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Research on the application of VR in education and gaming

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Abstract. VR in virtual reality technology is a new technology applied in the field of education and gaming in recent years. This article describes the current development of VR in the field of education and games, and demonstrates the diversity of VR technology applications to promote a better understanding of VR technology. First of all, starting with education, this paper expounds that virtual reality education is designed based on educational and teaching objectives. we introduce the performance of virtual reality technology in the field of education. This section describes the important role of virtual reality technology in the field of medical education and classroom education. The challenges in the field of education were discussed. Then it expounds the practical exploration of VR in games and the value of VR in game development. Finally, we analyse some advantages and characteristics of VR games. The article concludes with a summary and outlook for the full text.

Keywords: VR, education, game, application, advantage.

1. Introduction

Virtual reality is a computer technology that creates a simulated environment through computer-generated simulation, allowing users to interact with the virtual world and experience a sense of presence. The development of VR technology has exceeded several decades, but with the continuous improvement of computer hardware and software technology, VR technology is ushering in a new peak, and its application scope is becoming more and more extensive [1]. At present, VR applications have covered many fields, including games, education, medicine, entertainment, tourism, architectural design and so on. In the gaming field, VR has become one of the technologies that game developers are competing to develop. Players can enter the game world and interact with the game environment through head-mounted displays and hand-held controllers. In the field of education, VR technology can provide a new teaching mode, allowing students to learn history, geography, biology and other subject knowledge through virtual scenes. In the medical field, VR technology can be used to train doctors' skills and provide pain management. At the same time, some studies have shown that VR can help patients relieve anxiety and fear.

The value of studying VR in education and gaming lies in the following areas, improving student learning, enhancing the educational experience and allowing students to experience learning in a virtual

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environment that is more vivid and interesting than traditional teaching methods. It also promotes the innovative development of the VR game industry, so that more people can understand and love VR games and experience a more novel form of entertainment. This article explains the current state of VR development in the education sector as well as in the gaming sector, showing the diversity of applications of VR technology in order to promote a greater understanding of VR technology.

2. The application of virtual reality in education

Virtual reality technology is not a new technology, and its application in the field of education is not uncommon (Figure 1). The birth of virtual reality technology was precisely due to the needs of education, as the US Air Force developed a system in 1966 to simulate flight training for pilots, which is the predecessor of virtual reality technology [2]. Today, about 60 years later, virtual reality technology is widely used in education in fields such as medicine, sociology, and nursing due to its excellent simulation capabilities. It can be said that if we want to talk about virtual reality technology, we cannot avoid discussing its various applications in education.

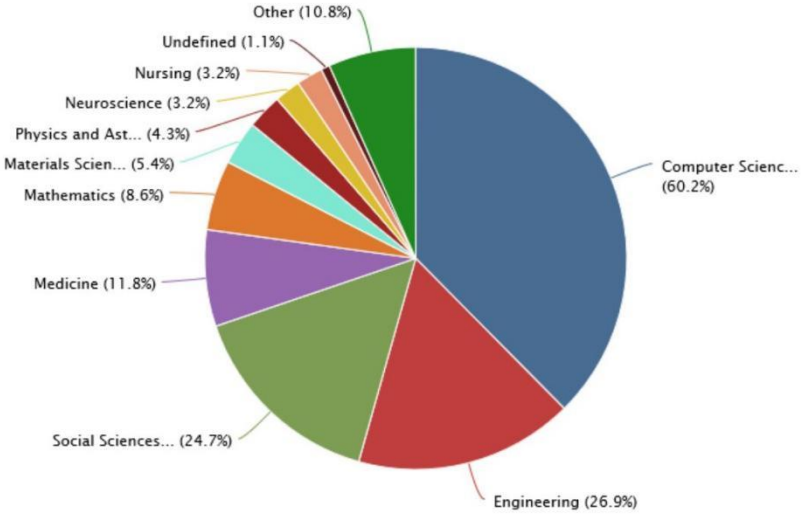

Figure 1. Immersive virtual reality education.

2.1. The application of virtual reality technology in medical education.

Medical education is a complex and demanding field that requires extensive training and experience to ensure that healthcare professionals are fully prepared to meet the needs of their patients. This training involves a combination of classroom instruction, hands-on experience, and clinical practice, with a strong emphasis on developing critical thinking skills and the ability to make sound clinical decisions in real-world situations. However, traditional medical education has faced a number of challenges in recent years, including a shortage of experienced instructors, limited opportunities for hands-on experience, and a lack of access to cutting-edge technologies and resources. In response to these challenges, many medical schools and healthcare organizations have turned to immersive technologies such as VR to enhance their medical education programs and provide students and healthcare professionals with more realistic and effective training experiences.

