

# Future Interactions with Virtual Reality Technology (VR)

-- How Virtual Reality Technology Will Impact Our Future

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**Abstract:** Every major milestone in the history of science, technology and interaction design has stemmed from the collision of technology and human nature (Katona, 2021). From the original paper tape punching, it has evolved to keyboard input, and now to touch operation, voice control, voice recognition, and advanced gesture recognition, motion capture, eye recognition technologies, and so on. In the future, brain-computer interfaces and mind recognition will also be implemented. Each technological innovation and product upgrade will bring about changes in the way human-machine interaction takes place. In terms of development trends and general trends, the core and most important thing is to be human-centred, to conform to the natural movements of the human body and the laws of the body, and to allow people to access information in the most comfortable way. Virtual reality is a new revolution in the way people interact with each other, and the field of VR is still in the development stage. This essay focuses on virtual reality technology, with a focus on how virtual reality technology and human interaction will look like in the near future. The paper is divided into seven sections: introduction, definition and current status of virtual reality technology, analysis of how virtual reality interacts with people and future development, analysis of the future application and interaction of virtual reality technology in multiple fields, advantages of future virtual reality technology, possible problems and solutions of future virtual reality technology and summary.

**Keywords:** Virtual reality technology, Interaction design, Future design.

## 1. Introduction

In the past, it was almost impossible to visit Prime Minister Tony Blair's House at 10 Downing Street, and even when one did, one could only observe from a distance outside the heavily guarded Prime Minister's House; tours were not allowed (Kim, 2022). It was probably not easy to visit the Prime Minister's Office in person if one was not a VIP, but nowadays, this wish is largely possible. The UK government has launched the Downing Street Offices virtual website, which shows a virtual space in the office environment of the British Prime Minister, Mr Tony Blair, and allows users to

enjoy this immersive tour of the Downing Street offices without leaving home via the internet. During the tour, a virtual guide takes users through each room of the Downing Street office, including portraits of successive prime ministers hanging on the walls; they can also see how the colour of the bricks at 10 Downing Street gradually change from yellow to black; and they will even notice that the signage at 10 Downing Street is tilted slightly to the right, just as it is in reality. This could not have been done without an important piece of technology - virtual reality. In addition to the British government's sense of openness, virtual reality is an important technical implementation behind it.



Figure 1-2. The application of VR technology in life (source: <https://ccm.net/gaming/games/4173-the-best-vr-games-of-2020/>)

## 2. Definition and Current Status of Virtual Reality technology (VR)

As a cutting-edge technology that has emerged in recent years, virtual reality technology integrates the latest scientific research results of various technologies such as computer graphics processing technology, image simulation technology,

artificial intelligence, sensing technology, and capture technology, and is an information simulation system automatically generated by an intelligent computer (Katona, 2021). Virtual reality is the use of intelligent computer technology to construct a virtual reality that allows the user to have the same experience and feel as reality (Rogers, 2022). Virtual reality technology usually uses a series of new

interactive devices such as head-mounted displays, smart grips, and wearable devices to create a computer software and hardware environment to experience or perceive the virtual world. The new interactive devices allow the user to send commands to the computer through body language (e.g. body movement and natural human language) and receive real-time feedback from the virtual environment to the user's auditory, visual, tactile and olfactory senses (Rogers, 2022). In the film *Top Gun* by director Spielberg, the male protagonist is able to immerse himself in a colourful virtual game world, *Oasis*, by wearing head-mounted smart VR glasses, which are generated by a variety of technologies such as computer algorithms, modelling and image simulation techniques. It is a digital environment that simulates the real world in a variety of ways to simulate the human senses of sight, hearing and touch (Kim, 2022).

Essentially, virtual reality technology is an advanced human-computer interaction system that requires interaction in a natural way and with multiple channels of information simultaneously (Katona, 2021). The more natural it is, the more mature virtual reality technology becomes. Virtual reality technology, like many other modern communication technologies, has gradually penetrated into various fields such as medicine, education, culture, entertainment, military and science, and has received great social attention and enthusiasm as a result, while many experts and research scholars have not yet explored its basic theories and information technology very clearly. In the future, virtual reality technology will develop even faster and further, penetrating widely into all areas of society and having an impact on the way humans will live and produce in the future.

