Charles Zhang

305413659

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CS1 Final Essay: Virtual Reality

The two most interesting presentations for me were those on robotic space exploration and distributed systems. The robotic space exploration one intrigued me, as, coming into this program, I was interested in the study of artificial intelligence. I found it very interesting that we have developed the capability to control operations billions of miles away from Earth, and for us to be fully capable of extrapolating information from them (Alkalai). I also found that the type of information we do extract is much more valuable than I thought possible, as it never occurred to me that we were diving deeper and deeper into the origins of our own universe. To me, this presentation expanded my view on how computer science can be applied to the world. Knowing that it was capable of assisting in the retrieval of data that would be inaccessible otherwise definitely expanded the scope of its potential applications in my eyes. I had always imagined computer science as a tool that could be used to create new experiences and sort through massive amounts of data, but I always limited it to relatively smaller scale operations. This presentation showed me that computer science also has the potential to teach us just as much about our world as classic laboratory sciences like physics or chemistry.

I found the presentation on distributed systems interesting primarily because I had dealt with them before at a beginner level through high school programs. I had experienced how frustrating they could be, but never saw a payoff for dealing with them. This presentation really

showed me how much our current society's infrastructure relies on these structures, and how important it is for us to understand and improve on our current system. It's also very interesting to see how much computer science really permeates our daily lives through entertainment, Google, etc., and how such a small amount of the population is really aware of what is going on behind the scenes (Netravali). The visuals and examples really highlighted how ubiquitous computer science has become in the modern world, displaying connections not only from coast to coast, but continent to continent (Netravali). I was also fascinated by the scale of these systems because of the way it was presented. To me, it seems like a globally-scaled puzzle that people are scrambling to solve and rework, which adds a degree of fun to a subject that many people view as mundane.

I personally think one of the rising topics in computer science is virtual reality. Virtual reality was originally conceived for its potential in modeling conditions in space, military training, flight simulation, and a number of other practical applications (Thomas). Currently, after its first consumer release in the late 20th century, virtual reality software is primarily gaining traction in the world of entertainment and gaming. While these developments are definitely interesting and much more accessible to the public, the software's strict association with gaming is an association with distraction, not practicality. I think in the upcoming years, as virtual reality improves in its ability to represent and model real-life situations, its practical applications will once again rise to the surface.

One such application is in the world of neurological surgery. Through the use of virtual reality, neurosurgeons can practice their highly dangerous jobs in a risk free environment. This would allow for a higher success rate in operations and a higher potential to save lives (Robison).

There is currently existing virtual reality software for training purposes, however it is limited by multiple drawbacks. One of the largest issues is that existing software is only capable of modeling very specific tasks. As a result, training simulations are only able to provide a limited experience of operations, and are not equipped to give neurosurgeons adequate practice in training. Perhaps one of the most useful aspects of virtual reality training is the ability to discover and deal with rare situations that could create fatal obstacles during operations. However, due to the limited scope of current virtual reality software, this benefit is left largely unexploited (Robison).

In addition, due to a variety of factors, virtual reality software is also consistently working with a trade-off of realism and interactivity. This is mostly limited by current software's struggles in modeling a realistic environment while also tracking collisions and user input accurately (Robison). Despite these issues, virtual reality software is projected to be able to develop into a highly valuable resource for training and credentialing purposes in the future as virtual reality technology improves. With the trend in technological advances occurring at an exponential rate, with additional motivation coming from the potential to save lives, it is fairly safe to say that virtual reality could easily expand into the world of medicine.

Another potential application lies in the world of psychology. A common method for treating anxiety disorders and phobias is called exposure therapy, where the patient is slowly habituated towards the anxiety causing stimulus by being exposed to it in a regulated environment. However, patients with more serious anxiety disorders may be much more opposed to facing these stimuli, and doing so may come at a great cost to their mental health. For this

reason, the application of virtual reality software to exposure therapy has been experimented with numerous therapists since the 1990s (Gorini).

The use of virtual reality to take a patient through exposure therapy allows the therapist to maintain full control of the patient's experience by altering the model being presented. They can adjust the intensity of the experience, or even stop the process if the patient cannot handle it. It also allows therapists to monitor their patient's senses, tracking their responses and isolating what stimuli and conditions are causing the patient's anxiety (Gorini).

However, due to virtual reality being a relatively new program in treating anxiety, there are multiple aspects holding it back from being put into wider use. The long-term effects of virtual reality are still disputed, as reports of patients experiencing adverse effects after undergoing virtual reality simulations have occurred. In addition, creating and maintaining an appropriate system with technical support is still very expensive, and may not be fully advantageous to the patient from a cost-benefit analysis. Regardless, research has shown that exposure therapy through virtual reality is more effective than traditional methods, and, if costs can be driven down while the technology continues to improve, virtual reality could easily become a common option for treatment (Gorini).

While only a couple potential applications have been shown here, virtual reality has endless applications in our world. Ranging from military training to industry work, the ability to simulate situations without physical endangerment or limitations has countless benefits (Thomas). As virtual reality technology continues to improve, making simulations more real, refining user input, and driving down costs, it is very likely that we will see it used much more commonly. However, for now, virtual reality is still very much in an experimental phase as it is

locked behind technological limits and high price tags. Even still, it is encouraging to see potential benefits that may arise from its incorporation into more practical matters. Hopefully, this positive feedback will encourage the development of virtual reality technology moving forward, and help transition virtual reality back into a more practical tool in the public eye.

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