Analysis on Performance of Vr Panoramic Image System

Yan Jingmin[1], LEE DUKSOON[2]

[1] Guangzhou Huashang College, School of Innovation and Design, Department of Digital Media Art and Design, Guangzhou City, Guangdong Province, 511300, China

[2] Guangzhou Huashang College, School of Innovation and Design, Department of Digital Media Art and Design, Guangzhou City, Guangdong Province, 511300, China

Abstract: The digital revolution and the generation of "E-topia" have promoted the visual experience of VR technology and the "digital art" of panoramic images to a new state. This paper not only analyses and researches the visual performances of VR panoramic images, but also takes the campus virtual roaming of the 3DVR panoramic system platform as an example, proposing three innovative analysis of the existing VR panoramic images: immersive substitution sense design, visual symbol design and virtual experience design. This paper hopes to create a new visual technology to meet the needs of more photography and business.

1. Introduction

1The current status of VR technology applications

VR technology is originally used in the military field, which promotes the development of VR technology. Using VR simulation drill system to simulate military virtual scene, not only solves the space and equipment to reduce the loss, but also improves the training effect. On the entertainment side, the multiple perceptual abilities and a three-dimensional display world of VR technology have been the ideal tool for games.

In addition, with the emergence of VR conference,VR sports events and VR social contact, VR technology will carry the vast majority of virtual reality content and become a new form of media, linking virtual and reality. In art museums and museums, VR technology breaks the traditional time-space boundary and constructs new concept exhibition space, which not only changes the form of artists creating and displaying works, but also enriches the sensory experience of audience participating in art.

2. Vr Panoramic Technology and Panoramic Images

2.1 The Characteristics and Application of Vr Panorama Technology

VR panoramic technology is a revolutionary technology in the new era of "Internet +" emerging after the development of VR technology. It has three main characteristics: (1)Short cycle and low cost. Generally, the production cycle can be completed in a few days, and the cost is equivalent to 1/10 of VR technology, which can meet the needs of users for 3D interactive experience. (2)Easy to

operate. When viewing VR panoramic images, users can easily browse online through web pages or mobile phones as long as they are in network environment. (3)Strong sense of real participation. VR panoramic images are shot on the spot during the production process, so they have the same level of three-dimensional real experience with real objects.

In 2018, the shell launched VR panoramic house viewing function, breaking the fixed limit of traditional online house viewing.At the beginning of 2021, JD launched VR panorama shopping, allowing users to shop in real life through the screen without leaving their homes.

In addition, the VR technology involves real estate home, tourism scenic area, hotel inn, school education, health care, public service, automobile transportation, urban construction, architectural decoration and other nine industries. Particularly 5G becomes commercial after the 2019, VR panoramic field will usher in a broader development space with the help of huge network broadband.

2.2 Visual Experience of Vr Panoramic Images

With the evolution of digital images, traditional photography and computer virtual images can no longer simply meet the needs of users. VR panoramic images have emerged in many fields by integrating digital art, panoramic perspective, super perception and other characteristics.

2.2.1 Peripheral Vision

In medicine, marginal vision refers to the reflection of things outside the corner of the eye by the edge of the retina. If the horizontal angle of view is 360°, the marginal vision is the remaining 204°~172°, excluding the range of one eye and both eyes. Even in the real scene, the user cannot see the scene without rotating the angle of view and moving the position.

VR panoramic images combined with computer graphics, computer vision and image processing not only break the way of information transmission of a single image, but also integrate multiple scenes and perspectives into a panoramic image, which restores a full and undead-ended visual experience beyond the physiological perspective, traditional photography and virtual images.

2.2.2 Visual Right

The unique panoramic vision presented by VR panoramic images returns the visual right to the viewer. In the process of watching, the audience is no longer subject to the picture content provided by the creator, and the real visual liberation has been achieved. The audience no longer passively accepts the pre-arranged visual content, but actively obtains the picture information. The initiative of visual behavior has become an important link in the process of watching, and the visual perception has been further sublimated.

2.2.3 Visual Perception

VR panoramic images are different from virtual images, which are based on the shooting of real scenes. The spatial environment and image elements of VR panoramic images are based on the true description of the objective reality to achieve the true representation of the real scene.If the audience wants to have an immersive experience, they can experience the scene by moving through arrows and text marks in the panorama interface of the mobile terminal without consuming energy and time.

