

Fire Detection Units

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Comwork



Objective

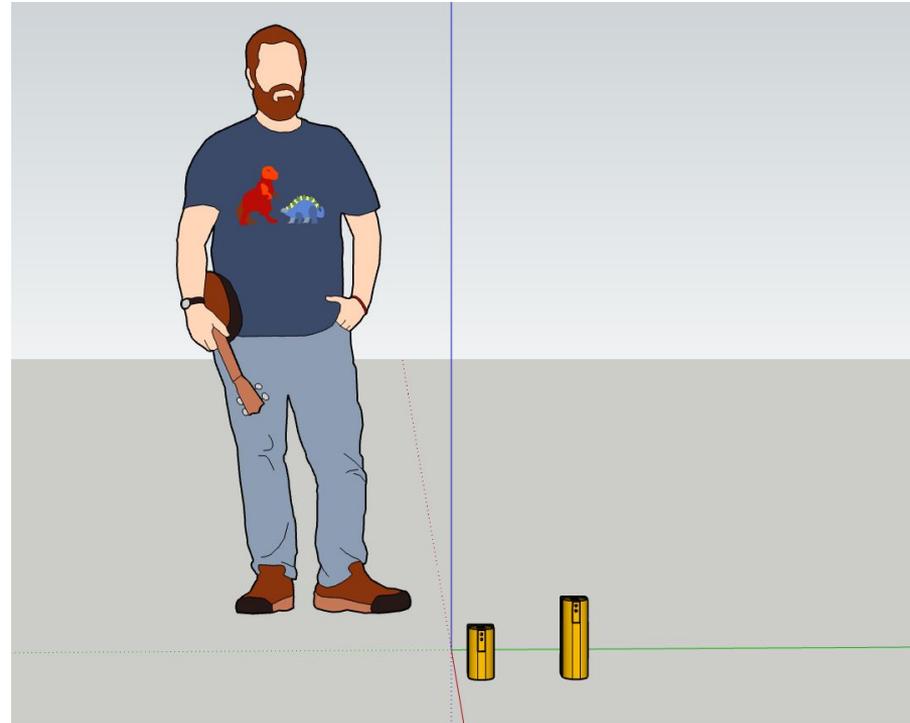
Faced with forest fires, this project serves to :

- Allow for early fire detection
 - Improve response time
 - Reduce collateral damages
 - Protect forests, people, and farmland
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Design Proposition

Design Proposition

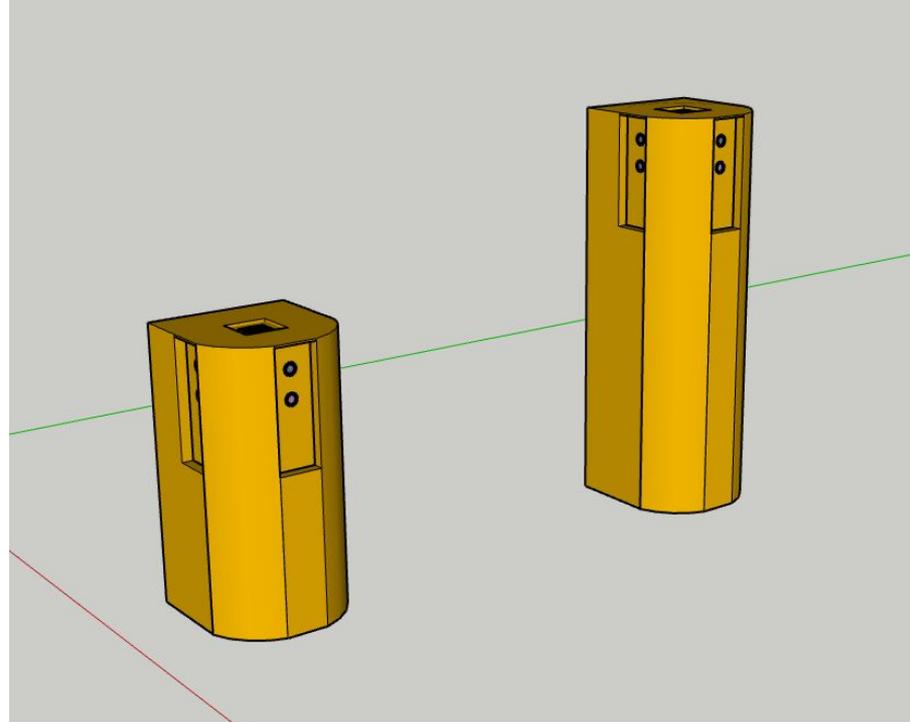
For this project's purposes, we propose a couple variations of **small-profile, self-contained, fire detection units**.



