

Application of Virtual Reality in Different Fields

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Abstract. Virtual reality technology is a rapid development of technology in recent years, has a vital role in the development of different fields. Using image display, human-computer interaction and other technologies to generate three-dimensional environment. Enable participants to interact and manipulate virtual environments and objects in real time. This paper analyses and summarizes the development of VR from three areas. Firstly, it analyses the immersive experience brought by VR in games and discusses the influence of VR on games. Then it summarizes the application of VR in medical care and other fields, bringing more effective means to the treatment of diseases. Doctors can use VR headsets to practice more surgeries and train the younger generation. Finally, the differences between VR films and traditional films are analysed from the perspective of films. At the end of this paper, the development of VR in the above three fields are summarized and prospected.

Keywords: Virtual reality, VR game design, VR medical, VR film.

1. Introduction

VR is the virtual reality technology, which refers to the use of computers to build a virtual world, people through some methods enter this realistic environment and interact with it, are immersed in it, to obtain some special experiences. This technology is likely to be widely used in various industries and fields in the future. The area where VR is currently used the most is in gaming. VR allows players to have a better gaming experience. VR is also used in other fields such as education and medical fitness. The perception in the VR is created by surrounding the user of the VR in pictures, sound, and other assorted stimuli that then influences the total environment of the VR user [1]. Due to their realistic design, their environments are more immersive. Moreover, it is immersive because the experience is like what one would encounter in the real world [2]. VR thus, coupled with powerful computers and the tracking of each eye's visual image, usually updates the virtual environment that an individual can see in the real world, which creates a 3D experience that improves immersion while watching a movie or playing horror games.

Although VR technology has been widely developed in different fields, the relevant literatures are not thorough and comprehensive enough to summarize the fields [3-5]. Therefore, this paper analyzes and summarizes the application of VR in three fields from the perspective of VR development. Firstly, from the aspect of game, the influence of virtual reality on game is analyzed and discussed, and its advantages and characteristics in game are summarized. Then, it summarizes the development and application of VR in medical treatment, and analyzes the new methods VR brings to disease cure. In addition, this paper also analyzes the differences and influences between traditional movies and virtual reality movies. Finally, it summarizes the impact and prospect of VR in these three fields.

2. Visual reality in the field of video games design

Visual Reality is a very advanced technology, and it is worth discussing and studying in the field of games. Visual Reality used to be not very popular, but with the development of technology, more and more Visual Reality potential is being explored, especially in the field of gaming (Figure 1). Just like when games made the leap from 2D sprites to 3D graphics, game designers are already preparing for the challenges that creating a fun virtual reality game will bring. So, what is special about VR?

Compared with other traditional games, Visual Reality games have some characteristics that other games cannot match, that is, the immersive experience of Visual Reality games and the game categories derived from Visual Reality.

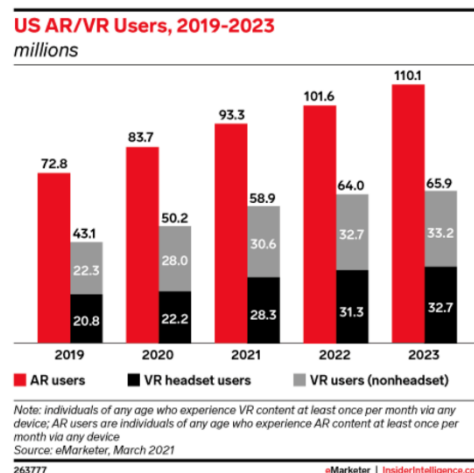


Figure 1 US AR/VR Users, 2019-2023.

2.1. Immersive Experience

The immersive experience plays a huge role in Visual Reality game design. To play games with Visual Reality, the players would require to have a headset, and that headset would magically bring the player into a whole new world, the visual reality [6]. It is a 360 degree360-degree space designed by the game developer, when the player plays video games in the new create space, they would feel more immersive when they do so, they would feel like they are actually the actually the act he characters in the “real world”. When people think about VR games, people imagine completely new experiences designed around the concept of being in-side the digital world. There are already a lot of very good pieces of video games on the market that are not Visual Reality games. What people need to start thinking about is that if a game is already getting a lot of players with its wonderful story settings, art, and gameplay, it will probably be even more incredible with a VR headset. In the article “Cross benefit between virtual reality and games”, the author mentions, “There are numerous benefits from virtual reality to games essentially because virtual reality is a gathering of multiple scientific domains in-stead of a single one [3]. These various research areas are improved by the needs of VR applications. Part of these enhancements generally transits into the mass market once the developing cost is reasonable.” This quote shows that visual reality and games could benefit each other, the existence of virtual reality in game design would only bring benefits to the games, but it would also gain benefit from the games, these two fields are almost meant to be together. That is one reason why immersive experience plays a huge role in Visual Reality game design.

