

VIRTUAL REALITY: AN ETHICAL GRAY AREA

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HELP A FRIEND OUT

As a recent graduate from the University of Pittsburgh's computer engineering department, I found a junior level software engineering position for ABC Technology Corporation where I work on research and development of virtual reality systems. I am fresh out of college, still in debt, but eager to put all that I learned in school to use. The company is currently in the running to secure Department of Defense (DoD) sponsored contract dealing with virtual reality training systems. With the hope of pulling more troops out of the conflict in the Middle East, the military wants to train the troops that are still in battle with the best equipment that they can get their hands on. Virtual reality offers a way for the DoD to train soldiers effectively even with a shrinking budget [1]. It also gives soldiers more opportunities to train, making them more effective in combat. The company can obtain the contract only if ABC produces the best immersion technology out of all of the contenders.

In my research department, I have been developing a cutting edge full body immersion suit that will revolutionize virtual training systems. The suit sends electric pulses through the skin to react with the user's nervous system giving more realistic sensations to the users. Virtual reality only works if a user is completely immersed in the environment. This immersion suit's preliminary testing proves that the user's immersion level is leaps and bounds ahead of any other technology on the market. Since immersion is the key aspect of virtual reality that needs to be improved, I am certain that my team's invention will win.

Word gets around to other contenders about ABC's recent success with their new technology. Out of the blue, a friend from college, John, sends me an email asking about the product I am working on. John is from a rival contender, Company X. Company X is massive in comparison to ABC and did not want to be beaten by such a small company. John works for their research and development department as well, so John offers me \$150,000 to provide him with the code and schematics for the ABC's design. John promises not to copy the product, just improve it. That means that it would be harder for anyone to find out I gave the information away. The \$150,000 dollars would be more than enough for me to pay off my school loans and have a very nice amount of spending money after. John and his company are willing to do this because he knows how important it would be for his company to secure a government contract. Currently, the United States spends over \$525 billion dollars every year just on the Department of Defense [2]. By claiming even a fraction of that total spending budget, Company X would have a promising source of income for years to come.

With the opportunity to escape all of my debt laying on the table, and a small chance of getting caught, I am stuck between a rock and a hard place.

This scenario has the obvious ethical issue where I encounter a bribe [3]. However, there is an underlying ethical issue with this technology that must also be discussed. Let's begin by looking at the technology.

WHAT IS VIRTUAL REALITY?

Virtual Reality Explained

Virtual reality (VR) is an up and coming technology that many different people have many different definitions for. Some believe it is simply a video game. Others believe it is any virtual world. But even with these differences, there are a few concrete aspects of virtual reality that everyone agrees upon. The best technical definition of VR is a computer generated, interactive, three-dimensional environment which a person is immersed. Group Captain Ajey Lele, research fellow with the Institute for Defense Studies and Analysis, put it more simply in his article "Virtual reality and its military utility" by saying, "...VR is an artificial environment created using information technology tools... and presented to the user in such a way that it appears and feels like any real environment" [4]. For virtual reality to work, it has to feel real. The users must feel completely immersed in the environment in order for them to believe they are in this alternate reality. To fully immerse the user, the virtual environment must take advantage of the user's senses.

Most commonly, the use of a head mounted display (HMD) and headphones are used to interact with the user. The HMD will track the positions of the eyes and detect the movement of the user's head. If the user turns his or her head to the left in the real world, his or her display will do the same thing in the virtual world by turning the camera by the same amount. When the camera mimics your movement, the illusion feels real. The user feels immersed and the user believes the virtual world to be real.

Other input devices like special gloves or full body suits, both of which are covered with sensors, allow for further realism by allowing other body movements to be tracked and then displayed in the virtual environment [5]. This style of virtual training is part of one of currently used systems known as Dismounted Soldier. This is the current virtual training system used by the Army. Dismounted Soldier is powered by the cutting-edge game engine, CryENGINE 3. With this game engine, simulations that are more realistic than ever before, can be created. It gives commanders the ability to change combat situations to anything they desire. Simulations can be during the day or night, in a blizzard or sand storm. Other

elements such as enemy patrols, snipers, and civilians can be added to the environment to create the most realistic training simulations possible. These images are displayed in HMDs, as shown below in Figure 1, that each soldier wears along with full combat gear. Along with the usual sensor gloves and helmets, users are also equipped with rifles covered in movement sensors.



FIGURE 1 [5]
“Head Mounted Display for Virtual Reality” [5].

