ECE4011/ECE 4012 Final Project Summary

Project Title	Drone Buddy
Team Members (names and majors)	Sriharsha Singam (CmPE) Jerrin Kakkanatt (EE) George Germanakos (CmPE) Zachary Mathews (EE)
Advisor / Section	Dr. Jennifer Hasler
Semester	Fall 2020 Circle: Either Intermediate (ECE4011) or Final (ECE4873)
Project Abstract (250-300 words)	The project involved developing a drone that would be able to act as a security device and threat prevention tool. The security aspect of the drone involves allowing a student or faculty member to call in a drone, in the case that he or she is uncomfortable on campus, to follow him or her safely to the desired destination. This required app development that would allow a person to not only call in the drone, but also pinpoint an exact location on or around campus so that the drone can get to the user and follow them. The drone also constantly takes footage of the student or faculty member and sends it to a secure AWS Database storage location. This video footage can be streamed in real-time as well as pulled up later at the authorized user's convenience. The idea of the drone following the user is to dissuade any crime that could happen. The main types of crime being targeted are close quarter sexual assault, hate crimes, and gun violence. These types of crime have been on the increase over the last 5 years and the hope is that a hovering loud drone with lights and sirens on it would dissuade any perpetrator from committing the crime itself. If the crime occurs anyways then the drone's footage can be easily accessed and used by GTPD to investigate the crime and quickly catch the attacker. To make the drone a more effective security tool it requires an active crime detection mechanism that unfortunately was thrown out of scope this past semester due to time constraints and the ongoing pandemic. The drones should potentially increase safety on college campuses and possibly other places through pure prevention (before the fact).

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List **codes** and **standards** that significantly affect your project. Briefly describe how they influenced your design.	H.R. 302 - FAA Reauthorization Act of 2018 (Subtitle B - Unmanned Aircraft Systems) This did not influence our current short-term plans. We believe that since the drone primarily follows a user's GPS location and can also be taken control of manually, by an authorized user such as GTPD, it can be stipulated that the drone is in fact not an unmanned drone but an actively controlled one by the user and GTPD/College. We also hope to see a change in legislation, especially as large companies like Google and Amazon start to use drones in a massive way.
List at least two significant **realistic design constraints** that applied to your project. Briefly describe how they affected your design.	Current realistic design constraints that were applied to the drone were related to battery life, height of normal flight, and way it follows the user. Battery Life: 30 Minutes. Height of Flight: 9-10 ft Method of Follow: GPS coordinates, instead of image-based motion detection (too ambitious for time-frame)
Briefly explain two **significant trade-offs** considered in your design, including options considered and the solution chosen.	**Battery life and weight** The drone must be capable of following someone across campus (around 30 minutes) and still be light enough to fly. Larger battery capacities typically come with greater weights. The major trade-off chosen here was to use a larger and heavier battery to gain longer flight time. **Image quality (camera) and weight** Larger cameras typically have better image sensors which is important for image processing and data analytics but also typically weigh more. The major trade-off chosen here was to use a small inexpensive camera for the sake of a prototype and since we did not employ image-based motion detection.
Briefly describe the **computing aspects** of your projects, specifically identifying **hardware-software** tradeoffs, interfaces, and/or interactions. *Complete if applicable; required if team includes CmpE majors.*	Hardware: ● STM32 Microcontroller (Flight Controller) ● Raspberry Pi 4B and Raspberry Pi Zero W ● Electronic Speed Control (ESC) ● Brushless DC Motors ● Peripherals: RC Receiver, GPS+Mag, RPi IR Camera ● Li-Ion Battery ● 3D-Printed Camera Mount Software: ● UART Serial Communication ● I2C Communication ● Flight Control ○ Real-Time Scheduling ○ Virtual COM Port Configuration of FC ● Mobile App ● AWS Cloud Architecture design