2.2. More Genres

The other benefit of Virtual reality is that more and more game categories are derived from Visual Reality (Figure 2). Since the concept of virtual reality for gaming is relatively new, there are not a lot of games that support virtual reality yet, but more and more new genre genres of games have already starred star started to appear. Of all the games available right now, about two-thirds to third auction video videos of action video games, which makes sense because virtual reality is created for the users to feel more immersive and let the users feel to feel like they are inter-acting with items in the games with their body bodies [4]. There are all kinds of those action games, such as first-person shooting games, sports games, flight simulators, race games, horror games, or music games, like Beat Saber. Among those non-action games, most of them are puzzle video games, also there are some management, relaxation, fun, and funny video games. The proportion of games that can be played by many people online is not high, and even if there are, the social attributes are relatively weak.

Currently, there are still many single-player games. But most of the players would live in one social system in the games, and networked multiplayer games will become more and more popular in the virtual reality games in the future.

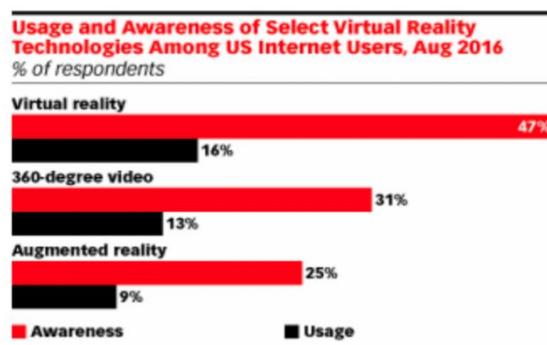


Figure 2 Usage and Awareness of select virtual reality technologies among US Internet Users, Aug 2016

Why people would choose virtual reality games over traditional games? From the perspective of virtual reality, the ultimate goal of making a game is to make the game very real to the players, so those players could immerse themselves on the game world. To be fully immersed in the virtual world, the user's perception system needs to be fully "tricked". Existing virtual reality technology level levels in vision, hearing, touch, and taste have made attempted. But having too many of the features of virtual reality is not a good thing, for example, making a good VR experience should avoid frequent, full-body, and strenuous exercise because it would not be a good virtual reality game if the game is making the players feel ill. Video games players are used to looking at high-quality art [5]. Not many people would give the game excuses to have bad art just because virtual reality is in these early stages of technology development, and they would not be willing to pay for the poor-quality art and graphics.

3. Visual reality in the field of medical

With the development of the technologies, numerous delicate medical instruments had been developed and created, such as MRI (Magnetic Resonance Imaging), CT (Computed Tomography), and DR System (Digital Radiography). Either one of the above medical devices was a milestone advancement in medical technology for mankind [6]. Furthermore, doctors today even use VR headsets to help them. With the introducing of Virtual Reality in medical health, doctors have overcome various intractable surgeries that could not be done thousands of years ago. When people started doing surgeries thousands of years ago, physicians need to use their eye to clarify and diagnose the pathogenies which will increase the risk of during the surgeries and future recovery of patients. Therefore, Virtual Reality did not only help doctors on medical surgeries, but also helped comfort the patients' anxieties.

3.1. Medical Surgeries

Virtual Reality headsets allow physicians to perform surgeries with complex and tedious procedures. Human bodies are a unique and complex organism. Billions diminutive vessels cross each other inside our bodies. Either one of the organs are lost or damaged can be fatal to us [7]. Therefore, physicians need to be precious can be careful with each step they are going to do. However, the help from VR headsets, physicians can distinguish the vessels easily (Figure 3). Computers in Virtual Reality can process numerous information and analyze the required procedures to accomplish the surgeries. It will also allow physicians to enter the place that actual surgeries cannot.



Figure 3 A surgical example based on VR.

During the 2016, in front of a crowd, Doctor Shafi Ahmed accomplished the first Virtual Reality surgeries. It live-streamed the entire surgery in 360-degrees, and anybody could see from the sight of Doctor Shafi Ahmed through the website Medical Realities. According to the nurse in the operating room that stood right next to him said, all he could do is staring at the screen that shares the vision of doctor and feeling nervous and anxious for the surgery. After the surgery, Ahmed said that he believed that this bizarre view of surgery provides audience with a new learning method. Audiences could not only see what the doctor is doing, but also saw the nurses' actions, which would make them feel that they were in the operating room too.

Besides of the useful way in surgeries, VR headsets also helped doctors to train students in school, or other doctors [8]. Medical school students or interns have insufficient experience in surgery because they do not have countless time for them to practice. For those physicians that can do surgeries required to be familiar with the body structure and steady hands to operate. Yet, with the use of Virtual Reality provides them a platform to practice. The platform of the VR headset possesses with thousands of different difficulties surgeries for students to practice, even just dissection. Even if it possesses with such number of scenarios in surgeries, it will still provide the real feedback that experts or doctors encountered during the real surgeries, and maybe the bad ones that they did not meet with. Allowing people deal with surgeries for thousands time will help them release the stress in the real surgery or remember the steps for surgeries also to learn through the virtual reality.

People can learn through their failure, after they made all the mistakes and knows how to solve it, any kind of surgeries will finish wonderful.

