

Type your research plan as text below. You can use all three pages, but you will have to split your text between pages manually. If you copy/paste from a word processor, make sure that formatting and special characters are satisfactory in the text below. Be sure that you cover the most important areas, including apparatus to be used, procedures and chemicals to be employed, care of research subjects, and supervision.

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Overview of Device:

Question or Problem Being Addressed:

Following the 2020 California Wildfires, a total of 4.1 million acres were burned and destroyed as a result of wildfires. Such wildfires tend to happen every year, resulting in millions of dollars in damages and a number of civilian and firefighter casualties. Such events are caused by a plethora of reasons, ranging from lightning strikes to arson, all of which could have been minimized in threat and damage by more accurate and location precise monitoring. This device can be used to collect, record, analyze, and transmit data of locations within the forest and help emergency responders better deal with and understand such disasters.

Goals/Expected Outcomes/Hypotheses:

The goal of this device is to be able to help prevent and better manage forest fires, as well as, aid researchers and advocates alike in helping preserve our forests and landscapes. In doing so, it also aims to prevent any property damage, human/animal casualties, as well as help, create healthier ecosystems. This device will be affordable, efficient, and effective in helping flora and fauna alike.

Methods and Procedures:

The apparatus utilizes an Arduino Microcontroller which is connected to a breadboard circuit that utilizes varying sensors to monitor and alert of changes in its surroundings. These sensors include gas sensors, humidity sensors, and temperature sensors, which will be constantly collecting data and processing it into easy-to-read and understand outputs. This device can be placed deep into any forest, field, or structure to read such information and transmit back any data to those who need it. Using satellite connection, the device will constantly send back information such as temperature and humidity levels and alert the authorities of its current location in the scenario that it senses the possibility of fire or unnatural variables. The device will employ a lithium-ion battery, and solar panels to maintain long periods of operation. After a device has expired or is no longer in need of operation it can easily be destroyed, dismantled, or recycled. The device can be easily concealed and poses no known threat to the ecosystems it will be placed in.

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Materials:

This project will utilize an Arduino Microcontroller, lithium polymer 9V battery, gas sensor, temperature sensor, humidity sensor, breadboard, pushbutton, resistors, wires, an LED, and a 3D printed casing.

Risk and Safety:

The creation of this device will involve soldering of cable leads to a microcontroller and different sensors on a PCB. This also involved batteries such as lithium polymer and nickel-cadmium. Safety precautions involve the usage of proper safety goggles, gloves, air ventilation, and supervision of power tools by the mentor. The whole project and its process will be supervised by Mr. Carlos Nodarse. Mr. Nodarse has supervised numerous engineering and engineering-related projects in the past and has a number of years of supervision and safety experience.

Data Analysis:

To analyze the device ' s efficacy, it will be determined through constant and consistent testing as well as prototyping of the circuit and its integration with the case. If the kill switch and code work properly using the data from the sensors, there should be no issues with moving ahead with the production and creation of the device.

Discussion of Results and Conclusions

Through the testing and prototyping mentioned previously, one can determine if the apparatus is capable of delivering as expected, if prevention of natural disasters and preservation of forests can be achieved directly through this device, then it can be deemed successful in that field/use.

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