### **3. Virtual Reality (VR) Interactions Analysis and Future Development**

In the present and future, virtual reality technology has to some extent changed the way people interact with each other, and the way human production and life is undergoing a big change (Galvan, 2017). Virtual reality will, to some extent, disrupt the original scientific development and technological status quo, thus extending the scope of scientific and technological development to a three-dimensional dimension above the two-dimensional one (Kyriakou, 2017). For example, while in the past, information interaction or social activities (sending messages, making phone calls) on electronic products or mobile devices usually involved tapping or swiping on the screen with one's fingers, virtual reality breaks through the limitations of this flat interaction, freeing one's hands and eyes from the screen and breaking through the traditional input and information interaction methods of keyboard and mouse, as well as the physical 2D display screen. It breaks through the traditional input and information interaction methods of keyboard and mouse, as well as the physical size limitation of 2D display screens, and realises natural interaction and panoramic presentation in digital form. At the same time, virtual reality technology further breaks the limits of space and time, allowing the experimenter to transport not only their senses to the past or the future, but also their physical counterpart's digital twin to travel freely in the past or the future (Lou, 2021).

There isn't a single method of interaction for VR (Virtual Reality), as there are various ways to interact in various situations. Because VR is multidimensional, its interactions naturally take on a richer form than simple two-dimensional

graphics interactions. There are now a number of ways to interact with a user in a multidimensional VR environment. The first is motion capture, which is essential for users to have an even more realistic experience and to actually "enter" the virtual environment (Wulff, 2021). Motion capture technology interacts with the user by providing input based on the user's natural body language and responding to it in real time. Additionally, full-body motion capture is not always necessary; one issue with it is that there is no feedback and it is challenging for the user to feel that their actions are effective, which is a significant pain point in interface design. Haptic feedback, which mostly consists of buttons and vibration feedback, is the second type. It is also the technology behind the grips for virtual reality. The smart grip applies haptic feedback to the virtual reality grip by receiving data when a user presses a button and providing feedback in real time via vibrations. Although it cannot be adapted to a wider range of applications, the advantage of this simplified interface device is that it can be used quite pleasantly in applications like gaming. Eye-tracking technology is the third. Because it tracks the position of the user's eyes, provides the best 3D viewing experience for the current viewpoint, and reduces latency, eye tracking is one of the most crucial VR technologies and has been dubbed the "heart of VR" by Oculus founder Palmer Larch. This can significantly improve the user's experience and playability (Hindmarsh, 2006). Eye tracking technology can simultaneously determine the depth of field of the point of view position on a virtual item because it is able to identify the actual point of gaze of the human eye (Katona, 2021). Therefore, eye tracking technology is seen by the majority of VR experts as a significant technological advance in resolving the vertigo issue with virtual reality headsets (Katona, 2021). Gesture tracking is the fourth kind of interaction. It is possible to employ gesture tracking as an interface in one of two ways: optical tracking or by wearing a data glove with a sensor on the hand. The low entry barrier, the adaptability of the scenario, and the absence of the requirement for the user to put the gadget on and take it off their hands are all benefits of optical tracking. In the future, it will be extremely possible to integrate optical hand tracking directly onto a built-in mobile VR headset as a form of interaction for mobile scenarios, however the field of view will be constrained (Krepki, 2007). Data gloves have the advantage of not having a constrained field of view and can have feedback mechanisms (such as buttons, vibrations, or touch) fully integrated into the device (Lou, 2021). Data gloves typically have inertial sensors integrated into the glove to track the movement of the user's fingers and in some cases the entire arm. Voice interaction is the sixth kind of interaction. Due to the user's propensity to ignore the text and visual cues in the centre of the screen and instead glance around to continue exploring and learning, it is simple to become overwhelmed by the amount of information available in virtual reality (VR). The easiest way to achieve this is through voice, as it does not obstruct their ability to see the world around them. Voice is ubiquitous, therefore using it to communicate in the VR world is more natural because the user doesn't need to move their head or body to find the other person. Real sites are the sixth category of interaction. This is a realistic, free-moving location that resembles the virtual world's walls, blocks, and borders. The "highest powerful virtual reality facility on earth," according to Chinese media (LI, 2019).

