ACMEGRADE

MINI PROJECT ON

'SMART DEVICE FOR LPG GAS AND SMOKE DETECTION'

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ABSTRACT

A gas-and-smoke detector system is a crucial system that is needed to be incorporated in industries and large-scale projects to prevent catastrophic accidents due to gas leakage.

A combined working component that serves as a gas leakage detector and smoke exhaust would be economically feasible and easy to install. This is what our team aims at designing.

Various features, software and components used to design a working model simulation are – TinkerCad, Arduino UNO Board, Breadboard , Gas sensor, Resistor, Buzzer, Wires, LED

This report describes the model, the code and the working of the idea presented above. The basic principle is that when the particles enter the chamber, they attract the ions and carry them away, reducing the current. When the number of particles entering the chamber is enough to reduce that current below a certain amount, the device registers those particles as smoke and the sounds the alarm.

This project has the potential to reduce loss of life and property and assets due to accidents caused by gas leakage.

1. INTRODUCTION

1.1 MOTIVATION

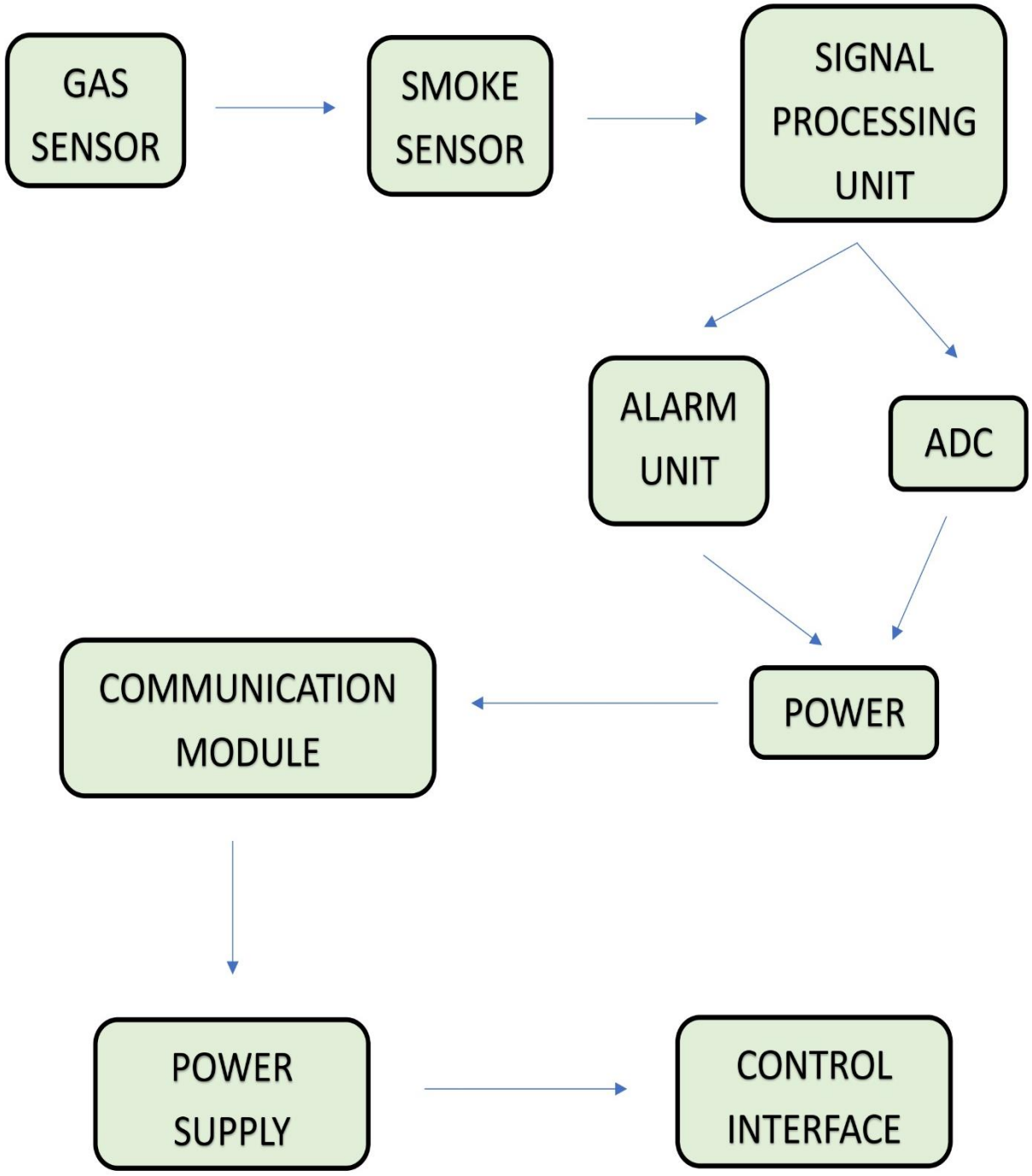
The only thought that provoked the necessity of making this apparatus was to reduce the number of causalities happening due to carelessness in handling the gas suppling equipment and the consequences then encountered.
Protecting the environment and precious lives is what this framework is designed for.

