GAS LEAKAGE DETECTION SYSTEM

An Application Development – 1 (Project) Report Submitted
In partial fulfillment of the requirement for the award of the degree of

Bachelor of Technology
in
Computer Science and Engineering (Internet Of Things)

by

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CERTIFICATE

This is to certify that this is the bonafide record of the project titled **" Gas Leakage Detection System"** submitted by **L .Sreenivas Reddy (20N31A6933)** of **B.Tech III Year – I Semester** in the partial fulfillment of the requirements for the degree of **Bachelor of Technology** in **Computer Science and Engineering (Internet of Things)**, Dept. of CSE (Emerging Technologies) during the year 2022-2023. The results embodied in this project report have not been submitted to any other university or institute for the award of any degree or diploma.

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DECLARATION

I hereby declare that the project entitled **"Gas Leakage Detection System"** submitted to **Malla Reddy College of Engineering and Technology,** affiliated t**o** Jawaharlal Nehru Technological University Hyderabad (JNTUH) as part of III Year B.Tech – I Semester and for the partial fulfillment of the requirement for the award of **Bachelor of Technology** in **Computer Science and Engineering (CSE-IOT)** is a result of original research work done by me.

It is further declared that the project report or any part thereof has not been previously submitted to any University or Institute for the award of degree or diploma.

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Finally, I would like to take this opportunity to thank my **family** for their support and blessings for completion of my project that gave me the strength to do my project.

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ABSTRACT

The gas usage brings great problems in the domestic and industries. The inflammable gas such as Liquidized petroleum gas (LPG), which is commonly used in the houses and factories. The leakage of the gas causes the property damage and affects catastrophically on people. So, by observance it in the concept of the project we have determined to develop an examining system which finds the leak of LPG gas and protects the property by taken correct precaution at correct time. The project consists of Alarm unit which is Buzzer gives an audible sign of the presence of LPG volume. The gas sensors are widely used to detect essence of harmful gases, LPG and even smoke. If the MQ-2 Sensor senses gas leak from industries or homes and it sends information to Arduino UNO. The Arduino UNO turns on the LCD, buzzer and servo motors. The servo motors helpful in ventilation. It turns on the GSM modem after that, it continues to send messages SMS to multiple mobile number specifically mentioned in the program of the source code for alerting danger to the people. Hence, by using this system we can reduce gas leakage accidents and save the lives and properties.

KEY WORDS: Arduino UNO, MQ-2 Sensor, Buzzer, LCD, Servo motors, GSM Module.

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CHAPTER 1
INTRODUCTION

Usage of the gas brings great problems in the domestic as well as working places. The inflammable gas such as Liquidized petroleum gas (LPG), which is excessively used in the house and at work places. The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. So, by keeping it in the concept of the project we have determined to develop an examining system which finds the leak of LPG gas and protects the work places by taken correct precaution at correct time. This system provides the information such as when a gas leakage is noticed, sensors of in the project are used to notice the gas leakage and immediately turns ON the buzzer for the danger indication. Buzzer is a clear indication of gas leakage. By the detection of the hazardous gas the alerting message reached to the person who has control over it from the GSM. Detection of the gas leakage is important and stopping leakage is important equally. The main objective of this project is that it is extremely accurate with a least cost, this project system is best to detect gas leakage and also warn people around by buzzer beep sound and an SMS is been send to the responsible person for preparatory safety calculations. Servo motors is used for ventilation to send the gas from room. LCD display is used to display the status of the gas leak.

1.1 PROBLEM DEFINITION :-

Liquid Petroleum Gas (LPG) is a highly flammable chemical that consists of mixture of propane and butane. LPG is used for cooking at home, restaurant, and certain use for industry. They have certain weaknesses that make the gas leakage occur. The leakage of gases only can be detected by human nearby and if there are no human nearby, it cannot be detected. But sometimes it cannot be detected by human that has a low sense of smell. Thus, this system will help to detect the presence of gas leakage.

Furthermore, gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties. This system was developed by using IoT to give real-time response to the user.

1.2 EXISTING SYSTEM:-

The existing system, it senses the gas leakage and send's SMS's to only one person. The ventilation is also not present in existing system.

1.3 PROPOSED SYSTEM:-

In this proposed by using the "Gas Leakage Detector with SMS Alert using ARDUNIO and GSM module", will be a great help in terms of preventing any danger caused by gas leakage. The purpose of this project is to detect the presence of LPG leakage in the homes and working places. Apart from sound alarm and SMS alert it will also turn on servo motors for ventilation. The exhaust fan is used to remove the gas leaked in room. which is used in case of the nobody is present when the leakage occurs and to prevent accidents and property damage. It is cost efficient and reduce damage caused by the gas leakage.

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CHAPTER 2
SYSTEM REQUIREMENTS

2.1 SOFTWARE REQUIREMENTS:-

1.**Operating System**: Windows 7 or newer. (32-bit or 64-bit)

2.**Arduino IDE software**:-

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as **Windows, Mac OS X, and Linux**. It supports the programming languages C and C++. Here, IDE stands for **Integrated Development Environment**.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino.'

3.**Languages:-**

- Embedded c

2.2 HARDWARE REQUIREMENTS:-

- Ram: 4GB or more.
- Processor: i3 7th gen or more.
- Hard disk space: 10GB or more.