Virtual reality is a new revolution in the way people interact,

from two to three dimensions, from flat interfaces to three-dimensional spaces. The future of technology will focus on the delicate emotional experience, the medium of interaction to achieve goals, the efficiency of problem solving and the creation of scenarios where interaction takes place. The five human senses are sight, sound, touch, smell and taste, and the most effective way to enhance the memory of an experience is to combine all five senses (Krepki, 2007). Seeing and hearing information has become the norm and the most common way of experiencing, while more realistic perception of information is the objective demand for upgrading the user experience, and a full sensory experience can better create an "immersive" experience. The future of lifestyle and design will be a full-sensory (multisensory) experience. In the future, multi-channel interaction mode will be the mainstream interaction form in the VR era. At present, the input mode of VR interaction is not yet unified, and various interactive devices on the market still have their own shortcomings.

#### 4. Future Applications of Virtual Reality (VR) in Multiple Fields and Interactions Analysis--Take Tourism, Gaming (Film and TV) and Education/Medicine as Examples

Virtual reality technology has been evolving for some time

now, with Jaron Lanier, founder of VPL Research, defining the concept of virtual reality and developing the first VR glasses and gloves back in the 1980s (Lanier, 2019). Nearly 40 years later, the technology gradually began to drift into the mainstream, becoming easily accessible and usable by the general public (LI, 2019). Many people have experienced virtual reality or see it in their everyday lives on a regular basis. Whether it is in theme parks, VR experiences or VR games in arcades. The gaming experience has nearly entirely transformed as a result of VR, which is well renowned for revolutionising the entertainment and gaming industries. With virtual reality (VR), players can become totally immersed in their own gaming universe, which significantly strengthens the bond between the player and the game. Not just in gaming and entertainment, but also in travel, healthcare, retail, and education, where it is being introduced for better results and more cost savings, such as helping people with anxiety to relax or students to gain a deeper understanding of knowledge (Cvetkovi, 2021). VR is changing a variety of industries, not just gaming and entertainment. In the next 20 years, VR technology will develop even further, penetrating into a wide range of sectors and industries, changing the future of human life and interaction even more dramatically, bringing more convenience and efficiency to humans. In this paper, we will focus on the changes in the way of interaction that virtual reality technology will bring to these industries in the future, using the tourism, education and entertainment industries as examples.



Figure 3. VR painting

(source: <https://sapizon.com/blog/usefulness-of-virtual-reality-vr-during-the-covid-19-pandemic/>)



Figure 4. VR in the medical field

##### 4.1. Future applications of virtual reality technology in tourism

With the rapid spread of virtual reality technology, people are expected to enjoy an alternative form of tourism that is extremely cheap, fast and free from any constraints of time and space (Lanier, 2019). Virtual travel is even a perfect alternative for those who are in poor health or even have a disability.

Virtual tourism may sound a bit sci-fi, but many tech companies and travel industry players are actually working to make it a reality. One such company is Jaunt VR, which offers virtual reality video filming and processing services as its main business. And one of their big ambitions is to use virtual reality to transform tourism, or at least give people an alternative way to travel (Jaunt, 2017). Thomas Cook Group, a UK-based tour guide company, has been experimenting with virtual reality content to engage potential tourists since 2014. When visitors arrive at one of the 10 shops in the chain, selected by Thomas Cook and located in the UK, Germany or Belgium, they can put on Samsung's Gear VR headset and

then experience the local scenery before deciding to place an order: walking through the blue curtain on the cloisters of the Santorini Hotel or flying a helicopter over Manhattan overlooking the land.