3. New Technology of Vr Panoramic Vision--Campus Virtual Tour Based on 3dvr Panoramic System

3.1 Analysis of Functional Requirement of 3dvr Panoramic System

Customer value has been divided into three levels and defined by the Customer Value Hierarchy Model proposed by Woodruff and Gardial in 2002. The attribute-based level refers to the practicability of product features and components to customers, the consequence-based level refers to customers' evaluation of products after use, and the goal-based level refers to core values and main goals of customers. The three levels complement each other and finally reach the highest level to meet consumer demands for products.

3DVR panoramic system is analyzed from the perspective of the Customer Value Hierarchy Model, focusing on the attribute-based level, the consequence-based level and the goal-based level of products as follows:

The first one is the attribute-based level. The attribute-based level is the most basic and core value manifestation. 3DVR panoramic system has contained various functions to meet the needs of users. For example, panoramic display is the main interface of virtual tour display and user experience; The function of 360°object surrounding can convert the multi-angle picture of products into the form of animated picture for looping; The interactive function allows users to thumb up, leave messages, share, etc., which can increase the interest of the interaction. In addition, it also has functional modules such as hot spots and embedding, in order to optimize the interface.

The second one is the consequence-based level. The consequence-based level is the way to obtain the highest level of value, directly reflecting the emotional value that products bring to customers. VR panoramic display returns the visual right to the audience, realizes the visual perception, and gives the audience more sense of reality and participation at the same time to deeply understand the scene.

The third one is the goal-based level. The goal-based level, the highest level of value of customer experience, is the objective reflection of both emotion and aesthetics and existence and self-experience. 3DVR panoramic system relies on VR panoramic technology to restore the real scene 1:1 to the Internet and integrate panoramic display and detailed viewing, thus achieving the purpose of "panoramic perception" on the spot.

3.2 Design of 3dvr Panoramic Navigation in Campus

When designing the panoramic navigation in campus, we firstly made a thorough analysis of the plane and space of Zengcheng Campus of Guangzhou Huashang College, and planned the shooting methods, shooting locations and navigation routes. We determined nine scenes in five areas, including the school gate, teaching area and library, as shooting locations and comprehensively considered the shooting light, shooting time, the density of people and other issues, to ensure that images taken in the early stage can successfully guarantee the completion of the subsequent tasks of image stitching.
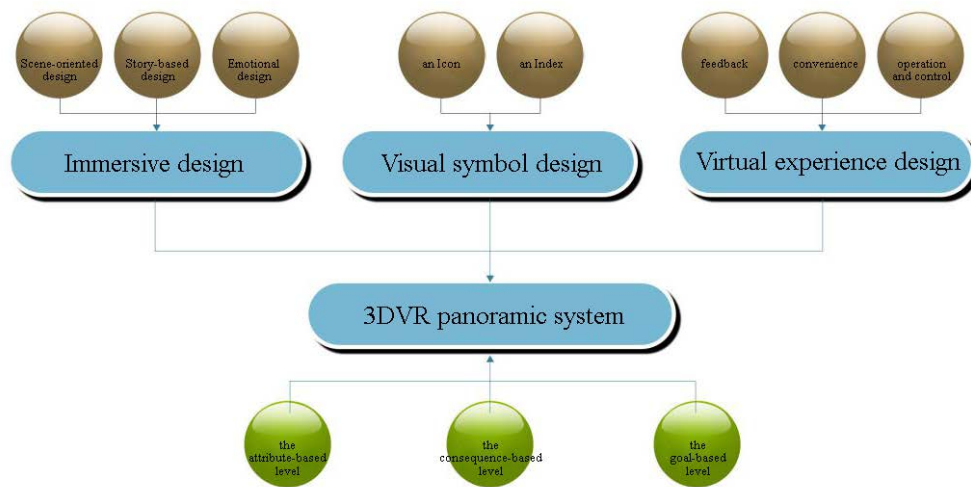
In the post-processing of panoramic pictures of the campus, we used Photomatix Pro to preserve the highlights and shadows in three photos of different exposures for each scene and each angle and perform three-in-one processing to finally obtain a high dynamic rage (HDR), and then used PTGui software to match automatically or add control points manually for image stitching. We conducted the image inpainting with Photoshop and ended up with a perfect panoramic image.

In the design of panoramic display and the production of virtual tour of the campus, We used the Kuleiman 3DVR panoramic system to upload the panoramic picture of the campus and set content such as work information and bulletin board, used panoramic switching function to interactively connect with other scenes, used the video, manual, 360° object and other functions in the hotspot tool to optimize the scene, used the annotation and ruler in the embedded tool to enrich the scene, published the uploaded panoramic image of the campus after setting it up. Thus, the entire 3DVR

panoramic image of the campus is completed.

