

Application of VR In Game Design & Filmmaking

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Abstract. Virtual reality is a kind of application technology combining computer application, multimedia, information technology and simulation technology, which provides a broad development prospect for advertising, sports and game design. At present, in the United States and Europe and other developed countries and regions have been used in many fields of production, and achieved good economic and social benefits, but the research in this field is not obvious in China. It is very important to explore the technical advantages of virtual reality in game design and improve the overall application level of virtual reality. This paper summarizes and analyses the history and technological development of VR immersive experience, the application of VR in game production, and the application of VR in film production, and critically reviews and understands the application potential of VR technology as an interactive medium.

Keywords: Virtual Reality, Interactive media, Game design, Filmmaking.

1. Introduction

Virtual Reality (VR) technology has seen its rise in popularity over the last decade, particularly in the field of entertainment and interactive media. Virtual Reality has been technologically improved over the past decades. It will play a crucial role in the future technological and scientific revolution as it is applied to various fields such as education, medical science, and psychotherapy [1]. VR content producers and innovators utilizing VR in different areas of study mainly aim to produce virtual environments that resemble a physical environment, creating an immersive experience. This is one of the primary objectives of entertainment and storytelling mediums (games and films) that gave rise to the popularity of VR [2]. The introduction of VR to the already successful game and film industry altered the ways in which users experience games and films and how the content is produced. The commercialization of wearable sensors and equipment now allows users to access VR content ever more than before, potentially making VR a mainstream medium for both producers and consumers of games and films.

Current VR game and film projects utilize the immersive that the VR medium provides, creating virtual environments based upon sensory details (visual and audio) that give the user the impression of physical environments [3]. In VR games and films, narrative immersion is equally important as sensory immersion, requiring game and film producers to adopt a new way of producing VR projects [4]. Currently, commercial VR technologies such as the Oculus headset are limited in several ways: accessibility, physical interaction, cybersickness, and postural stability [5]. Cybersickness and postural stability, in particular, obstructs traditional methods in producing games and films from achieving their intended effects as they would on a 2D screen. In addition, user experience in VR, including factors such as user reaction and decision, vary drastically compared to a more traditional medium. VR game and film producers have utilized VR to achieve unique effects that take advantage of user experience in VR and the various ways virtual environments can be constructed. This study aims to provide a critical review and understanding of the potential of VR technology's application as an interactive medium through three aspects: historical and technological development of VR in presenting immersive experience, application of VR in game production, and application of VR in film making. Understanding how producers adapted games and films into VR experience, the specific

production process for VR game and film content, and VR content's psychological effect on the user is essential for future developments in VR game and film production.

2. Development of VR application on game and film production

The first generation of Virtual Reality technology emerged in the 1980s and 1990s. Since then, the idea of virtual reality has largely determined how the future of the medium and the contents presented on the medium would be. The term "Virtual Reality" emphasizes the concept of "telepresence," which is the perception of occupying a space other than a physical space where the user's body is located [6]. The idea of "telepresence" in VR contributed to the conceptualization of the idea of "immersion" in VR, which is the primary attribute that VR content producers are aiming to achieve. The hype around the first generation of Virtual Reality technology was not only caused by the emergence of "telepresence," but also by the idea of the virtualization of reality. Despite the use of the term, virtual reality is constructed by generated digital virtual environment and body tracking technology, none of which is the virtualization of reality. The commercial and marketing nature of the term "Virtual Reality" has influenced consumers and users in conceptualizing virtual reality technology as the next-generation technology that can provide the experience of an alternate reality. The production of the experience is also one of the main goals of contemporary films and games that focus on user immersion. Film and game content thus had become the main content that users consume using VR technology.

Virtual Reality gaming has been commercialized over the past decade. It has become increasingly accessible to the public as commercial VR devices such as Oculus Rift, Samsung VR, and PlayStation VR have become popular in the VR market (see Fig. 1). Engaging and immersive experiences promoted by VR technology first presented themselves through VR games, proving the video game's broad appeal in the area of telepresence and immersive experience. The first VR arcade machine, which was also the first mass-produced VR system designed for entertainment, was designed by the Virtuality Group and was named "Virtuality" [7]. Auditory and visual experience continued to be refined when the Oculus Rift headset was released by Oculus VR, whose success was largely determined by its game library, which consisted of original and popular games. Games like Doom 3, Mirror's Edge, and Hawken were adapted to be able to experience in the Oculus Rift headset [8]. These original games, however, were not designed specifically for VR. Till now, little research has been conducted on current VR technologies to understand the extent to which VR can be utilized to enhance the immersive qualities of video games instead of recreating the same experience achieved in older formats.

