CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
S0806

Project Title
Early Fire Detection

Abstract

Objectives/Goals
The purpose of this project is to build and test a prototype hardware and software to detect fire in the earliest stage possible and produce an automated warning response via wifi as well as provide a live feed for when a fire is detected.

Methods/Materials
Materials used for this project include a raspberry pi 3 model b, a gas, UV, IR, temperature, and humidity sensor to detect flame signatures and a 5mp camera to provide a live feed of the area when an alarm is raised to reduce false alarms. The humidity and temperature sensors detected the current risk of fire, while the other sensors detected an actual flame. Natural fire squares were used to test the prototype with a fire at a somewhat consistent size. Sensor outputs that would warrant a fire alert were tested for. A code that would periodically retrieve sensor data and check if the data fell into the range that would suggest the occurrence of a possible flamewas written and deployed to the Pi. If it did, the camera would then capture an image of the area which would be sent with an alert to the recipient using wifi. If the humidity and temperature sensors reached values that warranted a high potential for fire, then a fire hazard warning would be sent. To test the prototype, it was set up in a small room where fire hazards were eliminated in order to start small fires. 3 fire cubes were used in order to start a fire and measure the amount of time it would take for the prototype to recognize the fire at different lengths away from it.

Results
Results showed that the prototype was able to detect a fire both quickly and efficiently. It was able to send a warning message when factors such as temperatures and humidity levels suggested conditions that might lead to a fire starting and then send a different warning when the IR sensor and gas sensors picked up on heat and carbon monoxide caused by the fire. Certain sensors, however, did not work as efficiently when distance increased, which in turn caused the prototype to rely mainly on the gas sensor, increasing the amount of time it took to recognize the fire.

Conclusions/Discussion
All in all, the prototype was able to remain effective in determining a fire without being too costly, costing under $60. This allows for the possibility of it being implemented in homes and fire prone areas at an affordable cost while still maintaining reliability in alerting recipients to fires as early as possible.

Summary Statement
This project tested and built a prototype hardware and software to detect fire in the earliest stage possible and produced an automated warning response via wifi as well as provided a live feed for when a fire was detected.

Help Received
My mentor helped me to learn how to use the Pi.