3.3 Design of 3dvr Panoramic Campus Virtual Tour

At present, the functions provided by the Kuleiman can basically meet the requirements of enterprises for content promotion, but there is no content-oriented and user-centric consideration of the user real experience. Moreover, domestic research on VR panoramic images in China is still at a relatively low level, without forming systematic interface specification. In view of the current imperfect design of platform, the author puts forward three suggestions for the reform of design of 3DVR panoramic campus virtual tour, in order to better satisfy user experience.

Scene-oriented design   Story-based design   Emotional design   an Icon   an Index   feedback   convenience   operation and control

Immersive design   Visual symbol design   Virtual experience design

3DVR panoramic system

the attribute-based level   the consequence-based level   the goal-based level

3DVR panoramic system picture

3.3.1 Immersive Design of 3dvr Panoramic Campus

The immersive design of 3DVR panoramic campus is based on VR panoramic images with 720 degrees random display, which is designed and improved on the basis of its two main features that are "no border" and "no center". First of all, VR panoramic images have the feature of "no border". In traditional photographic images or artistic works, the picture presented by the work is limited to the frame with a fixed ratio of length and width, and the information contained in the picture is also naturally limited. However, in VR panoramic images, panoramic display breaks the conventional limitation of "frame", and the information of picture can be presented as much as possible without being limited by the border, so that users can expand the viewing angle when browsing the panoramic images. Secondly, VR panoramic images have the feature of "no center". When viewing traditional images or artistic works, users always face a one-way fixed center of the picture in physical space. This one-way relationship that does not change or transfer according to the will of people naturally reduces the user's immersive experience, but the flowing screen of VR panoramic images with 720 degrees random display brings a new visual experience to users.

3DVR panoramic campus images have the features of "no border" which breaks the border limit and "no center" which liberates the visual right. In order to improve users' immersive experience when browsing panoramic images, we design and improve on the basis of two features and put forward the immersive design of VR panoramic images.

(1) Scene-oriented Design

In the display of 3DVR panoramic campus images, the post-processing of images can strengthen the virtual and real relationship of panoramic images to open up the sense of space in the picture,

combining the senses with cognition to form immersive experience.

(2) Story-based Design

3DVR panoramic campus virtual tour, an image completed from the early shooting to post-processing, is a kind of scene reflection of objective documentary, but lacks of the integration of story plots. By adding appropriate illustrations or strip cartoons in the scene to attract users, a new mental model of experience can be built.

(3) Emotional design

Emotional design, producing emotional resonance with users, is an experience of timely feedback and effective touch. In the process of visual design, it can conform to people's instincts and behaviors. Only in accordance with the users' instinctive cognition, can design win users' favor.

3.3.2 Visual Symbol Design of 3dvr Panoramic Campus

From the point of view of Semiotics, 3DVR panoramic campus image reflects Peirce's interpretation of Three Trichotomies of Signs. Different from Saussure's dual relationship between signans and designatum of signs in the theoretical system of linguistic semiotics, Pierce's semiotics divides signs into an Icon, an Index, or a Symbol on the basis of Saussure's "chivalrous semiotics" in pragmatic philosophy. This division is more applicable to explain the art of visual images. An Icon refers to the existence of the same nature between the representatives and objects, such as male and female images in the bathroom; An index is a physical trace of something that is present or caused by something, such as hidden information or signs of emotion; A symbol which is socially agreed or prescribed are compulsory rules made by users of symbols, such as words. Pierce's Three Trichotomies of Signs also illustrates the three aspects of human cognition: process, method and result.

The display of 3DVR panoramic campus has implied the icon and index of Pierce signs, but has not applied this idea in place. In the process of experiencing panoramic image display, the user's perspective moves along with the direction indicated to change the scene when the arrows in the image interface of each panoramic campus scene indicate the transition from one scene to another. In this way, users are informed of the contents of each scene in the panoramic campus, and a kind of relational space is generated between the feeling subject and the felt object, while emotional signs for the information of the panoramic campus image are also produced in the user's heart. There is a dynamic connection between a single object on the one hand and someone's emotional sign on the other hand. This requires 3DVR panoramic campus to establish a connection between VR panorama and users in the display, so that users can have interactive emotions in the process of experience.