Figure 5. VR Tourism

(source: <https://digitalmediawire.com/2017/03/30/advr-unveils-ar-and-vr-discovery-marketing-platform/>)

## 4.2. The future of virtual reality technology in the education sector

Virtual reality is certain to bring another technological impact and reform wave to education with its realistic 3D effects and the immersive, interactive, and immersive experience it delivers (Hudson, 2019). Thomas Furness, the inventor of virtual reality, said: "VR alters society, starting with education" (Cvetkovi, 2021). VR has ushered in a new paradigm of teaching and learning in the history of human education and training. Through the use of virtual reality technology, objects will be accurately represented in three dimensions, allowing learners to engage with them

organically and directly. Additionally, it gives the student the most freedom to manage and influence the environment by allowing them to participate in the development of events in many ways. These multidimensional information-presenting virtual learning and training environments will offer the most natural and efficient means for students to pick up new knowledge and skills (Cvetkovi, 2021). Numerous areas of education and training, including virtual laboratories, three-dimensional concepts, ecological teaching, special education, simulation experiments, training in professional sectors, and other applications, benefit greatly from its features and advantages.



Figure 6. VR teaching activities

(source: <https://digitalmediawire.com/2017/03/30/advr-unveils-ar-and-vr-discovery-marketing-platform/>)

## 4.3. Future applications of virtual reality technology in the entertainment industry

The characteristics of the entertainment industry determine the inevitable advantages of interactivity and immersion. The realistic interactivity of virtual reality provides the entertainment industry with a new and unprecedented way of experience. Virtual reality technology turns users from spectators to participants in content such as games and movies. Already, many well-known gaming brands are applying VR devices, while some pure VR-based games are

gradually coming out (Galvan, 2017), and it is believed that the use of VR technology in the entertainment industry will become more and more widespread and in-depth in the near future. Movies can be viewed on VR glasses, driven by virtual reality technology. With the improvement of virtual reality technology and network transmission technology,

VR has enhanced the technical support for both online and offline entertainment services, optimising the experience of services such as games, live streaming and movies, and enhancing audience participation and immersion experience.



Figure 7-8. VR physical games

(source: <https://digitalmediawire.com/2017/03/30/advr-unveils-ar-and-vr-discovery-marketing-platform/>)

Virtual reality cinema has transformed the viewer from a passive viewer to one who 'participates in' the plot of the film, who can change the content and ending according to their wishes and emotions, and who is the character and can interact with the characters of the film content and their viewers, resulting in a new immersive experience (Galvan, 2017). In the future of VR cinema, screen size is no longer limited. Virtual reality turns a limited screen into a 360°

panorama without dead ends, enhancing the viewer's subjective and realistic vision. The future VR+ movie has the following advantages: a strong sense of integration of the immersive viewing effect, the choice of viewing content varies from person to person, the viewing time and location can be changed at will, and the fun of the interactive viewing experience is substantially increased.

In addition, the future of virtual reality technology in the shopping industry will also cause huge changes. Online

shopping has grown at a phenomenal rate over the last decade (Katona, 2021) and people are already accustomed to shopping from the comfort of their own homes. One of the current drawbacks of online shopping is the tendency to buy things that don't fit or don't meet expectations. Virtual reality can largely eliminate this. It is expected that by 2040, shopping malls will be replaced by the ability to try on clothes in virtual reality dressing rooms (Peukert, 2019), where consumers will not only be able to see how clothes should fit and whether they fit them, but will also be able to get advice from artificially intelligent shop assistants. In the near future, people will have their own virtual shopping assistant (Peukert, 2019).



**Figure 9.** VR Shopping

(source: <https://digitalmediawire.com/2017/03/30/advr-unveils-ar-and-vr-discovery-marketing-platform/>)

## 5. Advantages of Future Virtual Reality Technology in Education (Virtual Reality Education)

In years past, 'virtual reality' was still a science fiction concept in the minds of many, but today we can easily see that VR has touched many areas and changed the way many industries operate. Virtual reality is growing at a faster rate and is making huge strides, with statistics stating that the total number of virtual reality devices is expected to reach 13.5 million by the end of 2023 (Katona, 2021). According to UN research findings: VR is changing our daily activities as well as many important industries (Galvan, 2017). Virtual reality technology brings better experiences and more convenient production methods to all industries in the future, and this paper takes the education sector as an example, where the introduction of VR technology into education and the popularisation of virtual reality education is a trend in society (Katona, 2021).

