Gas Sensor

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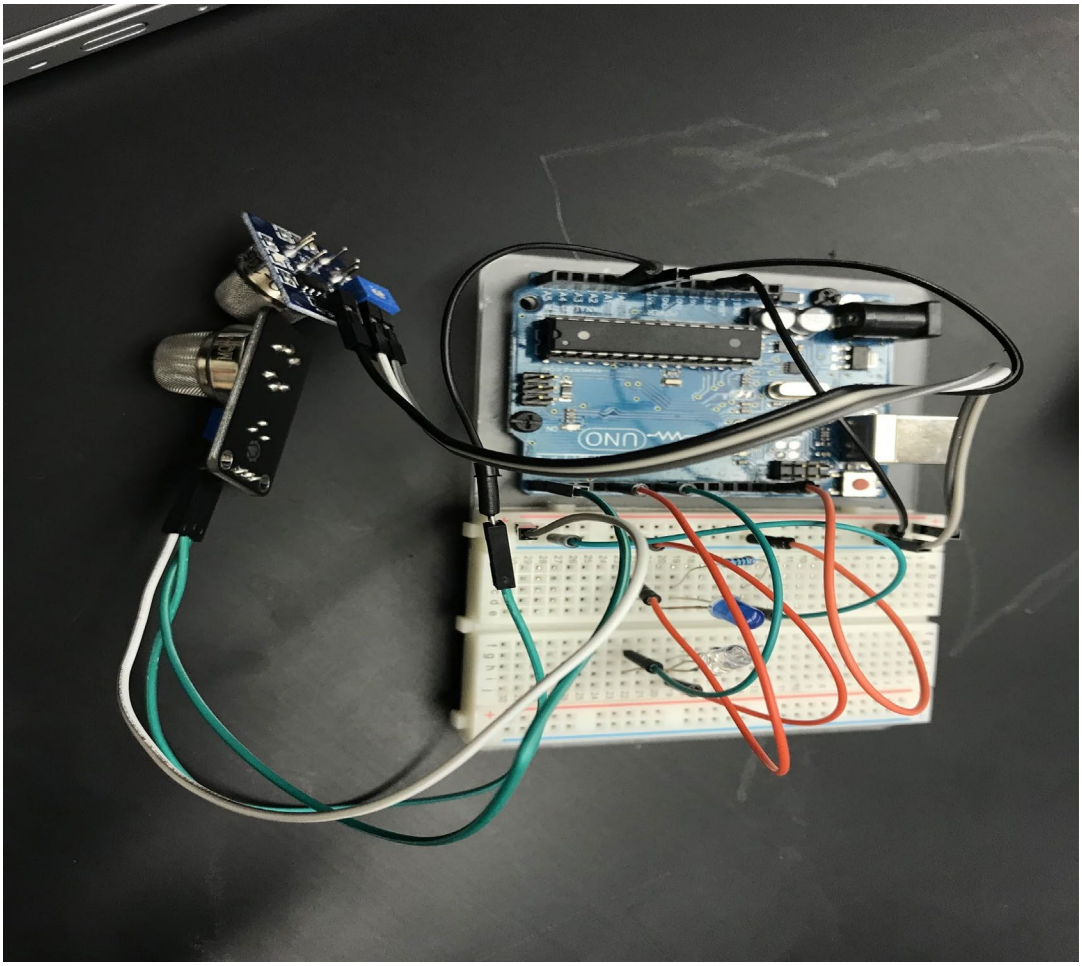


Problem Statement: What we have decided on for our problem is that so many people are so unaware of the dangers of gas leaking into their house through the vents and ducts. It's a two step problem, step one being that people don't even have a sensor to begin with. The other part of the problem would be that even if they have a sensor they have no way to check up on it consistently.

Problem Justification:

- The family in the household is alerted to the gas leak throughout the whole house
- Many people as close as 500 people a year are dying to a gas leak that is not being notified to the people living in the household.
- A live feed of the readers that is being picked up by the sensor that is connected to a phone or a computer.

Research:

1.

Title: Gas Sensor Characteristics for Smoldering Fire Caused by a Cigarette Smoke

Citation: Sawada, Ayako, et al. "Gas sensor characteristics for smoldering fire caused by a cigarette smoke." *Sensors and Actuators B: Chemical* 130.1 (2008): 88-93.

