Introduction

My technical work on the capstone project was central to my topic selection for the STS portion. Both relate to the use of Internet of Things (IoT) technology in flood emergency response systems. I was interested in the possibility for this technology to influence the social climates in the midst of growing environmental concerns. There seemed to be a natural connection between working on the technology, and understanding the implications of its use, especially when learning STS concepts as well as engineering ethics in either class this school year. Both projects address the same technology but the STS paper analyzes the use of IoT for flooding at a higher level. The work done in the STS paper considers various uses of IoT for flooding generally from many different sources. However, the technical portion of the project idss built solely on an existing system within the University of Virginia area, which uniquely caters to a smaller community.

Summary of Capstone Project

My capstone project covered hydrological modeling and system optimization for IoT flood management. In an effort to holistically address the existing IoT flood management and analysis system that was built by previous capstone groups, there were multiple components to the project. Firstly, a segment of the project team created a hydrologic flood plain model for the Charlottesville area using Geographic Information System (GIS) data. Another portion of the project was about understanding the life cycle management of our IoT system by collecting data and creating models to predict the battery life. Multiple models were created to reflect both the dynamic nature of day-to-day measurements, as well as the long-term decay of the battery life. Throughout the year, our team was also part of the successful installation of three new IoT

sensors which will be used to build stronger models to predict flooding in the future. The research into the improvement of this system culminated in a paper submitted to The Systems and Information Engineering Design Symposium (SIEDS).

Summary of STS Research

The STS research paper was written on the use of IoT for flooding, and the attributes that make it a strong tool to social inequality gaps in current flood infrastructure. I begin the paper by introducing at-hand issue of climate change, and the increased frequency and severity of flooding. I explain the unequal damage to marginalized communities that has been observed and documented, giving examples over the past decade. Then, I introduce the framework that I subsequently use to examine flood infrastructure in the United States in a literature review. In my literature review I find that current flood infrastructure is marred by its one-size-fits all nature and environmental and economic policies that ignore the social positioning of marginalized communities, creating an inequality gap which manifests in the aftermath of floods. The following section covers various case studies of IoT for flooding and use the same framework to understand to argue that IoT provides a remedy for these inequalities because of its affordability and accessibility, its ease of implementation, and its versatility. I also cover some future work areas which will be important to understanding the rapidly growing IoT landscape as it continues to grow in popularity.

Reflection

Working on both projects simultaneously offered a unique opportunity to revisit each with a new perspective each time some progress was made in the other. For example, working on

my technical project gave me insight into how IoT for flooding could be adapted in a way that allows for accessible flood infrastructure to be developed, and as such, my anecdotal experiences were incorporated into my STS research paper. In the other direction, my research into the attributes that make IoT a potentially powerful tool for transforming the social landscape of flood infrastructure inspired my interest in maintenance and life cycles management of IoT that were integral to my part of the technical portion. Because of this, I was interested I realized that in order for communities to fully take advantage of IoT's capabilities, it would be important to understand how to proactively maintain its power levels, in order for them to stay effect for long periods of time. As such, understanding the batteries of our small system of IoT devices became a priority in my project. These are just a few examples of how each project influenced the other. It was important to iteratively ask questions from one perspective to the other each time some new development either in my technical work, or my STS research was reached.