Application of VR Technology in Video Games

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ABSTRACT: In recent years, VR technology has gradually matured, and video games have also combined with it to expand the market. This market change not only triggered the innovation of VR technology, but also exposed many drawbacks and technical defects. This paper analyzes the problems that still exist and the technical problems that can be broken through the published VR technology and the examples of the combination with video games.

Keywords: virtual reality (VR), VR glasses, interaction, video game

1 Introduction

Virtual reality (VR), also known as virtual environment or VR technology, is the use of computer simulation to create a three-dimensional space of the virtual world. It offers users visual and other sensory simulation, giving them the impression that they have actually experienced the environment and are free to immediately observe objects in the three-dimensional space [1]. The computer can carry out intricate computations as soon as the user moves, sending back precise three-dimensional representations of the environment to give the user a sense of presence. This technology combines the most recent advancements in network parallel processing, artificial intelligence, induction, display, and computer simulation. It is a sophisticated simulation system with computer assistance.

The concept of virtual reality first comes from **Stanley G. Weinbaum**'s science fiction ***Pygmalion's Spectacles***, which is regarded as the first science fiction work to discuss virtual reality [2]. The short story describes in detail the virtual reality system based on olfactory, tactile and holographic goggles. In the mid-1950s, American photographer **Morton Heilig** invented the first VR device: Sensorama (patent filed in 1962) [3]. This device is considered by some to be the granddaddy of VR devices. It's huge, with a fixed screen, 3D stereo sound, 3D display, vibrating seats, a fan, and a scent generator. It can be seen that in the early days, people's understanding of virtual reality is not limited to vision.[4]In 1960, **Morton Heilig** filed a patent for an even more ingenious VR headset that would bring **Weinbaum**'s fantasy device to life. In appearance, the VR device is designed to be very similar to modern VR glasses. However, it only has a three-dimensional display function, there is no information interaction function. This means that when people wear glasses and look left and right, the view in the glasses does not change.Ivan Sutherland, a computer scientist from the United States, created the first prototype VR glasses in 1968. It is known as the "Sword of Damocles" because of its requirement to be suspended from a human's head by two mechanical arms due to its high weight. The role of preliminary pose detection is accomplished. The computer

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instantly calculates a new graph and shows it to the user as the user's head position changes. Modern VR glasses can be viewed as "Sword of Damocles'" (also known as the creator of AR) technological advancement.[4]Major console companies are scrambling to introduce their own VR goggles as a result of the rapid development of VR technology, seeing it as a game-changing potential, such as Nintendo's VisualBoy, Sega VR, and Forte VFX-1. The display technology, 3D rendering technology, and motion detection technology from the 1990s are still in their infancy, despite the fact that the appearance of the aforementioned items is identical to that of VR today. The viewing experience is not even close to being "useful." For instance, the Nintendo Virtual Boy, one of the most well-known Virtual Boys, only supports the colors red and black.

As far as the evolution of video games goes, they have evolved from the original text-based MUD games to 2D games, then 3D games, and have gotten increasingly more lifelike and immersive with advancements in visuals and technology. However, it is still impossible for players to play without experiencing a sense of being outside of the video game due to technological and other limitations.

Since virtual reality technology first became available, video game makers have been considering ways to make their creations more immersive and realistic. Because of this, virtual reality technology has received attention and been put to use in the fiercely competitive video game sector, which has also led to the development of virtual reality gear specifically made for video games despite many technological challenges. Prior to this, the idea of virtual reality already existed in the early 1960s, but it did not apply to gaming technology until it was advanced enough to support the hardware, at which point the earliest by shenx first can be practical model is proposed, and the following Oculus developers, toru iwatani shenx and famous Pac-Man developers and others to complete, And last, the popularity of VR video games skyrocketed in 2016.Today, dozens of video games have been released to support the Oculus Rift, including horror, shooting, and survival simulation titles. One example is Blue Marble, a space flight title that lets players drift aimlessly between the Earth and the moon while listening to their favorite music and experiencing the mysterious universe. The Underworld, on the other hand, is a horror-adventure video game where players must avoid monsters while exploring dungeons.There are several tools available to provide gamers a sneak preview of virtual reality video games even if the Oculus Rift is still under development. In addition to the Oculus Rift, new products from Google Cardboard, Samsung Gear VR, Sony's "Project Morpheus" PS4 goggles, and China's 3glasses have all been introduced, showing that an increasing number of major industry players are entering the market. The performance of virtual reality technology has not yet attained a perfect level, and a number of issues in the process of practical implementation are still inescapable.

The year 2014 is a pioneering period for the VR video game industry. Many big video game manufacturers also use professional teams to experiment with VR content and video games. For example, the Show Down VR produced by Epic video game is a landmark movie-level VR experience, which is short but brings more possibilities to VR. For those who experience VR, the images in VR are very important, and the realistic effect is very shocking. The two core aspects of VR video games are immersion and visual impact. VR technology enables users to get the senses in the video game through peripheral devices, and realizes the information interaction between the reality and the video game world.