Abstract: A sensor that was an oxide gas sensor is used detect various kinds of gases. It was used to attempt to detect a fire which was caused by a cigarette in a house. The gas sensor can be put on a supporting bar and the height can be changed from 50 cm to 150cm. While the cigarette was put on a cotton cloth and the gas sensor picked it up. The sensor's characteristics are effective to identify the fire position by the sensor output and the differential characteristic. All this is caused the fire to be detected within 30 seconds.

Relevance: The sensor in the home did not detect any gas which caused a fire in the house mainly by a cigarette. This is relevant to our work because it is related to gas sensor.

2.

Title: Carbon Monoxide Poisoning

Citation:

"IIT School of Applied Technology." *Web Design and Application Development | IIT School of Applied Technology*, appliedtech.iit.edu/school-applied-technology-information-technology-and-management/projects/iit-gas-detection-sensors.

Abstract: In this article they explain the forming of Carbon monoxide. Carbon monoxide is produced by the incomplete combustion of carbon-containing fuels, such as gas (domestic or bottled), coal, oil, coke and wood. Gas stoves, fires, heating boilers, gas-powered water heaters,

paraffin heaters, and solid fuel-powered water heaters.The problem arises when such appliances are poorly maintained, not serviced and housed in poorly ventilated areas.

Relevance: We can use this information to explain how carbon monoxide is produced.

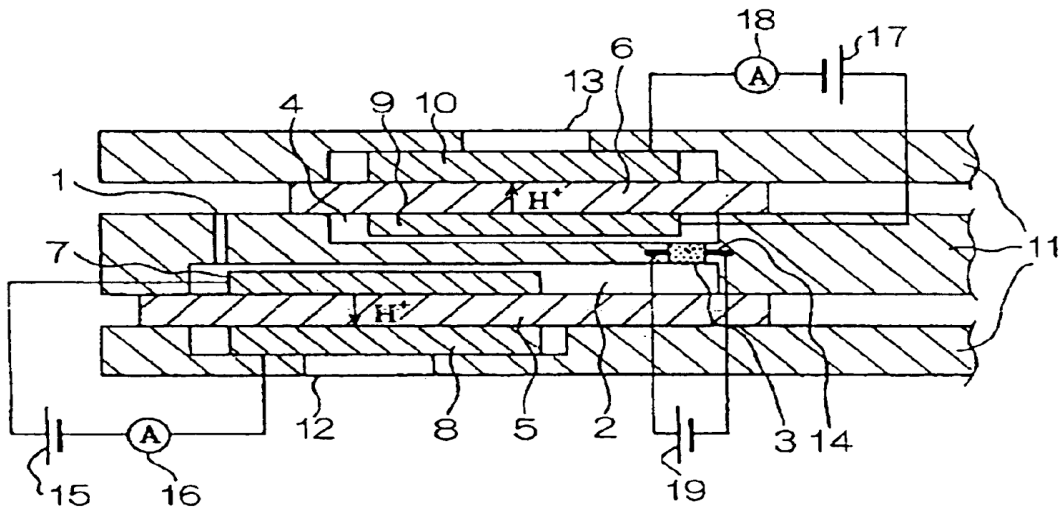
3.
Title: Unintentional Carbon Monoxide—Related Deaths in the United States, 1979 Through 1988

Citation: Cobb N, Etzel RA. Unintentional Carbon Monoxide—Related Deaths in the United States, 1979 Through 1988. *JAMA.* 1991;266(5):659–663. doi:10.1001/jama.1991.03470050059023

Abstract: We reviewed data from 56 133 death certificates that contained codes implicating carbon monoxide as a contributing cause of death. Of these, 25 889 were suicides, 210 were homicides, 15 523 were associated with severe burns or house fires, and 11 547 were classified as unintentional. The number of unintentional deaths decreased steadily by about 63 deaths per year, from 1513 in 1979 to 878 in 1988. The highest death rates occurred in winter and among males, blacks, the elderly, and residents of northern states. Motor vehicle exhaust gas caused 6552 (57%) of the unintentional deaths; 5432 (83%) of these were associated with stationary automobiles.