1.2 PROPOSED SYSTEM

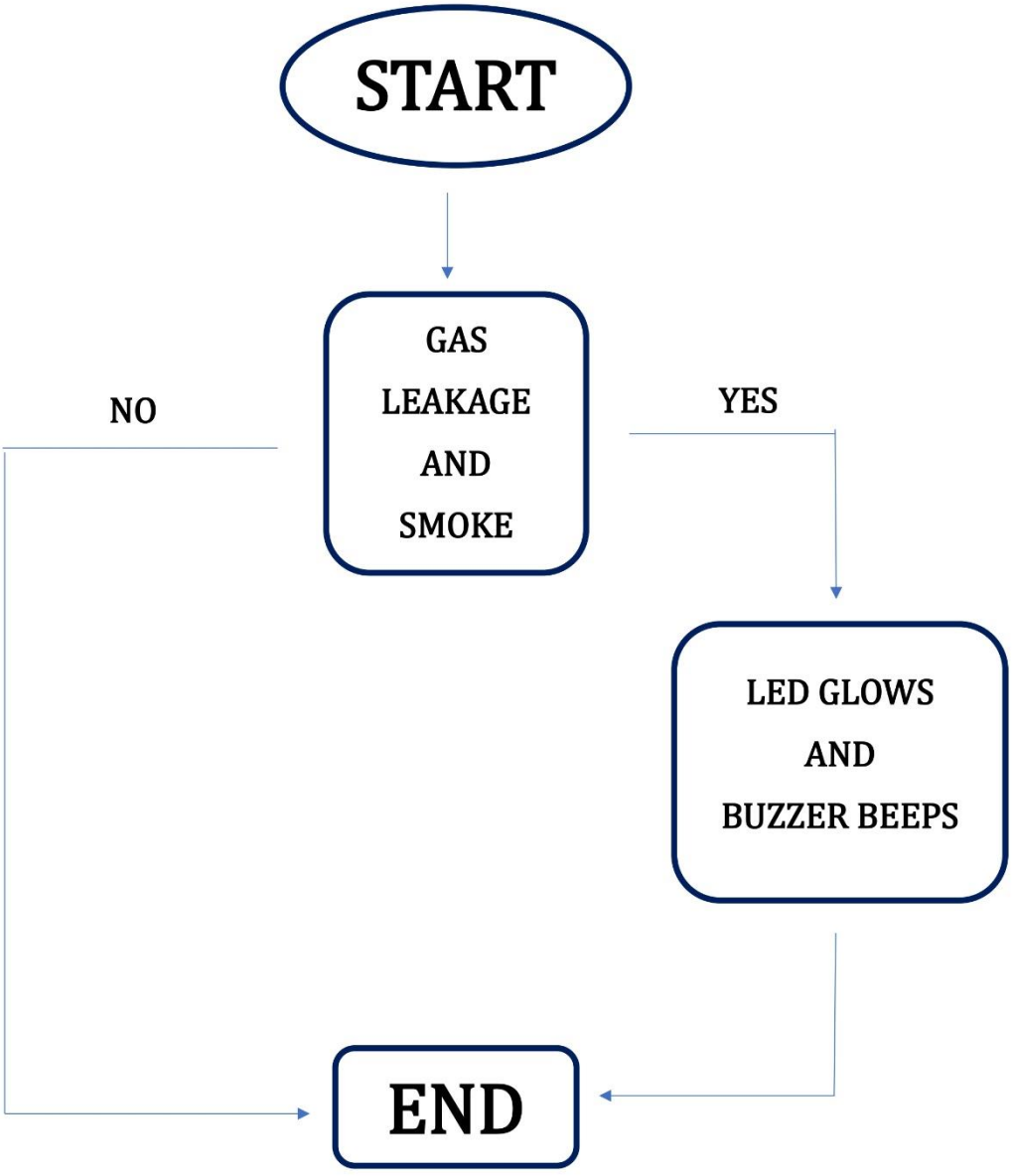
We aim at building a circuit that not only beeps on detecting but lights up an LED simultaneously.
The gas sensor acts as a switch – as soon as the it detects the presence of particles of smoke or gas leakage it immediately passes on the current to the LED and simultaneously to the buzzer so that necessary action can be taken at the earliest.

