Name(s)	Project Number
Jayasuriya Senthilvelan; Jacob Yee	**S0829**

Project Title

Detection of Forest Fires Using Autonomous Drones

Abstract

Objectives/Goals

The goal of this project is to prevent the spread of forest fires by detecting them as early as possible. In order to accomplish this, our project uses autonomous drones to monitor a forest along a planned route, detecting temperature spikes and reporting their locations if these spikes match the experimentally determined patterns of fires. This data will be sent to a ground station through radio signals for evaluation.

Methods/Materials

The main materials used in this experiment are the Raspberry Pi 3 Model B, carbon fiber frame, motors, electronic speed controllers, temperature sensor, accelerometer/gyroscope/barometer/magnetometer sensor, lithium polymer battery, Rpi900, and DNT900 (for radio communication).

Methods:
1. Assemble drone body and wire all devices
2. Access all sensors and motors in code through their various communication protocols
3. Use sensor data to control stable flight
4. Use GPS to fly along a predetermined path
5. Test drone's capacity to detect fire in a closed environment

Results

According to data that was collected, temperature values collected from the thermal sensor's field of view (view temperature) were better for recognizing the flame than ambient temperature (which is a reading of the temperature of an object that directly touches the sensor) values. This can be seen as the prominent peaks in all three graphs were from view temperature data. However, the ambient temperature value stayed relatively constant. In addition, as the height of the drone decreased, more and more closer toward the candle flame, the peak of the view temperature increased significantly, from 26.3 to 28.68 degrees Celsius when moved from 2.0 feet to 0.5 feet, respectively (approximately 9% increase). Eventually, the view temperature rose above the ambient temperature in 0.5 ft. graph.

Conclusions/Discussion

Due to peaks in temperature compared with surrounding temperatures in the graphs, the presence of a flame can be detected. In order to implement this in an efficient fire detecting algorithm, collected temperatures must be compared with a baseline temperature. Deviations from this baseline and the intensity of these deviations would then indicate the presence of a fire as well as its intensity.

Summary Statement

An autonomous drone was created that uses various sensors to control its flight and detect forest fires.

Help Received