COMPONENTS REQUIRED:-

- **ARDUINO UNO:**

  The Uno with Cable is a micro-controller board base on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs); 6-analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything need to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. “Uno” means one in Italian and is the name to mark the upcoming release

of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards. Note: The Uno R3 reference design can use an Atmega8, 168, or 328, Current models use an Atmega328, but an Atmega8 is shown in the schematic for reference. The pin configuration is identical on all three processors.

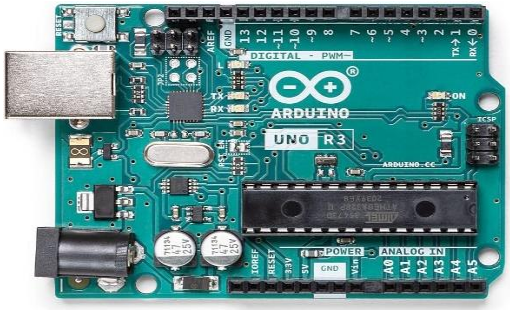


Fig: Arduino uno

- **<u>SIM900A GSM MODULE</u> :**

  The **SIM900A** is a readily available **GSM/GPRS module**, used in many mobile phones and PDA. The module can also be used for developing IOT (Internet of Things) and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

Features and Specifications :

- Single supply voltage: 3.4V – 4.5V
- Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
- Frequency bands:SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.
- GSM class: Small MS

- GPRS connectivity: GPRS multi-slot class 10 (default) , GPRS multi-slot class 8 (option)
- Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800
- Operating Temperature: -30ºC to +80ºC
- Storage Temperature: -5ºC to +90ºC
- DATA GPRS: download transfer max is 85.6KBps, Upload transfer max 42.8KBps
- Supports CSD, USSD, SMS, FAX
- Supports MIC and Audio Input
- Speaker Input
- Features keypad interface
- Features display interface
- Features Real Time Clock
- Supports UART interface
- Supports single SIM card
- Firmware upgrade by debug port
- Communication by using AT commands

Fig: Sim900a GSM Module

- **16×2 LCD MODULE** :

  LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light. LCD is either made with an uninvolved lattice or a showcase network for dynamic framework show. Likewise alluded to as a meagre film transistor (TFT) show is the dynamic framework LCD. The uninvolved LCD lattice has a matrix of conductors at every crossing point of the network with pixels. Two conductors on the lattice send a current to control the light for any pixel. A functioning framework has a transistor situated at every pixel crossing point, requiring less current to control the luminance of a pixel.

Figure : 16×2 LCD Module

- **MQ-2 SENSOR** :

  The MQ-2 sensor is capable of detecting a wide range of gases including carbon monoxide, alcohol, methane, hydrogen, isobutene, liquefied petroleum gas, propane, and smoke. For the easy interfacing, the MQ2 sensor Module is provided with 4 male headers so that it can be easily interfaced with the Arduino Uno or Mega using male to female type jumper wires.

  MQ-2 SENSOR PINOUT

  - As you can see the 4 male header pins are labelled with
  - A0
  - D0
  - GND
  - VCC

Figure: MQ-2 sensor

- **EXHAUST FAN :**

  If the leakage is detected system automatically starts the exhaust fans. the exhaust is used to suck the gas out of the room. Exhaust fans are used to pull excess moisture and unwanted odour out of a particular room or area. They are commonly found in industries and kitchens, where moisture can build up due to activities such as showering, washing, or cooking.

Figure: Exhaust Fan

- **MQ-3 SENSOR:**

  Gas Sensor(MQ3) module is useful for gas leakage detection (in home and industry). It is suitable for detecting Alcohol, Benzine, CH4, Hexane, LPG, CO. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by using the potentiometer.


Figure:MQ-3 Sensor

- **SERVO MOTOR:**

  A servo motor is an electric device used for precise control of angular rotation. It is used in applications that demand precise control over motion, like in case of control of a robotic arm.

  The rotation angle of the servo motor is controlled by applying a PWM signal to it.

  By varying the width of the PWM signal, we can change the rotation angle and direction of the motor.

Figure: Servo motor

- **BUZZER :-**

  The buzzer will be used to emit sounds to alert users during leakage. A buzzer or beeper is a signaling device usually electronics, that is most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a pre-set time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong.

