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Virtual Reality in Digital Media Art: A Comparative Case Study of Immersive Experience and Interactive Design

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Abstract. This paper investigates how Virtual Reality (VR) technology changes artistic expression and audience experience in digital media art through a comparative study of Notes on Blindness: Into Darkness and Terminus. Based on the theoretical perspectives of immersion, presence and interaction, this paper will study the two projects in four areas: visual and sound design, construction of virtual space, interaction mechanism and audience engagement. Thus, the study has found two types of immersive art experiences. Notes on Blindness: Into Darkness is an exploration of altered perception and emotion through abstraction, spatial audio and autobiography, without the use of sight. Terminus, on the other hand, has created an all-encompassing virtual world for exploration and imagination in space. Although the artistic goals of these two projects differ, both achieve good immersion through the coordination of sensory elements, organisation of space and design for interaction, rather than high-end technology. Therefore, in terms of interactive mechanisms, they should be in line with the original ideas of art creation and story development. Based on the above, this study offers some ideas for using virtual reality in digital art creatively and provides practical guidance on creating immersive works of art that combine high-end technology with artistic expression.

Keywords: Virtual Reality, Digital Media Art, Immersive Experience, Interactive Design, Spatial Storytelling

1. Introduction

Recently, virtual reality (VR) technology has begun to be used in many parts of digital media art creation and display to offer new ways of experiencing art. Unlike the traditional forms of visual art that are generally two-dimensional pictures with a fixed viewpoint, Virtual Reality (VR) can create three-dimensional virtual environments for people to experience and interact with digital artworks. Thus, the passive observation of art has been replaced by immersive and interactive experiences, extending the scope of modern art in all aspects. Research on immersive VR applications in art and design has shown that three-dimensional environments can provide support for creative exploration and new forms of visual communication [1].

Virtual Reality (VR) technology can be used to create virtual environments and tell stories in a new way for digital art. Through the combination of visual composition, space design, sound and interactive devices, artists can build virtual worlds where the audience is an active participant rather

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than an observer. Earlier studies on interactive art have explored how to use immersive technology and digital interfaces to change the layout of exhibition spaces and affect the audience's experience [2]. Therefore, one should learn to express oneself through creation in a new way and not focus only on skills and instruments. There are also problems with VR art creation; for instance, how to integrate high-tech features with artistic ideas, design simple and intuitive operations, and create an illusion of presence. Empirical studies show that immersive VR can enhance users' sense of presence and enjoyment, and the effectiveness of the experience is also influenced by how the digital content is designed [3].

Research will be conducted to explore the design of immersive artistic spaces in virtual reality (VR) technology and how they present narratives through visuals, sound, interaction, etc. A comparative case study of the two VR projects with different methods of artistic expression is conducted to investigate how these elements promote immersion, audience engagement and narrative communication. First, the paper introduces the relevant concepts and design ideas of VR-based digital media art, and then studies the two selected projects in terms of visual presentation, spatial storytelling, and interaction design. Finally, it presents the results and proposes some practical directions for the development of immersive artistic experiences that combine technology and creativity.

2. Theoretical foundation

2.1. Virtual Reality in digital media art

Virtual Reality (VR) can be used to create three-dimensional spaces, virtual installations, and interactive narrative environments for artists' works in digital media art. Different from the previous kind of digital media, which typically shows content on a fixed screen and is a one-way view, VR can allow people to experience a virtual world from all sides and interact with it in real time. These functions enable the audience to participate in the work more actively. Virtually Reality (VR) based works of art can be understood as the result of the interaction among space construction, user autonomy, and perceptions of virtual worlds. Jung and Lindeman believe that visual, auditory and tactile cues can be used to create a sense of reality and immersion, and their effectiveness varies according to the environment and goals [4]. Therefore, good VR art should be able to engage the senses and interaction with the intended artistic ideas, rather than just showing realistic graphics.

2.2. Immersion, presence and interaction

Immersion, presence and interaction are all different ways to explore VR experiences. Immersion generally refers to the technological ability of a system to surround users with sensory information, and presence is the subjective feeling of being in a virtual environment. Slater and others have classified the two types of place illusion as the sense of being in the represented environment and plausibility illusion, the latter making virtual events seem to have occurred in real life [5]. The two are in different places and have different effects in different environments for immersive art.

