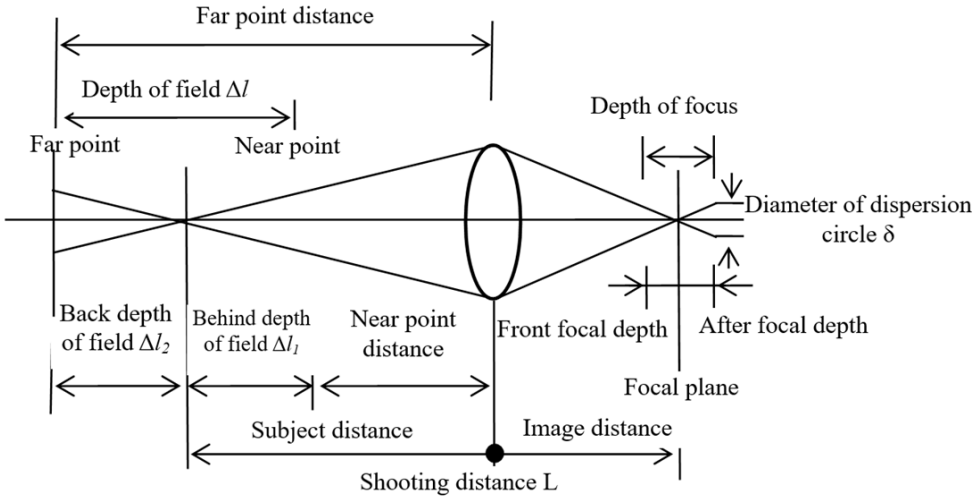

Figure 2: Camera Focus Calculation Diagram

The digital experiential exhibition experience has a 360 degree holographic perspective, bringing the audience into the first person perspective, and creating a "game viewing style visit" experience for the audience. This leisurely and leisurely form of visit can itself bring great interest to the audience. From the perspective of technology, due to the first person perspective, the inherent contradiction between the depth of field and the scene also appears. The control of the human eye on the spirit of scene is natural and not easy to be found by people themselves. The human eye is more like a camera, which can control the scene and depth of field by controlling aperture, phase

distance, size of sensor, etc., as shown in Figure 2. However, the control of first person perspective on the scene and depth of field is calculated by computer algorithms, which is not controlled by people's subjective consciousness, and is relatively difficult to adjust. So the scene type and depth of field cannot be adjusted entirely according to the subjective wishes of the audience. Based on a frequency that is more suitable for the audience's naked eye and certain visual guidance, it is currently a technically appropriate way to alleviate such conflicts.

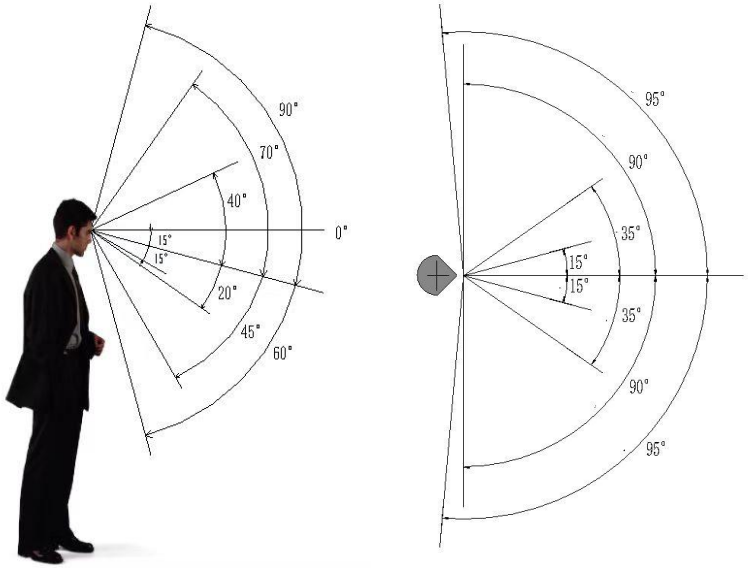

Figure 3: Human Line of Sight Angle Diagram

In the first person perspective, the involvement of the sound environment is also one of the differences from the traditional pavilion. The processing ability of the sound environment in the physical display space is relatively weak, while in a digital experiential display environment, comprehensive control of music, ambient sound, and human voice can be achieved, using the ambient sound brought by the audio to create an immersive sound environment for the audience; Rendering the narrative through music to assist in expressing emotions and atmosphere during design; Use sound to convey a richer amount of information. Technological innovation has brought full surround stereo sound field, the blessing of Dolby Atmos and the design of reasonable broadcast scheme. These can well show the immersion brought by the first person.

