Thesis Project Portfolio

Board Buddies Remote Othello Game System

(Technical Report)

Improved, But Not Enough: Analyzing the Contentious Rollout of the 5G Network

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

*When wireless is perfectly applied, the whole earth
will be converted into a huge brain, which in fact it
is, all things being particles of a real and rhythmic
whole. We shall be able to communicate with one
another instantly, irrespective of distance.*

— Nikola Tesla, *Collier's Interview 1926*

In 2030, the number of devices connected to the Internet of Things (IoT) is expected to increase to greater than 29 billion devices. To support a rapidly growing industry, the 5G network advertises an improvement in data rate and capacity to satisfy the increase in devices operating on the network. My STS research topic discusses the reasons for the slow rollout of 5G, specifically focusing on the privacy and social media aspects of the issue. My technical project is an electronic board game system in which two players can remotely play the board game Othello. While the technical project operates on Wi-Fi (which is different from the 5G mobile network), the considerations of privacy and security applies to all wireless devices connected to a network. My technical project also emphasizes the capability and benefits of networks such as Wi-Fi and 5G to connect people from different parts of the world. Looking on the other side of the topic, my STS research analyzes the negatively received aspects of a wireless network which may be slowing down the advancement of 5G.

The technical aspect of my thesis included designing a game board system where two users can remotely play the board game Othello with their own physical board game setup. The main inspiration my capstone team had for this project was the idea that Covid has caused many people to become more isolated from social interaction and forced to resort to using screens. Our

product uses Wi-Fi to attempt to fix that, by providing users the option to interact remotely but still have the satisfaction of playing a physical board game. The physical boards are constructed to be an 8x8 grid (as seen in Figure 1) on a piece of acrylic with LEDs underneath to represent the pieces. Users can then press a tile which will cause the LED underneath the tile to light up a certain color. When the opposing player makes a move, an LED will light up a different color on their board to indicate the opponents move. Both boards keep track of the state of the game and
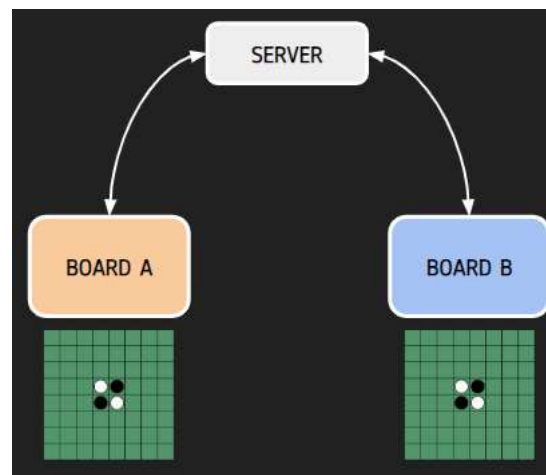

Figure 1. Technical Project Diagram

will show both the pieces of the user and their opponent. Communication between the two boards is done strictly through Wi-Fi but can be modified to operate on other networks such as 5G.

My STS research analyzes the slow rollout of 5G through the lens of cultural lag as defined by William Glade. Through this analysis, I have gained a new perspective of the reasons for the slow rollout of 5G. Thinking of 5G as a socio-politico-economic structure, it is clear that 5G creates more than just a technical impact on the world. For example, privacy and security concerns heavily shape the public perception of 5G despite these topics not being directly associated to technical topics. In my research, I also use the #5GCoronavirus incident in the United Kingdom, in which 5G masts were set on fire due to misinformation spreading that 5G

causes Coronavirus. This event illustrates the ability of society to dictate the technologies that can or cannot succeed.

My technical project and STS research indicate the sheer complexity of designing and implementing devices that send data wirelessly. While the prospect of wireless communications is very desirable, social issues such as privacy and security will always be a large point of contention that will slow down the expansion. Even a seemingly harmless device such as the board game for my technical project may provide hackers and nosy companies an easy path into the network of people's homes. This emphasizes the urgency of privacy concerns that must be addressed when moving forward with wireless technology. For me, an aspiring Radio Frequency engineer, the topics of wireless communication are both interesting and necessary for me to consider in my future career. When designing devices for wireless application, I must always keep in mind the importance of the security of the information being sent.