Visual Design, Spatial Audio and Bodily Perception can be used together to increase users' immersion in the virtual world. Guy and others believe that embodiment in virtual reality includes related attributes of body ownership, self-location, and agency, and these factors affect how users experience and control their virtual bodies [6]. These attributes can be used in the art world to change how viewers move in virtual spaces and alter their perception of digital objects. Interaction Design can also change how users perceive and react to virtual content. Kyrlitsias and Michael-

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Grigoriou have identified several factors that influence social interaction with virtual agents and avatars, and their responses are not solely determined by the visual characteristics of virtual characters [7].

Based on the above reasons, the four analytical directions of the case studies in this study are: visual and sound design, virtual spatial construction, interaction mechanisms, and audience engagement. The above attributes offer a system for exploring how different VR works present sensory information, space and user behaviour to express artistic ideas. Instead of being under the impression that more technology will automatically lead to a better experience, this study has examined whether the Design decisions can help the stories and emotions be communicated more effectively.

3. Case study and analysis

3.1. Notes on Blindness: Into Darkness

Notes on Blindness: Into Darkness is an immersive virtual reality (VR) documentary based on the audio diaries of John Hull, a writer and theologian who became completely blind in 1983. Ex Nihilo, ARTE France and Archer's Mark collaborated to create this work that combines autobiography, live 3D animation and spatial audio to explore the cognitive and emotional experiences of blindness [8]. Instead of building a reconstructed world of visual reality, the work turns Hull's memories and sensory experiences into an abstract digital space. Simplified shapes, modified patterns and motion are ways of presenting sound and memory in space and time. Thus, it is no longer necessary to be visually accurate for immersion. Abstract images are not only used to convey the story but also to evoke a sense of the virtual world through the five senses and to create a new kind of space.

Sound and pictures are closely linked in the Design of immersion for this project. Binaural audio can present the location of a sound in space, and Hull's first recordings are typical cases. Environmental sounds help the audience perceive the direction, distance and other attributes of objects in the environment to create a sense of space through sound alone. Kern and Ellermeier have studied how soundscapes and movement-triggered footsteps affect the sense of presence in VR, and therefore, should be considered during the design of virtual environments [9]. Although the study has not dealt with this work of art directly, it may offer some theoretical support for the exploration of how sound can create a sense of space and presence in a virtual environment. In Notes on Blindness, sound is no longer an addition; it can be used to tell stories and show the world in different ways for the audience.

Audience participation can also enhance the emotional impact of the work. Through observation, listening and interaction with the changing environment, viewers are able to feel the story rather than just watch a series of pictures. Most of the interaction is exploration and observation; little learning of technical skills or task completion occurs. Verhulst et al. compared the VR and augmented reality experiences in a cultural environment, and found that the VR version received higher scores in several areas related to immersion and pleasure [10]. Although the results cannot be directly applied to Notes on Blindness, they show the possible value of immersive presentation in cultural experiences. Through the combination of personal stories, space-time audio, and abstract pictures in this work, we hope to prompt people to reconsider perception, vulnerability, and the limitations of visual language. Its art lies in the combination of technology with emotion and storytelling to create a work of art.

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3.2. Terminus

Jess Johnson is the artist and Simon Ward is the animator who created the virtual space for Terminus. First commissioned by the National Gallery of Australia and the Balnaves Foundation, there are now five VR experiences based on science fiction, comics and fantasy. It has a world of many colours, repeated patterns, strange buildings, humanoid clones and gates to unknown places [11]. Notes on Blindness present a person's experience of sight in abstraction; Terminus creates a rich fictional world. Repeat geometric patterns for visual connection and use animated structures and buildings to give a sense of movement to an unfamiliar place. Johnson has extended the scope of two-dimensional drawing to space in this work and, thus, allowed the audience to experience the language of pictures from the inside rather than observing it from the outside.

The conversion of drawings into virtual spaces alters the connection between the artworks and the public. Do not look at the work of art from a single place; move around it to appreciate all sides of the work. The five experiences lead the audience to different places via paths and gates, and at the same time, allow for some freedom of exploration. Jo and Jeon have studied how various ways of reproducing visual environments in VR affect the perception of soundscapes and landscapes, and pointed out that audiovisual relationships are necessary for interpreting virtual environments [12]. Based on Terminus, it can be seen that the experience of each world is influenced by the organisation of space, motion and sound, as well as visual richness. Scene transitions connect the scenes, and at the same time, there is freedom to observe at one's own pace for individual reflection.

