CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

J1003

Project Title

Disaster Drone

Abstract

Objectives

The objective of this project is to increase the survival odds in the first moments of victims in a natural or man-made disaster by designing and equipping a drone with a programmed microcontroller and sensors to scan for cell phone tower signal, water and air quality in the vicinity of the survivors as well as provide a live-stream video to the ground station. The Disaster Drone would zoom in to outlying areas to identify and assess the extent of the survivors emergency situation to inform them and prioritize the call for first-responders. The 3G-4G/LTE Base Shield V2 sensor is built in to detect the cell-phone towers' signal strength. The Disaster Drone will alert the ground station via an application called ThingSpeak (ioT application). The second set of sensors are the pH and turbidity sensors built in to detect water quality of the compromised area where people would want to know if their water source is still safe to drink, while awaiting first-responders, as it may have become contaminated from displaced waste of livestock, human sewage, chemicals, and other impurities. The third set of sensors are programmed to detect the air quality at the site of the disaster where pollution can reach significant levels from the huge amounts of waste generated in a very short period of time, and survivors need to steer away until the arrival of first-responders. The MQ5 sensor is used to detect combustible gases: H2 , LPG, CH4 , CO and Alcohol. Humidity and temperature sensors are built in as humidity and heat increase fuel flammability. The drone is built to be light and efficient to conserve battery life for travel time.

Methods

To the drone body, I attached the following sensors: MQ5 gas, pH , turbidity, humidity, temperature, Base Shield V2 and attached an arduino IDE to program the sensors and an arduino uno for the microcontroller. I then ran trials of testing the water quality and cell-phone signal strengths in different environments. I didn't test air quality for combustible gases for safety reasons.

Results

The readings from the sensors generated accurate values that matched the ground station readings necessary to relay situation.

Conclusions

I equipped and programmed the Disaster Drone to test with different sensors that I researched from which the parameters are relevant to the vital safety of survivors in the immediate moments after a natural or man-made disaster before first-responders can reach them. The readings from these sensor generated accurate values and matched the reading on the ground station. The Disaster Drone was durable and dependable to

Summary Statement

I equipped and programed a drone to zoom in to survivors of a disaster to measure cell phone signal, water and air quality and communicate with the ground station before first-responders are able to arrive.

Help Received

Ms. Najwan Naserelddin, teacher and mentor, to learn to code and engineering skills to build. Dr. Ahmad Bani Younes, SDSU Aerospace Engineering Professor, about space robotics and applications in dynamical systems and the ioT technology I applied.