Smoke Detector

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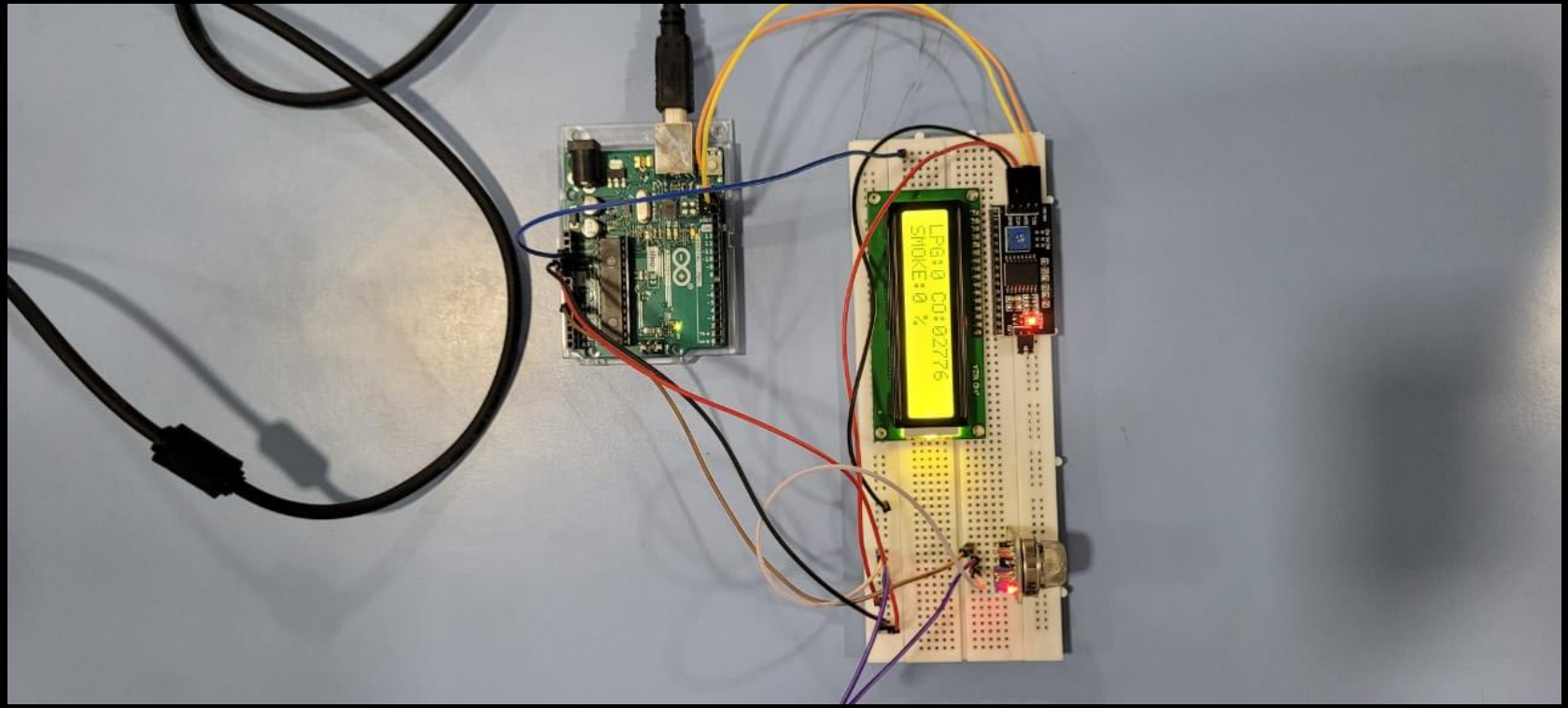
A basic prototype to detect and measure snoke contents present in fire smoke


LPG:0 00:02776
SMOKE:0 %

Materials

- Arduino uno
- Jumper cables (M-M, M-F)
- 16X2 LCD With I2C chip
- MQ2 gas sensor
- Arduino connector