2. METHODOLOGY

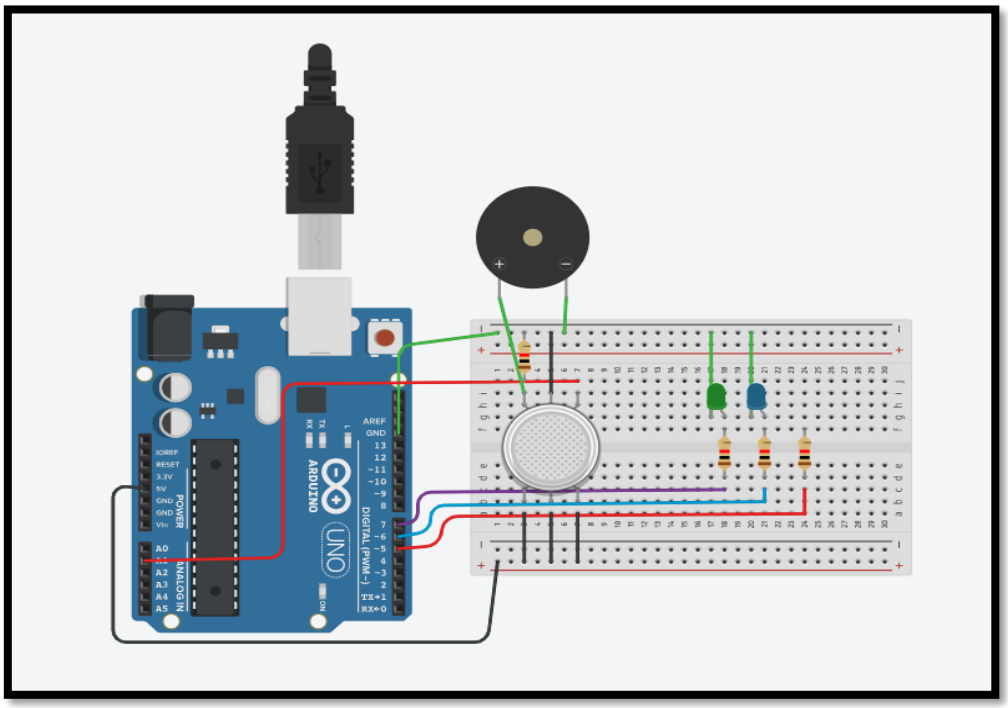
2.1 BLOCK DIAGRAM



2.2 DESIGN FLOW



2.3 CIRCUIT DIAGRAM



2.4 ARDUINO CODE

```
int const PINO_SGAS = A1;
int LED_VERDE = 7;
int LED_AMARELO = 6;
int BUZZER_PIN = 8; // Pin connected to the
buzzer

void setup() {
   pinMode(LED_VERDE, OUTPUT);
   pinMode(LED_AMARELO, OUTPUT);
   pinMode(BUZZER_PIN, OUTPUT); // Set buzzer
pin as output
```

```
    Serial.begin(9600);
}

void loop() {
    int valor = analogRead(PINO_SGAS);
    int mappedValue = map(valor, 300, 750, 0, 100);

    Serial.print("Raw Value: ");
    Serial.print(valor);
    Serial.print(" Mapped Value: ");
    Serial.println(mappedValue);

    int threshold = 30;
    int hysteresis = 5;

    if (mappedValue >= threshold) {
        Serial.println("Triggering alarm");
        digitalWrite(LED_VERDE, LOW);
        digitalWrite(LED_AMARELO, HIGH);
        tone(BUZZER_PIN, 1000);
    } else if (mappedValue < threshold - hysteresis) {
        Serial.println("No alarm");
        digitalWrite(LED_VERDE, HIGH);
        digitalWrite(LED_AMARELO, LOW);
        noTone(BUZZER_PIN);
    }

    delay(250);
}
```