The main advantages of the future of virtual reality education are the following: firstly, excellent visualisation. VR is an excellent technological tool in education because it allows users to explore a variety of things very effectively. Users can easily cope with a variety of scenarios and are enhanced by enhanced visuals, which according to scientific studies, a person remembers visuals far better than written text (Cvetković, 2021). Second, engaging learning styles. The use of virtual reality in education makes the classroom more active for students and enables teachers to bring life into the curriculum and make the content more vivid. Thirdly, it removes a degree of risk and safety concerns. We all know that medical students need to practise medical procedures without harming patients, and firefighters and military personnel need to learn how to react in dangerous situations without putting lives at risk. Virtual reality experiences can therefore provide the technology and facilities to support their

learning. VR technology can create extreme environments that allow users to learn without real and serious consequences. Fourth, providing promising results. vr technology can not only benefit students studying in school, but can also make a huge difference in the field of research. vr is already making inroads in research, especially in the fields of medicine and engineering (Akar, 2016). Some universities have set up a virtual reality lab in their health sciences library. Fifth, it is helpful for special students. For students and trainers with special abilities, VR may be a great help. Many powerful tools, such as myopic VR augmentation aids, can help visually impaired students by controlling contrast, text size and adding audio commentary where necessary. In addition, some VR products allow users to communicate seamlessly in a virtual environment using sign language (Cvetković, 2021). VR technology can bring great benefits to the education sector, but some possible problems and limitations cannot be ruled out.

## 6. Possible Problems and Limitations of VR In the Future and Solutions

In the previous section we have mentioned the definition of virtual reality technology, the future of interaction, the future applications in multiple fields and the benefits it can bring, but there are two sides to everything and virtual reality technology has certain problems and limitations. In this section, the limitations of virtual reality technology and possible solutions are explored. The first is the limitation of the development of hardware technology for virtual reality displays. The main parameters of head-mounted displays include field of view resolution and refresh rate. The maximum horizontal field of view that can be provided at this stage is about 110 degrees (Kim, 2022), which is still a far cry from the true perspective of the human eye. Secondly, the constraints of interaction devices. The slow development of posture tracking devices has also limited the popularity of virtual reality technology. At present, not many virtual reality devices can be experienced that can perform hand position tracking, and most of the virtual reality devices are interacted with through handles, and the interactive content is relatively simple (Rogers, 2022), mainly some can provide weak vibration feedback game handles, which is far from enough for realistic simulation. There are even fewer virtual experiences that can track body position, which greatly reduces the realism and interactivity of the virtual experience. Third, software and content constraints. Virtual reality content is being produced at a much slower rate than hardware development (Rogers, 2022), essentially because 3D models need to be created by humans, and with the current less-than-balanced investment and return, content development is very slow and homogenised, leaving the problems of vertigo discomfort and screen tearing to be resolved. Fourth, the limitations of the application environment. Virtual reality is also limited by the space in public places, home environment and office environment, building virtual reality requires a certain size of space and high cost, which makes it very difficult for ordinary home and office users to build a professional virtual reality system at present.

## 7. Conclusion

Human society is about to enter a new phase of media development based on virtual worlds, and the recent hot "metaverse" is not just a concept, but a new world we are

about to enter. With such a trend, VR+ has become a necessary path for the future development of multiple fields. This article focuses on the future interaction between humans and virtual reality technology, discussing what virtual reality technology is, the current development of virtual reality technology, the future interaction methods of virtual reality technology, the future application of virtual reality technology in multiple fields, the pros and cons of virtual reality technology, the limitations and solutions. When we put on the helmet and enter the virtual world, what we see is not a real world. Such a virtual world will cause the disappearance of real existence and our subject perception becomes digital perception, so that it is extremely easy for us to take the digital senses as the real ones, and then gradually lose our body perception. It is clear that only by further improving our understanding and mastery of VR technology will human society be able to properly grasp the development and direction of VR and allow virtual reality technology to be better utilised for the creation of a better world in the future.

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