Thesis Portfolio

Investigating the Efficacy of Virtual Experiences on Stress Reduction

(Technical Report)

Investigating Future Negative Social Consequences of Virtual Reality

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Virtual reality (VR) is an exciting emerging technology that, like any new technology, will have unknown consequences and uses. Both the technical project and STS research paper contained in this portfolio concern the future use of VR, but each approaches the topic from a different angle. The technical project investigates the therapeutic uses of VR and whether it can improve health and wellbeing outcomes in the workplace. The research paper investigates how VR usage in the future could resemble contemporary negative technology use. The research paper takes a more general and holistic view of the topic of VR use than does the technical paper which mainly focuses on analytically determining the psychophysical effect of VR on humans. These two endeavors naturally complement each other by treating the topic of VR more fully without simplistically focusing on just the positive or negative. Simultaneously participating in both of these efforts serves to improve the quality of both by providing a different perspective and combating confirmation bias.

The technical project is an investigation into the ability of virtual reality to mimic the soothing effects of natural environments in the context of Attention Restoration Theory (ART). ART posits that certain types of stimuli found in natural environments such as forests or pastures can have therapeutic effects such as a reduction of stress levels and the replenishment of working memory. The purpose of this study is to determine if simulating natural environments in virtual reality can achieve any of these effects. Participants of the study perform a demanding cognitive task designed to act as a stressor and then will either view images of green, natural environments in VR or on a conventional two-dimensional monitor. The participants rate their mood before and after both the stressor and the exposure to the images. Using the survey data and biometric

data such as heart rate variability and galvanic skin response, the study can then determine the degree of approximation of a natural environment in a virtual one.

The therapeutic and artistic goals of virtual reality are laudable and exciting; however, potential abuse of this new technology has received very little attention from academic literature. VR should be viewed through the lens of pathological technology usage and comparisons must be made with current technological abuse such as video game addiction. This paper aims to answer how current technological abuse can reveal potential negative impact of widespread VR adoption. Technological determinism is used to examine how VR and society will exert influence on each other and how that relationship may change over time. This framework provides a guideline for how society can maneuver VR in its formative years so that negative outcomes can be minimized. Academic research about the nature of video game addiction (a useful proxy for VR) and comparisons between VR usage and traditional media consumption will serve to build a picture of how like or unlike current technology VR is and how it could be misused. It is to be expected that VR will elicit more intense emotional reactions than traditional forms of technology use and, therefore, has a greater addictive potential. This research is important to engineering as it seeks to understand the impact of a product in the nascent stages of its development and aims to assist engineers in the ethical deployment of new technology.

These two projects create a good synthesis by not only covering both the technical and clinical aspects of virtual reality, but also the positive and negative aspects of the uses that VR could have in the future. But asides from being complementary due to their opposition both projects hinge on how potent VR is at manipulating brain chemistry. The more effective VR is at that task the more important the work of both the technical project and the research paper. A bifurcated research style is therefore very well suited. For instance, if the simulation of natural

environments is effective in the alleviation of stress, then the question should be asked: can this be a dependence inducing activity? If the research topic had been unrelated to VR then the technical research would have been limited in its depth by not considering the implications of the mechanisms by which VR functions.