Research on the Application of New Media Interaction Design in Exhibition Design

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Abstract—With the rapid development of modern science and technology, new media interaction design has been fully rolled out in many fields, setting off a wave of pursuing user experience. In modern exhibition design, new media interaction design can better link the audience with the exhibition content. With the continuous progress of science, technology and culture, the interactive design of new media has changed the display mode of traditional exhibitions. That is to say, there is more and more interaction between audiences and exhibition contents. According to the research results at home and abroad, combined with practical cases, this paper analyzes the development trend, design methods and practical application of new media interaction design in exhibition from all aspects. With the multi-directional development of new media interaction design in display design, new creative ideas are put forward and then inject new vitality.

Keywords-new media technology; interactive design; display design; interaction; experience feeling

1 INTRODUCTION

1.1 Research background

In the era of information, immersive experience stands out with a search growth of up to 3,800%. This is because it provides the audience with a sense of existence and experience, which is highly compatible with the current fashion trend. The momentum of China's immersion industry is increasing day by day, as shown in Table 1. Under the iterative upgrading of technology, when designers design exhibition spaces, they integrate new media interaction design with it to create a exhibition space which pays attention to interaction with audiences and has a strong sense of experience.

Table 1. Trends of Immersion Experience Projects in China from 2013 to 2019

(Data source: <Fantasy 2020 White Paper on the Development of China's Immersive Industry>)

Trends of Immersive Experience Projects in China from 2013 to 2019	Number of immersive experience projects	
	Current year quantity	Increase in quantity compared with the previous year
2013	1	0

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2014	2	1
2015	4	2
2016	37	33
2017	142	105
2018	442	300
2019	1100	658

1.2 Purpose of research

At this stage, we are in an era of rapid development. We should realize that traditional display design is no longer the best way to convey the content of the exhibition, followed by its all-round and multi-angle presentation. The research purpose of this paper is to put forward reasonable design ideas for the display design according to the actual needs of the current audience, and to display it in an all-round way with using new media interaction.

2 OVERVIEW OF EXHIBITION DESIGN

2.1 Demonstrate the status of the design

2.1.1 The exhibition lacks interactivity and interest.

Traditional display design is mostly static, and the information transmission is the one-way output of the display content to the audience [1]. When the audience is watching, they can only receive the information visually, associate and analyze the ideas that the display content wants to express, and the display effect is mostly unsatisfactory. Because the transmission of information is one-way. Audience cannot give feedback to the exhibition content, which greatly reduces the interaction and interest of the exhibition.

2.1.2 Single presentation form

In the early stage, the display design was mainly visual design with the aid of hearing at most. And it was often displayed by making display boards, which increased the sense of distance between exhibits and audiences. In addition, some photos of exhibition boards may be distorted due to some actual conditions.

2.2 The needs of the audience

2.2.1 Immersive and high experience

With the continuous development of science and technology, the audience has gradually become the main part of the exhibition. Audience's participation in the exhibition and interaction with the exhibition are paid more and more attention [2]. The audience put more emphasis on the multi-sensory experience and multi-directional three-dimensional experience in the exhibition space. It can bring pleasant experience to the audience in the exhibition space, so that the audience and the exhibition can achieve an inclusive effect.

2.2.2 Good visual enjoyment

With the continuous improvement of the audience's cultural level and awareness, its aesthetic needs and aesthetic labeling have also improved. The audience is not only satisfied with the simple display of the booth and exhibition board, but also values whether the expression mode is appropriate and visually beautiful while transmitting the content of the exhibition.

2.2.3 Have a pleasant and profound understanding of the content of the exhibition

The form of the early exhibition was mainly static. Besides, the exhibition content and the audience lacked interactivity. The way the audience accepted the content of the exhibition was also stiff, and the audience's memory of the exhibition content was also temporary and superficial. The audience needs to interact actively and happily with the content of the exhibition, which will make the audience have a deep impression of the content of the exhibition.

3 DEVELOPMENT OF NEW MEDIA DATA ANALYSIS AND NEW MEDIA INTERACTION DESIGN

3.1 New media usage frequency data analysis

Due to the continuous progress of technology and the growth of audience using new media, a questionnaire was made on the frequency of the use of new media.