Figure: Buzzer

CHAPTER 3
SYSTEM DESIGN

3.1 SYSTEM ARCHITECTURE:-

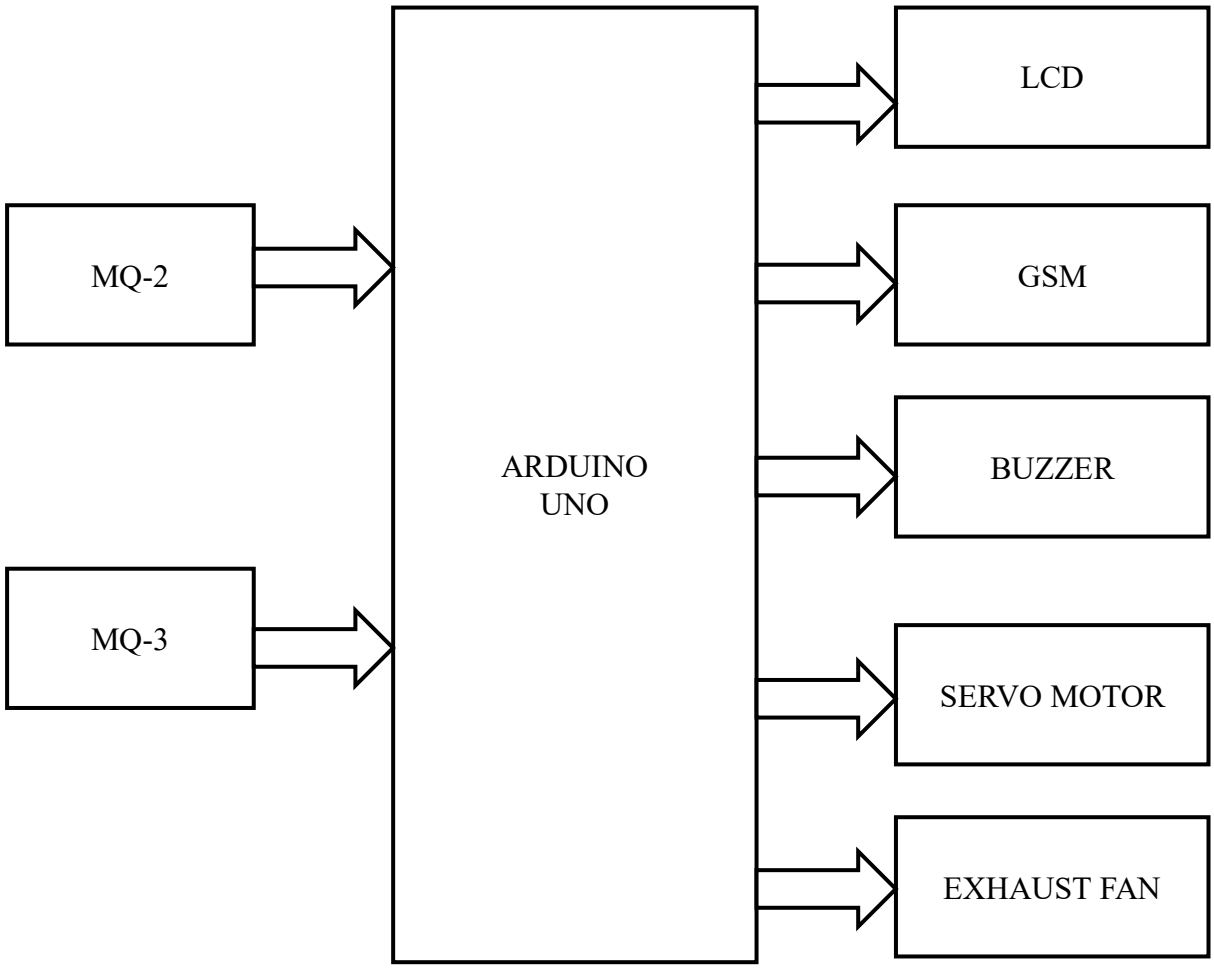


Figure1: System Architecture

3.2 DATA FLOW:-

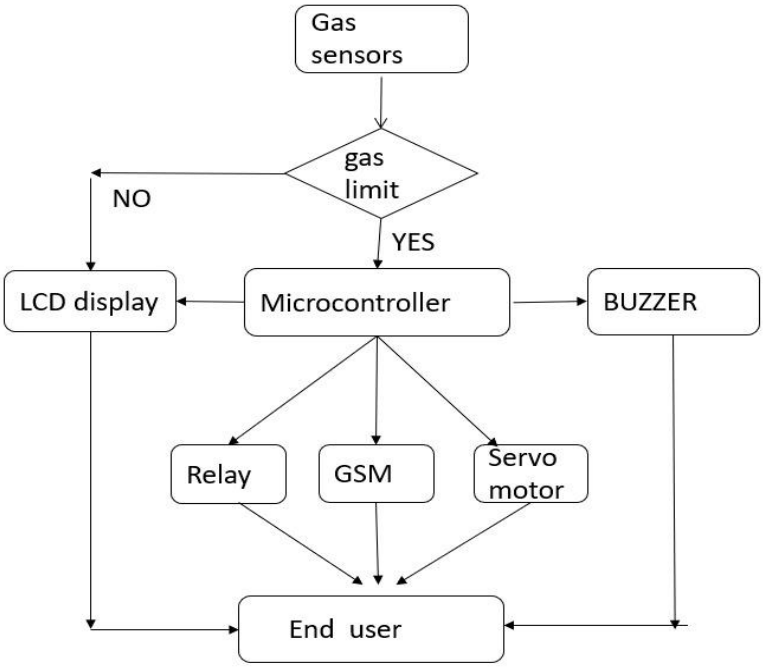


Figure2: Data flow diagram

3.3 UML DIAGRAM:

USE CASE DIAGRAM:-

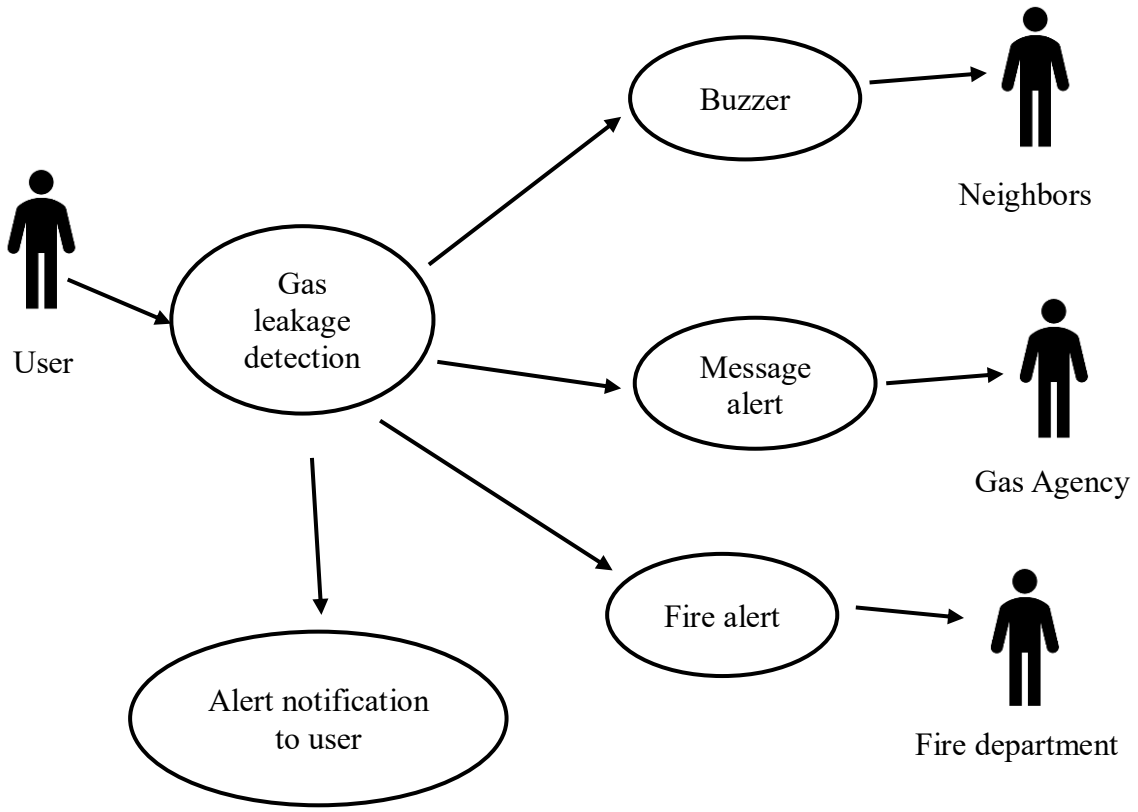


Figure3:- Use Case diagram

CLASS DIAGRAM:-

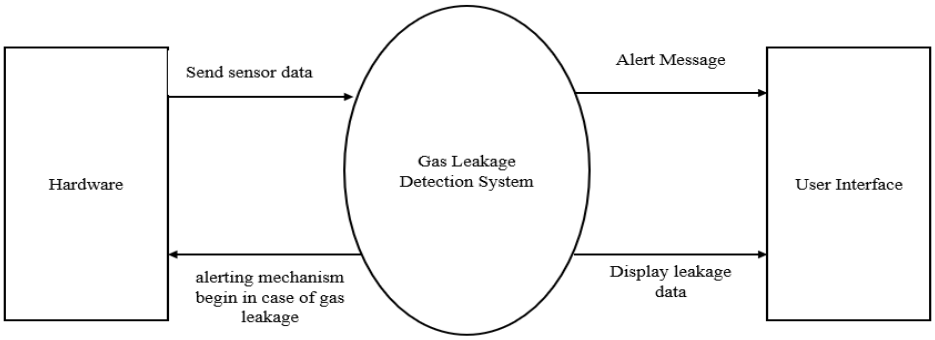


Figure4: class diagram

SEQUENTIAL DIAGRAM:-

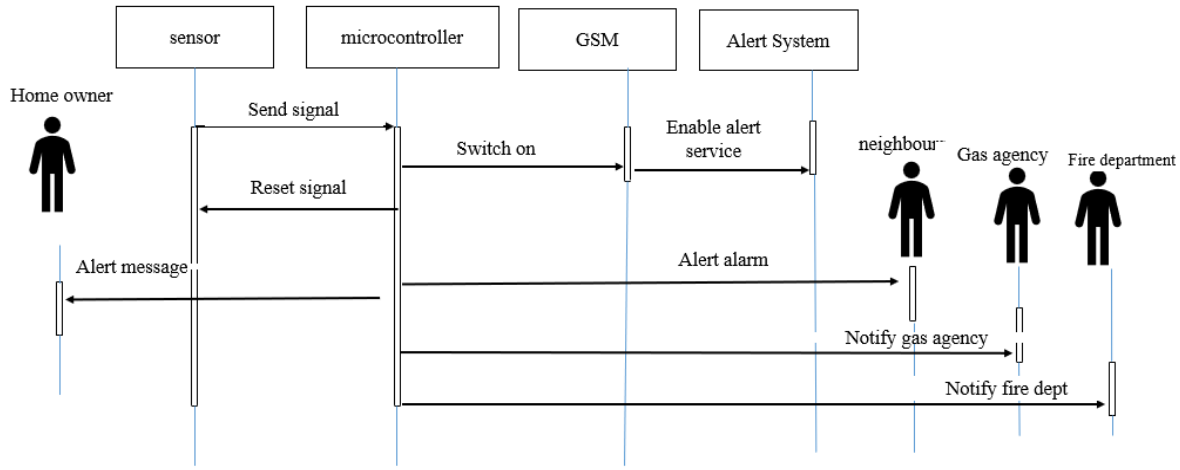


Figure5: Sequential diagram

CHAPTER 4

IMPLEMENTATION

PSEUDO CODE:-

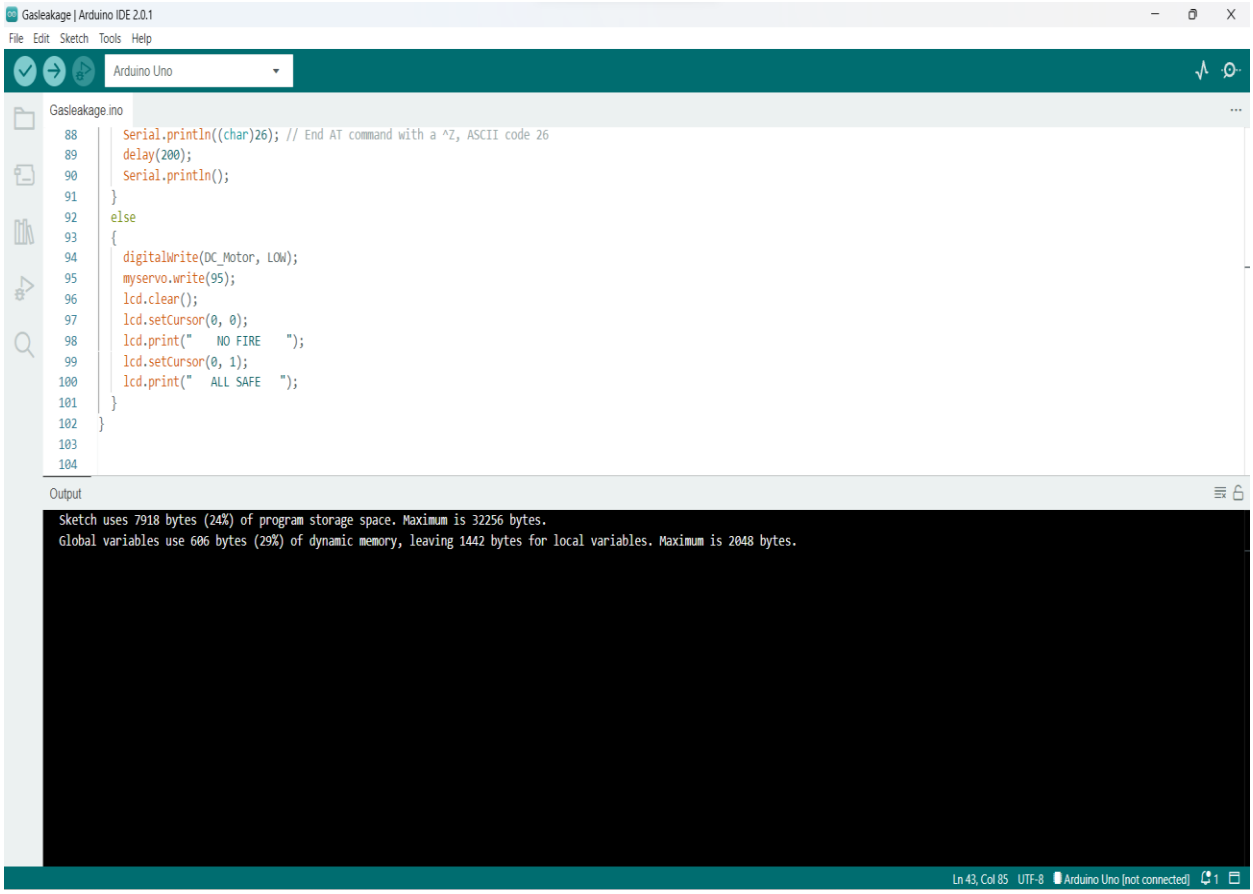
```
#include<Servo.h>
Servo myservo;
int pos = 0;
int val;
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
#include <SoftwareSerial.h>
SoftwareSerial mySerial(9, 10);
byte tx = 1;

const int Buzzer = 6;
const int DC_Motor = 7;

int gasC_1 = 0; //set initial tempC 0 for all MQ 3
int smkC_1 = 0; //set initial tempC 0 for all MQ 2

const int SensorPin1 = A0; //fire input sensor pin
const int SensorPin2 = A1;
```

```