The mq2

Technical Data

Model No.			MQ-2
Sensor Type			Semiconductor
Standard Encapsulation			Bakelite (Black Bakelite)
Detection Gas			Combustible gas and smoke
Concentration			300-10000ppm (Combustible gas)
Circuit	Loop Voltage	V_C	≤24V DC
	Heater Voltage	V_H	5.0V±0.2V ACorDC
	Load Resistance	R_L	Adjustable
Character	Heater Resistance	R_H	31Ω±3ΩRoom Tem.
	Heater consumption	P_H	≤900mW
	Sensing Resistance	R_S	2KΩ-20KΩ(in 2000ppm C_3H_8)
	Sensitivity	S	Rs(in air)/Rs(1000ppm isobutane)≥5
	Slope	α	≤0.6($R_{5000ppm}/R_{3000ppm}$ CH4)
Condition	Tem. Humidity		20±265%±5%RH
	Standard test circuit		Vc:5.0V±0.1V V_H: 5.0V±0.1V
	Preheat time		Over 48 hours

Phases of the project

Phase 1: Collection of hardware. Sourced from amazon

Phase 2: Basic integration. Here we checked whether the sensor is working or not by simply checking its power supply and its ability to detect smoke.

Phase 3: Connection of arduino uno with mq2 sensor

Phase 4: Soldering the pins on the lcd display and then integrating the lcd with i2c with the entire setup. (Soldering was a tricky part)

Phase 5: Uploading code and integrating the right libraries

Phase 6: Testing with incense sticks and burning paper.

Phase 7: Using esp8266 wifi module to use the cloud service on thingspeak.

Precautions taken care of:

1. Proper safety while soldering
2. Always connect 3.3V to the esp pin. If 5v power supply is used then the esp will be fried.
3. Always disconnect the arduino while changing pins on the board.