As shown in Figure 1, 54% of the audience uses it every day, 24% of the audience uses it once every two to three days, 12% of the audience uses it once a week, and 10% of the audience use it once a half a month to once a month. It can be seen that the audience still uses new media more frequently. New media are getting closer and closer to our lives.

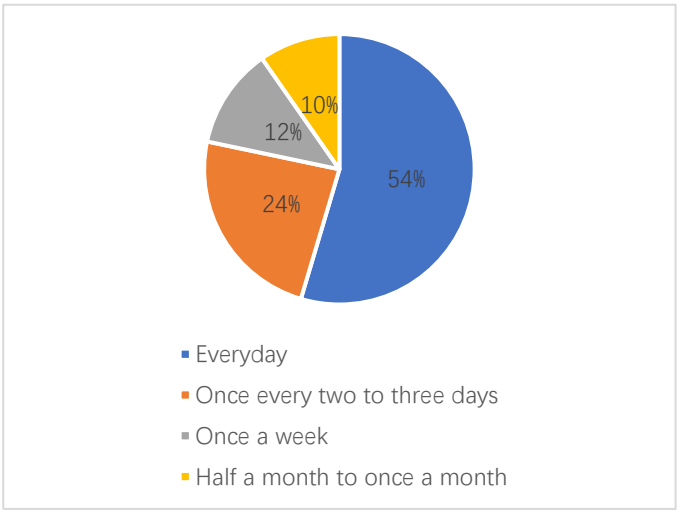

Figure 1. New Media Usage Frequency Question (Image source: Self-drawing by the author)

3.2 Innovation of new media technology

In addition to the obvious "newness" feature, the new media technology has strong interactivity, which can realize the interaction between the exhibition content and the audience. What's more,it can increase the audience's sense of experience, and make them better understand the exhibition content, thoughts and feelings[3]. Designers cannot just focus on the technical level and the accumulation of science and technology, but ignore the audience's most direct experience. In the whole process of new media interaction design, it is necessary to fully ensure the audience's experience, which is the most basic condition. In addition, before designing, we should do a full market survey. Experience is very abstract and complex, difficult to describe and intangible, but we can literally reflect the success of the design through the audience's personal experience. This interactive experience focuses on interaction and simulation, which can stimulate the subconscious of the audience to the greatest extent [4].

3.3 Exhibition design incorporating new media interaction design

With the continuous progress of society, great changes have taken place from traditional display design to modern display design. The most obvious thing is that the audience's immersive experience is getting better and better. To some extent, the application of new technology has stimulated the enthusiasm of the audience and improved the influence of the exhibition. Under the new media interaction design, the display design will convey information to the audience through more diverse display ways and more humanization. The object of the exhibition is the audience. Interactive design with new media can provide the audience with a better appreciation and experience, so that it can achieve the effect of communion with the exhibition. Therefore, the exhibition design under the multimedia interactive design can bring pleasant experience to the audience and make them infected by the exhibition. The purpose is to make the biggest highlight of the exhibition content and the thoughts and emotions contained therein be accepted by them to the greatest extent, and keep positive and happy in the process of acceptance. Before new media was widely used, the form of exhibition was mainly static, and the interaction between exhibition content and audience was lacked. In recent years, the innovation and wide application of new media technology have made it a reality to combine new media interaction technology with new media interaction design [5]. Now, the exhibition design is presented to the audience through the interactive design of new media, which has become the current popular trend. On the basis of fully considering the audience's sense of experience, designers should fully mobilize the enthusiasm of the audience through new media, guide the audience step by step, and make them feel immersive. This kind of exhibition mode conveys the exhibition content to the greatest extent and enhances the audience's sense of experience, so that the exhibition can better serve the audience.

