

# Fire Detection Units

...

Comwork



# Objective

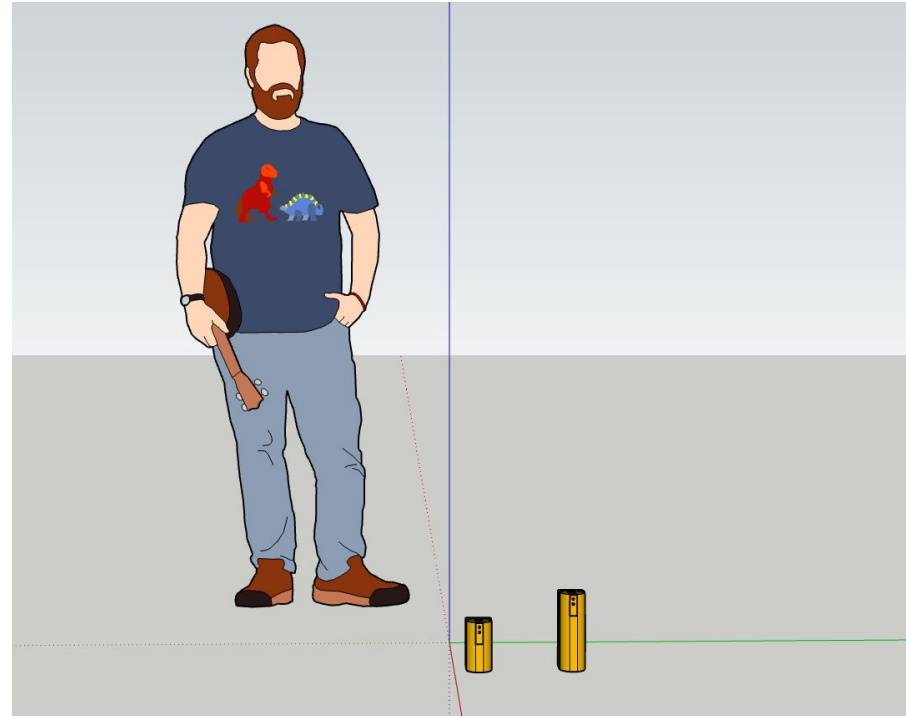
Faced with forest fires, this project serves to :

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

# Design Proposition

# Design Proposition

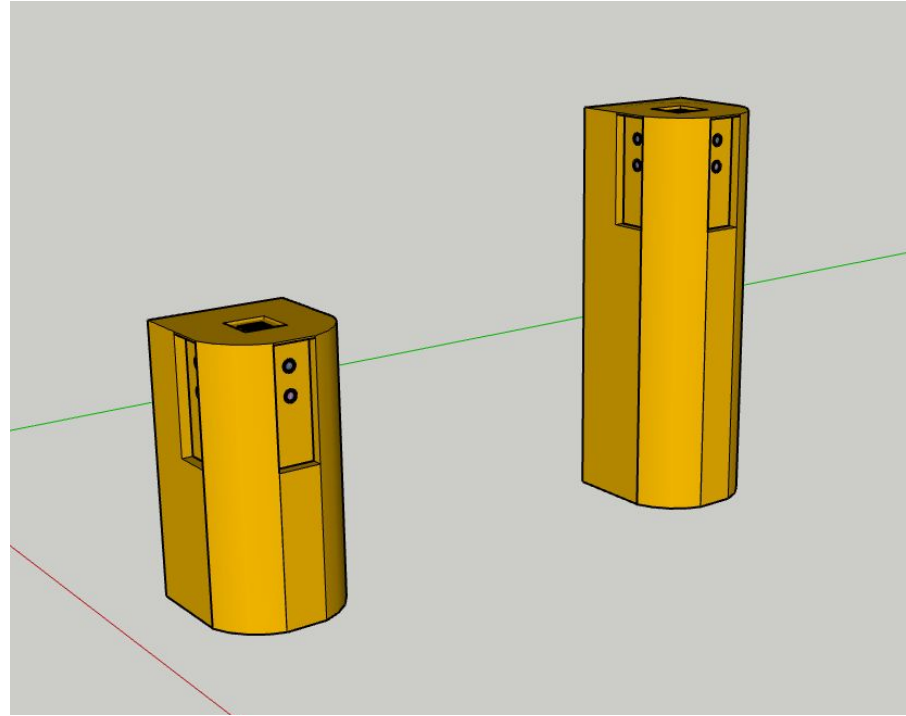
For this project's purposes, we propose a couple variations of **small-profile, self-contained, fire detection units**.



