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Research on the current situation and development prospects of VR games

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Abstract. Virtual reality technology is used to display some objects in life through electronic informationization on an electronic screen. It can perform a spatial interactive experience through VR glasses, which can greatly improve the display effect of design sketches. Through the retrieval and inspection of related literature, this article proposes the latest and future development of VR games in the current society. First of all, this article wants to explain what VR is and then discuss the current achievements of VR and future expectations in the market. This article also wants to continue to let people know what areas VR can use in other fields other than the field of the game. This article finds that ordinary people have no reason to buy VR devices, so the current VR game's success in the current market is not as good as previous expectations. However, as more and more technology industries have begun to join the VR industry, the future of the VR game industry will expand.

Keywords: virtual reality development, virtual reality devices, VR games, virtual reality business achievements.

1. Introduction

With the continuous development of the economy and society, various electronic products have been invented. These inventions have more or less changed people's entertainment life. For example, the emergence of television has enabled people to have a new way of entertainment, which is television programs. The emergence of computers has brought electronic games to the world. The emergence of mobile phones has brought mobile games that occupy people's fragmented time. The birth of VR devices has also brought a different way of entertainment to the world[1]. VR device is a virtual reality technology that allows users to immerse themselves in the virtual world. With the continuous development of VR technology, VR devices have become an integral part of people's lives. However, the current household holdings of VR devices must catch up to the expected results. According to the latest data, the current global household holdings of VR devices account for only about 1% of the total population. This figure is far below expectations, indicating that there is still a long way to go regarding the popularity of VR devices. However, the future is still promising. With the continuous development of VR technology, VR devices will become more popular and cheaper. Ultimately, VR devices will become an integral part of people's lives. For example, in education, VR technology can help students better understand the knowledge points; in the medical area, VR technology can help doctors better perform surgery, etc. In short, although the current home holdings of VR devices are not up to the

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expected results, the future is still promising. Shortly, VR devices will become an integral part of people's lives. This article wants to explore the latest and future development of VR games in the current society. First of all, this article wants to explain what VR is and then discuss the current achievements of VR in the market and future expectations. This article also wants to continue to let people know what areas VR can use in other fields other than the field of the game.

2. Development of VR devices

The full name of the VR device is virtual reality headset. From the name, we can understand Virtual Reality, also known as VR, Lingjing, etc. From an application point of view, it is the latest technology in the computer field that integrates various technologies such as machine graphics technology, multimedia technology, human-computer interaction technology, stereoscopic display technology, and simulation technology. It creates a virtual environment for users in an imitative way and makes users feel immersed in the virtual environment through visual, auditory, and tactile perception behaviors. Users interact with the virtual environment to cause real-time changes in the virtual environment. Now content related to virtual reality has expanded to many aspects related to it, such as Artificial Reality, Telepresence, Virtual Environment, Cyberspace and so on[1].

The history of VR devices can be traced back to the early 20th, century when people began to use electronics to achieve the effect of virtual reality. In 1962, American cinematographer Morton Heilig developed the first multi-perception simulation experience system, Sensorama Simulator, which was the first VR video system. It has perceptual functions such as images, sounds, vibrations, wind, and smells, but it is a non-interactive system.

In 1968, Ivan Sutherland used two cathode ray tubes (CRTs) that could be worn on the eyes to develop the first helmet-mounted display (HMD). He also published a paper entitled "A Head-Mounted 3D Display", which discussed in depth the design requirements and construction principles of helmet-type three-dimensional display devices and drew the design prototype of this device. This became a seminal achievement in three-dimensional stereoscopic display technology. Today, 30 years later, HMD still uses CRT with the same configuration. It's just that today's CRT is much lighter than in 1968.

In 1970, Ivan Sutherland continued to develop helmet-mounted displays (HMDs) at the University of Utah. The first HMD prototype was finally developed but was very heavy. The first virtual object was a cube and was programmed by Daniel Vickers, a student of Ivan Sutherland at the University of Utah.

In 1972, Nolan Bushnell developed the first interactive electronic game called Pong, which allowed players to manipulate a bouncing ping-pong ball on a TV screen. Since interactivity is a key aspect of virtual reality technology, the development of this interactive game is of great significance.

In 1975, Myron Krueger proposed the idea of Artificial Reality and demonstrated a conceptual environment called Videoplace [2].

Although the sales volume of VR devices has been increasing every year, it has not reached a satisfactory growth rate. Although the sales volume of VR devices reached 15.73 million units in 2022, the growth rate has been declining since 2020. This indicates that VR devices are not a necessity in people's real lives in today's society[3].