Relevance: The articles shows that many of the deaths in the U.S. was caused by severe burns or house fires which could have been avoided by a carbon monoxide detector that could have picked up the level of monoxide in the house and alreated the family to evacuate the house.

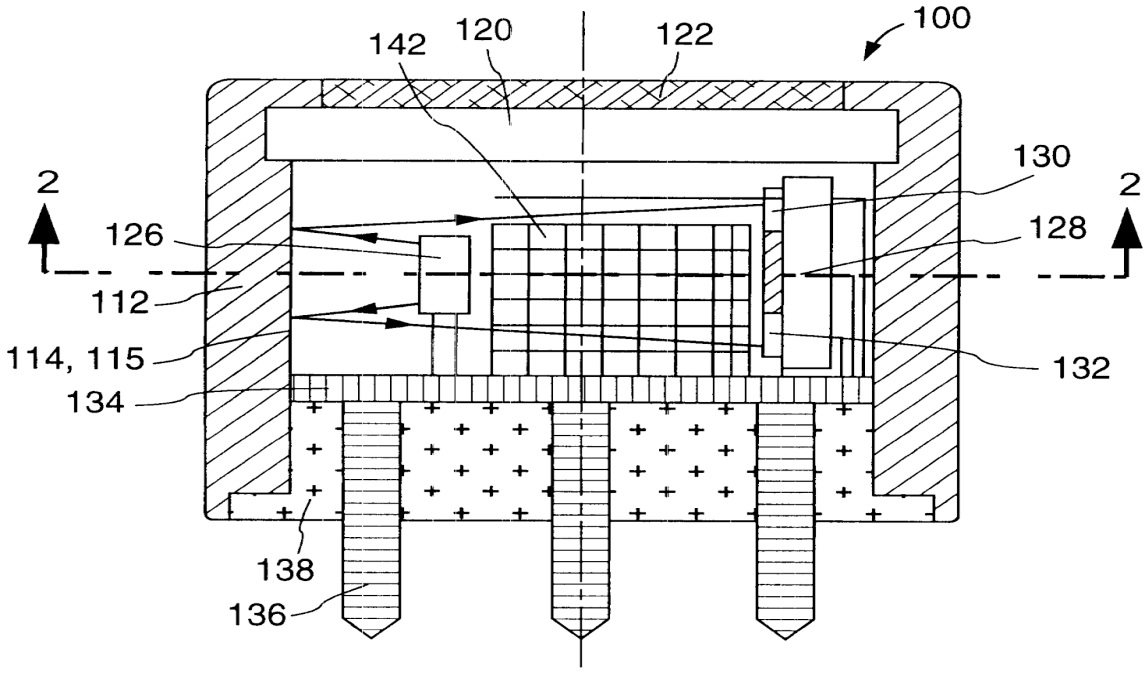
1. **Patent 1**
    a. Title:CO sensor and method of measuring CO concentration
    b. Patent Number:US20020092780A1
    c. Image



Pro:
Accurate measurement of co concentration, of the hydrogen concentration of gas under measurement

Con :
Doesn't respond with live feedback when wanted by the family living in the household.

2. **Patent 2**
    a. Title:Non-dispersive infrared gas sensor
    b. Patent Number:US6469303B1
    c. Image



Pro:
Gas detector measures the concentration of gas using an infrared absorption of the gas.

Con:
Does not respond with live feed back and measurements for the people to be notify of the gas sensor

Commercial Product 1

Title: Propane/Natural Gas Detector, Home Gas Leak Alarm, Tester, Sensor, Sniffer; Monitor Combustible Explosive Gas Level: Methane, Butane, LPG, LNG; Sound/Light Warning & LED Display; eBook
Url:https://www.amazon.com/Propane-Natural-Detector-Combustible-Explosive/dp/B077XS87LN/ref=sr_1_1_sspa?ie=UTF8&qid=1538404296&sr=8-1-spons&keywords=gas+sensor+detector&psc=1
Image:

Pro:
This alarm precisely measures and displays concentration of combustible gas as an easy-to-read percentage from 0% to 20% of LEL.

Cons:
it needs to be connected to a power outlet which make it's less convenient to move around the house.

