Thesis Portfolio

Exploring Decentralized Swarm Algorithms for Drones
(Technical Report)

Should Drones Be Used by Police in US
(STS Research Paper)

An Undergraduate Thesis

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

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Table of Contents

Sociotechnical Synthesis

My technical project is on drone swarms, specifically swarms implemented in a distributed fashion. Thus, I wanted to explore some of the ethical aspects and non-user points of view on drone swarms for my STS Research, as it is a powerful new technology potentially causing similar scale of effects on society as GPSes, smartphones, and security cameras. However, drone swarms are still under research and less commonly seen, so I scoped my STS Research paper to just individual drones, specifically exploring the police use of drones.

The technical portion of my capstone research produced an implemented algorithm on distributed drone swarms. I selected Craig Reynolds' animation boids model as the basis for my project after researching different proposed decentralized drone swarm algorithms from research papers. When simulating the implementation of my algorithm, with correct parameters, the drone swarm was able to consistently navigate to all set destinations while avoiding collision between the drones. The swarm also avoids obstacles in general but can get too close to some obstacles on rare occasions. All work is done in the context of simulators due to Covid-19 and loss of access to the lab.

In my STS research, I explored the topic of whether drones should be used by police in the US or not. I first researched and found immense potential in possible ways that drones can be utilized by police to help protect safety of individuals in the US. The powerful technological capabilities of drones, however, also come with potential consequences. One major concern, especially with the advancements in facial recognition technology and the increased use in drone surveillance, is privacy. Previous research has shown that people are concerned with privacy when dealing with police drones, and that it is very beneficial for police departments to gain trust and make effort in providing transparency when adopting Unmanned Aerial Systems, which I

think is good and should be enforced with legislation. In the end, I believe that utilizing drone technology will be beneficial to the citizens of the United States, under the condition that appropriate guidelines and legislation are established.

I have always enjoyed technical work, coming up with algorithms, and playing with drones, but I have never thought of the impact and different aspects of change the new technology developed would have on society. I have learned to think differently, including thinking from not just the developer's or user's perspective, but seeing the technology from non-user's shoe. Specifically in this example, thinking of regular citizen's perspective of police use of drones. Police use of drones might bring immense benefit to investigation of crimes, but it is at a possible cost of privacy invasion and comfortableness of citizens of the United States. It was also good to keep in mind and learn that not all fancy technological advancements equate progress for society, and that we should always consider the potential impacts and effects before releasing new technological developments.