2.5 LIMITATIONS OF EXISTING SYSTEMS

1. This detection technique in use might not detect any inflammable gases in vacuum or oxygen free environment.
2. It can also happen that the excessive heat produced at the workplace is not accurately detected.
3. The detector is susceptible to poisonous gases and minute organic vapours which have the potential to damage the sensors of the device hence it may lead to false alarming or no detection in case there's real smoke.
4. The existing systems have a limited range of detection thus a large number of such circuits are required at be installed at huge workplaces.
5. The maintenance job requires high investment.

3. TOOLS AND LANGUAGES REQUIRED

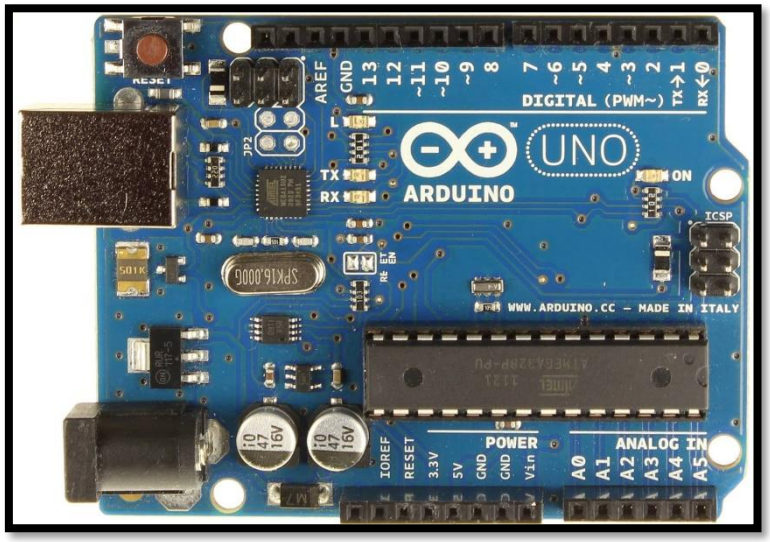
3.1 SIMULATION TOOL

The simulation tool used was TinkerCad.
Tinkercad has a range of electronic components which can be used to build circuits and control devices.
It also has a built-in Arduino simulator that allows the users to program and test their circuits in a virtual environment. This makes it easy to prototype and test new ideas before building them in the real.

3.2 HARDWARE COMPONENTS

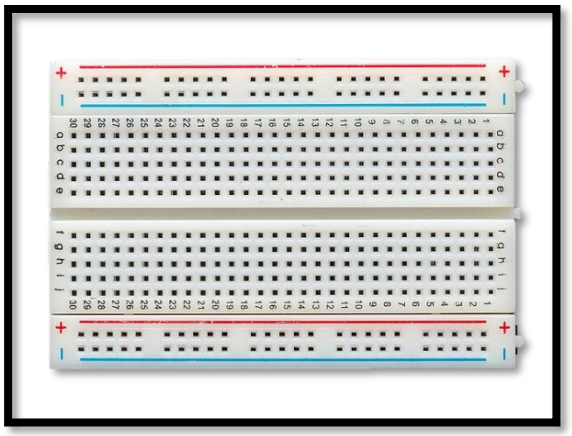
1. LED – Light Emitting Diode is a semiconductor device that emits light when an electric current is passed through it.

2. Arduino UNO Board – is an open-source microcontroller board that helps create interactive projects giving smart solutions by automation. It is based on the processor ATmega328p. It also comes with a variety of input and output pins that can be used to connect different electronic components.