4 DESIGN METHOD

4.1 Virtual reality

The three-dimensional interaction intersects with the two-dimensional interaction, which makes the operation more flexible and free. Virtual reality technology is becoming more and more popular with people, and the audience can experience the real feelings through virtual reality technology, just like "crossing". It is difficult to distinguish between the simulated space and the

real world, which makes the audience feel immersive. Therefore, the audience's desire to consume virtual reality has greatly increased, as shown in Figure 2. This experience has gradually become one of the main ways for the audience to interact with the exhibition content. Makeing effective use of virtual reality technology, participate in the exhibition from the perspective of the first person in the process of browsing, and watch the whole space freely and omni-directionally. Like you had experienced it yourself, so that the audience can know the exhibition content from zero distance. Holographic immersion experience can increase the sensory level of the audience. By manipulating the handle, the audience constantly explores new things in the space and participates in interaction in the space. The audience will also continue to explore, slowly immerse themselves in it, and actively learn about the contents of the exhibition. This memory is very profound and not easy to forget.

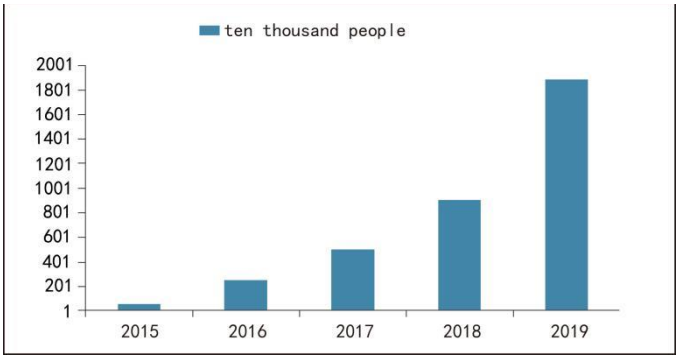

Figure 2. China's virtual reality consumer scale chart for 2015-2019 (Image source: Self-drawing by the author)

Figure 3. Frida kahlo's dream fragment (Image source: China Lighting Network)

For example, Figure 3, < Frida Kahlo, The Life of an Icon > Immersion Exhibition, which tells the life journey of Frida Kahlo, a famous Spanish painter, and "revives" the painter through photos, videos, music and installations. In the exhibition space, a large number of new media interactive designs are used around, so that the audience can walk freely and immerse themselves in the exhibition. There is also an interactive device area in the exhibition hall, where the audience can create their own works. Through interactive devices, the works can be "revived" on the

canvas, and the contents of the exhibition can be exchanged dynamically and bidirectionally. The exhibition adopts virtual reality technology. With virtual reality equipment, you can instantly enter Frida's dream and bring the audience into another wonderful world.

4.2 Multi-touch

The audience can operate more freely and flexibly, and touch the screen with different gestures, such as touching, clicking, panning and rotating, etc., which is conducive to getting closer to the audience. This is a natural interaction, which conforms to the living habits of the audience. Serving the audience more directly and conveniently, the browsing method is also different from that of the traditional exhibition board. After browsing, the traditional exhibition board may be "forgotten". However, after the touch technology is added, according to the prompts, the audience operates according to their own needs, and the combination of graphics and text and voice explanations makes them impressed by the exhibition.

4.2.1 Multi-Touch interaction recognition process

This recognition design process is divided into three steps: data acquisition, feature extraction and gesture matching, as detailed in Figure 4.

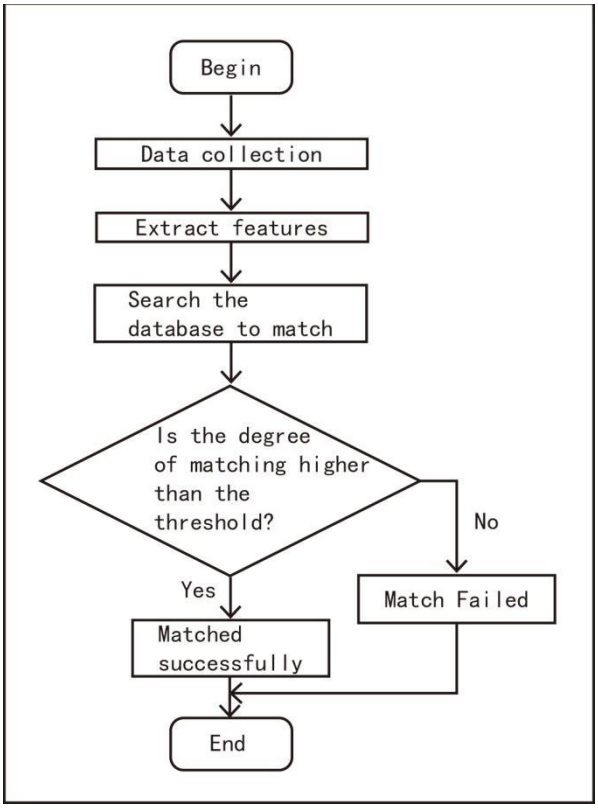

Figure 4. Multi-Touch Interaction Recognition Flowchart (Image source: Self-drawing by the author)

