Thesis Project Portfolio

Autonomous Obstacle Avoidance for Unmanned Aerial Vehicles

(Technical Report)

Analysis of Social Shaping in Solar-Powered Battery Installations for Home Use

(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

Balancing the Needs of Separate Groups to Achieve Success

My technical and STS topics are related in an unconventional manner in that they each contained the idea of having a balance between separate parties. In terms of the technical topic, my group and I worked with our capstone professor as well as another professor in the ECE department. This proved to be challenging at times because we had to meet all the requirements, they set forth to successfully design and develop an unmanned aerial vehicle (UAV) obstacle avoidance to enable shared autonomy. Likewise, my STS topic discussed how there needs to be a balance between the companies and users of solar-powered battery installations for home use to be used in society. Although these topics are different from one another, this overarching parallel of understanding the needs of separate groups to meet a specific goal relates them together.

The technical portion of my thesis was to design and develop an aerial platform to enable shared autonomy and obstacle detection for unmanned aerial vehicles. This project was chosen to address the common types of issues with fully autonomous UAVs. My team's goal is to investigate and enable a form of shared autonomy that incorporates capabilities, human-controlled input, and onboard autonomy. This compromise allows for desired human input (e.g., flying a drone to an area of interest) while keeping the system safe (or performing other tasks) through onboard autonomy and obstacle avoidance. This will allow for a much safer and more efficient drone that is less likely to crash due to operator error, which our team believes is a necessary development in the advancement of autonomous UAVs.

In my STS research, the focus was how solar-powered battery installations for home use were hindered in the past by several factors, such as policies and economics, to where it currently stands in society as well as speculate where it could be in the future. It is very evident to see over time this technology has not become as prevalent, and it is uncertain as to why this has transpired. For these installations to become more common in society the issues preventing their growth need to be identified and addressed, which can be accomplished through the framework of SCOT. The framework of technological determinism is then used to foresee the impacts that may come about with the growth of this technology brought about by SCOT. Overall, this research is crucial in addressing and informing on how certain aspects pertaining to how solar-powered battery installations for home use can be improved upon to shape society for the better. This is important to understand because the overarching takeaway from this project could be applied to other forms of technology as well.

The two projects did influence and enrich each other due to being on completely different topics. Specifically, from doing separate topics that were not related I gained a wide array of knowledge in both autonomous UAVs and solar-powered battery installations. In terms of designing and developing the UAV, my group and I were tasked to present a lot of the same concepts in the final report for capstone that the STS research paper required. If this thesis were to be done entirely on the same topic, I would have a more solidified understanding of how to develop and design either system as well as the significance and effects it would have on society. Overall, having experienced this idea of satisfying multiple groups in order to reach a goal as well as gaining the insights and ideas discussed throughout STS is very beneficial. In particular, these aspects will be carried with me for the rest of my career as an engineer. Without

conducting the work done in this thesis, it is safe to assume I would not be as well of a rounded student, engineer, and most importantly as a person.