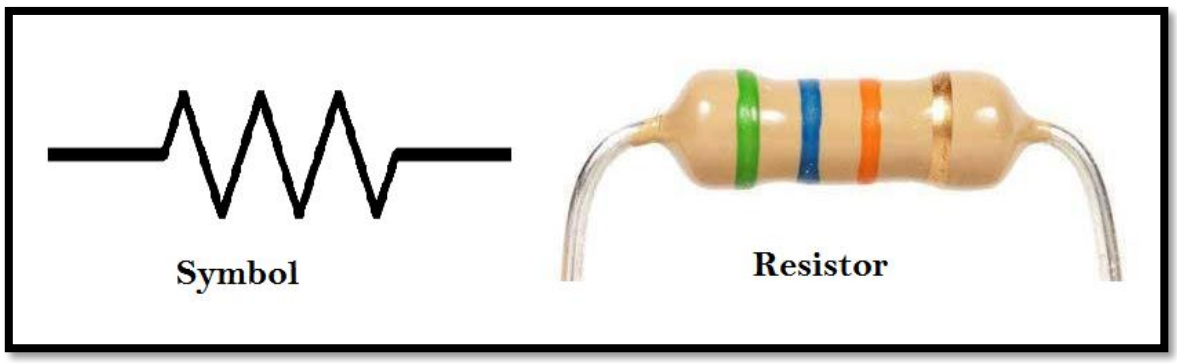


3. Gas sensor – reveal the amount of gas in the environment and the nature of the gas composition

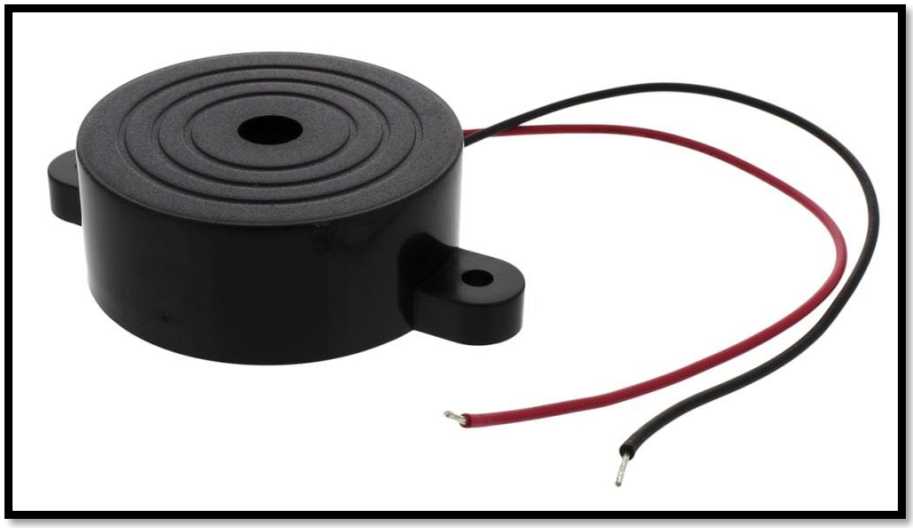
4. Breadboard – allows for easy and quick creation of temporary electronic circuits



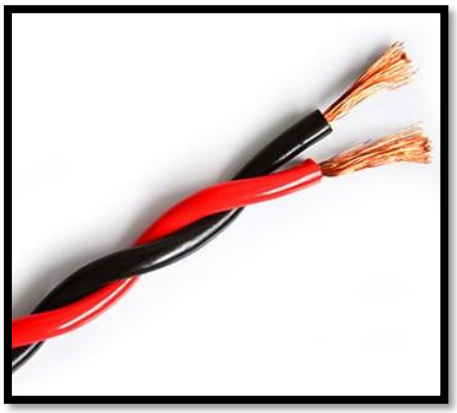
5. Resistor – an electronic component that limits or regulates the flow of current in a circuit