In addition, the connection between the physical exhibition and the virtual experience can add to the art. The original installation added custom-built buildings and a floor plan to link the gallery space with the world of digital art [11]. As a result, the two spaces of experience can be divided into the physical environment where visitors experience the installation and the virtual space explored via a headset. Ziat et al. investigated passive haptic feedback in a VR artwork that turned paintings into three-dimensional landscapes, and showed that bodily sensations can enhance the experience of virtual movement [13]. The Design of Terminus is different, but this study also suggests that one should consider how to connect sensory presentation, body experience and artistic immersion. Terminus changes the familiar drawing practice of the audience into an exploratory form of digital art by creating a new visual environment and space for exploration. Therefore, VR is not merely a display technology; it is a space where the language of art can be organised to inhabit.

3.3. Comparison analysis

The two projects have different ways of achieving immersive artistic expression. Notes on Blindness: Into Darkness focuses on sound, perception and autobiographical narration; Terminus prioritises the visual world-building and spatial exploration of surreal art. All the above differences are not the result of a single technology; they are intended to evoke emotions and provide experiences for people in various settings.

Notes on Blindness: Sound is used to present the virtual world for the visually impaired, and abstract pictures are employed to convey memories and feelings. The strategy of immersion is primarily perceptual and emotional; that is, people are motivated to rethink the connection among sight, sound and space. Terminus builds an immersive experience through the continuation and intricacy of its fictional world. Repeating Patterns, animated buildings and transitions between worlds motivate people to explore and dream. Therefore, it is no longer just about sound and sight; many other senses are also engaged. Rather, it is about the role of each part in promoting the artistic concept.

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Different Directions of narration and degrees of audience participation are also shown. Notes on Blindness employs sensory exploration to support an emotionally oriented narrative of personal experience, and Terminus leads visitors to discover an imaginative world through spatial movement. In the former, interaction strengthens an existing autobiographical story; in the latter, discovery is a key component of the work of art. Neither way is inherently better. The Effect of Interaction Design Depends on How it Serves Artistic Expression. Research on VR audio, cultural experiences and haptic feedback has provided strong support for considering sensory presentation and bodily engagement in the context of immersive design [9, 10, 13].

Finally, the two case studies show that effective VR art is achieved through the integration of visual language, sound, space construction and interaction, rather than just high-end technology. Notes on Blindness uses sensory abstraction to create an emotional and perceptual experience, and Terminus builds a fictional world that can be explored visually. Together, they show that VR can expand the concept of digital media art beyond traditional screens and create new meanings through the connections among art content, virtual spaces, and audiences.

4. Discussion

VR expands the expressive scope of digital media art by turning works of art into multi-sensory and interactive experiences. Instead of being external observers, audiences can enter the virtual environment through VR to explore space, experience art with movement and perception, and interact with it. Therefore, in new ways, these works of art will be seen and understood by the public. As shown in "Notes on Blindness: Into Darkness and Terminus", immersive art can use VR to create one's own sensory experience or build an imaginary world beyond the limitations of traditional screen-based media.

Technology does not have to be beautiful or artistic. Graphical Realism and the quantity of interactive functions are also sources of immersion in addition to visual complexity. Technology gains artistic significance when its functions can help achieve the goals of expression and emotion in art. Abstract Images and Spatial Audio are Used in Notes on Blindness: Into Darkness to Present Perception and Memory. Terminus has many visual patterns and navigable spaces that are inviting to explore and imagine in the virtual world. The above cases show that the effectiveness of immersive design in expressing art through sensory elements and interactions should be judged, rather than relying on the level of technology.

5. Conclusion

This study has investigated the application of virtual reality in digital media art through an analysis of Notes on Blindness: Into Darkness and Terminus. Therefore, VR technology can also be used to create art through new ways of expression, space and interaction design. VR can give users a sense of being in a different place and, through senses and motion, experience meaning created by art in a new way.

The two cases are in different states of immersion. Notes on Blindness: Abstract visual forms, spatial sound and autobiography are used to explore perception and emotion. Terminus, on the other hand, builds an elaborate fictional world for exploration and imagination through visual symbols. Although they are different, both projects have achieved outstanding immersive art through the integration of artistic goals, sensory experiences and interactive functions. Thus, immersion is not merely a feature of technology but also a type of connection among the work of art, its virtual space, and the audience.

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In the future, more comparative studies can be conducted to examine a wider range of VR artworks in different art forms and production environments. Audience interviews, usability tests and structured observations of the sense of presence, emotion and interaction for various works may also be conducted. The above studies will help us better understand how virtual reality technology can be used to create new works in contemporary digital art.

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