Chapter 1

Introduction to Virtual and Augmented Reality

Virtual and augmented reality (VAR) is not a new concept, but over the past couple of years, these technologies have become more accessible to the public, and libraries are at the forefront of this access.

This report provides an overview of virtual and augmented reality and how it can be used effectively in libraries. This chapter focuses on the history of virtual and augmented reality and the current standing of these technologies. Chapter 2 discusses the use of virtual and augmented reality in libraries and how these technologies are being used to enhance patron learning. VAR technologies are becoming prevalent in many different types of libraries, though the uses differ depending on user base, and chapter 2 looks at these applications and the anticipated future of VAR within libraries.

Chapter 3 addresses software applications that can be used in the classroom or workshops in order to both teach virtual reality–themed lessons and to develop them. According to the ACRL *Framework*, information creation as a process is especially relevant when discussing virtual and augmented reality in libraries, and there will be a discussion of how libraries can help with the knowledge-creation process even with virtual applications.[1] Chapter 4 looks at user engagement and potential real-world applications of virtual and augmented reality. The final chapter delves into the future of virtual and augmented reality and how libraries are able to help shape that future.

History of Virtual Reality

Virtual reality is described as an experience that encompasses most of the senses, including sight, hearing, and touch, and represents an alternative to reality. The concept of virtual reality has made appearances in media going back almost a half century, usually shown as a futuristic plot device in books such as *Ender's Game* by Orson Scott Card, or films like *The Matrix*. Thanks to advances in technology, the fictional virtual reality is coming close to actual reality. While virtual reality has been used in the private sector for a while, it has just recently become available to the more general public through a variety of devices for home use that have been released onto the market.

The origins of the concept of virtual reality are debated, mostly because there is no definitive time line that determines what an attempt at virtual reality would look like. In fact, one of the reasons why pinpointing an origin is difficult is that those who were trying to create a virtual reality didn't have a cohesive term to use when describing their work. It wasn't until the 1980s that Jaron Lanier of VPL (visual programming lab) Research coined the term.[2] So though it did not have an established name until the mid-1980s, work was being done in this field far earlier.

Some people look at the panoramic paintings of the 1800s as the first attempt at virtual reality. By creating larger works that could be spread around a circular room, panoramic paintings allowed the viewer a more immersive experience than a flat scene. Although they lacked the complete sensory displacement that is associated with modern virtual reality, panoramic paintings gave viewers an experience that they would not have received by looking at a flat piece of art.

While these paintings could be thought of as the first steps toward virtual reality, other people believe that the development of photography brought us closer to the modern idea of virtual reality. Photography itself was created in order to capture reality,

which it did much more precisely than the aforementioned paintings. In fact, the idea of putting two photographs side by side with mirrors in an ocular device in order to trick the brain into seeing three dimensions is something that was developed in the 1830s by Charles Wheatstone and called a stereoscope.[3] His idea was then improved upon by William Gruber, who released the first View-Master and founded a company that still survives and adapts for virtual reality today.[4] View-Master was also the first company that used the idea of a virtual reality as virtual tourism, a concept that will be discussed more in chapter 3.

Virtual reality is not all rooted in visual simulation, however. With the invention and development of electronics, devices were able to become more sophisticated in the early twentieth century. The first flight simulator, a motion-based device, was created in 1929 by Edward Link and was used to train US military pilots in World War II.[5] Flight simulators have continued to improve upon this technology in the years since, with the military being on the forefront of virtual reality.

Moving more toward a physical and visual reality, Morton Heilig developed the Sensorama, which was supposed to be a new movie-watching experience.[6] A precursor to the 3-D films in modern cinemas, the Sensorama was a viewing cabinet where users would be immersed in the film by having most of their other senses cut off from the outside world. This was primarily achieved through blocking out light while the viewer was in the cabinet. Though it had limited applications, the Sensorama was a big step in developing true virtual reality. Expanding on the success of the Sensorama, Heilig also developed the first headset for virtual reality, called the Telesphere Mask, in the 1950s, although it was purely to show movies and had no motion tracking.[7] Shortly after Heilig's headset came out, a headset that did incorporate motion, called the Headsight, was released by the Philco Corporation.[8] It was intended to aid military operations by incorporating remote camera movement into the motion tracking of the headset.

