

The Sparks/Automated Battleship
(Technical Paper)

Technologically Savvy: Mental and Social Effects of the Covid-19 Pandemic
(STS Paper)

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Computer Engineering

By
Deianira Griffith

November 1, 2022

Technical Team Members:

Maggie Bono
Madisen Patrick
Kyle Kuennen

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISORS

Harry Powell, Department of Electrical and Computer Engineering

Bryn E. Seabrook, Department of Engineering and Society

Prospectus

Introduction

The Covid-19 Pandemic has turned the world upside down for all who have experienced it. It has challenged us in ways we were not ready for and has similarly impacted our worldview in ways we have not seen before. Loneliness and isolation are emotions most people deal with at some point; however, the ongoing COVID-19 pandemic has exacerbated this issue for many. Hours spent online during the height of the pandemic were found to be positively correlated with reported loneliness (AlSumait, et al, 2021). Even with the worst of the pandemic having passed and life returning to normal, those who have struggled with loneliness continue to feel its effects to this day.

A variety of technologies and measures have been created to combat this ever-present sense of loneliness, and the goal of this Capstone project is no different. My technical work will create a version of the Battleship board game with a fully automated opponent, thus allowing some semblance of playing against another opponent who is physically present. The effects of technologies such as this Capstone project are still being researched. To better improve the experience of users my STS research will delve into the mental and social effects of technologies during the Covid-19 pandemic's height.

Technical Discussion

Even with the worst of the pandemic having passed and life returning to normal, those who have struggled with loneliness continue to feel its effects to this day. Many online games and social media have tried to fill the void of loneliness but have instead led to an increase in addiction to said platforms (Kayis, et al., 2021). The time spent playing video games since the

pandemic has increased for 71% of players and most players reported an increase in playing in multiplayer mode (Barr, 2021). The need for socialization increased due to the constriction of human interaction caused by the pandemic.

Studies have been done on the benefits of board games in education, showing that the introduction of Augmented Reality (AR) in Board Games has been beneficial for students (Lin, et al., 2020). This study has denoted that there was a decrease in helplessness for students who had used AR Board games. While my technical project is not that of AR board games, there is a similar premise in the use of an automated player in a board game to improve upon the loneliness of users.

Despite the pandemic being over, this project will allow individuals to feel less lonely by being able to play a game that allows you to feel like you are playing another individual. This project may not solve a notable problem, but it enables individuals to play a fun game against an automated player while being alone or isolated.

To approach this project, I will be working with a group of other students to create high-level circuit and software designs that will model the system prior to its actual implementation. The software will be used to virtualize the game board and evaluate the game's functionality while the game's actual board is being developed. This visualization will allow us to debug the system without the need to finalize the design.

There are some online articles about individuals that have created an electronic chessboard using hall effect sensors (Sušac, 2021). The chess pieces have a small magnet in their base that triggers the hall effect sensors, and the microcontroller reads these sensors. This is a completely different game, but our game will also use hall effect sensors to read where the player

has placed their ships. Hasbro has created an electronic battleship game. To input where you want your ships for this game the player would press the buttons corresponding to the letter and number of where their ship is (B7, A3, etc.). To choose where to fire against the opponent, the player must push the buttons corresponding to the letter and number as well. Our game uses magnetic sensors to sense where the player has placed their ships which is different from Hasbro's buttons technique. A similarity between Hasbro's game and ours is that the player will need to select where he wants to fire using buttons. This game is also a two-player game whereas our game is a one player game. Another difference is that our game uses LEDs to show whether the player has hit or miss versus Hasbro's game that uses sounds.

To ensure that our design meets the standards of a consumer product made for children my group must research more into consumer standards for electronic board games (Federal Register, 2008). We must ensure that proper warnings are included (such as there being the potential for choking hazards, electronic shock, etc.) as well as that the device can manage some mishandling without breaking or causing electronic discharge. We must ensure that the project acknowledges concerns outside of our project, such as the environmental concern of the greenhouse gases produced by the electricity used to power this project (Environmental Protection Agency, 2022).

STS Discussion

While seeking to remedy the loneliness caused by the pandemic, I also seek to better understand the lasting effects it has had on the mental and social well beings of others. Due to this subject matter being new, research on it will be difficult at times. However, there are still numerous studies to reference and a plethora of data to draw from for this research. One

advantage of this research is that the effects of the pandemic can be seen in our day-to-day with those who were out of a job reporting a persistent sense of anxiety, depression, etc. (AlSumait, et al., 2021). Being only two years past the peak of the pandemic, it is difficult to say what the true lasting impact of the pandemic and the technology will be.

At the same time there have been studies into the shorter-term ramifications. A common point of study being the mental and social effects on the youth in education. In Mexico, the unequal access to technology directly resulted in a disparity in learning during the pandemic (Martínez-Domínguez & Fierros-González, 2021). Children who lacked easy access to technology were given accommodations to aid them. However, they still reported intense feelings of helplessness due to their difficulties in keeping up with their peers. Their process of learning has been disrupted by the pandemic, a common issue reported among those in school during Covid.

In the same vein of youth and technology, it has been shown that gamification of learning has improved learning. The introduction of microcontrollers and points to the classroom allowed students to feel more motivated in a virtual environment (Marin, 2021). The results imply that the move from in-person learning to virtual has reshaped the very way students learn. Students no longer approach learning in the same manner that they had prior, a fact that seems to extend past virtual learning.