However, if we combine virtual reality with medical education, none of these will be an issue. Virtual reality technology is widely used in medical education, such as creating virtual spaces to provide students with education in healthcare and nursing (Figure 2) [1]. In another way, learners can simulate patients by wearing VR headsets, haptic feedback devices, and other interactive tools to diagnose, treat, and manage computer-simulated patients in virtual scenarios [2].

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Figure 2. Surgical treatment of cerebral aneurysms using VR technology.

Previous research has shown that incorporating virtual reality technology into medical education can indeed help students improve their professional skills. For example, under similar conditions, students who received virtual surgery training showed better performance in surgical skills, surgical time, operational accuracy, and overall surgical performance compared to students who received traditional surgery training [3].

Simulation-based medical education has gained wide recognition as it provides students with safe, efficient, low-cost, and low-risk clinical training experiences, which can enhance their skills and confidence.

2.2. The application of virtual reality technology in classroom education.

In traditional distance learning, teachers and students often face the problem of lack of interaction, and the impact of this problem cannot be ignored. Many students can only learn effectively through interaction with teachers, because interpersonal communication is an important part of effective learning for most people; without it, the learning process can be negatively affected. Another negative consequence of the lack of communication between teachers and students is that it is difficult for teachers to know the extent to which students have mastered the knowledge, which can significantly increase the failure rate of courses.

However, through virtual reality technology, students are able to connect to a virtual classroom that simulates real-life classroom situations in real-time. When the teacher speaks in the virtual classroom, their voice is transmitted through the network to the virtual classroom (Figure 3). At the same time, the teacher's image appears in the classroom as a model, and through synthesized movements, facial expressions, and gestures, the teacher is able to effectively convey their points in remote teaching. Similarly, students can also use similar technology to express their own views. This effectively solves the problem of lack of interaction in remote classrooms [4].

Figure 3. Virtual reality enters the classroom.

The use of VR technology in the classroom offers many potential benefits, including increased student engagement, improved learning outcomes, and the ability to provide immersive, hands-on learning experiences. One example of VR application in classroom education is the use of immersive virtual environments to teach science subjects such as biology, chemistry, and physics. Students can explore complex 3D models of cells, molecules, and physics phenomena in a more engaging and interactive way than traditional textbook learning. VR simulations can also provide students with hands-

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on experiences that are difficult or impossible to replicate in real-life, such as conducting experiments in microgravity environments or exploring the interior of a nuclear reactor.

2.3. Challenges in the application of virtual reality technology

Virtual reality technology indeed can provide students with immersive learning experiences, but its applications also need to comply with ethical and legal standards in the real world. Educators and researchers need to work closely with policy makers to prevent potential issues. Another challenge is the cost associated with VR hardware and software, which can be a significant barrier for schools and universities with limited budgets [5]. Additionally, there are concerns about the potential negative effects of prolonged VR use on students' health, such as eye strain, motion sickness, and disorientation. Despite the many challenges currently facing VR education, it has indeed brought us many benefits, and we hope to gradually overcome these challenges in the future.

3. VR games and the state of development

VR games are applications based on virtual reality, which not only create a virtual environment of equal scale, but also provide a high degree of realism with the surrounding sound effects, bringing users a higher level of service experience. In 2016, the system of VR games has been relatively complete, and the VR games launched in the market are loved by many people, so this year is also known as the "first year of VR" [5]. According to a report by market research firm Omdia, the global VR content market is expected to reach $3.1 billion in revenue by 2022, with VR games accounting for about 89% of that revenue. In addition, a study published by market research firm Transparency Market Research predicts that the virtual reality (VR) gaming market will exceed $86.22 billion by 2031. The study also suggests that the compound annual growth rate (CAGR) will be 32.3% between 2022 and 2031 [6]. Thus, it can be seen that recent years have been a period of high growth for VR games, and VR games are popping up in mainstream games, gradually being accepted and loved by the public, the market value of VR games continues to increase.

3.1. VR casual entertainment games

VR games have a powerful effect in terms of entertainment and relaxation. By wearing a virtual reality device, players can enter a 360 degree panoramic virtual world. With visual and auditory augmentation, this virtual world will appear very realistic and highly interactive, allowing players to perform various operations through control devices such as joysticks and with physical movements.