They can track the accuracy of every shot each soldier takes. Possibly the biggest development that this system has over traditional ones is the use of an electronic mat. This ten foot by ten foot mat is used to track every step the soldier takes. It uses the collected data and translates it into movement within the system. The mat can pick up signals when the soldier stands up, crouches down, and jumps. When the user performs any of these actions, the picture inside the HMD shows, in the environment, exactly what would happen in real life. Instead of having a backpack full of bullets and supplies, they are filled with super computers that compile all of the sensory information together. The system’s compact nature makes the experience even better. Only 1600 square feet of space is required. Whether inside, outside, in Texas or in Iraq, the system can be used anywhere the mats and computers can be set up.

Another system in development is called the Immersive Training System. This system places soldiers inside a 12 foot diameter sphere. When the screens are turned on, the system displays a 360 degree programmed environment. The system uses sensors similar to those in the Dismounted Soldier system with the addition of one component. Cubic Defense Systems, creators of the Immersive Training System, invented what they call a “pain belt.” This pain belt uses data it receives from the computer system and tells the soldiers when they get shot by striking them with simulated pain. The belt can give a realistic pain that once again adds to the realism of the system. Another added component of realism that can be added to the dome environment takes advantage of the senses of smell and touch. Gases that simulate the smell of burnt gunpowder from spend shells, sewage from crowded streets, or smoke from a fire can be injected into the dome. At the same time, heat and

wind effects can be added to provide an even more immersive experience [6]. When all of the different inputs and programs work seamlessly together, they create an environment that the brain believes. Programmers can design infinitely many missions with adaptive environments that put soldiers to the test. A simulated combat situation can put your body through nearly the same stress as the real thing. The screens inside the goggles, combined with the headphones, combined with the realism of the computer generated environment creates a genuinely believable training experience for soldiers. These simulations allow soldiers to run convoy missions on IED infested roads, get ambushed in while on a steep mountain pass, or run patrols in areas mixed with civilians and enemies. The possibilities are endless and the dramatic and physical sensations felt while undergoing the missions only make the soldiers more experienced.

THE ENGINEERING CODE OF ETHICS

When faced with an ethical issue, there are many sources that an engineer can look at to decide what to do. A general set of guidelines that an engineer would follow has been laid out by the National Society of Professional Engineers (NSPE). The code of ethics that they list covers most situations that engineers would run into. Additionally, other codes of ethics could be consulted depending on which field of engineering you are involved in. Virtual reality would fall into the category of computer and electrical engineering. Thus, the Institute of Electrical and Electronics Engineers’ code of ethics could also be consulted. A classic example of an ethical dilemma includes the tragic case of the Challenger space shuttle. On January 28, 1986, NASA launched the Challenger even though there was a known design flaw regarding its rocket boosters. The space shuttle blew up moments after takeoff killing the entire crew. The engineering design teams tried to reason with their superiors, but the launch commenced anyway [7]. Given the NSPE code of ethics, “If engineers’ judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate” [8]. Had the engineers consulted an even higher authority, they may have been able to save the lives of the crew.

Virtual Reality Ethics

Realistically speaking, VR is a video game on steroids. It makes everything more realistic for the users in the environment being experienced. It is a fantastic way for people to learn and practice skills in areas such as health care, manufacturing, and language skills [9]. However, there is another fact to take into account. This technology has a military application as well. When it comes to the military, war is not a game. Real people get shot with real bullets and actually die. Military ethics are very controversial because

they deal with deciding who it is acceptable to kill, when it is acceptable to do so, and how it is acceptable to do it. Additionally, it deals with national defense where ethics are often ignored in order to ensure national security. The application of VR in this violent manner can be unethical because it of what it ultimately teaches.

ETHICAL PROBLEMS

As stated before, virtual reality allows you to create any scenario that you want using a simulated virtual environment. That means that anything we can imagine can be designed and experienced. While that can be helpful for general training purposes, military training entails much more than just learning a skill for a job. This is where virtual reality presents us with a few problems that cannot be overlooked.

Abusing the System

The first problem is that the system can be abused. Basic virtual reality systems are already available to the public. Additionally, the ability to create a realistic virtual environment is a skill many programmers have or can learn. Imagine a scenario similar to the one I already presented. Say a worker in the research and development lab for a VR company is bribed and sells a prototype military training system to an extremist group such as ISIS. With this new technology in their hands, they can better train their soldiers to kill more people and advance the effectiveness of terrorism. Since the environments are created by the computer, any type of situation can be made up and practiced. This could be anything from a shooting drill, to learning where to place IEDs to maximize their effectiveness, to an actual assassination attempt on a high value target. These are all possible situations that can be programmed and practiced if this powerful technology were to fall into the hands of the wrong groups.

