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Analysis of the Advantages and Disadvantages of Virtual Reality Technology in Gaming

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Abstract: Virtual reality has an exciting future in gaming. With the ability to fully immerse players in unique and engaging virtual worlds, VR technology offers a new level of gameplay and interactivity. As the technology continues to improve and becomes more accessible, it is likely to become an increasingly popular way to experience games. The related research has analyzed the using of VR technology in different fields and the advantage of the technology, but the research that analyze the advantages and disadvantages is rare. This article analyzes the advantage and disadvantage of the VR technology in the gaming field by comparing the VR to the PC and console. It focuses on the differences between VR games and PC games, as well as the related advantages and characteristics. At last, the article expect that the VR technology will have a great development and will tackle the disadvantages.

Keywords: VR, games, advantages, disadvantages

1. Introduction

Virtual reality technology, which is also called VR technology, is a technique that use related technology to create a virtual environment [1]. The virtual environment is same to the reality and the user can have immersive interaction with the environment. And VR technology has 3 features: real-time, real space, real interaction [2]. The technology is a new field based on Computer graphics and many other computer science [3]. The user can get a 3D interface that the user can observe and interact with the virtual world [4]. To make the virtual world more realistic, multiple technologies are engaged, such as 3D image, motion sensing, motion capture and so on. With the related technologies such as 3D image, internet and other technologies developing rapidly, the VR technology began being used in the gaming field. In 2020, there are 1.7million people use steam VR for the first time, and there are 104 million times that users use PC VR, and each of these sessions lasts about 32 minutes in average [4]. The total duration has a raise about 30% in compare of the total duration of users use steam VR in 2019 [5]. Since there are more and more user use VR, the research of the use of VR technology is necessary. It may help the viewer to have a clear view of VR technology.

Although there have been many researches about the using of VR technology in gaming field, these researches are not comprehensive enough. Researches analyze the using of VR technology in gaming field, and does not showing the existing disadvantages. This article will compare the advantages and disadvantages of the VR technology in gaming field to have a further view of VR technology.

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2. The Advantage of VR in Games

2.1. More Immersive

The VR games has better immersion than most pc and console games. VR technology can show content or interact in a higher dimension. The VR headset uses two screen work together, enabling user take part and involved in the virtual world with a better performance of distance and space, which is much more similar to the real world than the screen of the PC and console. PC and console cannot provide such a realistic sense of distance and space.

In most conditions, first-person view can provide a better immersion than third-person or top-down, so most games that needs a better immersion will use first-person view. But the movement of the view still needs user to move the mouse or joystick. And the movement of the mouse and the joystick is made by fingers, while in VR games, the movement of the vision is captured by the sensors in the VR headset. And in PC and console games, the action of the character is designed previously, while in VR it is not. In VR these actions are captured by the controller and headset. For example, in the first-person shooting games, when player needs to shoot at something, they need to move their mouse or joystick to turn the center of their view to the target, which is hard for the beginner to aim and shoot with a high accuracy (Figure 1). But in VR games, the player can aim with their arm point at the target, which is more similar to the real life, and is easier to be accurate. So does the other actions in the games like melee and turning the head. The movement can be done by the instinct and captured by controller or other devices, without thinking how to do it. Obviously, the movement capturing by the sensors in controller and headsets makes the VR games more immersive than PC and console games.

Figure 1: VR first person shooting games [6].

And the VR will also block external light sources, preventing the user to be distracted by other things. While there is something out of the screen that can pull the player's attention away from the game, which will reduce the immersion of the game. When touching something or smelling something, the PC and console game cannot provide feedback of touching or the smelling, But VR can. There has already been a device that can provide the user the feeling of touching something, and the feeling of smelling [7,8]. And in some games the character needs to run. To have a better immersion, VR gimbal treadmill can be attached to the computer, player can run like the character and feel tired as well. Obviously, these devices provide extra feeling than vision only, and enable VR has a better sensory immersion. So, VR can have a better immersion and provide more feeling than PC and VR games.

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2.2. Better Interactivities

The VR games enable people to have much more choice of how to interact with the items around than the PC and console games.

Players can interact with the items more freely than PC and console games. For example, in games in PC and console, when player needs to interact with an item, they need to get close and press a key to interact and how the character interact with the item is designed by the designer. But in VR games, player can get close and use the controller to grab the item, and with the using of physics engine, player can do more freely with the item. Although the item that can interact with is also designed, but how to use it is free to the player. The players can have much more freedom in using the item with the movement captured and the physics engine used to calculate the effect of collision of the items.

So, VR technology can provide the players a better interactivity than pc and console, which will provide players a better gaming experience.

3. The Disadvantages of VR in Games

3.1. VR Is More Expensive Than PC and Console

The hardware is the first thing to consider. VR glasses is the most common VR controller now. There are two kinds of VR glasses. First kind is All-in-one. The All-in-one has a gaming computer inside the glasses and it doesn't need to connect to computer. But limited to the volume and cooling problem, a laptop with better performance, and larger storage. The other kind of googles don't has a computer inside, so it has to connect to computer to enjoy the games. For example, in China, a cheapest VR glasses that can play VR games is pico4, with a snapdragon xr2 gen 1. According to related documents, the chip's performance should be close to the Snapdragon 865 5G Mobile Platform, which has already had chips with higher performance. For another kind VR glasses, user have to connect to their computer to enjoy VR games, which is an extra budget for many people who just want to enjoy the game. If the user needs a better experience, extra devices is necessary, for example VR gimbal treadmill and mo-cap suit, which is more expensive.