Compared with the traditional video content, it has a 360-degree panoramic picture. The experiencer, that is, the protagonist, can be immersed in the scene, and the atmosphere and atmosphere can be comprehensively affected through the sound. The sense of space and distance will be more hierarchical.In addition to the video game, in teaching, medical, industrial and other aspects have a certain role, this advantage is irreplaceable.

video game host **Ryan Trahan** uses Oculus Quest VR specialist equipment to play Minecraft. He plays the video game by tapping into the Metaverse using a VR device that not only uses VR eyes but also a video gamepad and stereo. **Ryan Trahan** said: "The world in Minecraft is still beautiful, especially when you lie down and look at the beautiful night sky full of stars! It can be clearly seen that the combination of VR technology and video game and the support of various devices, users can interact with the video game from visual, auditory and other sensory information, which can greatly improve the experience of each sensory sense of the user [5].

2 Practice of virtual reality technology in video game design

2.1 The initial VR technology had a lot of difficulties in integrating it into video games.

Midway through the 1980s, the first attempts to incorporate virtual reality into video games were developed. However, early VR gaming options were rudimentary and failed to draw in a sizable audience. Modern VR devices like the Oculus Rift, HTC Vive, and SONY Playstation VR, which enable users to enter virtual environments, have been on the market for a few years now and have sped up the development of VR in the gaming sector. However, the widespread diffusion of virtual reality video games has been constrained by the high cost of hardware. The top headphone manufacturers have reduced their prices as a result, and this pattern will persist. Creating high-quality content is still a struggle. The VR equipment itself has no use if the player doesn't have a video game to play.[6]

2.1.1 How big is VR in the video game industry?

The gaming industry generated $108.2 billion in revenue in 2017, according to Super Data Research. It was the highest revenue ever for the video game industry. Meanwhile, the share of VR revenue so far is small: $2.2 billion in 2017. However, due to the increasing popularity of VR devices and users' awareness of virtual reality, there is a clear trend of increasing revenue from VR video games. Revenue from virtual reality video games is expected to reach $4.5 billion in 2018. [7]In fact, Super Data predicts VR gaming will generate $19 billion in revenue in 2021. High-end users are now the main source of revenue for virtual reality video games. Devices like the HTC Vive and Playstation VR attract a lot of hardcore video gamers.[8] While mobile VR leads in terms of users, the platform only took in 15% of VR video game revenue last year.

2.1.2 Which market players can stimulate industry growth?

In the market for virtual reality gaming right now, Sony, Oculus, HTC, Google, and Samsung are the leading suppliers. In an effort to promote consumer awareness of virtual reality and increase sales, these businesses have done so. For instance, SONY provided certain prospective consumers with their initial VR headsets and two weeks of free testing. The ongoing battle among the biggest VR gaming companies for market share has fueled the

expansion of the entire sector. Leading companies in the VR sector are actively working on standalone headsets with location tracking features. Currently, Google and Oculus are developing their cutting-edge standalone VR headsets. Both devices will offer six degrees of freedom and position tracking.This entails monitoring the player's translation and rotational motions. In order to get a competitive edge, top organizations also buy creative startups. In 2017, Google purchased one of the most popular VR gaming businesses, Owlchemy Lab, while Microsoft acquired social VR app Altspace VR and Samsung acquired virtual reality app studio VRB. Additionally, there is still price competition, particularly between SONY, Oculus, and HTC.Instead of charging $129.99 for the Gear VR headgear and controller in June 2018, Samsung charged $99.99. As a result, consumers may get cutting-edge VR equipment for incredibly affordable costs. In comparison to classic video games, virtual reality video games now provide extremely few alternatives.In order to increase the number of services offered on their platforms, vendors are looking to entice video game developers. Large corporations assist independent video game creators and provide free SDKs for virtual reality development environments as a result.

2.1.3 How will VR change gaming?

The potential of virtual reality is yet being fully realized. However, virtual reality has altered the conventional video gaming industry. Players are drawn to a variety of virtual fairy worlds. The reason why virtual fantasy worlds are so alluring is that they are totally distinct from and apart from the real world. VR software developers build elaborate, breathtaking settings. These beautiful locations make for good walking entertainment. In certain video games, players can design their own own fairy tale settings. The eagerly anticipated Minecraft VR was released this year. The only constraint on creating a 3D world in Minecraft VR is the user's creativity.

Haptic feedback uses sensory perception to understand an object's shape, texture, and weight. The virtual reality experience is more realistic when one can feel the "presence of hands." The way people play video games has altered as a result of virtual reality. Our brains believe we are actually in the scenario while we are using a VR app.

