SENSOR-BASED GAS LEAKAGE DETECTOR SYSTEM

A SOCIALLY RELEVANT PROJECT

Bachelor of Technology
In

COMPUTER SCIENCE AND ENGINEERING(AI & ML)

BY

V.HEMALATHA
22331A4260

M.PAVAN
22331A4235

G.AVINASH
22331A4218

M.ALEKYA
22331A4232

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

MVGR COLLEGE OF ENGINEERING (Autonomous)
VIZIANAGARAM-535005, AP (INDIA)
(Accredited by NBA, NAAC, and Permanently Affiliated to Jawaharlal Nehru Technological University Kakinada)

ABSTRACT

Liquefied Petroleum Gas (LPG) is a main source of fuel, especially in urban areas because it is clean compared to firewood and charcoal.Gas leakage is a major problem in the industrial sector, residential premises, etc. Nowadays, home security has become a major issue because of increasing gas leakage. Gas leakage is a source of great anxiety with ateliers, residential areas and vehicles like Compressed Natural Gas (CNG), buses, and cars which are run on gas power. One of the preventive methods to stop accidents associated with the gas leakage is to install a gas leakage detection kit at vulnerable places. The aim of this paper is to propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage. This proposed system also includes an alerting system for the users. The system is based on a sensor that easily detects a gas leakage.

INTRODUCTION

Gas leakage is a serious problem and nowadays it is observed in many places like residences, industries, and vehicles like Compressed Natural Gas (CNG), buses, cars, etc. It is noticed that due to gas leakage, dangerous accidents occur. The Liquefied petroleum gas (LPG), or propane, is a flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, and vehicles because of its desirable properties which include high calorific value, less smoke, less soot, and meagre harm to the environment. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage.The number of deaths due to the explosion of gas cylinders has been increasing in recent years. The Bhopal gas tragedy is an example of accidents due to gas leakage.Therefore, the gas leakage should be detected and controlled to protect people from danger.

EQUIPMENTS REQUIRED

S.NO	EQUIPMENT	QUANTITY
1.	ARDUINO	1
2.	MQ-6 GAS SENSOR	1
3.	16*2 LCD	1
4.	BUZZER	1
5.	10 K VARIABLE RESISTOR	1
6.	MALE TO MALE/FEMALE WIRE	40
7.	GAS LIGHTER	1
8.	9V BATTERY / CHARGER TO GIVE SUPPLY	1
9.	ATMEGA328P	1
10.	SIM CARD	1

GAS SENSOR:

A gas sensor is a device which detects the presence or concentration of gas in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor , which can be measured as output voltage . based on this voltage value the type and the concentration of the gas can be estimated.

ARDUINO-UNO:

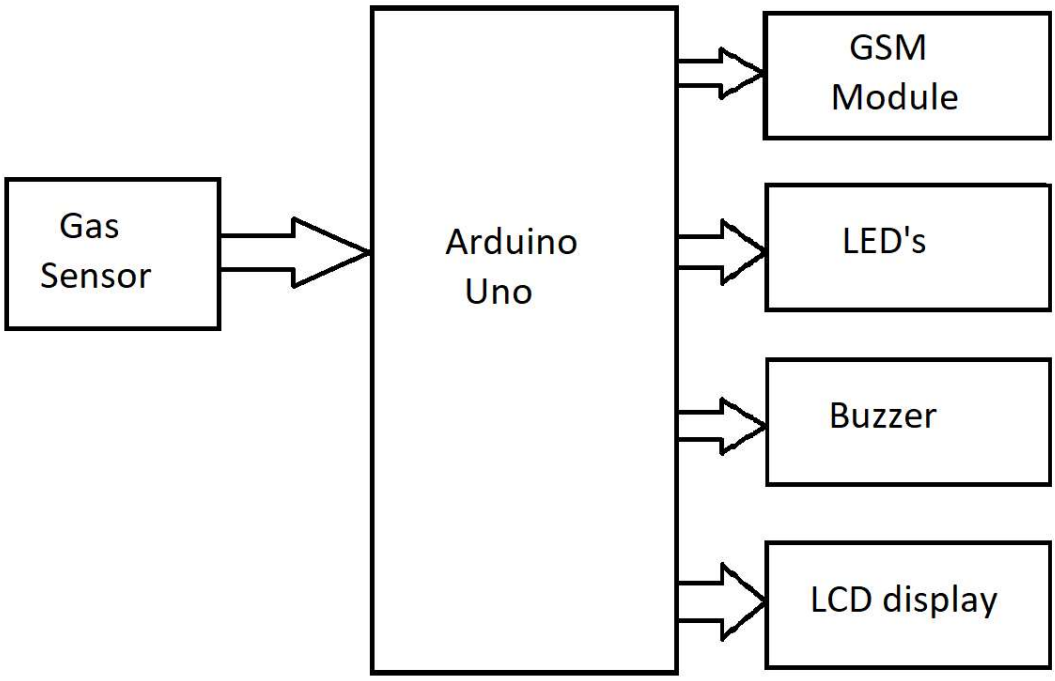
Arduino-uno is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

ATMEGA328:

The ATmega328 is by Atmel in a single-chip microcontroller .The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers.