The significance of semiotics to 3DVR panoramic campus lies not only in the emotional connection between the two aspects, but also in the design of visual symbol. In the study of the communication mode of visual image, on the one hand, Pierce's index reveal the emotional relationship of an object to an object; on the other hand, the image, text, tone and other elements in symbolic relations are also of great significance in the 3DVR panoramic campus interface. Visual symbol design can be directly placed into the panoramic image, or a "hyperlink" similar to an index can be added to integrate perception and vision in the form of "meaning outside the picture", which intensively shows the volume of information that VR panoramic image can carry. The diversified design of visual symbols can transform 3DVR panoramic campus display from documentary to visual, and lead users to enjoy the carnival feast of visual consumption in the way of visual invitation.

3.3.3 Virtual Experience Design of 3dvr Panoramic Campus

"Experience" is a kind of emotional psychological activity generated from the heart, while

"virtuality" is a kind of subjective feeling and consciousness when people face the digital life. "Virtual experience" refers to the real emotional experience generated from people's communication with virtual digital media in the virtual social space and time. Virtuality expands the emotional space of experience, which is no longer limited to "this situation", in the same way, experience also expands the virtual geographical space, no longer limited to "this scene".

3DVR panoramic system itself is a virtual digital platform. In the display of panoramic campus, users' feeling and experience of the virtual platform has been ignored. In the design of virtual experience, we should pay attention to three aspects.

(1)Feedback

Feedback is the result of interaction, for example, you can hear the voice when you speak, and you can touch the object when you reach out. In the face of the product, the interaction between users and products is a continuous cycle. Different from the natural feedback in the real physical world, the feedback in the virtual world is human-oriented, so 3DVR panoramic system should be able to give accurate and timely feedback to the user's operation. First of all, the system should pay attention to correspondence between time and space of feedback. When pressing different icons on the panorama interface, corresponding information feedback should be given timely to ensure the fluency for users to browse the panorama. Secondly, the feedback can meet people's expectations, which can reduce the cognitive misunderstanding between users. Timely, corresponding and effective feedback can increase users' sense of reality and participation in the scene when experiencing VR campus panorama.

(2) Convenience

Convenient experience should be established and implemented on the basis of an accurate understanding of the actual needs and operations of users. The convenience of virtual products is reflected in the complete life cycle, including the convenience of purchase, use and follow-up services. In the process of making panoramic campus teaching, the author deeply realized the inconvenience of the platform, and the system should set up two methods of registration which are individual user registration and group registration to meet the needs of different users.

(3) Operation and Control

At present, there are two users in 3DVR panoramic system, one for customers and the other for operators. In the backstage, 3DVR panoramic system can exert its maximum function independently, without using software for pre-processing of pictures. It can reduce the operation steps when customers watch, and provide more intuitive operation and clear instructions when operators process in the backstage to meet the needs of users in both aspects.

4. Future Development of Vr Panoramic Technology

VR panoramic technology in China is still a young science and technology. Although VR technology has been applied in many fields and is quite mature, it still has profound room to improve in the future, such as using more abundant VR panoramic advertisement, improving the usability of VR panoramic products, etc., to really meet people's spiritual consumption and emotional needs in virtual time and space.

VR panoramic technology cannot be separated from the digital age, and it is bringing unparalleled creativity and imagination to this era at an unprecedented speed. The environment of digital information endures VR panoramic images with new responsibilities, that is, to display and disseminate rich image information in more diversified ways. With the development of the times and the continuous advancement of information technology, and under the guidance of effective design methods, VR panoramic images will definitely play a greater role and value in the updating and iteration process of digital information, so as to better meet the needs of public service.

References

[1] [US]Peirce:C.S.Peirce: On Signs(James Jacób Liszka Peirce's introduction to semiotics) [M],Zhao Xingzhi translation, Chengdu: Sichuan People's Press,2014,Page 35

[2] Guohong. The main points of the two theoretical systems of Saussure's linguistic semiotics and Pierce's semiotics.[J].Foreign Languages Research,2004(04):1-5.

[3] Hu xiaoqiang. Virtual reality technology and application [M],Beijing: Higher Education Press,2004:page74-75

[4] Yu xiangping. A review of the research on customer value theory in western countries [J],Commercial Research, Issue 3, 2008, page109-113

[5] Xiongju. The self-interpretation of new media video installation art [J],Journal of Hubei Academy of Fine Arts, Issue 2, 2011,page110-112