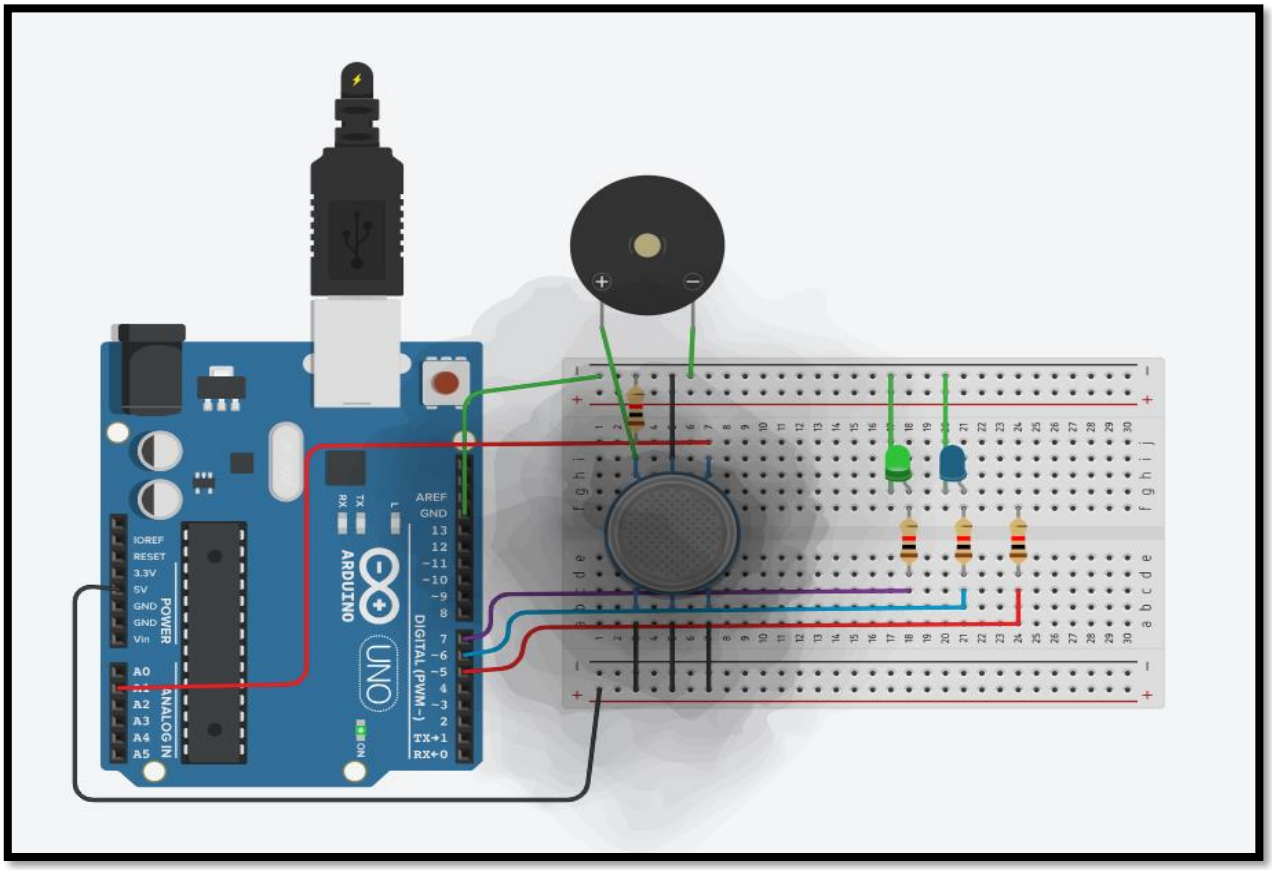
6. Buzzer – is an audio signalling device. We use the *piezoelectric buzzer*



7. Wires – used to connect different components



4. SIMULATION RESULTS



The LED starts glowing in the presence of smoke in the surroundings and passes the current to the buzzer so that it beeps immediately.

5. ADVANTAGES

A gas detection system is must to be installed at places that involve working with dangerous inflammable gases and high heat production.

It offers various advantages to look for and overview the expenses of installation –

1. Having such a system helps monitor the number of gases in the environment and control their amount and thus, develop a safe working environment.
2. Less response time: Detects and alarms if there any fire or smoke or gas leakage immediately.
3. Reasonable costing when installed in large industries and refineries since repairing the damage then caused otherwise would charge much more.
4. Very low operating cost.
5. Reliable technology with advancing and useful modifications being evolving regularly.

6. FUTURE SCOPE

The LPG gas leakage detection and the alert system have a significant future in improving safety and preventing accidents in households and industries.

With advancements in technology, the system can be further enhanced to provide more accurate and efficient detection of gas leakage.

The most disruptive technologies are predicted to be printed and acoustic gas sensors, which hold the promise for ultra-low form factor applications such as smart packaging and wearables.

CONCLUSION

This report confers the importance of the Gas and Smoke Detector System.

Installation of such a system is very crucial and necessary on industrial basis. The system proposed in the report is a hands-on and simple way to avoid situations that may cause severe damage to life and property.

This is done by deviously designing a comprehensive and coherent electronic circuit that uses LEDs, an Arduino UNO Board, Gas Sensor and Buzzer.

TinkerCad was used to stimulate the circuit and the simulation results show that the circuit has been executed successfully.

REFERENCES

Took reference from the ACMEGRADE platform and help from our instructor, Prof. Manjunath G.

He guided us as to how to make the connections and proceed with coding to stimulate the circuit built.