

Assisting Forest Firefighters Using Drones

Liaison: Jeffrey English: jeffrey.english@fujitsu.com

Introduction

Every year, hundreds of fires destroy thousands of hectares of forest in British Columbia. These fires destroy property, degrade air quality, and cost hundreds of millions of dollars to manage each year. Fire-prone conditions are expected to worsen in Canada because of climate change, potentially doubling the area burned from current levels.

Timely information is critical in fighting forest fires. Fires that are detected early can be managed much more easily than those that grow significantly before management efforts can begin. Once a fire does spread, maintaining up-to-date information is critical to ensuring safe and effective efforts. In 2013, 19 firefighters were killed in Arizona when a wildfire overtook their position.

This project is to look at how drones can be used to assist firefighters in forest fire activities. The group will design a system to help forest firefighters in their efforts by providing real-time or updates on fires. The ultimate goal is to provide a platform that can provide a stream of data to firefighters identifying both the current fire boundaries and, for larger fires, locations of developing offshoot fires.

Brief Project Description

This project is part of Fujitsu's effort to further develop applications for advanced technologies globally. Previously, Fujitsu has used drones in conjunction with artificial intelligence to monitor endangered species in Australian bushland, helping conservation efforts. In Japan, Fujitsu provides infrastructure monitoring using drones to detect cracks in concrete structures.

Several universities and companies have previously explored the use of drones in aiding firefighters. The industry-leading example is DJI Enterprise, the world's leading commercial drone provider, who used drones to provide aerial surveillance during fires in California. Recent, researchers at the Universidad Carlos III of Madrid used a drone to autonomously gather optical and thermal images of suspected hot spots before they develop further.

The focus of this project is on the integration of the mechanical systems of the drone and additional sensors to acquire useful information. Early in the project, the team will scope what information they wish to collect. They will then design a system to collect that information using commercial technology. Finally, the team will build a mockup of the system and test it.

Expected Outcomes

At project completion, the team should have a working prototype of the sensors and data processing system. Ideally, the system will implement machine learning components to extract insights from the sensor data (e.g. image segmentation identifying hot spots in an image). During the project, we expect students to review currently available equipment and computing resources relevant to this project. By the end of the first semester, the team should have decided on a system design and identified

components to build a prototype. In the second semesters, students will build and test the prototype including data processing methods.

Resources Available from the Customer

Fujitsu will provide a contact with experience implementing machine learning systems that can help students develop their project scope, find relevant resources, and integrate relevant subsystems. They can also provide help for students to identify potential end-users and contact them for input. Financially, Fujitsu will provide support to purchase the parts necessary to build a prototype.

Customer Requirements

Must have:

- Design a system that can collect information from at least one remote sensor relevant to firefighters from a drone and present it in a useable format (*e.g.* map layers, annotated live stream)
- Select components for the sensor and processing system and build a lab-bench prototype
- Designs on how the sensors can be incorporated onto an existing commercial drone design

Nice to have:

- Use machine learning to augment or interpret the data collected
- Combine readings from multiple sensors into a single rich data source
- Include a system to communicate remotely between the drone and a user
- Have a moving prototype (*e.g.* on a working drone)

Maybe:

- Have the prototype detect where the drone should move to acquire more useful information