3.2. Comforting Patients

With the outbreak of COVID-19 during 2020, the virus went rampant without any control or solutions. People started to worry about the future of mankind, in fact, people had been worried about variety of things. Wars, climate changes, asteroid, and virus, either one of them could cause population of mankind drop suddenly or even eliminate humans from this planet. However, more relevant to daily life, people are afraid of unhealthy. With only the verbal depiction and description about the pathogens from doctors, usually patients will be confused or frightened [9]. With the help from Virtual Reality, doctors and patients can connect to the same device in VR headsets which will create the inner bodies of patients (Figure 4). Also, doctors can lead the patients around their own bodies to see more accurate pathogens from multiple angles and predict the future going of the problem they find right now.

With the rapid development of technologies, more and more difficulties in various fields had been overcome. People started looking for a higher quality and standard of daily lives. People and scientists are thinking about how and what can make our lives more pleasant and easy, coming up with different kind of things and ideas every day, and Virtual Reality had been invented. Now, it is widely used in different places, entertainment and medical, and still being developed and try to adapt to more. Two ways how Virtual Reality are used mentioned above had just started using in small quantities. In the future years, VR can be more accurate and proficiency than today. It still contains great possibilities no matter in medical care area, or finishing simple tasks for us.



Figure 4 Examples of VR disease treatment.

4. Visual reality in the field of filmmaking

In recent years, the application of virtual reality technology in the field of the film has attracted much attention. In 1966, the first head-mounted virtual reality equipment appeared [8]. With the continuous production cost of head-mounted equipment became lower and lower, which largely promoted the development of Virtual reality films. Filmmakers and film companies also paid more and more attention to the development and shooting of VR films [10]. The combination of VR and film will dramatically change film and its production.

4.1. Level of Science Fiction

The first thing needs to needs to talk about is the change in the traditional experience for the audience. One of the benefits is the level of science fiction. In 2009, the 3D film Avatar was released around the world and received great popularity. The exquisite pictures, real and detailed actions, and lifelike three-dimensional effects conquered the audience's senses and made every audience get a more shocking experience. The role of 3D technology in movies has been irreplaceable. But moviegoers are still split with movies on the big screen. The emergence of VR breaks the barrier of space and allows the audience to "step into" the virtual scene with a 360° or even 720° perspective, "except for you, there are movies all around" [11]. In 2016, Penrose Studios released The Rose And I, an adaptation of the children's short story The Little Prince, which tells the story of loneliness, friendship, love, And loss. This VR the short film has an obvious style of drawing style. It is made of clay style with Unreal engine 4, which enables the experiencers to separate themselves from the real world and immerse themselves in the fairy tale world where the little prince and rose are located. It's a few minutes, but it's good and it's very immersive.

4.2. More Immersive Experience

To bring audiences better audio-visual enjoyment, many advanced modern technologies, including 3D, IMAX, and Dolby panoramic sound, have been integrated into film shooting and cinema construction. The emergence of these technologies has raised audiences' audio-visual enjoyment to a new level. And VR movies in addition to wearing equipment broke the boundary of the screen, the viewer directly into the computing machine in the virtual environment [9], also joined in the equipment of all kinds of sense organs, able to the timely action of computing experience, for experience person to see different scenarios, such as can be turned to watch the 360 ° direction of each scenario. These sensors enhance the sense of immersion by enhancing the sense of environment, making the viewer feel like a part of the environment. Currently, VR movies include the senses of sight, hearing, touch, and even smell and taste. VR will continue to extend and mimic human perception to deepen immersion. For example, "Fly Like a Bird," a VR film that attaches people to simulators and allows viewers to fly like birds, is more about the experience than watching. Imagine if VR immersion is applied to similar situations

In films like Inception, which emphasize space, the audience can immerse themselves in a variety of grand or micro-worlds at will, and the effect will be even more shocking.

5. Conclusion

In conclusion, virtual reality is very powerful and has a lot of potential in a lot of fields. It has a very bright future in the video game field because of the special new content virtual reality could bring. Also, the immersive feeling of virtual reality could give the player to take the experience for video games to the next level. Also, virtual reality could play a huge role in the medical field. It could bring special treatment for special patients that traditional medicine could not accomplish. There are so many possibilities for the development of the software using virtual reality. Finally, virtual reality would improve the quality of education a lot. Nowadays, when people learn, they would listen, they would, they would speak, but with the help of virtual reality, the learner or the teacher could feel, interact or have a real conversation. These huge features and with the help of professional designers who designs virtual reality software will overcome the difficulty they have and bring these fields to another level. Right now, virtual reality is having issues because the technology is not complete, after more and more ideas and more and more people trying to interact with virtual reality, virtual reality will be great.

At present, virtual reality are still incomplete in all aspects, given the lack of equipment and development, also, virtual reality still needs some technology support, but if the industry makes a break-through and countless manufacturers see the possibility of making money. On the one hand, virtual reality is the vision that accounts for the largest proportion of human cognition, and also, it is the most consistent with human cognitive habits. Based on these two points, virtual reality would show some kind of popularity when the technology is not mature, because this is some new technology and people wants to try it out, but right now virtual reality is not just so great because it still needs time. Players should give it more time and the results of virtual reality development would be amazing and shocking.

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