The potential in terms of VR gaming has been widely explored through the continuous development of VR technology and support from gaming manufacturers, so let's take a look at some examples of VR games in the entertainment and relaxation category [7]. The first game to be introduced is called "Rhythm Lightsaber", As shown in Figure 4. in which the player's handle turns into two lightsabres, blue and red, and the player needs to slash the corresponding coloured squares through the rhythm of the music, matching the movements in his hands, while needing to turn sideways and crouch down to avoid obstacles and gain points. Rhythm Lightsaber is an iconic VR game that is a good representation of VR devices, allowing players to relax to upbeat music while exercising physical coordination and reaction time [8].

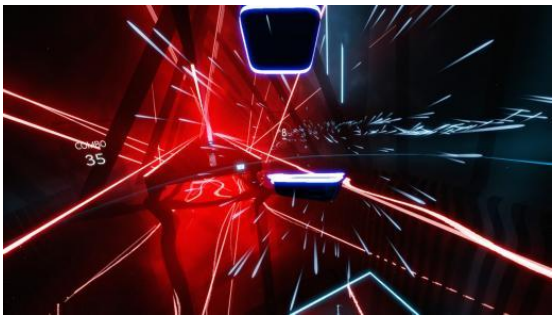

Figure 4. Rhythm Lightsaber.

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In addition to this, there are games that will leave players feeling thrilled and bloodied. These are represented by the shooter genre, which usually has intense gun battles that can be highly concentrated and bring a sense of pleasure as well as a sense of achievement when the enemy is defeated and with the release of dopamine in the brain [9]. So the next game to be presented is a classic shooter, called "Sam the Hero VR" and is available in both single player and two player co-op modes. As shown in Figure 5. In the game, the player takes on the role of Sam Stone and explores a variety of scenarios, facing countless monsters from different times and spaces and killing them in turn with the weapons at their disposal. After each level, there is a wide range of weapon skills and other enhancements for the player to choose from. The highlight of this game is the immersive nature of the combat and adventure, with a wide range of weapons and skills to choose from.

As a steady stream of enemies rushes towards the player, the sense of pressure will be very strong with the panoramic screen and tense background music. When successfully shot, the enemies will burst into blood, while the blood will splash on the screen, leaving a trail of blood, realistic and exciting, with a strong sense of immersion. The descriptions of the two VR games above show that VR games can be both thrilling and immersive and relaxing. When you want to experience something exciting, playing VR games would be a good choice.

Figure 5. Sam the Hero VR.

3.2. Advantages, features of VR games over traditional games

VR games have more features than traditional games, partly based on features that most VR games will have, and partly about the games themselves, which will also have their own features compared to traditional games in terms of narrative, for example. Among the features that most VR games have are the following.

(1) Immersive experience: VR games put players in the middle of a virtual gaming world by putting them in the middle of it themselves. This immersive experience is more realistic and vivid than traditional gaming.

(2) Interactivity: While traditional games usually require the use of peripherals such as a gamepad or mouse and keyboard for control, VR games allow for more natural and intuitive interaction through the player's body movements and gestures.

(3) Emotional experiences: VR games can create more realistic and intense emotional experiences such as fear, excitement and surprise that traditional games cannot match.

(4) High degree of freedom: VR games can offer a higher degree of freedom, allowing players to move and interact freely in a 360 degree panoramic view of the game.

In addition, in terms of the narrative of virtual reality games, the narrative approach is another leap forward in game narrative. The traditional cinematic narrative logic is no longer applicable to VR games, and the narrative approach of virtual reality games must be conveyed to the player through more interactive actions and metaphors. Virtual reality games also require a more specific visual design, with applications such as scene scheduling and screen composition that are very different from cinematic narrative games. The narrative unit of a virtual reality game is the 'scene', not the 'shot'. The presentation of panoramic shots removes the notion of 'frame composition' from traditional video [10].

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4. Conclusion

This article discusses the current development of VR in the field of education and games, analyses the diversity of VR technology applications, and promotes a better understanding of VR technology. Specifically, this article describes the performance of virtual reality in the field of education. The application and important role of virtual reality technology in medical education and subject education are discussed. And then discusses its challenges in the field of education. Then, it expounds the current application of VR in games, explores the application of VR in games from practical examples, and explores the value of VR in game development. Finally, we analyse some advantages and characteristics of VR games.

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