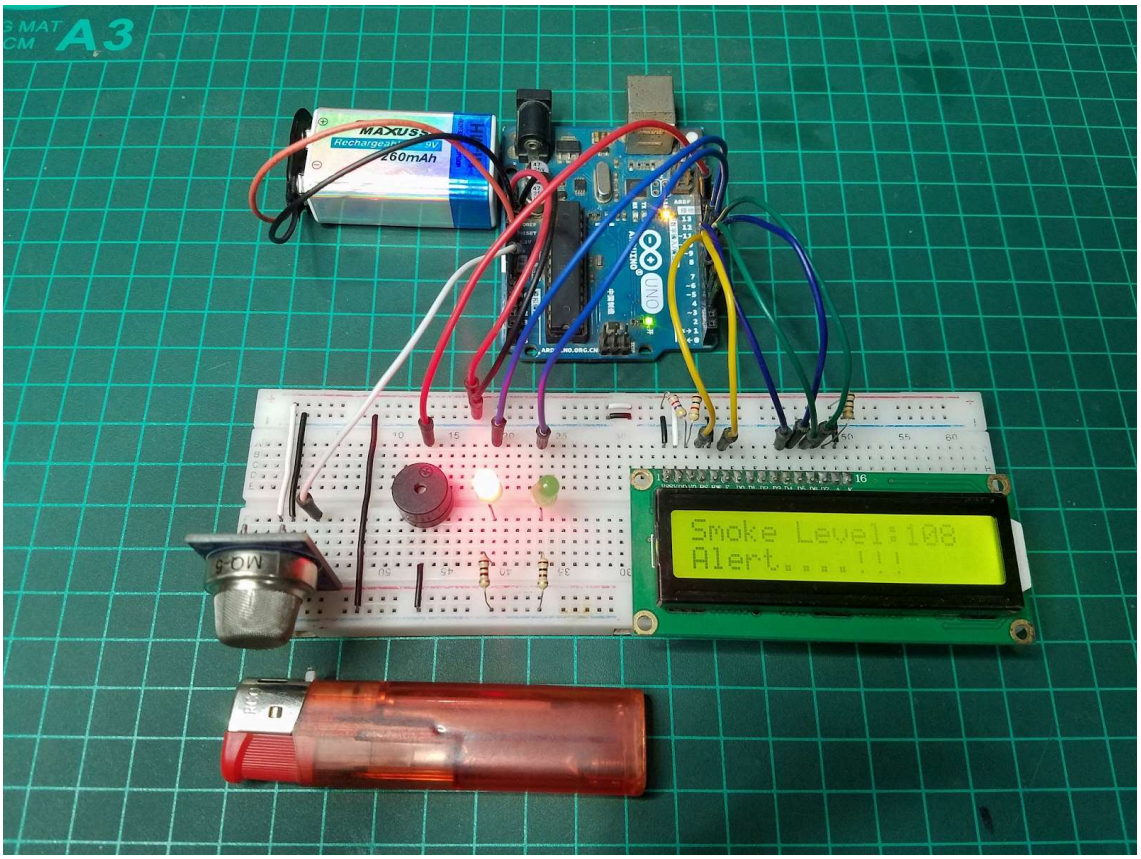
LITERATURE REVIEW

BLOCK DIAGRAM:



In this semiconductor sensors are used to detect LPG gas. An MQ6 semiconductor sensor is used. Sensitive material of the MQ-6 gas sensor is SnO2, which has lower conductivity in clean air. When the target combustible gas exists, the sensor conductivity increases along 8 with the rising gas concentration. The MQ6 gas sensor has a high sensitivity to Propane, Butane and LPG, and response to Natural gas. The sensor could be used to detect different combustible gases, especially Methane; it has a low cost and is suitable for different applications. The MQ-6 can detect gas concentrations anywhere from 200 to 10,000 ppm.

