Thesis Project Portfolio

Improvement of Home Surveillance Cameras

(Technical Report)

Deepwater Horizon Spill: A Networked Approach

(STS Research Paper)

An Undergraduate Thesis

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

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science in Computer and Electrical Engineering

Kousuke Angelo Tapia Iijima

Spring, 2024

Department of Electrical and Computer Engineering

Table of Contents

Sociotechnical Synthesis

The relationship between my technical and STS research project is indirect and subtle since it takes a more comprehensive approach to examining the factors that are relevant to a project beyond its technical constituents. For the technical project, my team and I set up a network of non-homogenous actors in order to successfully develop a prototype for a security camera with enhanced capabilities. To better inform ourselves on all the considerations that must be taken into account for such an undertaking, my STS research focused on the actors surrounding the Deepwater Horizon Oil Spill, which allowed me to evaluate their individual actions and how it affected the stability of the overall network. That analysis did not only contribute valuable insights for the technical success of a project, but also helped me identify any future considerations that might need to be evaluated for its long term success in an environment where it will be interacting with society.

The goal of my technical project was to improve on the current standard of security cameras that most consumers use today. In order to achieve that we focused on two key metrics that make a security camera useful: field of view and visibility under different conditions. Unlike a traditional camera which is confined to the area on which it is mounted, our design makes use of electrical motors to pan and tilt the camera. Through that capability, the user is able to manually control the camera through a website that can be accessed through a computer. Alternatively, the camera can be set to an automated mode that would track any subjects of interest that come into the camera's field of view. This allows for a wider area to be covered by a single camera. The second major feature that our design includes is thermal detection capabilities, which drastically improves the visibility under different conditions, especially nighttime. Finally, the camera also comes equipped with a potent flashlight that can illuminate any subjects within view, serving both as a deterrent or for locating purposes.

My STS research used Actor Network Theory (ANT) to thoroughly evaluate the reasons as to why the Deep Water Horizon rig exploded and how it led to the biggest oil spill recorded in history. My main argument is that there was no single reason for the incident, but rather a complex web of interactions between all the actors that culminated into a catastrophe. In the paper, I identified the network builder and other relevant actors while describing how they exacerbated each other's failures with their own. In that process, it becomes clear how even the most technical factors of the operation were negatively affected by overarching systemic issues.

The work that I performed for both the technical and STS research project proved to be immensely valuable to me both as an individual as well as an engineer who is preparing to be an active member of society. It brought along many benefits such as a deeper understanding of the complex dynamics that surround technological disasters, enhanced interdisciplinary analysis, a heightened awareness of the ethical issues in engineering, and even practical project management skills. Having thoroughly analyzed the Deepwater Horizon network will surely inform my decision making in the future, especially if I find myself involved in a project with stakes as high as those. I will recognize the importance of ensuring that all components of a network are fulfilling their roles rather than just focusing on my own. This endeavor has without a doubt equipped me with the necessary skills and knowledge that will allow me to succeed in my future endeavors.