According to many VR specialists, there are still no truly groundbreaking VR video games available. The video games that we're accustomed to playing in traditional video games are currently the most popular ones in virtual reality. The most lucrative video games are shooters, adventures, and racing games. Virtual reality hasn't actually been experienced by players in video games. Most of them also make use of popular mechanics from classic video games, with the exception of VR game makers. As a result, innovative video game mechanisms that make use of virtual reality might grab a lot of people's attention.You need to mix the innovative thinking of a video game designer with the technical nuanced expertise of a VR development business to build a successful VR video game. By immersing players in VR worlds and utilizing as many sensory systems as possible, future advancements in VR technology, such as improved movement flexibility, haptic feedback, and the capacity to taste and smell, may completely change the way that people interact with virtual reality.

2.2 Advantages and application of virtual reality video game technology

VR technology can simulate environment, perception and natural skills in video game design, and form 3D dynamic scenes on this basis, so that players can directly communicate with the environment and characters in the video game through interactive interfaces and VR wearable devices. For VR, there are several advantages in video game design.

2.2.1 Loyalty

The virtual technology in the video game can quickly record the information that the video game needs to transmit, bring the sense of immersion and reality to the player, and make the video game scene more realistic. The application of VR technology in video game design can make players and characters in the video game, the scene contact each other. Given the physical nature of VR, the gaming experience will be more varied and personalized. For example, when the player enters the video game environment, there is a shaking high bridge in front of the player, the player will have the feeling of climbing, which enhances the sense of realism and fidelity of the video game [9].

2.2.2 High interactivity

Application devices for virtual reality video games include hardware headsets and video gamepads [10]. According to the virtual scene displayed in the hardware helmet, users can use the video gamepad to simulate the relevant operations of running characters in the scene, which can improve the interaction between users and the machine. Compared with traditional video game design, video game design under VR technology will have more sense of space and manipulation, so that players can feel more fun in the video game [11].

2.2.3 Playability and fairness

video game design based on virtual reality technology is more playable, fair and entertaining. Entertainment is the core of the video game itself, playability and interactivity are the key factors to attract players' interest, and fairness is the indicator to sustain the development of the video game. Digital video games are entertaining and easy to play in The Times.

2.2.4 An immersive experience

In contrast to traditional video game design, virtual reality video games have lost the concept of spatial graphics. The current approach to VR video games is the HUD design, which presents the information the player needs to know during the experiment in a packaged form. In this way, the video game player will have a sense of immersion. Through the realistic effect of the scene, the user can get the same feeling as the real environment.

3 Discussion

In some aspects, it has promoted the research of VR technology, some of which have made breakthroughs to a certain extent, some progress is not obvious, and some are hidden by more urgent problems, which reflects the activity of VR technology field. At the same time, due to

the shortcomings of other technologies, VR technology and other applications such as video games have the following problems:

3.1 Input and interaction of VR headset display

The existing VR head-mounted display can not see the experiencers themselves, which is inconvenient to input and lacks the interaction mechanism with the scene, so the immersive perception is limited. Therefore, the mechanism of VR mouse and other convenient and friendly VR input methods that can faithfully represent the body of the experient in real time and interact with the virtual scene object in real time is a problem that needs to be studied.

3.2 Head-mounted display for spatial computing and AR virtual reality fusion and outdoor visualization.

The spatial calculation of virtual scene with head-mounted display, including real-time accurate tracking and positioning of the experiencers' heads and positions, as well as the position calculation and real-time performance of virtual objects in real space in AR head-mounted display, need to be further studied.

Related to this, virtual-real fusion is one of the basic problems of AR, including the fusion of graphic objects and video images in video AR display, and the fusion of graphic objects and real scenes in optical perspective AR display [12]. The former has been studied for a long time, while the latter has gradually become the mainstream in this direction with the practical application of optical AR head-mounted display, and many problems remain to be solved. At the same time, the outdoorization of optical perspective AR, including the fusion of virtual-real in large outdoor scenes, is a direction to be explored.

3.3 VR based on mobile terminals and Internet

VR based on mobile terminals and the Internet has great development potential. For the former, VR technology with low computing and low storage, VR technology with cloud computing, low latency big data transmission and new interaction are the innovative technology directions. The latter requires full-screen 3D rendering, VR device access and more appropriate human-computer interaction mechanisms, as well as new browser standards. Web VR will revolutionize and disrupt existing browsers and email systems, becoming a new entry point to the Internet.

3.4 More representations of physical features and new physical models

Kinematics and dynamics are currently the key areas of attention in research on physical representation and physical model of virtual things. Only a few number of physics models exist, including the particle system, the spring model, the SPH (smoothed particle hydrodynamics) technique, etc. Physical events including explosions and cutting, as well as real-time accurate performance of physical features and interaction reactions of material objects like soft, viscous, plastic, flow, gas, and field, pose numerous theoretical challenges. Due to the extensive physical model calculation, it is important to balance fidelity with real-time performance in some applications [12].

4 Conclusion

This paper's primary goal is to examine how VR technology is used in everyday life. It is evident that, despite the fact that VR technology is still lagging behind in terms of practical application, video games and VR technology work really well together. This essay utilizes video games as an illustration of how VR technology might be used in situations where it is still technically feasible. This study offers several insightful research questions on VR technology that can inspire the vast majority of scholars. I'll keep researching these issues in the interim.

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