Thesis Project Portfolio

The Sparks/Automated Battleship

(Technical Report)

Technologically Savvy: Mental and Social Effects of the Covid-19 Pandemic

(STS Research Paper)

An Undergraduate Thesis

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Executive Summary

My technical work and STS research are closely connected to one another. My Capstone project was to design an automated version of the Battleship board game, with the intention being for this device to assist with loneliness caused by the Covid-19 pandemic. My STS research expanded upon this device's intent by delving into the social and mental effects of the Covid-19 pandemic, and the role of technology in these effects. The Capstone project is a topic that could be studied in my STS research, and the STS research expands upon the intent of the project.

My Capstone project was a game of Battleship with a fully automated opponent; this project was done in a group and produced a physical gameboard that users were able to play on at a Capstone fair. This project's intent was to help ease feelings of loneliness by allowing the user to simulate playing a game with another human. The

automated player utilized an algorithm that tests a randomized location and moves

orthogonally on its next move in response to a hit. Each coordinate on the game board had

magnetic sensors that interacted with corresponding magnetic sensors on the game pieces

themselves. These sensors allowed the algorithm to automatically know if the location queried

was a hit or a miss. Game progress was tracked using Light-Emitting Diodes (LED) boards

driven by multiplex chips. The LED lit up one color to indicate a hit, and another for a

miss. One board tracked the progress the automated player has made on the player, while the

other tracked the player's progress. Players would interface with the algorithm through an

additional game piece with the magnetic sensor, the player would place this piece on the board to indicate their guess to the algorithm. The technical project was successfully manufactured and operated as intended for the 2022 Electrical and Computer Engineering Capstone Fair. The automated opponent's algorithm worked as intended, and proved to be a fun project that many children enjoyed at the fair.

The coronavirus disease-2019 (Covid-19) pandemic fundamentally changed the modern world. Technology's unique presence during Covid-19 shutdowns and isolations both created issues entirely unique to it and also exacerbated pre-existing ones; many of which the full extent of their side-effects have yet to be determined. Determining what exactly these side-effects are is integral to preventing further harm; this research paper will look further into these issues to answer the question of what the social and mental effects of the Covid-19 pandemic are and how technology might have contributed. To answer these questions a participatory research case study focused on college students who experienced virtual semesters due to Covid-19 shutdowns will be utilized to answer these questions. For parties outside of the case study's reach, articles and other research papers will be analyzed and synthesized to expand the breadth of research, and allow for more generalized conclusions to be made. The intended goal of this research paper is to contribute to the understanding of how the Covid-19 pandemic has affected society beyond physical illness, to contribute potential remedies for preventing these issues from becoming long-standing, and to promote a healthier future for those afflicted.

My Capstone project was completed a semester before my STS research, in other words the two were completed largely independent of one another. My Capstone project gave me invaluable experience within my field. Prior to this project, I had little to no experience with the full life cycle of engineering, and I was incredibly uncertain of myself regarding an actual job. I

felt as if I did not have enough experience to head into the work force. This project allowed me to become more confident in myself, and present myself as an experienced engineer. I gained skills in time management, communication, and a better understanding of engineering principles. While my project was intended to help with loneliness, I did not think to research the effects of loneliness nor the causes. It was designed based off personal experiences of my group, and while external considerations were taken into account they were smaller parts of the project. Meanwhile, my STS project was an opportunity to closely consider the primary external consideration for my Capstone project. Likewise I had not done intensive research prior to my STS project, anything I had done was surface level for projects where it was not the primary focus. This project allowed me to gain hands on experience with research, and by researching into a topic related to my Capstone project I was given a deeper understanding of my design's implications. Prior to my research I did not understand how valuable good research was to good engineering; I left this project with a greater appreciation for research. Had I done this research before or concurrently with my Capstone project I believe there might have been changes to my approach and the final design. Both of these projects have imparted upon me lessons that I will take into future engineering endeavors; one granted me hands on experience in the field, and the other the skills to refine that experience for more meaningful engineering endeavors.