

Project3: Virtual and Augmented Realities: Shaping the Societal Fabric

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1. Introduction

Virtual reality (VR) and augmented reality (AR) have become popular contemporary technologies. These technologies enable humans to connect to the digital world. By clicking the digital and physical worlds, people can introduce or change information, expanding the possibilities for creativity and interaction. Artists can combine their digital works with physical spaces, gamers can bring gaming worlds from their computer screens into physical environments, and physical workplaces can provide more information quickly. There are many definitions of VR, but they all have one thing in common: interaction in an electronically simulated environment with the help of instruments.

There are three main types of VR display devices: spatial projection, head-mounted (HMD), and handheld. The most common VR display device is the HMD, as it immerses the user in the environment.

However, as a variant of VR, AR allows users to see the natural world and superimpose virtual objects onto the real world. In contrast, VR does not let users see the real world but instead projects a virtual environment in front of the user. This means that AR complements the natural environment rather than completely replacing it. Therefore, AR is a middle ground between a wholly virtual and an authentic environment. Augmented objects should coexist with the natural environment, and users should be able to interact with these objects through calibration and programming tools, similar to virtual objects in virtual reality environments. In this case, the contrast between VR and AR and their impact on people's lives have received more and more attention and importance.

2. Impact on Social Interaction

Virtual Reality (VR) and Augmented Reality (AR) technologies increasingly influence our lives and behavioral habits. The application of VR in the retail industry is particularly significant; for example, consumers can try out products in a virtual environment. In addition, in medical training, VR effectively improves doctors' technical level and decision-making ability by simulating surgical scenarios. In the entertainment field, VR has also triggered changes, such as through virtual concerts and other forms, changing the way of music and theater performances.

Meanwhile, the applications of AR are equally diverse. In architectural design, AR technology supports designers in modifying and optimizing their designs in real-time, effectively improving work efficiency. In medical surgery, AR can provide critical information to help doctors improve the accuracy of surgery. AR dramatically enriches the learning experience in education by making complex concepts more intuitive and understandable through augmented reality content. In addition, AR has shown its unique value in the arts and entertainment fields, such as museums utilizing AR technology to enhance the exhibition experience and bring a more vivid and interactive experience to the audience.

In addition, VR and AR technologies are profoundly changing how we interact socially. VR provides a new immersive social experience, e.g., through platforms such as VRChat, users can communicate and interact with each other in virtual space in the form of 3D avatars, breaking the limitations of physical space. However, this immersive experience may also cause users to become overly dependent on the virtual world, thus neglecting real-life relationships. At the same time, AR can enhance our perception of the natural world, thus facilitating shared experiences, such as adding interactivity and layers of information when visiting historical sites and deepening connections between users. However, AR also has the

potential to create social isolation, especially if users become overly immersed in the augmented digital world. As such, VR and AR have potential and challenges in facilitating social interaction. How they are used and integrated into everyday life will determine the ultimate impact of these technologies on social interactions.

3. Challenges and constraints for VR and AR

While VR and AR technologies show great potential in several areas, they still need to overcome several challenges and limitations in practical applications. These technologies' complexity and high cost limit their widespread adoption and create increased demands on developers and those investing in them. Challenges in user interface design affect the user experience and the popularity of the technology, and only a tiny percentage of people may choose and use it. In addition, these technologies may face performance limitations in advanced applications. Privacy and data security issues are becoming increasingly prominent, and effective measures to protect user information are also a direction to consider in an era where information security is constantly emphasized. Then, there are health issues, such as eye fatigue and motion sickness, which are also concerns when using VR and AR devices for long periods. Finally, user acceptance and adaptation to new technologies is another critical factor in achieving technology penetration.

4. Convergence of VR and AR in Future Societal Developments

There are many directions and questions about the future of VR and AR.

Technology Convergence:

The convergence of AR and VR technologies is gradually diluting the boundaries between the physical and digital worlds, giving rise to a new type of mixed reality (MR) experience. This experience combines the respective strengths of AR and VR, opening up new opportunities for immersive narratives, interactive product visualization, and

collaborative work spaces. The emergence of MR marks a new era in which the two technologies are working in tandem to provide users with a richer and more diverse interactive experience.

Future Development:

As technology advances, AR and VR are rapidly integrating into our daily lives and becoming key technologies for people to access the next generation of the Internet - the metaverse. In the commercial field, the applications of AR and VR are expanding to cover a wide range of aspects, such as maintenance, design, and training, showing great development potential and application prospects.

Technical Challenges and Opportunities:

While AR and VR technologies continue to evolve, they also bring new challenges to high-speed communications and computing, placing unprecedented demands on optical engineering. Fortunately, innovative technologies such as holographic visual elements (HOEs) and lithography equipment are solving these challenges. The application of these advanced technologies not only helps to overcome existing limitations but also opens up new possibilities for future AR and VR technologies, giving them even more significant potential for delivering higher performance and better user experiences.

5. Conclusion

This article takes an in-depth look at how virtual reality (VR) and augmented reality (AR) technologies are shaping the fabric of society. VR and AR, as contemporary popular technologies, VR and AR allow us to connect with the digital world in unprecedented ways and by combining the digital and physical worlds. This has profoundly impacted many fields, such as art, entertainment, and medicine.

We also explore the technical challenges and ethical issues faced by VR and AR in

practical applications and how society accepts and adapts them. Finally, we foresee the integration trend of these technologies in future social development.

To sum up, VR and AR technologies are crucial in shaping the future social structure, providing unlimited opportunities and bringing new challenges. We must continue to explore the potential of these technologies while maintaining sight of their possible impact to ensure that they bring positive change to society.

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