There is another way that it can be abused. Also stated before, VR is a powerful video game. Something to take into account is how massive the video game industry is in not only America, but also throughout the world. The video game market brings in over \$10.5 billion every year [10]. The biggest market for these games is the youth of today. Games like Battlefield™ and Call of Duty™ are military-style shooters. These games are designed to reward players for killing the “enemy”. With the integration of virtual reality with these games, they will be more realistic than ever. In a Fox News report regarding recent mass shootings, news correspondent, Mike Jaccarino states that “some experts worry that as the games get more violent and more realistic, so does their power to blur the line between fantasy and reality in alienated gamers” [11]. Since young minds are so impressionable, this gives us reason to worry and leads us to the second big issue.

Numbing the Mind

For some time, violence in video games has been a cause for concern. Many psychiatric professionals believe that violent video games numb the minds of players. This is known as desensitization. In the virtual training simulations, the user is able to kill the “enemy” and never think twice about it. Once you hit restart, the “enemy” reappears as if nothing had happened. The “enemy” is a virtual person. It isn’t real. The user knows this, regardless of how immersive the system is. The problem this creates is that the user feels no compassion for who or what they kill. VR only enhances this experience by making it feel more real.

Time and time again, we see terrible news stories about disturbed veterans or troubled children that do something terrible. Virginia Tech, Sandy Hook, Columbine, and Fort Hood are all examples of tragedies that many people believe happened because video games had influenced the shooters and desensitized them enough into thinking that what they were doing wasn’t real. Though it is hard to blame a video game completely, connections can be made. In a study done by Iowa State they found that these violent video games show an increase in aggressive behavior in a majority of users [12]. Kids that play these violent games are desensitized from the reality of what they do. Additionally, troops that are deployed may act more aggressively and violently when in combat. They may kill people that were not involved in the conflict. Worse yet, what happens when they return from their tour of duty? Sometimes, soldiers that return to America seek out “a power rush” [13]. This means that they will look for an aggressive or violent situation that will make them feel powerful. More often than not, this is a circumstance in which people get hurt. If a soldier that was trained using virtual reality was desensitized and tried to find a situation that he would get that adrenaline rush, the consequences could be devastating.

HOW THE CODE OF ETHICS APPLIES

Let’s go back to the scenario at hand. For this specific situation, there are two documents that would help me when I evaluate what I should do. As stated specifically in the Institute of Electrical and Electronics Engineers’ code of ethics, engineers are “to reject bribery in all its forms” [14]. Bribery is an obvious breach of ethics. In this situation Company X is not only stealing the ideas of ABC, Company X is actually paying for the ideas [15]. This is a relatively simple ethical scenario to discuss. It has a pretty simple answer.

The ethical issues surrounding VR are an entirely different story. Virtual reality is a fantastic training tool and can be used in all sorts of applications. However, ethically speaking, this technology can be used to teach people to kill other people. It clearly states in the code of ethics for engineers that engineers must “hold paramount the safety, health, and welfare of the

public” [8]. How can a technology that teaches people to kill other people possibly be ethical? Also, it can be hard to define the “public”. If the engineer only thinks of the public as his own nation’s people, then I could easily see why he would believe he is doing the public a favor by implementing this technology. However, it would be naïve and irresponsible to only look at the public in that manner. Engineering is an international profession. We affect everyone in the world. So the general population is our “public” that we must always keep in mind.

The other way this code of ethics about protecting the public involves virtual reality is with the ramifications it could have on the civilian population even when the military is not at war. Virtual reality is a powerful training tool and it makes everything feel more real. When children play these violent video games and soldiers become desensitized to their true actions, are we, as engineers, responsible for what they do if they are influenced by what we create?

THE ULTIMATIUM

Research shows that virtual training is effective method of education [1]. Therefore, this is a technology that could benefit people if the technology were used to teach a certain skill set. This could be used on the manufacturing level or with a peaceful organization such as the United Nations or the Peace Corps. On the other hand, it can be used for military purposes where people can get hurt. A way to minimize this technology’s impact on innocent people would be to make sure it is only used by militaries that follow international laws and treaties. For example, my company could require that the military be a part of the North Atlantic Treaty Organization (NATO) [16].