In terms of social effects of the pandemic there has been an uptick in addictions to both social media and video games. A special case being the game *Animal Crossing: New Horizons* (ACNH), a life simulation game where players create their own island and can socialize with other players through online connectivity. The latter feature allowed for people to bridge the gap

caused by the pandemic, which allowed them to improve upon their emotional health (Zhu, 2020). The game was used as a platform for social meetups, weddings, etc., and was the only platform in which players could do so, these activities, etc. A blessing and a curse with players becoming addicted to the escapism provided by the game, with players engrossing themselves in the virtual world and forgetting reality.

The usage of smart phones and addiction to them increased during the pandemic lockdowns as well, especially in young adults. Reduced sleep hours, and stress were found to be positively correlated with smartphone addiction in young adults (Zwilling, M., 2022). To fill the void of social isolation young adults turned to their phones resulting in acute phone addiction.

This project focuses on these lasting effects of the pandemic and how technology has impacted society socially and mentally. At the same time, this project will investigate technologies developed during the pandemic to assist with social isolation and their effects as well.

As previously stated, the research goal is 1) to identify the social and mental effects of the pandemic on society, and 2) to investigate the effects of technologies developed during the pandemic. While challenges exist for this project due to the newness of the subject material, articles and other research materials will help remedy them. Research for this project will be conducted through referencing said research materials from various sources to gain a consensus on areas outside of my reach. Should time and interest allow I would also like to perform a study in which I conduct interviews with fellow students. This is to better understand the current long-term impact from the pandemic.

Conclusion

The world we now live in is one that has shown the dangers of total isolation. Even those who prefer their own space have noted the desire for a companion or something to keep them company— well after the end of the pandemic’s height. The proposed project hopes to alleviate this issue by creating a game of Battleship™ with an automated player. The project will respond to the user’s moves and provide prompt feedback to allow them to feel less alone even in the absence of another person.

Research will be done to gauge the potential long-term social and mental effects of technology during the pandemic. The results of this research will help identify potential issues caused by the pandemic’s period of social isolation, and if the technologies developed during this period assisted its users. In identifying these pain points, I hope to draw attention to issues that need to be addressed in this new world we now live in.

References

AlSumait, L., et al. (2021, October 8). *Exploring the effects of loneliness and internet addiction on adults'*

well-being during COVID-19 quarantine. SpringerLink. Retrieved September 38, 2022, from

https://link.springer.com/chapter/10.1007/978-3-030-88163-4_42

Barr, M. (2021, May 6). *Playing video games during the COVID-19 pandemic and effects on players' well-being*. Retrieved October 23, 2022, from

<https://journals.sagepub.com/doi/full/10.1177/15554120211017036>

Environmental Protection Agency. (2022, July 11). *About the U.S. Electricity System and its*

Impact on the Environment. EPA. Retrieved September 22, 2022, from

<https://www.epa.gov/energy/about-us-electricity-system-and-its-impact-environment>

Federal Register. (2008, November 17) 67730 *Federal Register* /vol. 73, no. 222/Monday, November 17,

2008 Retrieved September 26, 2022, from https://www.cpsc.gov/s3fs-public/pdfs/blk_pdf_lrtgafin.pdf

Kayis, A., et al. (2021, May 15). *Fear of covid-19, loneliness, smartphone addiction, and mental wellbeing among the Turkish general population: A serial mediation model*. Taylor & Francis.

Retrieved September 22, 2022, from

<https://www.tandfonline.com/doi/full/10.1080/0144929X.2021.1933181>

- Lin, H.-C. K., et al. (2020, October 22). *Effects of Incorporating AR into a Board Game on Learning Outcomes and Emotions in Health Education*. MDPI. Retrieved October 25, 2022, from <https://www.mdpi.com/2079-9292/9/11/1752/htm>
- Marin, I. (2021, November 15). *A neuroscience approach regarding student engagement in the classes of microcontrollers during the Covid19 pandemic*. arXiv.org. Retrieved October 36, 2022, from <https://arxiv.org/abs/2112.01240v1>
- Martínez-Domínguez, M., & Fierros-González, I. (2021, August 25). *Determinants of internet use by school-age children: The challenges for Mexico during the COVID-19 pandemic*. Telecommunications Policy. Retrieved September 30, 2022, from <https://www.sciencedirect.com/science/article/pii/S0308596121001452?via%3Dihub>
- Sušac, F. (2021, July 13). *Digital Chess Board based on array of hall-effect sensors*. IEEE Xplore. Retrieved October 26, 2022, from <https://ieeexplore.ieee.org/document/7973572>
- Zhu, L. (2020, September 9). *The psychology behind video games during COVID-19 pandemic: A case study of Animal Crossing: New Horizons*. Wiley Online Library. Retrieved October 28, 2022, from <https://onlinelibrary.wiley.com/doi/10.1002/hbe2.221>
- Zwilling, M. (2022, March 9). *The impact of nomophobia, stress, and loneliness on smartphone addiction among young adults during and after the COVID-19 pandemic: An Israeli case analysis*. MDPI. Retrieved October 28, 2022, from <https://www.mdpi.com/2071-1050/14/6/3229/htm>

