Thesis Project Portfolio

Automated Battleship

(Technical Report)

Road Traffic Noise Control: Analysis of the Ineffectiveness of Various Implementations

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Sociotechnical Synthesis
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Exploring Technology Outside of a Vacuum

Road traffic noise was described as "the second worst environmental stressor affecting human health, exceeded only by air pollution", according to the World Health Organization. Additionally, it has been known to cause symptoms such as anxiety, hostility, sleep disturbance, headaches, and fatigue among others. Various forms of control have been put into place to reduce road traffic noise and thus my research focuses on its effectiveness when implemented in a larger sociotechnical system. Contrastingly, my technical project focuses on revamping the classic board game of Battleship with the version we recognize today first introduced back in the late 1960s. While the two projects are not inherently connected, the insight I gained regarding the impact non-technical factors have in the development and implementation of technology is my biggest takeaway when looking back at both endeavors.

The technical portion of my thesis involved the design and construction of the strategy game of Battleship, as first developed by the game company Hasbro, however, with some key differences. The main deviation from the original board game compared to the version created by my team and I is that whereas the former requires two players our version incorporates a fully automated opponent to compete against a single player. To properly interact with the automated opponent, sensors were used to record the player input as well as light emitting diode (LED) displays used to show whether a ship has been hit, missed, or even sunk replacing the plastic pegs from the original game. This project stemmed from the effects my group saw as result of the Covid 19 pandemic lockdowns in which many people had to isolate from others. Thus, when

someone doesn't have others around and/or not able to be around others, our system provides a form of entertainment.

In my STS research, I explored the effectiveness and societal impact of different implementations of road traffic noise control. I was interested in this topic due to being in my apartment and being able to hear noises, especially at night, whether it's from people shouting, the trains passing by on the tracks right behind my building, or especially the vehicles passing by on the road just below. I decided to narrow my focus on road traffic noise specifically and upon further research I discovered the large prevalence of road traffic noise around the world along with the harmful effects it has on the health and well-being of individuals. There have been attempts at reducing road traffic noise such as through legal regulations, wall barriers, and traffic management. However, even fifty years after some of the first attempts at implementation, the problem still is present. Thus, through looking at the actors involved and the relationships between them, I analyzed why this is the case. It was found that there are many non-technical factors, especially cultural and organizational, that could contribute to the ineffectiveness of road traffic noise control implementations in addition to the more researched technical factors.

Both projects have aided in how I view the development and implementation of technology in a larger sociotechnical system. My prior studies in engineering have mainly focused on the math and technical factors for a system; however, while the technical design of a system can be perfect this doesn't mean it operates perfectly in a larger system specifically with regard to the impact of non-technical factors. For instance, upon developing the technical project, although many times we had a technically correct circuit layout and design, we often times had to redo it mainly due to the real-world problem of chip and component shortages as a result of the Covid 19 pandemic. With regard to my STS research there are wall barriers which although

from a technical viewpoint is effective at reducing excess road noise, there is often an expensive price tag associated leaving them to be underutilized. Ultimately, technology along with the engineering which makes up its development should not be placed in a vacuum as even the most perfect designs could fall short when factors within the larger sociotechnical system its placed in are not considered.