In addition, VR devices are a field that requires a large investment and has a high degree of difficulty. This also makes current VR devices very expensive. The price of a set of VR equipment is as follows: Low-end version: VR all-in-one machine 3000 yuan + computer configuration 5000 yuan = 8000 yuan. Mid-range version: PCVR 5000 yuan + tracker 3000 yuan + computer configuration 7000 yuan = 15000 yuan. High-end version: PCVR 10000 yuan + tracker 3000 yuan + computer configuration 7000 yuan = 20000 yuan. The full set of VR equipment includes: VR host, display screen, VR helmet, handle, other hardware equipment related to experience projects, plus basic game software. Full-body tracking in VR is used to track body movements and integrate real-world objects into the virtual world. A complete set of full-body tracking VR must be equipped with a computer, PCVR, tracker, and sufficient space. Generally speaking, a VR helmet with an area of 4 – 9 square meters is more reasonable and comfortable. HTC's positioning technology can be expanded to cover up to 10* 10 = 100 square meters. If it is a VR

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all-in-one machine, there is no space constraint. The general safety range is 4–9 square meters. If it goes beyond the safety range, the VR all-in-one machine will return to the real environment reminder [4]. The high price and limited play space make the threshold for using VR devices particularly high. Despite the continuous development of the economy and society, people's economies continue to grow. But most people still don't consider using VR devices.

3. VR games

The VR device can be involved in the field of games, which cannot be ignored. VR device practitioners in the field of games have a very broad distribution.

From the above picture, we can see that the VR market in the gaming industry is far ahead. In the gaming industry, the number of VR games and user groups is almost the sum of all other games. Therefore, when it comes to VR devices, we cannot avoid talking about VR games. The definition of VR games is to create a virtual space using a computer and allow us to interact with the virtual space. The advantage of VR devices is that they are more immersive than traditional electronic games.

Players can adjust the perspective in the game through VR helmets, use wearable devices to run or walk to synchronize control of characters in the game, and perform all operations such as aiming and shooting like real combat. Based on VR technology, FPS presents players with a more three-dimensional virtual picture, a tense and exciting rhythm atmosphere and a real sense of participation.

AVG games can use VR technology and eerie and mysterious background music to create a gloomy and terrifying scene atmosphere. Players pull the plot development by completing phased tasks and get a real emotional experience.

The integration of RCG games and VR technology will break through the constraints of flat picture quality and allow players to truly feel the speed.

Players can present pictures through VR technology and create an atmosphere, and enhance character immersion through simple and convenient operations. RPG-type games have a strong demand for character immersion. Players can integrate into the plot story to play one of the roles and feel the game world.

The integration of action games and VR technology will improve players' immersion in terms of picture effects, atmosphere creation, and operation experience. The VR-based action game allows players to freely manipulate characters, thereby truly experiencing the sense of hitting in the game[5].

3.1. VR equipment problems

Most of the VR headsets currently on the market interact with each other through handles, and the interactive content is simple and not in line with people's natural habits. There are fewer devices that can track hand and body position, which also reduces the authenticity and interactivity of the virtual experience.

VR headsets may cause dizziness, discomfort, heat and other reactions during use, affecting the health of users. Moreover, since VR headgear isolates the user from the outside world, it may also lead to accidents or attacks on the user in the virtual environment.

The problem of comfort is that VR headsets are still heavy, uncomfortable to wear and have insufficient battery life, which makes users feel inconvenienced and uncomfortable in the process of using them. Moreover, as the resolution, refresh rate, field of view and other parameters of VR headset devices still need to be improved, which also affects the visual experience of users1.

The VR headset currently relies mainly on vision and hearing to simulate the virtual world, while the simulation of other senses such as touch, smell and taste is relatively lacking. There are also very few devices on the market that can provide real feedback, such as thrust resistance, which is far from enough for real simulation[6].

3.2. Expectations for VR in previous years and the status of VR devices

The VR market at home and abroad is in the primary development stage and began to emerge in 2015. Driven by capital and lower prices of equipment, VR devices are popular among young groups. 2015

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China VR market size of 1.48 billion yuan; industry companies are mostly startups or Internet companies; VR technology is seen to have great potential; the market size is expected to reach 58.95 billion yuan in 2020.According to IDC forecasts, the global VR market size is about $14.67 billion in 2021 and will reach $74.73 billion in 2026, with China's market growth rate ranking first in the world and will exceed $13 billion in 2026.

The development of the VR market has benefited from technological advances and the expansion of applications. In terms of technology, VR headset devices are constantly being upgraded, improving the user experience and comfort. In terms of applications, VR has been widely used not only in games and entertainment, but has also gradually ventured into new areas such as healthcare, education, and manufacturing, providing new solutions for various industries.

In short, the VR market is a dynamic and promising market, and more technological breakthroughs and application scenarios will emerge in the future to bring users a more immersive and realistic experience[7].