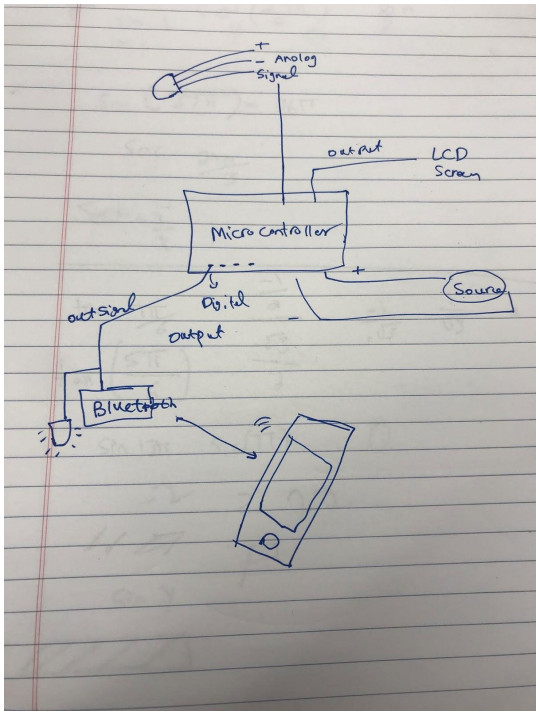
Commercial Product 2

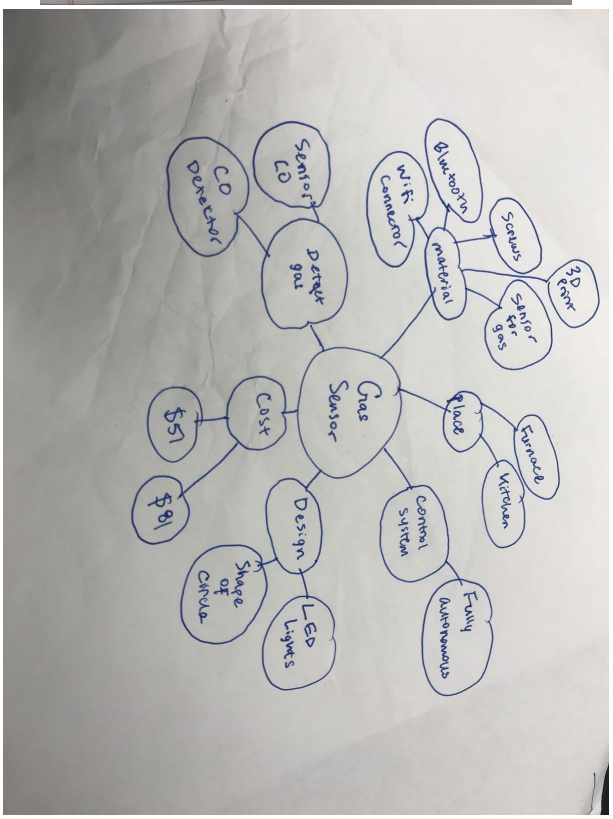
Title: Funtin Home Natural Gas Detector, Combustible Gas Leak Alarm
Url:https://www.amazon.com/Funtin-Natural-Detector-Combustible-FTH-KBF1/dp/B07G5JK19M/ref=sr_1_4?ie=UTF8&qid=1538404808&sr=8-4&keywords=gas+sensor+detector&dpID=41FJhkiBQLL&preST=_SY300_QL70_&dpSrc=srch
Image:

Pro:
Displays live feedback on the led screen on the alarm as well as it does a self test program when it is in your house.

Con:
It doesn't have a backup power supply incase the battery fails.