4.2.1.1 Data collection

This process is to form a database through data acquisition. The multi-touch event processing function onTouchEvent presented in the Androi system monitors touch events, and then uses getX( ) and getY( ) methods to obtain the coordinates of touch points.

4.2.1.2 Extract features

This process extracts features through relatively high curve features, refining algorithms, and gestures. Then it stores the corresponding gesture features in the database.

4.2.1.3 Gesture matching

After extracting the feature of the gesture, the match is completed with the gesture in the database. If the match is successful, the corresponding interface will be output. In other words, if the matching fails, the program will end.

4.2.2 Guided Multi-Touch Interaction Recognition Process

When designing the process, we should conform to the daily logic of the audience, reduce the audience's doubts about their own operations, actively guide the audience to operate step by step, and provide timely feedback, so that the audience can get started quickly. Therefore, compared with the multi-level recognition process, a flat recognition process is designed to reduce the audience's nervousness about strange interaction modes and interact more relaxed, flexibly and confidently.

Figure 5 shows the interactive wall of the Cleveland Museum of Art in the United States, which uses multi-touch technology. Its length is about 12.2 meters, with a collection of 4,000 works of art, and the screen display is switched every 40 seconds. When the audience touches the screen, the touched picture will be enlarged, and exhibits similar to the picture will also be displayed. During the exhibition, we have a more comprehensive understanding of the exhibition content, which makes the exhibition more diversified. At the same time, in the whole exhibition space, the new media interaction design will make the audience's eyes unconsciously focus on it, forming a visual focus. Designers can create better visual effects to attract audiences through new technologies.

Figure 5. Interactive wall of Cleveland Museum of Art, USA (Image source: Baidu Picture)

4.3 Holographic projection

In many exhibition designs, the scenes displayed by virtual imaging are illusory and unpredictable, giving the audience fantastic visual enjoyment. The display content under holographic projection can show a dynamic display effect according to the change of equipment output. Even in a relatively large space, it can be displayed realistically. At the same time, holographic projection is intuitive and not limited by time and space. It has a very good display effect for some historical relics, and it has become the most popular art display method of cultural relics. Holographic projection technology is divided into two steps: wavefront recording and object reproduction.

4.3.1 Recording the optical information of objects based on the interference principle of light

The beam splitter scatters the laser emitted by the laser into two beams, one of which is reflected by the plane mirror and scattered by the beam spreader to the object, showing a diffuse reflection; while the other beam of light directly shines onto the holographic dry plate after reflection and beam expansion, forming a reference beam and overlapping with the object beam. T the amplitude and phase signal of the object. It is recorded by the contrast and geometric characteristics of these two beams of light interference fringes. As shown in Figure 6.

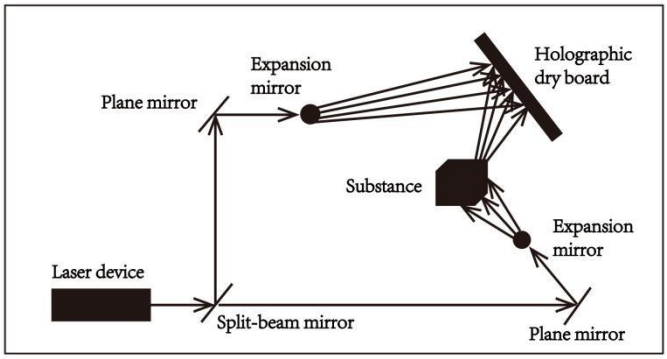

Figure 6. Principle of holographic projection wavefront recording (Image source: Self-drawing by the author)

4.3.2 Reflect the light wave information of an object with the diffraction principle of light.

The hologram is a relatively complex grating. After the diffraction of illumination light waves (reproducing light), there will be three diffraction waves, namely material light waves, conjugate waves of matter light waves, and direct waves of illumination waves. The light wave produces the original image, and the conjugate wave produces the conjugate image. The reproduced image has a strong three-dimensional sense, which can achieve a very realistic visual feeling. As shown in Figure 7.

