

This week I experienced applications that spanned across virtual reality (VR), augmented reality (AR), and mixed reality (MR). Each reality evoked similar feelings of excitement and joy, but in different ways. Furthermore, within each reality, it was easy to notice how different platforms and applications offered different experiences. Within VR, the demos consisted of various applications utilizing either Google Cardboard or the VIVE head mounted display. Within AR, I tried the mobile application Quiver. HoloLens is a MR Technology, with AR being the prime focus. Finally, I experienced several demos within the CAVE2 MR environment. It's also important to note that hardware played a key factor in the quality and level of immersion.

Google Cardboard and the VIVE are both head mounted displays (HMDs), but offer distinct experiences. In terms of hardware, Cardboard is on the lower end of the spectrum, being made out of, well, cardboard. The VIVE is on the higher end, being made out of premium materials and components. As you can probably tell, CardBoard is cheap and the VIVE is expensive. In addition, VIVE adds several levels of VR by providing a system with it's accessories. You get precise, 360-degree controller and headset tracking, and HD haptic feedback. Another aspect to consider is portability. The VIVE needs to be tethered to a computer with high end specs and a dedicated GPU, which adds to the cost. CardBoard houses your phone to utilize its display and runs the application tether free, making it highly portable. With all things considered, CardBoard is best applied towards education or anyone that is starting down the path of VR. The VIVE is for people wanting full immersion and precise mappings of realistic movement and actions in virtual worlds, and for running complex applications. Both are used to experience a virtual world.

Mobile AR applications like Quiver and the HoloLens share a similar relationship. Quiver utilizes your phone, which makes it affordable and very portable. HoloLens consists of special hardware, which makes it more expensive and less portable. A drastic difference between both platforms is that HoloLens contains a holographic HMD, which is perfect for solo experiences, and Quiver can be used with a small group of people sharing the experience. AR is powerful in that the technology superimposes a

computer-generated image on the user's view of the real world. Thus, AR is used to interact with the environment around you, as well as the virtual one being rendered. HoloLens takes this a step further by being hands-free with its self-contained HMD. With applications like Quiver, you have to hold the device in your hand, which provides different interaction techniques.

The CAVE2 is a lovely blend of AR and VR, creating many advantages. First, collaboration! With a space so big, many people can interact with each other simultaneously while experiencing the application. Groups can work together and collaborate efficiently to solve problems. Furthermore, the CAVE2 display monitors offer high resolutions, which is very important for big data, scientific visualizations. With 19 computers running the CAVE2, it can handle the most complex applications. There are disadvantages, however. The CAVE2 is not portable at all, living its life in one location, and it's extremely expensive. The CAVE2 is best applied towards education and research, but with the right people at the right time and right place, beautiful, creative, and artistic applications can be enjoyed as well to highlight the power of MR technology and the CAVE2.