String textForSMS;
void setup()
{
  lcd.begin(16, 2);
  delay(100);
  pinMode(tx, OUTPUT);
  myservo.attach(13);
  pinMode(Buzzer, OUTPUT);
  pinMode(SensorPin1, INPUT);
  pinMode(SensorPin2, INPUT);
  pinMode(Buzzer, OUTPUT);
  pinMode(DC_Motor, OUTPUT);

  mySerial.begin(9600);
  Serial.begin(9600); //Start the serial connection with the computer
}
void loop()
{
  int gasC_1 = analogRead(SensorPin1);
  int SmkC_1 = analogRead(SensorPin2);
  gasC_1 = analogRead(SensorPin1); //read the value from the LM35 sensor
  gasC_1 = (5.0 * gasC_1 * 100.0) / 1024.0; //convert the analog data to temperature
  smkC_1 = analogRead(SensorPin2); //read the value from the MQ 2 sensor
  smkC_1 = (5.0 * smkC_1 * 100.0) / 1024.0; //convert the analog data to
temperature
```

```
delay(50);



if (gasC_1 >= 100 || smkC_1 >= 100)//set gas limit
{
  val = analogRead(pos);
  val = map(val, 0, 1023, 0, 180);
  myservo.write(val);
  delay(50);
  digitalWrite(DC_Motor, HIGH);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("  THERE IS FIRE ");