Design Proposition

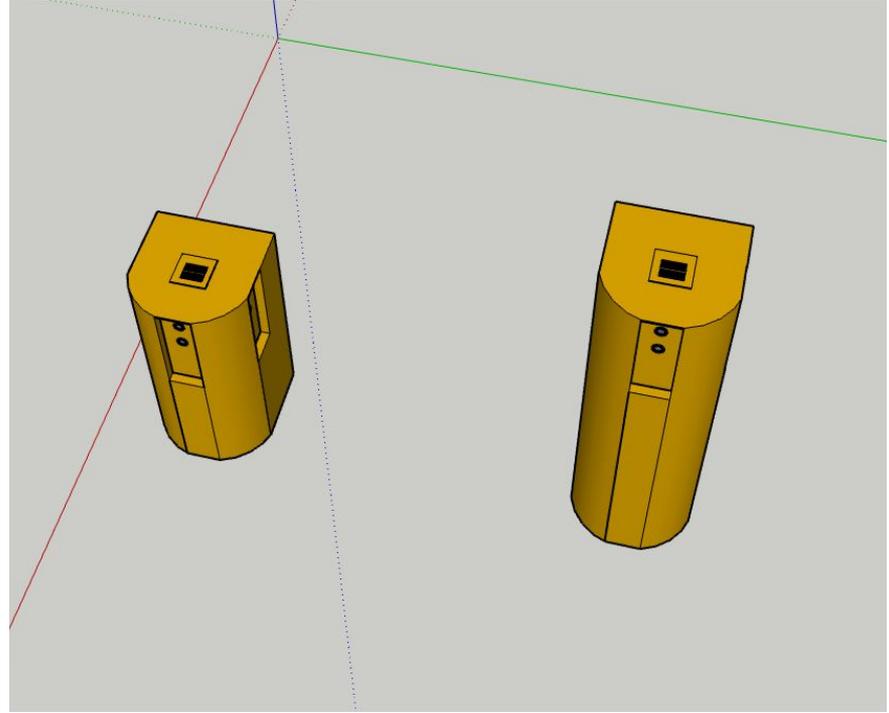
Each unit will have 6 cameras in total:

- Between 2 and 3 **thermal cameras**
- 3 **traditional cameras**



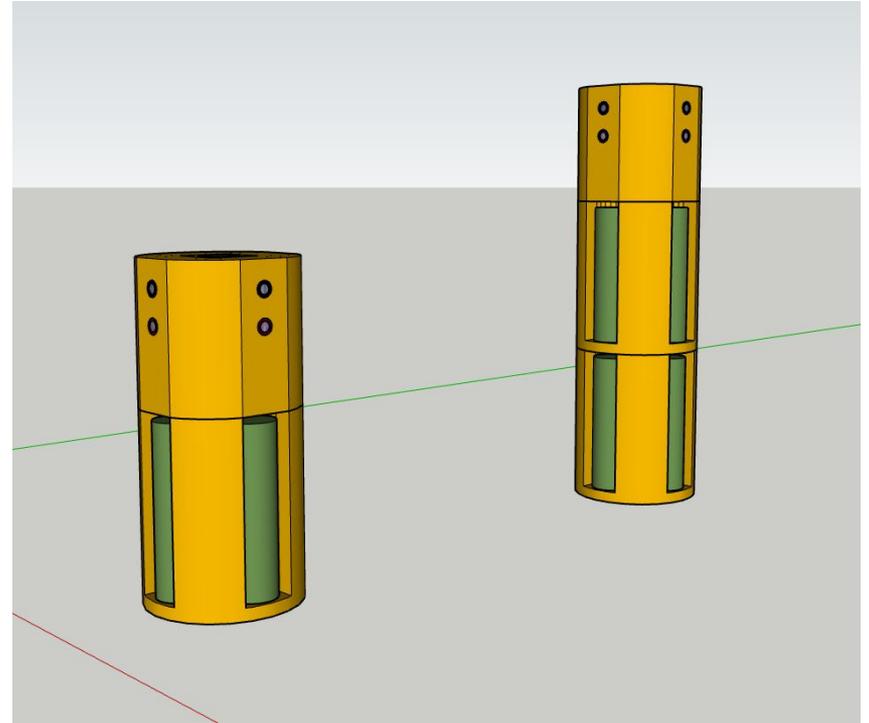
Design Proposition

Each unit will also have a **Temperature, Humidity, CO2 combination** sensor on top, *or* separate **Temperature/Humidity** and **CO2** sensors.