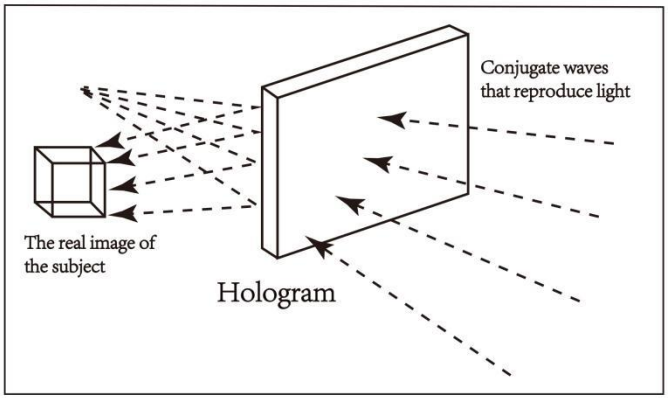

Figure 7. Principle of object reproduction of holographic projection (Image source: Self-drawing by the author)

For example, in Figure 8, Qiu Ying's version of "Picture on the River during the Qingming Festival" is immersed in the exhibition. It adopts holographic projection technology. On the 25.8-meter holographic giant screen, it reproduces the folk life scene of the Northern Song Dynasty, so that the audience can appreciate the ancient Chinese life customs and prosperity, and feel the beauty of Chinese classical art. Adding the power of science and technology to the traditional culture, reshaping the traditional exhibition space with the interactive design of new media fully reflects the times of the exhibition, and the new technology brings a special immersion feeling to the audience. The content of holographic projection is interactive and operational, which attracts more attention from the audience.

Figure 8. "Riverside Scene at Qingming Festival" under holographic projection (Image source: Baidu Pictures）

5 THINKING ABOUT THE PROSPECT OF NEW MEDIA INTERACTION DESIGN IN EXHIBITION DESIGN

5.1 Positive significance

With the passage of time, the audience's demand for exhibition experience is increasing day by day, and the traditional exhibition design is not suitable for the current times. The emergence and development of new media interaction design has solved this contradiction. Satisfied the audience's demand for experience, diversified new media interaction design, stimulated the audience's curiosity, and greatly improved the influence of the exhibition. The form of the exhibition has also gradually developed from two dimensions to multidimensional, and the audience's sense of experience has become more and more real, and it has promoted the continuous development of modern design.

5.2 Possible problems

The combination of science and design is getting closer and closer. The exhibition design is increasingly dependent on the interactive design of new media, but it may also bring some problems.

5.2.1 Energy supply

Immersion digital exhibition hall is especially dependent on electronic components, sound, light, electricity and other resources. Once the energy supply in the exhibition area is unstable, resulting in the abnormal operation of the equipment. The electronic resources of the exhibition may be lost, which will seriously affect the normal progress of the exhibition.

5.2.2 Uncontrollability of electronic equipment

A large number of electronic devices will be used in the new media interaction design. The electronic devices are greatly affected by the environment, so the protection of electronic devices is extremely important. If effective and timely protection is not available, it will cause sudden problems and malfunction of the devices, and later maintenance will require a lot of manpower, material resources and financial resources, which will increase the cost of the exhibition.

6 CONCLUSION

With the rapid development of economy, science, technology and culture, it has become a trend to integrate new media interaction design with display design. In this case, the integration and development of the two are extremely important. The combination of new media interaction design and exhibition design not only greatly improves the interactivity, but also brings a more real experience to the audience. With the continuous development of society, more and more new media will appear, and the connection between them will be closer and closer. More and more new technologies will be combined with exhibition design to provide technical support for modern, three-dimensional and information-based exhibitions. As a designer, we should keep up with the pace of the times, grasp the trend and direction, actively understand new technologies,

and apply them flexibly, scientifically and accurately in design to promote the modernization of design in China.

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