  lcd.setCursor(0, 1);
  lcd.print(" NOT SAFE HERE ");
  delay(100);
  lcd.clear();
  lcd.print("Sending SMS...");
  delay(100);

  digitalWrite(Buzzer, HIGH);
  delay(200);
  digitalWrite(Buzzer, LOW);
  delay(200);
```

```
  digitalWrite(Buzzer, HIGH);
  delay(200);
  digitalWrite(Buzzer, LOW);
  delay(5);


  Serial.print("AT+CMGF=1\r");
  delay(100);
  Serial.print("AT+CMGS=\"+916305382898\"\r");//can change mobile number
  Serial.print("FIRE ALERT! Please Be Informed that Fire has Occured!\r");


  Serial.print("AT+CMGF=2\r");
  delay(100);
  Serial.print("AT+CMGS=\"+919849324401\"\r");//can change mobile number
  Serial.print("FIRE ALERT! Please Be Informed that Fire has Occured!\r");
  delay(200);
  Serial.println((char)26); // End AT command with a ^Z, ASCII code 26
  delay(200);
  Serial.println();
 }
else
 {
  digitalWrite(DC_Motor, LOW);
  myservo.write(95);
  lcd.clear();
  lcd.setCursor(0, 0);
```

```
    lcd.print("    NO FIRE    ");
    lcd.setCursor(0, 1);
    lcd.print("   ALL SAFE    ");
  }
}
```