VR technology is currently affected by factors such as hardware technology, content physicality, and market demand and is still limited to research and application in certain industry sectors. With the progress of science and technology, the improvement and innovation of VR equipment, the development of content ecological construction, and the change of user perception, VR technology can mature in certain professional industry fields and the mass consumer market in subsequent development[8].

4. Application of VR devices in other fields

We learned above that VR devices are not only involved in the gaming industry but also in the medical, engineering, and education industries.

4.1. Application of VR devices in the medical industry

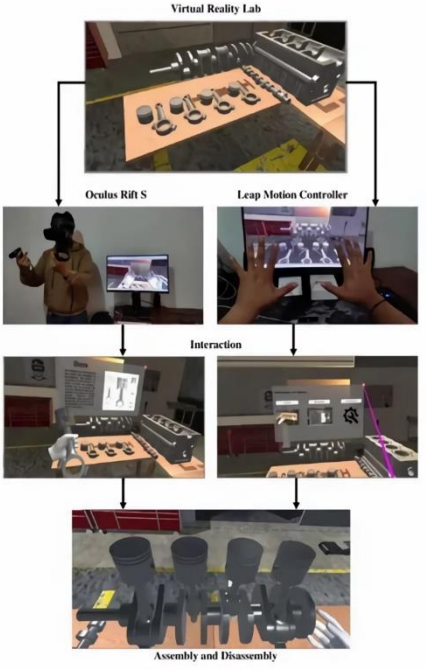

Figure 1. A four-stroke engine in the main scene.

Currently, among the world's leading VR medical companies, the United States has the most representative companies; at the same time, countries such as Switzerland, Israel, and the United Kingdom also have outstanding players in the VR medical field. It is worth noting that the current main direction of foreign VR medical companies is pain management, surgical teaching, and treatment of mental or psychological disorders[9].

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However, there are several reasons why a large-scale VR medical industry has not yet formed in the medical industry.

The clinical efficacy and safety threshold of VR medical treatment are relatively high: Unlike entertainment projects such as VR games, VR medical treatment requires talents who understand both the corresponding medical industry and VR to perfectly combine VR and medical treatment to play a substantive role.

Difficulties in landing VR medical products: As a traditional industry, some doctors with qualifications in the system have relatively conservative ideas and low acceptance of new technologies. In addition, VR medical products also need to prove themselves useful enough to be accepted by the traditional medical industry.

Motion sickness makes it difficult for VR technology to enter for a long time: However, psychological treatment often requires a long time. If motion sickness cannot be resolved, the effect of VR technology in psychological treatment will be greatly reduced[9].

4.2. The use of VR in engineering

In this section, we present the virtual reality lab developed for engineering students training. When the application starts, it displays the workbench containing all the parts of a four-stroke engine in the main scene as shown in Figure 1. [10].

Here, students can interact with each part, analyze its operation and determine its correct position within the engine. As we mentioned earlier, this interaction can be a fully immersive experience using Oculus Rift S or a partially immersive experience using the Leap Motion Controller™. A test consisting of six different projects was designed and applied to 20 students who evaluated the main components of assembling a four-stroke engine using a virtual laboratory with Oculus Rift S and Leap Motion Controller™. However, interestingly, the participating students were divided into three groups: students with no prior knowledge of four-stroke internal combustion engine operation (either practical or theoretical), students with prior theoretical knowledge, and students with knowledge of four-stroke internal combustion engine operation. Previous research as an automotive systems technician[9].

4.3. Application of VR devices in the education industry

The application of virtual reality technology in the teaching of network and new media courses can help students better understand and master the course content. Through virtual reality technology, students can feel the course content more intuitively, so that they can better understand and master the knowledge. At the same time, virtual reality technology can also help teachers teach better and improve the teaching effect. For example, through virtual reality technology, teachers can combine text, sound, dynamic pictures, and short videos to build a virtual teaching situation for students that helps them use their imagination. In this way, it can not only improve students' interest and motivation in learning but also their learning effect.

In addition, virtual reality technology can help further reduce the difficulty of network and new media teaching, especially for some more abstract imagery or compositions, which can achieve more ideal teaching effects. At the same time, the core technology of virtual reality is introduced into the school's industry-education integration, and the "VR production" virtual simulation interactive teaching covering network new media majors is established to cultivate more high-quality talents to meet the higher social demand and create a new integrated teaching mode.[10]

5. Conclusion

Although the VR gaming industry is not that much of a commercial success in the market right now, people are excited about the future of VR, which everyone can look forward to. As the VR field continues to expand, more and more companies are now entering the VR sector. This paper believes the future of VR gaming will be better and better. There are some shortcomings in this thesis, and the predictions for the future are not always accurate. It would be more accurate if we could find more data

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about the VR game market. In the future, we will focus more on the user stickiness of the VR game market and how often users play games on VR devices during the week.

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