HARDWARE -DIAGRAM



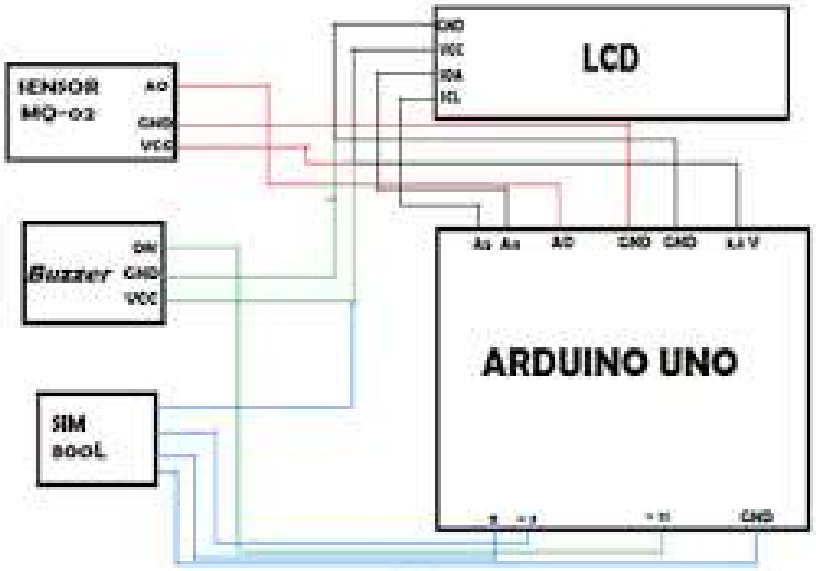
The above fig shows the hardware connection of the sensor based gas detection system . In practical whenever the supply is in on condition and the MQ-6 sensor if detects the gas it shows the ppm value in LCD display .when the ppm value reaches the value of 190 ppm the controller gives the signal to the buzz

FLAWS IN THE EXISTING SYSTEM:

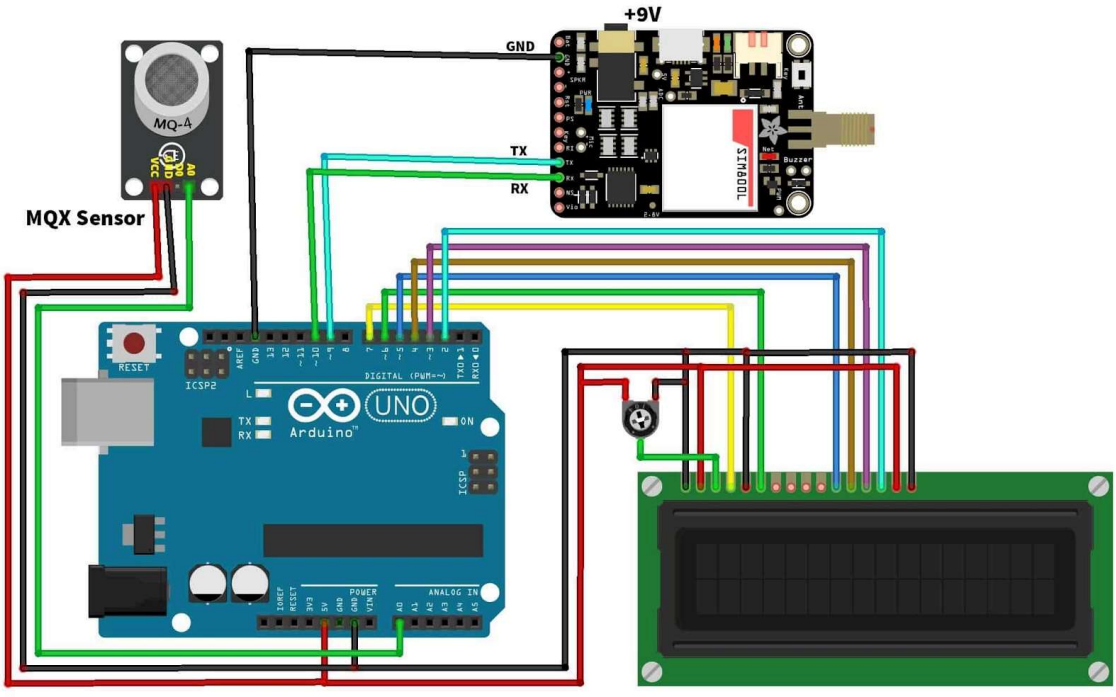
Inadequate Alarm Design: The buzzer may not be loud enough or distinctive enough to capture attention in critical situations, especially if users are engaged in tasks that require focus.

ADVANCED MODEL

BLOCK DIAGRAM:



HARDWARE DIAGRAM:



SOFTWARE COMPONENTS:

1. C/C++ :

The code uses C/C++ syntax for:

- Managing pin configurations (pinMode, digitalWrite).
- Reading sensor values (gasSensor.readMQ()).
- Sending SMS messages through the GSM module using AT commands.
- Controlling the buzzer and LED.

