Changes made: We decided to detect CO ppm levels instead of CO_2 levels, as the former spikes especially during fires.

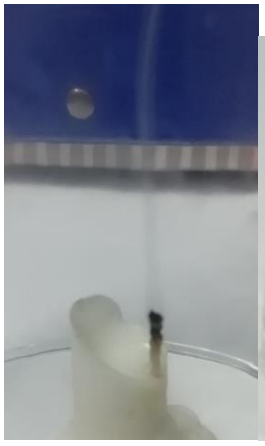
Hypothesis: If high levels of CO are produced during a wildfire and humidity & temperature also increase during a fire, then we can use these three factors to detect a wildfire in its initial stages.

If pressurized CO_2 is cool and is able to displace enough Oxygen to suffocate the fire and will dissipate quickly, then it can be used as an extinguisher.

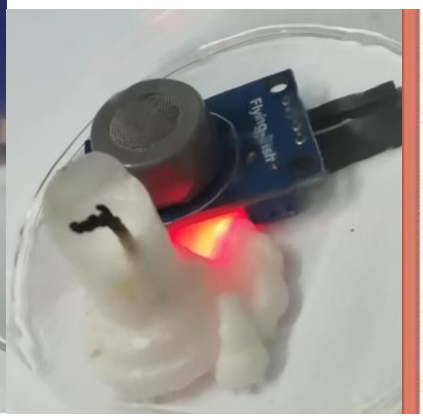
Procedure:

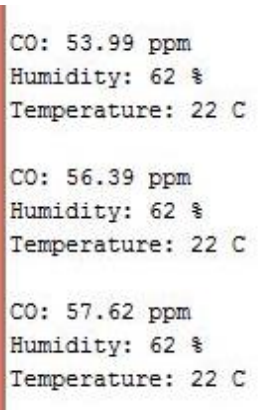
Step1: Set up the Arduino-based CO + temp. & humidity sensor (ABCOTH sensor).
Step 2: Verify measured values with standard measurements.
Step 3: Perform Candle Test

1. Light candle



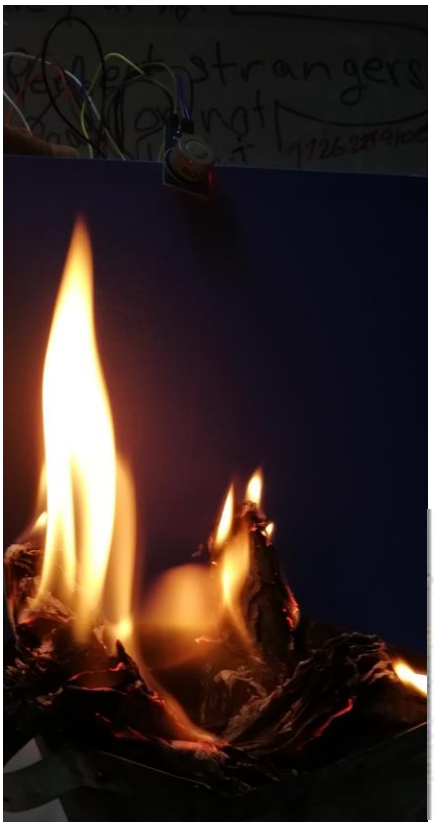
2. Suffocate flame in glass

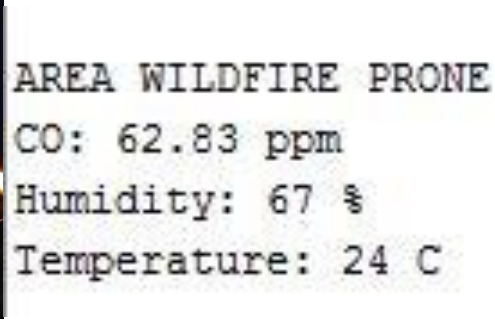




3. Insert CO sensor into closed atmosphere with smoke

Step 4: Perform controlled experiment in room using fire.