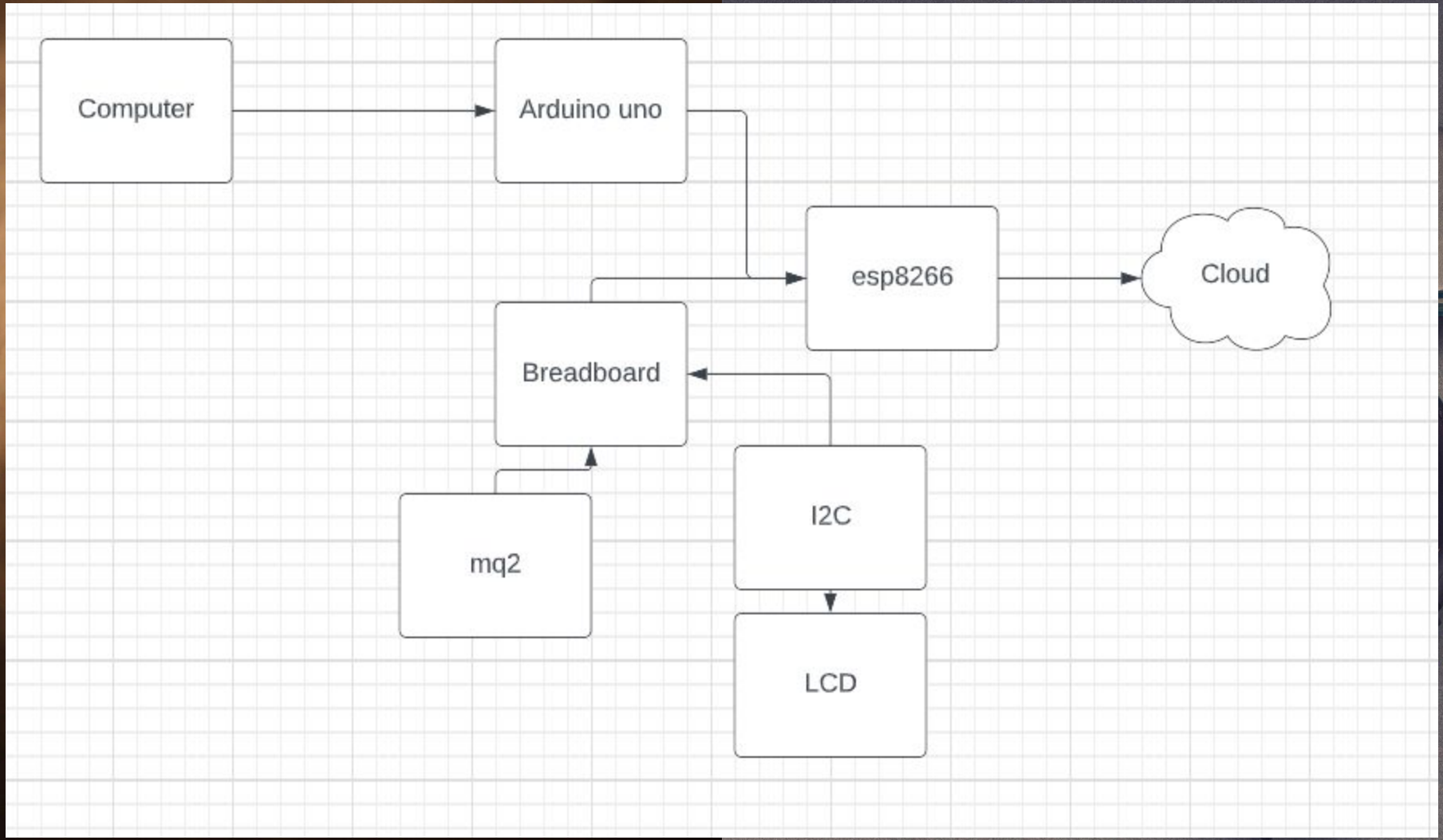
Efforts

Phase 1: Rushabh, Atharva

Phase 2: Sensor checking and reading data sheet and research papers: Neal, Vishwas

Phase 3,5 : Rushabh, Mihir, Atharva

Phase 6: Rushabh, Vishwas


Computer
Arduino uno
esp8266
Cloud
Breadboard
mq2
I2C
LCD

Purpose and requirements specification

Purpose: To design a working model to detect smoke and give readings about the contents of the smoke such as carbon monoxide, smoke percent, lpg, etc

Requirements: The model should measure all the major components of smoke and give an analysis graph. The results should be stored on the cloud using thingspeak and esp8266. All the hardware requirements are mentioned above.

Processes

The processes include:

a. Measuring of CO, smoke, LPG
b. Plotting results
c. Detection of threshold markers
d. Display on LCD with dark and light modes.

Domain model specification

Physical entities: smoke with traces of CO, LPG, other gases

Virtual entity: room atmosphere

Devices: MQ2 sensor

Resource: Os on arduino uno

Service: Interface

How did we handled various problems

MQ2 sensor showing 0 values:

We adjusted the connections to the breadboard using jumper cables and verified the pins to be connected. After checking the values, we made use of a stronger source of smoke. This solved the problem as it turned out that the carbon monoxide present in incense sticks is too little to be detected

Soldering:

We asked for help from the racing department of our college to help solder the lcd pins.

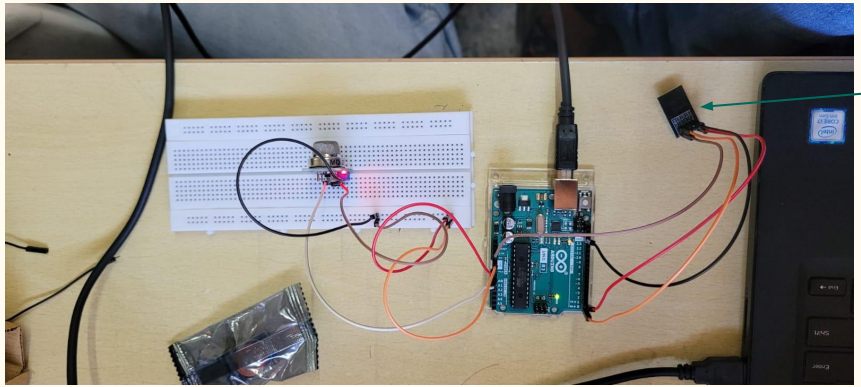
How we handled various problems

LCD display not showing values despite being powered on:

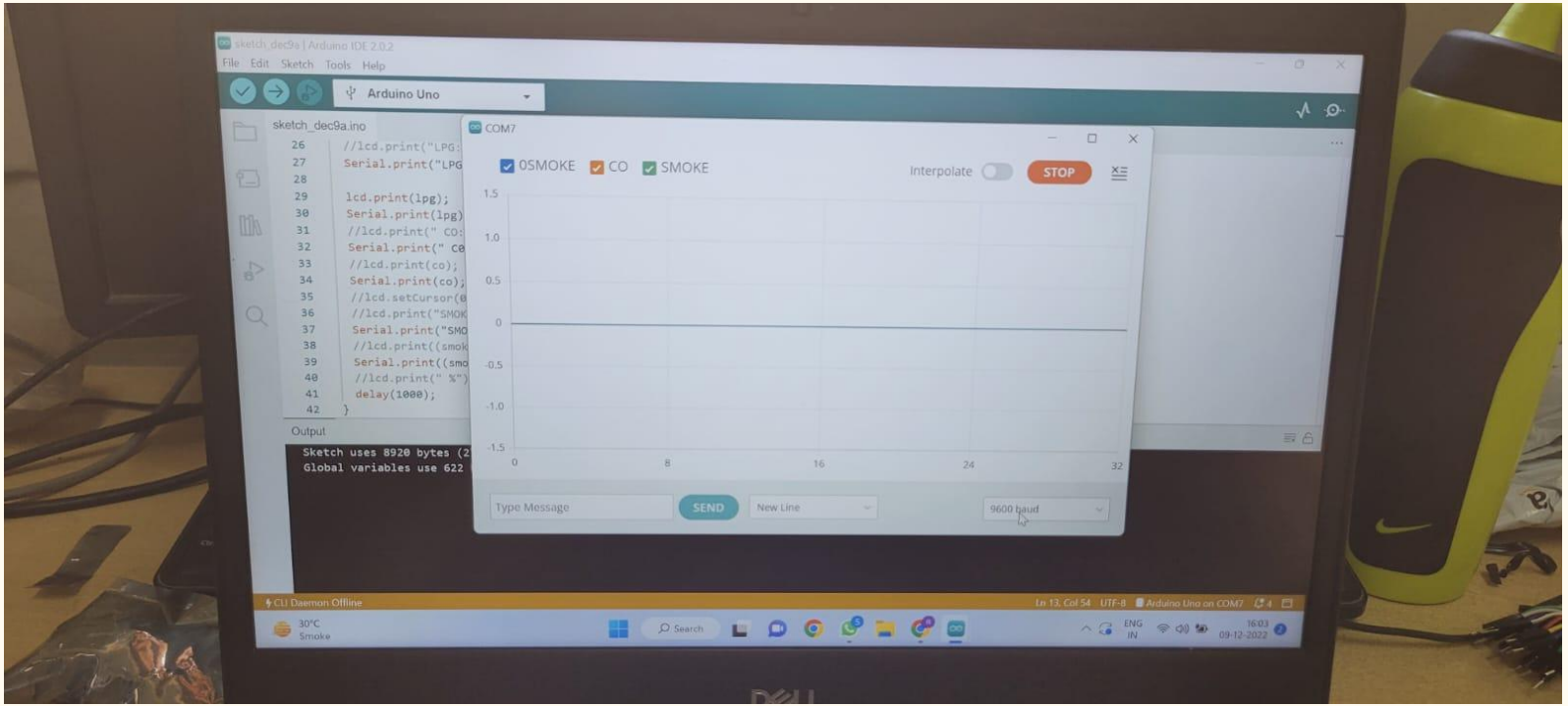
Turns out, this problem had an easy solution. After days of researching, we simply used a screwdriver and turned the screw of the potentiometer on the I2C module. As a result, the reading on the lcd were displayed properly.

Future scope

We aim to upload the reading on the thingspeak interface with cloud. Note that, arduino uno by itself does not have any wifi capabilities. So we need to take help of the esp8266 wifi module chip. However due to connection issues with the esp8266 and an error in thingspeak interface, we weren't able to complete the cloud service on time.



Plotter (Serial)



Testing

Following things can be used for testing:

1. Incense stick
2. A paper set on fire
3. Plastic set on fire
4. A burning cigarette stub

Code available on:

https://github.com/RushabhM03/Smoke-detector