



Colorado Science and Engineering Fair

2024 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Drone Fire Detection and Firefighting

Finalist's Name: Miles Stelzer

School and City: Summit Charter Middle, Boulder

Sponsor's Name: Peter Teasdale

Category: Energy (ERGY)

Division: Junior (6th - 8th grades)

Abstract (250 words or less):

With wildfires becoming more common and destructive, the lookout towers that have been used to detect fires for hundreds of years are insufficient (Park et al. 892). This project proposes a drone based fire detection system using drone flight paths, thermal cameras, and computer vision algorithms. An increase in sensor size in thermal cameras increases the range and accuracy of thermal cameras (Pušnik et al. 607). Therefore, as the sensor area increases, so do range and accuracy of the thermal cameras, increasing their feasibility for drone based wildfire detection. Range was tested by mounting a thermal camera to a drone and a distance reading was taken when the fire was no longer distinguishable from the background. This was repeated 10 times per camera and the DJI visual camera was used as a control. Temperature accuracy was tested using a temperature gun at 10 cm and by one of the thermal cameras. The percent temperature error was then calculated and graphed. These tests were repeated five times per thermal camera. The Seek thermal camera had the longest range at 123.31m and temperature accuracy of 7.6%. This was expected because the image sensor was $320 \times 240 \mu\text{m}$ compared to the smaller $256 \times 192 \mu\text{m}$ sensor in the InfiRay camera and $80 \times 60 \mu\text{m}$ sensor in the FLIR. The Seek thermal camera is the only thermal camera feasible for drone fire detection because of a range of above 100m which is the proposed flight altitude.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature:

Date:

3.1.2024

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.