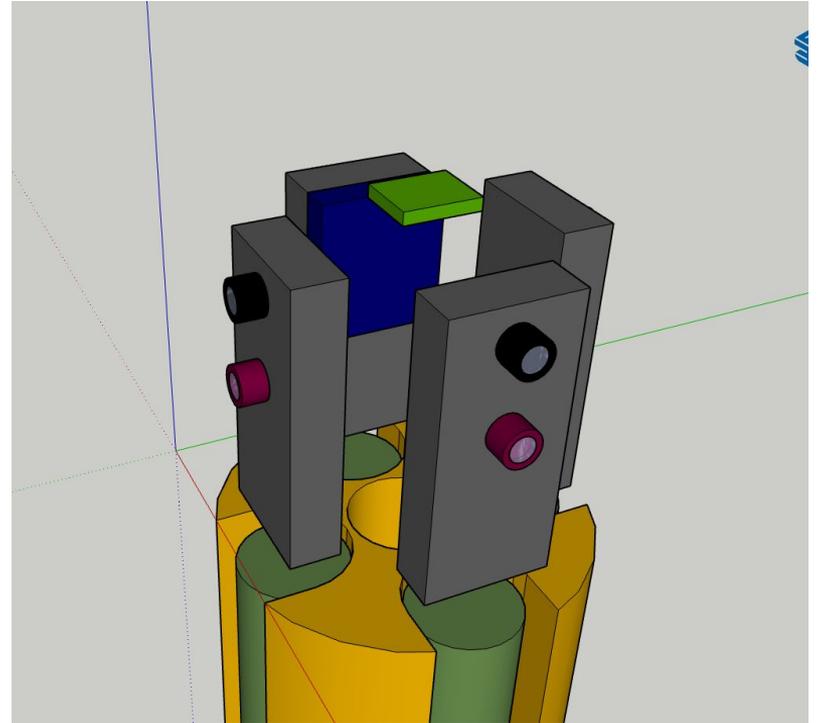
Design Proposition

Each will have 4 to 8, 18650 batteries which will allow them to have between 12000mAh and 24000mAh of battery storage. (given a 3v system, and 3000mAh per battery)



Design Proposition

All the sensors and relays will be concentrated on the top section of the sensor with the battery storage comprising of the bottom sections.



Components

Components

The proposed units will primarily comprise of the following parts :

- 1 x ESP32 LoRa Gateway
 - 3 x ESP32 Cameras
 - Between 2 x 110° and 3 x 55°
Thermal Cameras
 - One of the following :
 - 1 x Humidity, Temperature, CO2 sensor
 - 1 x Humidity and Temperature sensor + 1 x Air Quality Sensor
 - Between 4 and 8 x 18650 Batteries
 - 1x Solar Cell for Recharging
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Components

In order to ensure connectivity, the system will contain a gateway node that will be comprised of the following :

- 1 x Raspberry Pi 8Gb Model
 - 1 x Raspberry Pi LoRa Hat
 - 1 x GSM Module
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Terrain Coverage

Terrain Coverage

In order to be able to cover **5 Hectares** of terrain, we will be needing a minimum of the following number of components :

- Minimum of **56** units covering **900m²** each (30m of coverage in each direction)
 - Minimum of **80** units covering **625m²** each (25m of coverage in each direction)
 - Minimum of **125** units covering **400m²** each (20m of coverage in each direction)
 - Each configuration will require a minimum of **2 Gateway Nodes** to ensure redundancy
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Price Projection

Price Projection

The objective of this project is to implement a pilot project in the following highlighted area on the map. This area covers roughly 5 Hectares of forest.



Price Projection

The estimated total cost of the installation is roughly **€ 15,349.48** and is broken down as follows:

Article	Quantity	Unit Price	Total Price
Cost breakdown of components per Gateway			
RaspberryPi 4 8Gb	1	€169.99	€169.99
LoRa Hat	1	€35.68	€35.68
GSM Hat	1	€31.99	€31.99
Gateway Units	2	€237.66	€475.32
Cost breakdown of components per unit			
18650 3000mAh Batteries	4	€9.25	€37
100mA 3v Solar Panel	4	€3.5	€14
Optical Cameras	2	€8.04	€16.08
Thermal Cameras	2	€62.96	€125.92
ESP32 LoRa Gateway	1	€36.73	€36.73
DHT22 Temperature and Humidity sensors	1	€13.29	€13.29
Co2 concentration sensor	1	€19.59	€19.59
Plastic Injection Housing	1	€3	€3
Fire Detection Units	56	€265.61	€14,874.16