The code utilises“Gas Leakage Detection System using IoT with integrated notifications using Pushbullet-A Review” specific libraries like SoftwareSerial for serial communication and a library for the gas sensor (e.g., MQ2).

These libraries are often written in C/C++ and are included in the Arduino IDE environment.

CODE:

```
#include <SoftwareSerial.h>
#include <MQ2.h>

#define MQ2_PIN A0
#define GSM_TX 7
#define GSM_RX 8
#define BUZZER_PIN 9
#define LED_PIN 10

SoftwareSerial gsmSerial(GSM_RX, GSM_TX);
MQ2 gasSensor(MQ2_PIN);

const char* phoneNumbers[] = {
   "+1234567890",  // Replace with your first phone number
   "+0987654321",  // Replace with your second phone number
   // Add more numbers as needed
};

void setup() {
   Serial.begin(9600);
   gsmSerial.begin(9600);
   pinMode(BUZZER_PIN, OUTPUT);
   pinMode(LED_PIN, OUTPUT); // Set LED pin as output
   Serial.println("Gas Leakage Detection System Initialized");
   sendSMS("System Initialized and Ready");
}
```

```
    void loop() {
    float gasLevel = gasSensor.readMQ();

    Serial.print("Gas Level: ");
    Serial.println(gasLevel);

    if (gasLevel > threshold) { // Define your own threshold
        Serial.println("Gas Leak Detected! Sending SMS...");
        sendSMS("ALERT: Gas leak detected!");
        soundBuzzer();
        lightLED();
        delay(60000);
    } else {
        digitalWrite(LED_PIN, LOW);
    }

    delay(5000); // Check gas level every 5 seconds
}

void sendSMS(String message) {
    gsmSerial.println("AT"); // Test AT command
    delay(100);
    gsmSerial.println("AT+CMGF=1"); // Set SMS mode
    delay(100);


for (int i = 0; i < sizeof(phoneNumbers) / sizeof(phoneNumbers[0]);
i++)
{
```

```
  gsmSerial.println("AT+CMGS=\""  +  String(phoneNumbers[i])  +
"\"");
      delay(100);
      gsmSerial.print(message); // Message to send
      delay(100);
      gsmSerial.write(26); // Send CTRL+Z to send the message
      delay(100);
      Serial.println("SMS Sent to: " + String(phoneNumbers[i]));
   }
}

void soundBuzzer() {
   digitalWrite(BUZZER_PIN, HIGH);
   delay(1000);
 digitalWrite(BUZZER_PIN, LOW);
}

void lightLED() {
   digitalWrite(LED_PIN, HIGH);
   delay(1000);
   while (true) {}
}
```

CONCLUSION:

This is a low-cost, low power, lightweight, portable, safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to a rise in our economy, because when gas leaks it not only contaminates the atmosphere but also wastage of gases will hurt our economy.

This project highlights the importance of combining hardware and software components for effective safety solutions. By leveraging the capabilities of microcontrollers and various sensors, this system offers a practical approach to enhance safety in environments where gas leaks can pose significant risks.

FUTURE SCOPE:

One of the notable future functions of this system is to add a sub system where wastage of gas and the uses of gas can be monitored using this system.

Predictive Analytics: Utilise machine learning algorithms to predict potential leak occurrences based on historical data patterns.

Mobile Application: Develop a dedicated mobile app for real-time monitoring and control of the system from anywhere.

IoT Connectivity: Enable integration with IoT platforms (e.g., AWS IoT, Google Cloud IoT) for centralised monitoring and control.

Home Automation: Allow the system to interface with smart home devices to automatically shut off gas supplies or activate ventilation systems during a leak.

REFERENCES:

M Athish Subramanian, Naveen Selvam, Rajkumar S, R Mahalakshmi, J Ram "Gas Leakage Detection System using IoT with integrated notifications using Pushbullet-A Review"prabhakar , **"Gas Leakage Detection System using IoT with integrated notifications using Pushbullet-A Review"**, Proceedings of the Fourth International Conference on Inventive Systems and Control (ICISC 2020) IEEE Xplore Part Number:CFP20J06-ARTI; pp.no 359 – 363.

Ravi Kishore Kodali, Greeshma, R.N.V, Kusuma Priya Nimmanapalli, Yatish Krishna Yogi Borra, **"IOT Based Industrial Plant Safety Gas Leakage Detection System",** InternationalConference on Computing Communication and Automation (ICCCA), pp.no, 1-5, published in 2018.

https://sist.sathyabama.ac.in/sist_naac/documents/1.3.4/1923-b.e-eee-batchno-interdis-2