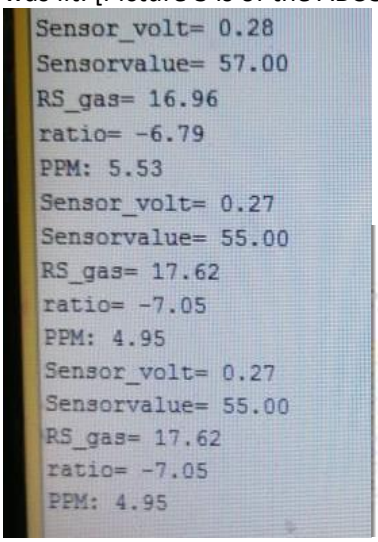


The sensor is located about 1.5 ft away from the small fire lit.

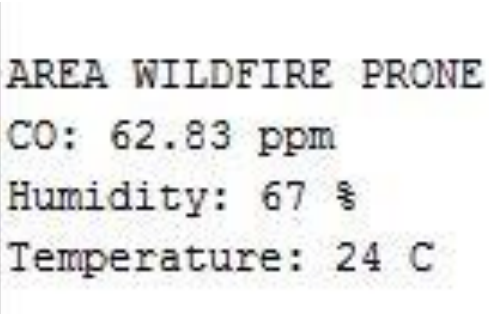
```
if(ppm >= 50 && temp > 56 && hum < 68){
  Serial.println("HIGH POSSIBILITY OF WILDFIRE");
}

else if ((ppm >= 50 && temp > 56) || (ppm >= 50 && hum < 68) || (temp > 56 && hum < 68)) {
  //if two of the three conditions are met, then print that the area is prone to a wildfire
  Serial.println("AREA WILDFIRE PRONE");
}
```

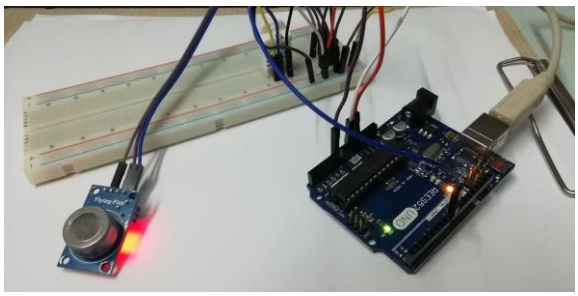
Observations: Humidity levels spiked considerable as considered to a normal reading and while temperature readings remained the same, CO levels were also quick to spike. Reading 1 is of a normal room whereas Reading 2 is after a small fire was lit. [Picture 3 is of the ABCOTH sensor]



(1)



(2)



(3)

Inference: We initially used a low humidity average to detect whether there was a fire in the vicinity, as low humidity and high temperatures make for the perfect conditions for a wildfire to start. Later on, when we observed that the humidity levels were spiking, we took into consideration that the ABCOTH sensor would be detecting a fire in its early stages and the basic combustion equation's products are CO_2, H_2O, and heat. We later increased the humidity levels so that we could get an accurate result.

Conclusion: The experiment was a success! We understood that by developing the ABCOTH sensor we could accurately detect fires in the local vicinity. We developed the prototype and were able to detect an area being 'wildfire prone.'

On further analysis, we also concluded that using pressurized CO_2 would not be plausible as even its minimum design concentration (34%) for its use as a total flooding fire suppressant would cause massive harm to the wildlife & humans.

Next Steps:

Design: We plan on improving the design by upgrading it from Serial Print, i.e., showing results on a computer screen to a Wi-Fi module so that it can transmit the alert to the nearest fire station. We will also be testing it outdoors next.

Extinguishing: While CO_2 on its own is a dangerous asphyxiator, we found that one of its products, carbonic acid is more effective at suffocating a fire. While it has its own downfalls to consider, we found that carbonic acid has a high decomposition rate in the presence of water. Therefore, using carbonic acid is one of the most effective remedies of isolation of a flame from oxygen. As it hits the fire zone, the flame will be covered in a gaseous cloud, creating a blanket which will dissipate the oxygen in the air to suffocate the fire.

The second wave of extinguishing should be done with water to smolder any remaining flames and further cool down the vicinity of the wildfire.

By doing so, not only do we prevent the area from being extremely flooded, but also increase the efficiency of the combatting extinguisher.

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