We also run into the problem of our influence on children through virtual reality video games, a place that the technology is bound to be used. As of today, virtual reality is not integrated into most video games. However, that is something that is bound to change very quickly. I do see this integration of VR as an issue that could cause problems. This desensitization and increased aggression is something I would worry about. Therefore, I would do what I could to prevent these problems from occurring. For example, I could talk to my superiors about my concerns about the effects our system could have on the mental health of the troops. I would ask them to bring the concerns up to the DoD and have them put a program together that would test for the desensitization and aggression problems that I am concerned about. As for the influence of the children, I could talk to my superiors about these known issues with violent video games and what it can do to kids. Therefore, if we were ever to take the VR system into the video game market, we could require video game companies to either issue warnings on their products saying that there are risk factors when using this product in unison with violent video games. Additionally, I could bring up my concerns with a psychiatric group and ask if they could do

studies on the use of virtual reality and violent video games. Therefore, they could do the research and make a public announcement on their findings so that people would know the risk factors that are involved when using virtual reality.

Looking at everything from the outside, we can see the positives and negatives of virtual reality. When it comes to an ethical issue that could have such a big impact, Deborah G. Johnson of the Department of Science, Technology, and Society at the University of Virginia tells people in science to remember that “negotiation with moral notions and beliefs is an ordinary part of science and engineering” [17]. This means that we, as engineers, are going to create ethical issues when we design new inventions. However, that doesn’t mean we should stop inventing and bettering things. We just have to do our best to use and implement what we create in a positive manner.

REFERENCES

- [1] Techtarget. (2011). “Case studies show the benefits of virtualization.” *SearchDataCenter*. (online article). <http://searchdatacenter.techtarget.com/feature/Case-studies-show-the-benefits-of-virtualization>
- [2] Department of Defence. (2013). “Defence Budget Priorities and Choices Fiscal Year 2014.” *Department of Defense*. (online article). <http://www.defense.gov/pubs/DefenseBudgetPrioritiesChoicesFiscalYear2014.pdf>
- [3] M. Hackworth. (1998). “The Case of the Million-Dollar Decision.” *Markkula Center for Applied Ethics*. (online article). <http://www.scu.edu/ethics/dialogue/candc/cases/million.html>
- [4] A. Lele. (2011, Feb). “Virtual Reality and its Military Utility.” *Journal of Ambient Intelligence and Humanized Computing*. (print article). DOI: 10.1007/s12652-011-0052-4. pp. 17–26
- [5] B. Gupta. (2012). “Virtual Reality.” *COMPUSOFT: International Journal of Advanced Computer Technology*. (online article). http://ijact.in/research_paper/v1-i1/COMPUSOFT,%201%281%29,13-17.pdf
- [6] W. Matthews. (2011, Nov). “Enter the Holodeck.” *The Officer*. (print article) Vol. 87. no 6. pp. 24–29
- [7] “Challenger Disaster” *History.com*. (2010). (video). <http://www.history.com/topics/challenger-disaster>
- [8] (2007) “NSPE Code of Ethics for Engineers.” National Society of Professional Engineers. (Online Article). <http://www.nspe.org/Ethics/CodeofEthics/index.html>
- [9] “Virtual Reality Technology.” *The Networking and Information Technology Research and Development Program*. (online article). <https://www.nitrd.gov/PUBS/bluebooks/1994/section.5.10.html>
- [10] ESRB Rating Board. (2010). “Video Game Industry Statistics.” *The Entertainment Software Rating Board*. (online article).

<http://www.esrb.org/about/video-game-industry-statistics.jsp>

[11] M. Jaccarino. (2013). "'Training Simulation:' Mass Killers Often Share Obsession with Violent Videogames." *Fox News*. (online article).

<http://www.foxnews.com/tech/2013/09/12/training-simulation-mass-killers-often-share-obsession-with-violent-video-games/>

[12] C. Anderson. W. Warburton. (2010). "The impact of violent video games: An overview." *Iowa State Department of Psychology*. (online article).

<http://public.psych.iastate.edu/caa/abstracts/2010-2014/12AW.pdf>

[13] Dr. K. Platoni. (2006). "Warning Signs, Triggers, and Coping Strategies for Iraqi War Veterans." *Patriot Outreach*. (online article).

<http://patriotoutreach.org/warning-signs.html>

[14] IEEE.org. (2014). "IEEE Code of Ethics." *Institute of Electrical and Electronics Engineers*. (online article).

<http://www.ieee.org/about/corporate/governance/p7-8.html>

[15] National Institute for Engineering Ethics. (2014). "Ethical Cases." *Texas Tech University*. (online article).

<http://www.depts.ttu.edu/murdoughcenter/products/cases.php>

[16]] "Virtual Reality Training for Military and Law Enforcement Immersive Training Simulation Applications." Must See Video. (2013). (video).

<https://www.youtube.com/watch?v=V34gCw4fyLs>

[17] D. Johnson. (December 2010). "The role of ethics in science and engineering." *Science Direct*. (Journal Article).

<http://www.sciencedirect.com/science/article/pii/S0167779910001393>

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