3.3. Scene Display Mainly Guided by Visual Center

Research in the field of ergonomics suggests that although a person's perspective is 190 degrees wide, their attention is often concentrated within a range of 30 degrees above, below, left, and right of the visual center (as shown in Fig.3). The display information that appears within this perspective can be broadly summarized as the central range of the line of sight, while the 360 degree panoramic display form allows the audience to have the initiative to choose their line of sight, allowing them to observe the content they want to observe according to their preferences. Due to the freedom of visual range, it is easy to jump out of the display content that the designer wants the audience to see during the visit[10]. In this case, designers need to consider the solution of "narrative clearing", which involves adopting a "clearing" approach to scenes where the audience has moved over as the position changes, focusing the design focus that the designer wants to highlight within the designed display range, and clearing other angles. In the display design of the "Panoramic Palace Museum Taihe Hall" (as shown in Figure 4), the author arranged all the displayed content and route at the most central position of the visual, and cleared all unnecessary content such as decorations around it.

This display method effectively guides the audience's visual center towards the exhibits. In addition to this "clearing" method, through analysis, light guidance can also be used to guide visitors' line of sight.

http://mob.visualbusiness.cn/gugong-pc/index.html

Figure 4: "Panoramic Palace Museum" - Taihe Hall

Human beings are inherently sensitive to light, and the visual effect of light entering the pupil and reaching the retina depends on the location where it enters the pupil. When light stimulates the same photoreceptor cell, the visual effect of light entering the eye directly through the center of the pupil is stronger than that of light entering the eye through the edge of the pupil [11]. Therefore, people's attention often focuses more on areas with richer lighting. Designers can make better use of this in their display design. For example, in the display section of the "Taihe Hall Dragon Chair" in the "Panoramic Palace Museum" (as shown in Fig.5), the dragon chair is illuminated with light to create a golden and brilliant atmosphere, while the surrounding environment is treated with reduced light. The dragon chair has become the most popular exhibit in this exhibition hall due to the creation of light.

http://mob.visualbusiness.cn/gugong-pc/index.html

Figure 5: "Panoramic Palace Museum" - Dragon Chair in Taihe Hall

3.4. Presentation of Diversified Interaction Design

Before the emergence of digital experiential display technology and display design, the term interactivity often appeared in the cognition of game developers. However, in the continuous growth of digital display technology and immersive display design [12]. Interactivity has also become a step that cannot be ignored. With the continuous improvement of direction sensor, motion capture, gesture tracking, research tracking, gyroscope, multi-touch, gravity sensing and other technologies, the audience will have more choices in media, such as mobile phones, computers, VR glasses, Kinect and so on, so that they can make good choices. When arranging the display route, the designer can guide the audience to visit the main line while also arranging multiple auxiliary lines for the audience to choose from. The main and auxiliary exhibition lines have different display contents, both of which are the points of interest for viewing. The audience participates in a process similar to a game experience as explorers, and the designer arranges each point of interest in various

parts of the exhibition for the audience to discover and explore. With the continuous increase of the functions and technologies of interactive media, the forms of interaction are constantly being explored. By utilizing novel environmental exploration and content interaction forms, the audience is continuously guided to participate, and by increasing their participation, the audience can maintain a sustained curiosity and enthusiasm for the display [13-15].

4. Conclusion

The connection between display design and economic development is inseparable, and the change in economic methods also affects the development of display design. From the primitive pure ecological form of display channels, to the industrial era that emphasizes ergonomics and consumption habits, to the service economy era that emphasizes the display image and unique services of exhibits, and finally to today's experience economy era that applies technology and design to better experience forms. The development of science, technology, and economy is constantly driving the continuous transformation of display design forms. The form of display design is gradually breaking away from standardization and shifting towards more unique and creative personalized experience forms. By analyzing the characteristics, current situation, and expression techniques of digital experience display design, this study aims to explore the ways and means of digital experience display design. By utilizing digital spatial display technology, new ideas for display design are broadened, interest in digital display space is enhanced, and the public and more designers are encouraged to participate in digital display design.

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