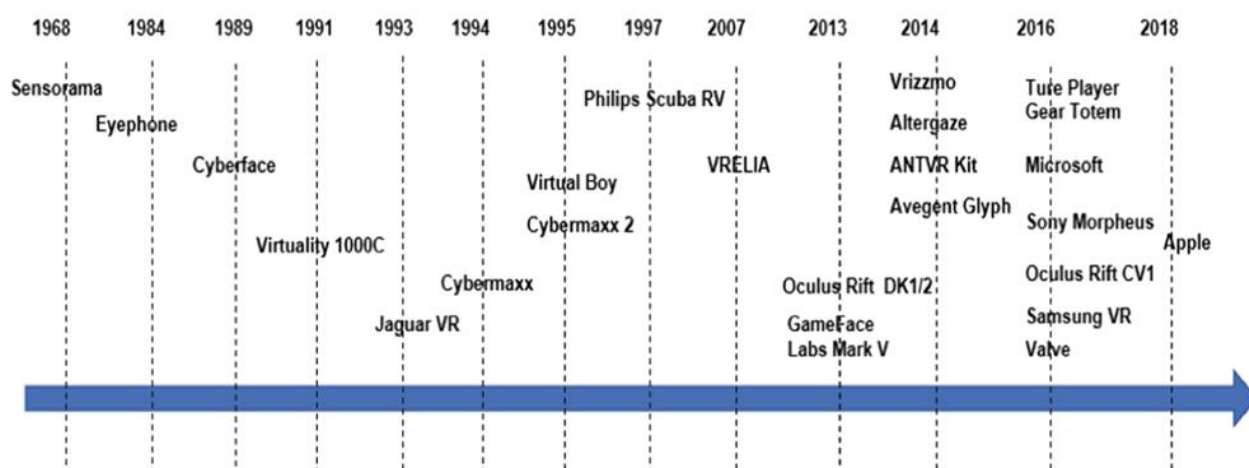


Figure 1. The development of VR equipment.

The development of application of VR in filmmaking compared to video game production is less mature, and the consumer base is smaller. The area is still crucial to VR's development in

entertainment and art, considering that cinematic language is being applied to most contemporary video games for purposes such as advancing the plot and creating a narrative structure. Watching a film is regarded as a passive experience, while VR film allows interactivity and is capable of immersing the audience in a narrative or a character. As film puts an emphasis on storytelling, VR is able to provide an immersive narrative experience through the 3D environment. Oculus presented the first VR short film *Henry* (2015), which showcased how VR could present a character's direct experience to the viewer [9]. Oculus' *Dear Angelica* premiered at Sundance Film Festival in 2017. In 2016, Cannes Film Festival screened VR short films, becoming the first film festival to showcase VR films [10]. Unlike VR games, VR films are still presented in video formats. 360° videos can be viewed on VR devices, and they are accessible to both the audience and the producers. 360° videos are available on YouTube, and viewers can experience the videos on mobile VR devices or computers and mobile phones. It is also easy for filmmakers to use 360° cameras to create VR films and upload them online.

3. application of VR in game dEsign

Tangible Interaction—a brand new way of interaction is changing the way people think of game designing. Different from traditional way of interaction, which only allows players to look at two-dimensional videos and press the buttons on the controller or keyboard, VR games with tangible interaction emphasizes the importance of using movements, gestures and sounds as the way of interaction, and at the same time realizing a freer environment for players to input their movement.

Nick Witsel, game designer at Arizona Sunshine developer Vertigo Games, suggests that it's very difficult to determine what is a should and a shouldn't in VR; the only rule is that there isn't any yet. [11] In the late '80s, the technology of 3D rendering was already applicable, but there were only a handful of games that actually did it. But later, games like *Doom* created a sense of going through a 3D level, but actually consisted of 2D sprites. Eventually, games started to apply full 3D geometry few years ago. During that entire process, we were trying to figure out: what does a 3D game feel like? What should a 3D game be like? With VR we're at the very start of that, but not only is it a different way of perceiving the world, it's a different way of being present in that world; it is similar to that, but more challenging." [12] Interactions in VR are more important than in flat screen development, simply because players expect to be able to act in-game the same way they would in real life. For instance, if there's a panel with a lot of buttons to push, player might want to be able to push all these buttons. This is what made VR games unique and yet very challenging to create one. If something in the game looks interactable, it has to be interactable, otherwise it will surely disappoint the player and creating a less immersive experience. A lot of Fast Travel Games employees have experience with AAA games, and it's so easy to get realism and believability by just cramming in tons of detail and not let the player interact with it. But if the rubbish is put in the corner, or books, or kitchenware, in a VR game, player must be able to interact with it. A super detailed world is not going to save a world that is not interactive. Nail the interactions and let the rest follow. [13]

Virtual reality technology had made crucial contribution on the development of video games: it has broken the barrier of virtual world and reality, expanded the range of game genres, added new ways of interaction between the user and the game and provided users better gaming experiences. For instance, when the user roaming in the virtual environment, he can have a realistic experience by using his own hand which also appear in the virtual environment to grab objects. Special equipment, of course, is necessary for this process to happen, such as VR goggles and gloves. These apparatuses allow players a higher level of freedom that they cannot feel when they are using traditional controllers or keyboard and mouse.