More breakthroughs came through the research of renowned computer scientist Ivan Sutherland into virtual reality. He theorized that it was possible to develop an experience that would encompass all of the senses and attempted to create a device that would achieve this. His initial attempts were to create a head-mounted display that, unlike its predecessors, was attached to a computer rather than a camera. It used rudimentary computer graphics to project images through the headset. This proved to be a huge step in forming what would become the blueprint for modern virtual reality.[9]

This blueprint was utilized by many companies over the next fifteen years to continue developing this technology. VPL Research worked heavily in virtual reality haptics, developing a responsive glove, its own headset, and numerous other devices and accessories in the late 1980s and early 1990s.[10] It was at this point that gaming companies began to get involved with virtual reality. Both Sega and Nintendo developed headsets in the 1990s to sell as companions to their gaming consoles; however, neither made a large impact because of cost and technical difficulties.

The idea of fiction and media driving virtual reality technology is not a new one, and some of the early descriptions of virtual reality were in science fiction writings going back as early as the 1930s. Novels like *Ender's Game* and movies like *War Games* gave the public a greater understanding of the possibilities of virtual reality, but it wasn't until *The Matrix* arrived in theaters in 1999 that the true potential of virtual reality was recognized.[11] Since *The Matrix* increased public interest in virtual reality, developments have continued.

The Oculus Rift, which was released as a developer's kit in 2013, was considered the first true virtual reality headset to hit the consumer market.[12] Using movement tracking and enhanced graphics, the Oculus Rift was one of the first truly immersive experiences where users had most of their senses obscured. Although designed for gaming, it helped to pave the way for other virtual reality headsets that would be broadly available in the next couple of years.

Most of the current headsets available for consumer purchase are primarily geared toward the gaming community; however, these devices are being used more and more for educational purposes. Every day, applications covering a wide variety of disciplines are released, giving educators and librarians the tools to improve the experiences of their users.

History of Augmented Reality

Augmented reality is a crucial, but often overlooked, relative of virtual reality.[13] Instead of surrounding the senses of the user, it presents additional information to supplement or augment the real surroundings. This can take many forms, some of which we will discuss in chapter 3. Whether through apps, headsets, or QR codes, augmented reality is more prevalent in our everyday life than most users think.

Many of the advances made in augmented reality stem from the same foundations as virtual reality. People like Ivan Sutherland created the blueprints not only for virtual reality, but also for augmented reality. In the 1970s, Myron Krueger created what he termed an "artificial reality" called Videoplace that surrounded users with silhouettes.[14] It was done with early computer graphics, but the ideas exhibited went on to have a larger impact in creating modern augmented reality devices.

Like *virtual reality*, the term *augmented reality* was not coined until after significant technological steps had been made. The term itself was created by an airplane researcher named Tom Caddell in 1990.[15] Since then, also like virtual reality, many of the technological advancements were initially created to help the military, mostly to improve the virtual fulfillment of tasks.

Also like virtual reality, augmented reality reached the mainstream by becoming incorporated into entertainment venues. Many don't realize that when analysts draw on their screens during sporting events or when graphics are displayed live, it is a form of augmented reality. These technologies have been improved upon and are still in use today. Augmented reality can be achieved by putting a computer graphic overlay onto an image, which makes it easier to create than virtual reality and therefore more easily accessible. Because of this accessibility, developers have used the newest technologies to create paths to augmented reality. While there are augmented reality devices out there, such as the Microsoft HoloLens and the now defunct Google Glass, the most successful augmented reality has come through applications that are developed for smart devices. These applications can do anything from helping you to fix your car and learning about national parks to capturing Pokémon. Snapchat, in particular, uses high-quality filters that are created using augmented reality technology.

As augmented reality applications become more widespread, their impact on how users learn continues to increase. Libraries have the opportunity to supplement these applications and to educate our users on how to use them.

Conclusion

Virtual reality and augmented reality are important technologies that continue to evolve, grow, and integrate into the lives of library users. By understanding what each technology is and its history, we can work to improve the education and experiences of our users.

Notes

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