# Design Proposition

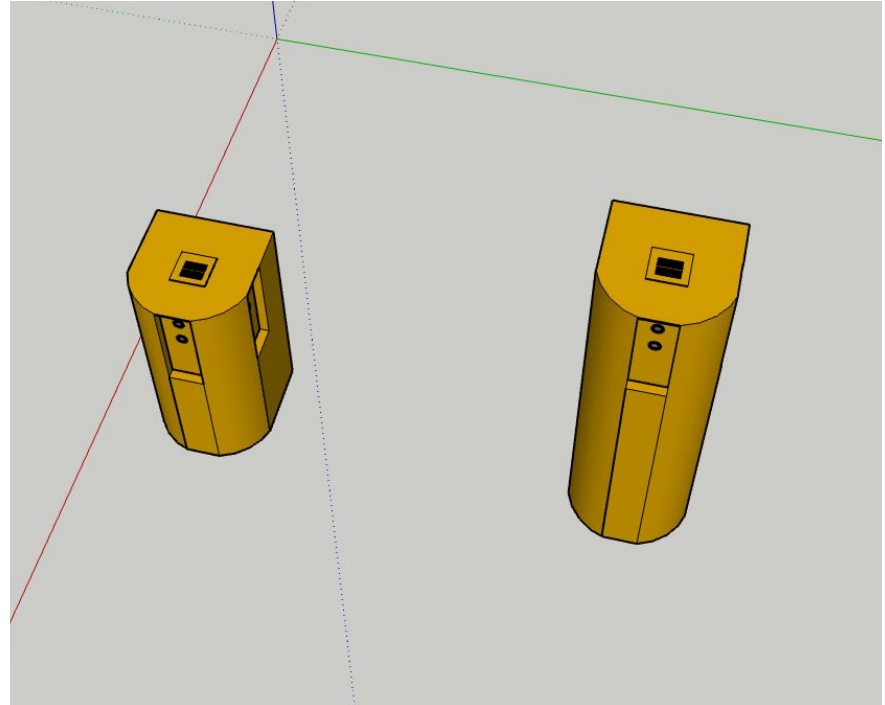
Each unit will have 6 cameras in total:

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



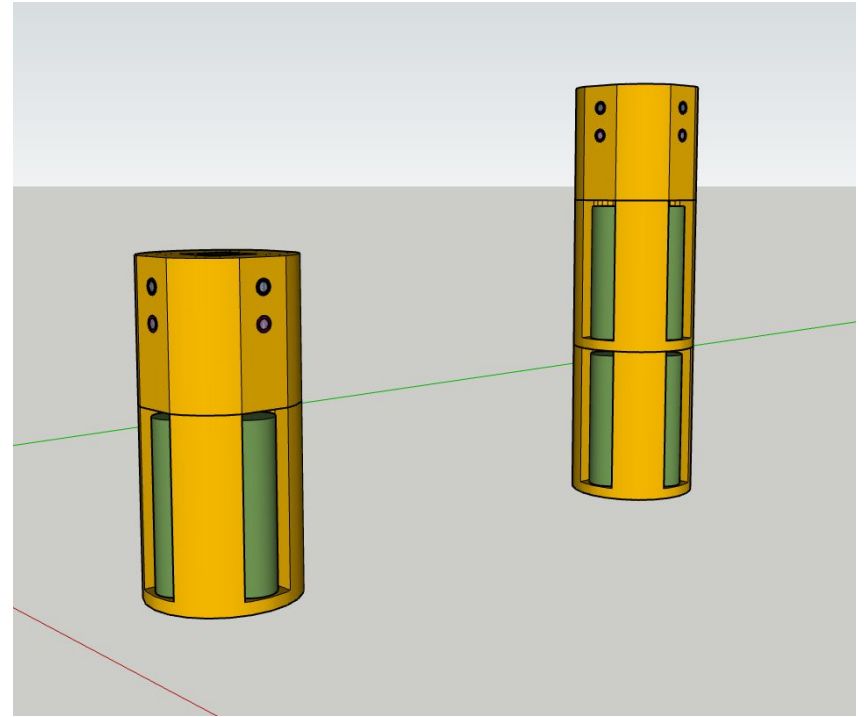
# Design Proposition

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



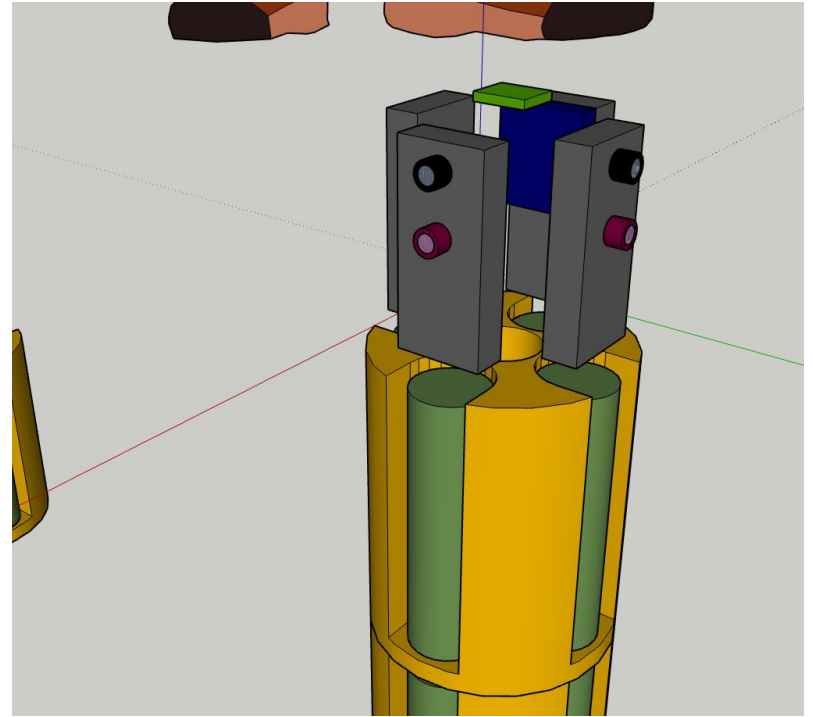
# Design Proposition

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

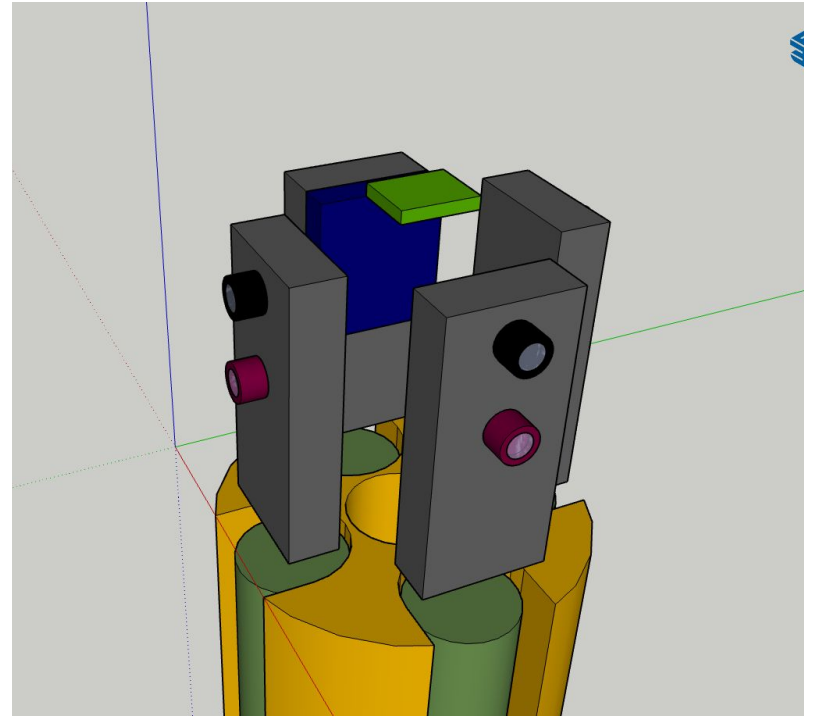
Each unit will allow for roughly **200°** of visibility. It will also relay its reading to a central, **gateway** node through a **LoRa** network.





# 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
-

# 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
-

# 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 **900m<sup>2</sup>** each (30m of coverage in each direction)
  - Minimum of **80** units covering **625m<sup>2</sup>** each (25m of coverage in each direction)
  - Minimum of **125** units covering **400m<sup>2</sup>** each (20m of coverage in each direction)
  - Each configuration will require a minimum of **2 Gateway Nodes** to ensure redundancy
-

# 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