In games, we can realize that visual effects have an important influence on video games and display technology, especially stereoscopic display technology, is an important supporting technology for video games. In order to further improve the experience of the game and enable players to immerse themselves in the game, at present we can know that the monitor used is a desktop stereoscopic

display or a helmet-mounted display. The screen of the desktop stereoscopic display alternates at a certain frequency. To generate left and right eye views, the user needs to wear stereoscopic glasses to have a good experience. The helmet display is another stereoscopic display device used in the virtual reality system. The helmet is fixed, and the head and the helmet cannot move relative to each other. It is mainly imaged through the display on the helmet, both of which are ordinary monitor. These two types of displays can provide users with a three-dimensional field of view, enabling users to enhance their gaming experience during use.

For game consoles, the sound output is as important as the image form. During the player's experience, the three-dimensional analogy sound is different from the familiar stereo sound. The three-dimensional stereo sound is surrounded by a spherical sound generated by the pair. The sound mainly appears in Above and behind the head. In VR, sound can enable users to accurately determine the location of the sound during the game. It is more in line with the real game scene and can enhance the realism of the game.

4. Application of VR in Filmmaking

The primary categories of VR Films include short films and documentary films. In contrast to VR games, VR films have less interaction. The primary method of interaction in VR films is the movement of the headset, which is the angle at which the viewer views the constructed 3D world. The majority of the production process and viewing experience for VR films revolve around the angle at which the audience views the film's contents. In order to understand the benefits of VR films over traditional films, comparisons of VR films with traditional 2D films are incorporated in this section.

The process in which VR films are produced varies according to the category of the VR film and the creative choices of the producer. Still, a general comparison can be made between VR film and traditional film regarding key elements of the traditional filmmaking process (see Table 1). Due to the nature of VR, VR films do not have a model for narrative logic, composition, camera language, and editing. The core of a Virtual Reality experience is presence, and the production should follow this principle since the viewer is actively experiencing and constructing the meaning through their head movements, instead of a director imposing a piece of specific information on the viewer in traditional 2D films. For editing, traditional films adopt a linear approach where cuts and transitions are used to match shots together. In VR films, the viewer can choose where to look, meaning that the only cuts and transitions are between different environments. The producer can only assume the potential experiences the viewer can experience and edit in accordance with the narrative progression of those potential experiences [14]. If a scene is located where the viewer is not looking, there is the probability that the viewer will miss parts that are essential to a narrative. Producers can choose to guide the viewer's attention; however, the viewer has the freedom to decide where to look. Thus, producers should aim to include scenes that only enhance the meaning of the story and do not hinder the viewer's perception of the meaning if the viewer chooses not to look at the specific area [15]. VR films need lighting that covers all the essential information in the scene and spatial audio that allows the viewer to identify the source of the sound in the virtual environment. From this perspective, light and sound are the essential elements used to direct the viewer's attention and determine where the viewer will look. For digitally generated Virtual Environments, special effects such as rendering effects are needed, which can require a long rendering time and advanced technology [16]. Unlike traditional film, high resolution is required in VR film to make the virtual environment believable and produce an immersive experience in addition to not causing the viewer nauseous.

Table 1. Comparison of VR filmmaking and traditional filmmaking's production processes

	Editing	Lighting	Audio	Resolution	Composition	Narrative Logic
VR Filmmaking	Progression from environment to environment	Practical Lighting	Spatial Audio, diegetic sound, Lavalier Mic needed [17]	High resolution is essential	Determined by the viewer	Influenced by the producers, determined by the viewer
Traditional Filmmaking	Progression from shot to shot	Partial Lighting	No requirements	No requirements	Determined by the producers	Determined by the producers

5. Conclusion

As technology continues to evolve, VR will become more mature in the future. VR can not only bring people an entertaining experience, but also combine with other fields such as education and healthcare to produce works with social significance and change people's negative view of traditional games. The immersion and the recreation of reality of Virtual Reality technology are its main advantage, and these factors made contribution to its leadership in video games and films. As a product of the development of the new era, virtual reality technology has produced some application systems on the basis of information technology, Internet, digital technology and three-dimensional production technology, but the development is relatively short. However, the development of the system is relatively short, and it is a long-term task. In order to meet the needs of the times, enterprises must cultivate a high-quality and versatile scientific research team. Only in this way can the practical design, game interoperability and user experience of virtual reality games be improved.

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