So, playing games on VR is more expensive in just to enjoy and have a better enjoyment.

3.2. VR Needs More Spaces

The other thing that must be taken into consideration is the space. When user using VR, they may walk, swing their hands or doing some more intense movement. To prevent getting hurt or damaging a furniture, a space without any barricade should be provided. And for some better VR sets like valve index, two sensor needs to put to the celling to capture users' movement, and enable the controller work normally, to achieve that, a spare space is a necessary thing, but it may cause inconvenient like moving the chair or other furniture. But it may be a problem for those who cannot afford a bigger apartment. Although there are games have designed to be able to play on chair, but there still should be space for arms. So, for most people, VR needs a large spare space that is hard to get to most people.

3.3. VR Make Players Uncomfortable

For the user, there are 5 main factors that influence the experience of VR headset: the layout of the scene, how smoothly the animation runs, details of the models, moving freely, and the venue comfort [9].

To achieve the performance of 3d, the VR headset has two screen work at same time, so there is a high demand to the resolution and refresh rate of the screen, the performance of CPU and a memory with faster read and write speeds. Most of the VR headset has a problem in refresh rate, which cause

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interval time between the two frames of the content displaying in the headset is more noticeable, and spoil the experience of the games. What is more serious is the synchronization with head movements. Some VR headset cannot make the image synchronize with the movement of head, which causes sickness, which called Virtual reality sickness.

Those who suffer from Virtual reality sickness mainly feel dizzy because people keep balance by vision, proprioception and vestibular apparatus of the inner ear [9]. But when playing VR, the movement of the body may not match the movement of character's vision in VR world [9]. In this condition, the 3 organs will deliver feelings that doesn't match to the brain, and the brain will misjudge the condition of body, which causes dizzy [10]. Compared to PC and console games, the screen cannot fill the whole sight, so the decorations on the desk may correct the vision and reduce the dizzy.

So, the VR games may cause people sick when playing for a long time. Although the failure of synchronization with head movement isn't the only reason of the virtual reality sickness, but it is a reason that is most easy to be noticed. The VR sickness also provides an explanation of why players on VR uses steam VR for only 32minutes in average, while players in pc can enjoy a much longer session since the PC games can have less feeling of dizzy that players can enjoy the games better [4].

Despite the excitement of using VR technology, it may also cause discomfort for users. This discomfort could arise from various issues, such as heavy glasses, hard cushioning, or difficult-to-wear devices. However, it is important to highlight the potential impact on mental health. VR technology's use in the gaming industry creates a highly immersive virtual world that may lead some young people to become addicted. As the virtual world is isolated, gamers addicted to it may be cut off from others and experience a sense of loneliness. If addiction persists over an extended period, mental health problems may ensue.

4. Expectation

As these technologies used in VR headset has improved to reduce the cost, the VR headset will become cheaper and cheaper, while the performance will be better. The extra devices will also be cheaper and easier to use, which will provide a better experience of VR games.

With the VR headset can synchronize with the movement of the head better, and the related feeling can be simulated, more players can enjoy VR for a longer time. With much more technology are invented, the controller and the VR headset can capture the face and the movement of fingers, making the character in the virtual world having the same movement and facial expression as the user in reality [11]. And as more technology being used in VR, the author believed that the second world which used to exists in sci-fi novel will come true.

5. Conclusion

This article delves into the advantages and disadvantages of employing VR technology in gaming. In recent years, VR technology has made remarkable advancements and garnered significant attention across a wide range of industries, including gaming. As we look to the future, VR is poised to revolutionize the gaming industry by providing players with more immersive, interactive, and realistic experiences. One of the most significant advantages of VR technology is the ability to create an entirely immersive environment that transports players into a virtual world, allowing them to feel as if they're physically inside the game's setting. Another significant benefit of VR gaming is increased interactivity. With the use of motion tracking devices, VR allows players to interact with their virtual environment in ways that are both intuitive and natural. This interactivity creates a deeper level of engagement and enhances the overall experience for the player.

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Despite the many advantages of VR technology for gaming, there are still some challenges to overcome. One of the most significant drawbacks is the associated costs. The price of VR headsets and other necessary hardware can be prohibitive, which restricts access to the technology for many gamers. Additionally, VR requires a relatively large amount of space to allow for proper movement and interaction, which may not be feasible for all players. Another concern is the potential for physical and mental discomfort, such as VR sickness or discomfort from wearing the headset and associated devices for extended periods. However, as the technology continues to evolve, vendors are continually working on solutions to address these issues, and VR is becoming more and more user-friendly.

In conclusion, the future of gaming with VR technology looks incredibly bright. As vendors address the challenges and costs associated with the technology, VR has the potential to revolutionize the gaming industry and offer players an entirely new level of immersion, interactivity, and realism. While there is still work to be done, the potential of VR in gaming is vast, and it is exciting to imagine the possibilities for the future.

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