Sketches:


+
- Analog Signal
output
LCD Screen
Micro controller
+
Source
-
out signal
Digital output
Bluetooth

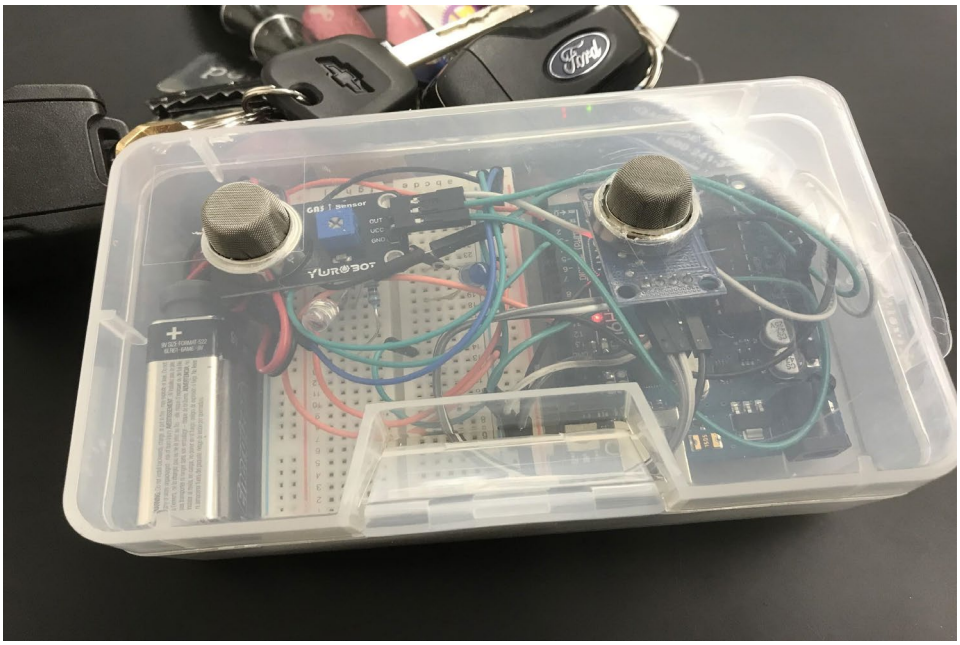

Gas Sensor
Cost
$51
$91
Design
Shape of curve
LED lights
Control System
Fully Autonomous
place
Furnace
Kitchen
material
Bluetooth
Screws
3D print
Sensor for gas
Wi-Fi Connector
Detect gas
Sensor CO
CO detector

BIlls of Material:

Name of Material	Where to Buy	Cost
Case	3D Printer	$0
Bluetooth	In stock	$0
Battery charger	In stock	$0
Sensor	Amazon	$5
LED	In stock	$0
mother board	in stock	$0

https://www.digikey.com/en/maker/projects/874229f4378346a7a0d86c28c5ca2850

FINAL PROJECT PHOTO



Code:

```
int analogPin0 = 0;   // potentiometer wiper (middle terminal) connected to analog pin 0
int analogPin1 = 1;   // potentiometer wiper (middle terminal) connected to analog pin 1
                      // outside leads to ground and +5V
int val0 = 0;         // variable to store the value read
```

```
int val1 = 0;         // variable to store the value read
void setup()
{
 Serial.begin(9600);           //  setup serial
 pinMode(4,OUTPUT);
 pinMode(7 ,OUTPUT);
}
void loop()
{
 val0 = analogRead(analogPin0);  // read the input pin
  val1 = analogRead(analogPin1);   // read the input pin
 Serial.println(val1);
delay(100);
 // debug value
 if(val0>60)
 {
digitalWrite(4, HIGH);//if limit has been reached, LED turns on as status indicator
}else{
digitalWrite(4, LOW);//if threshold not reached, LED remains off
}
if(val1>60)
 {
digitalWrite(7, HIGH);//if limit has been reached, LED turns on as status indicator
}else{
digitalWrite(7, LOW);//if threshold not reached, LED remains off
}
}
```

Construction Steps:

1) Sketch out and figure out the materials needed for the project
2) Gather all of the materials and start basic assembly
3) Put together the console and wiring
4) Go into arduino and write your code
5) Upload the code
6) Fire up gas sensors and run tests to see if they are working correctly
7) Once they are working correctly move to the 3D Printing lab and try to get a good shell
8) Fail miserably
9) Make the shell out of a plastic box and run final steps

Conclusion:
In conclusion we have created a cheap and affordable gas sensor that can measure the levels in the air and keep the household safe from toxic gasses. Overall the hardest part of this project was the 3d printing because of the fact that it kept failing so we had to be creative and make a plastic box and drill some holes in it in which we feel turned out better.