Gasleakage | Arduino IDE 2.0.1
File Edit Sketch Tools Help
Arduino Uno
Gasleakage.ino
Serial.println((char)26); // End AT command with a ^Z, ASCII code 26
delay(200);
Serial.println();
}
else
{
digitalWrite(DC_Motor, LOW);
myservo.write(95);
lcd.clear();
lcd.setCursor(0, 0);
lcd.print(" NO FIRE ");
lcd.setCursor(0, 1);
lcd.print(" ALL SAFE ");
}
}
Output
Sketch uses 7918 bytes (24%) of program storage space. Maximum is 32256 bytes.
Global variables use 606 bytes (29%) of dynamic memory, leaving 1442 bytes for local variables. Maximum is 2048 bytes.
Ln 43, Col 85 UTF-8 Arduino Uno [not connected]

CHAPTER 4

RESULTS

- Using single mobile number

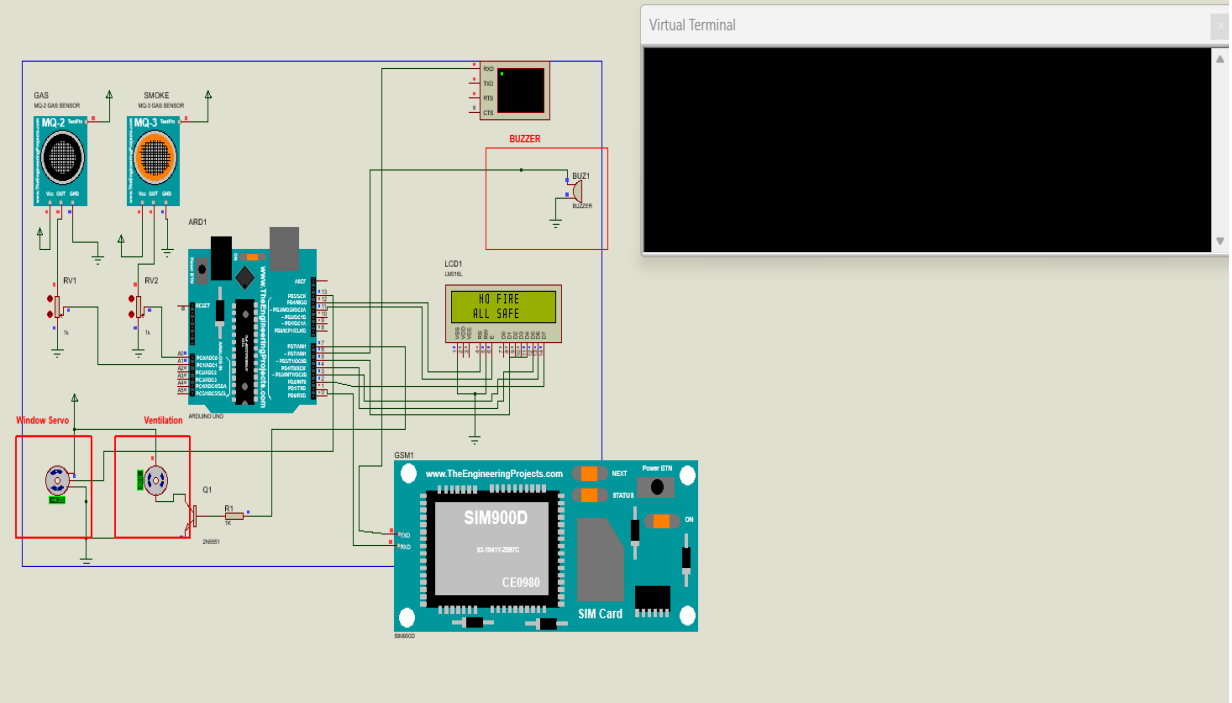


Fig : No gas leakage

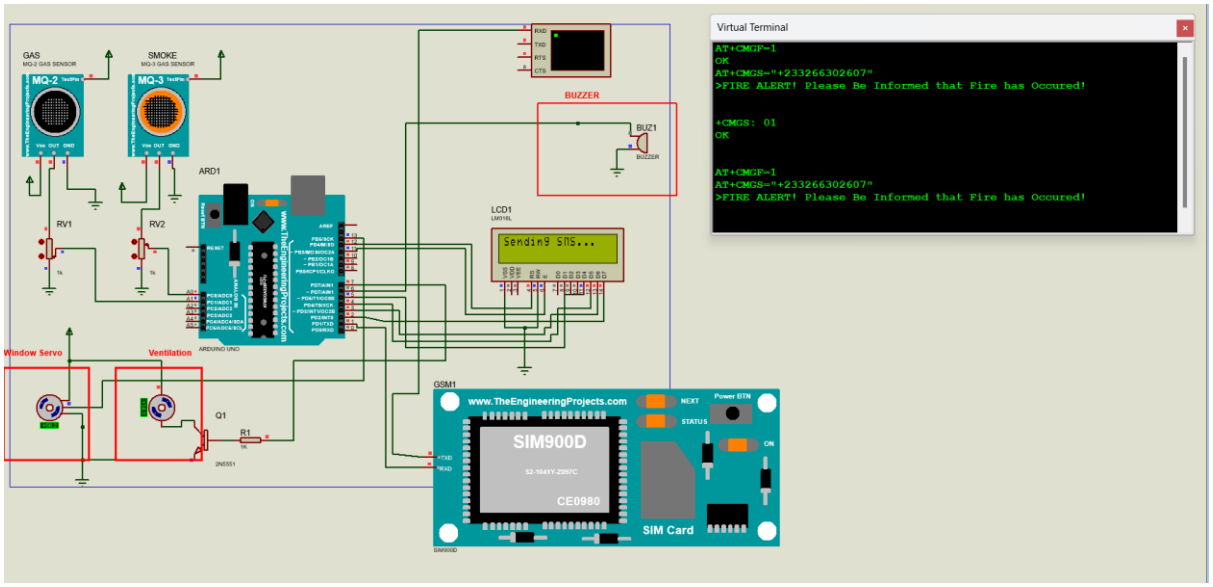


Fig : Gas leakage

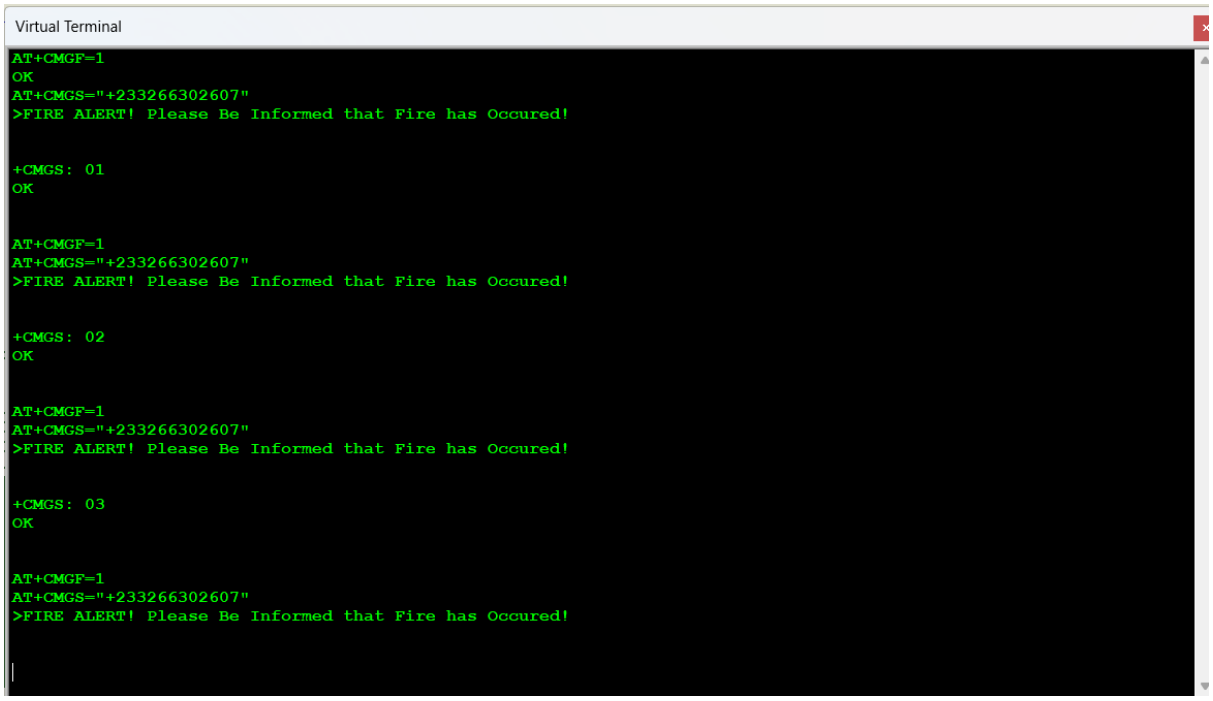


Fig: sending message to one number

- Using 2 mobile numbers

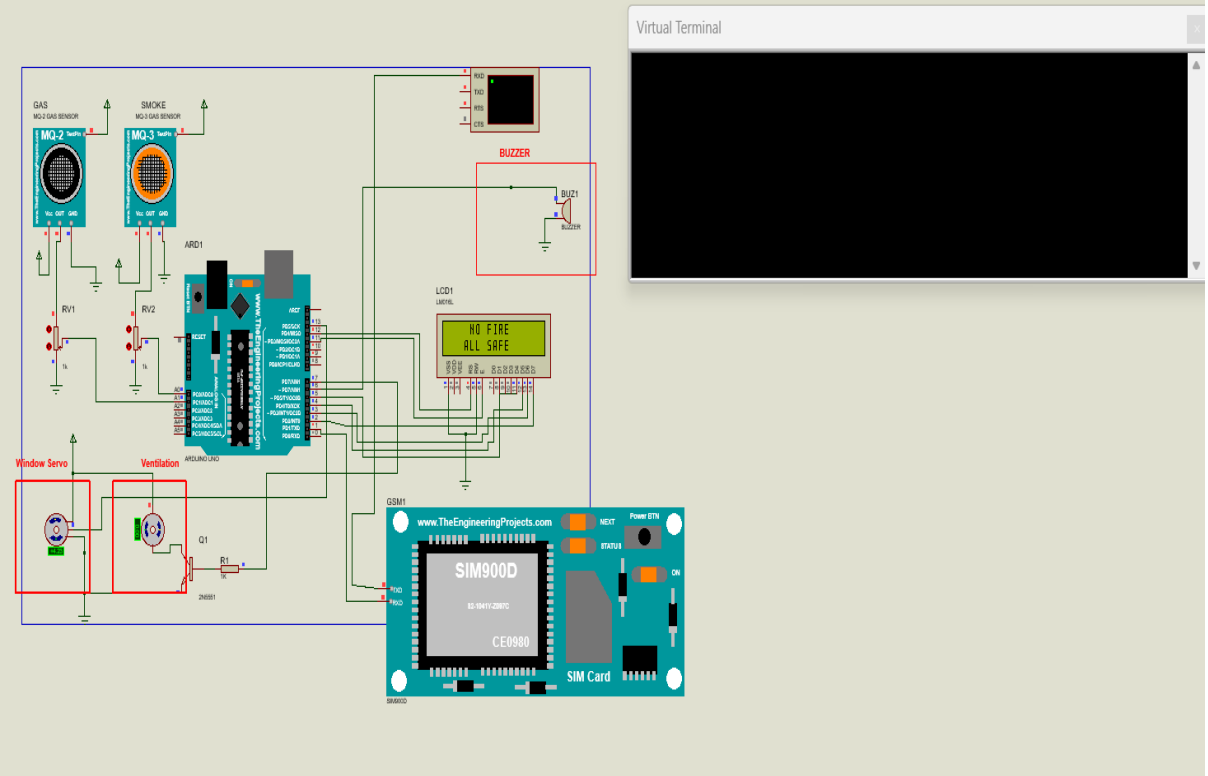


Fig : No gas leakage

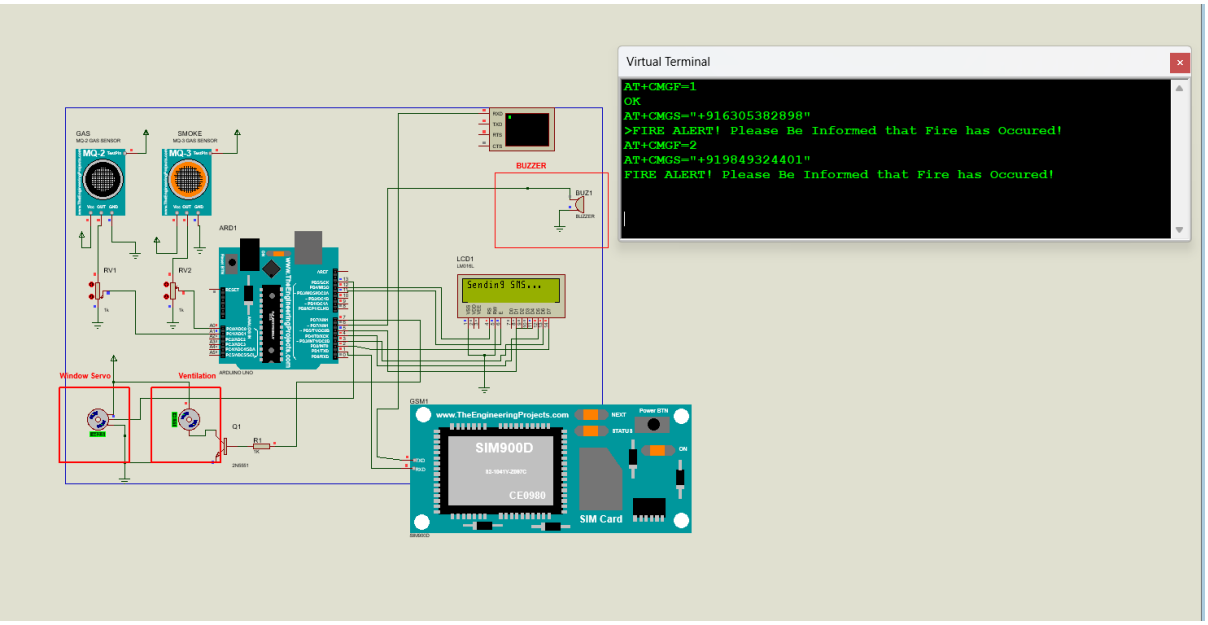


Fig : Gas leakage

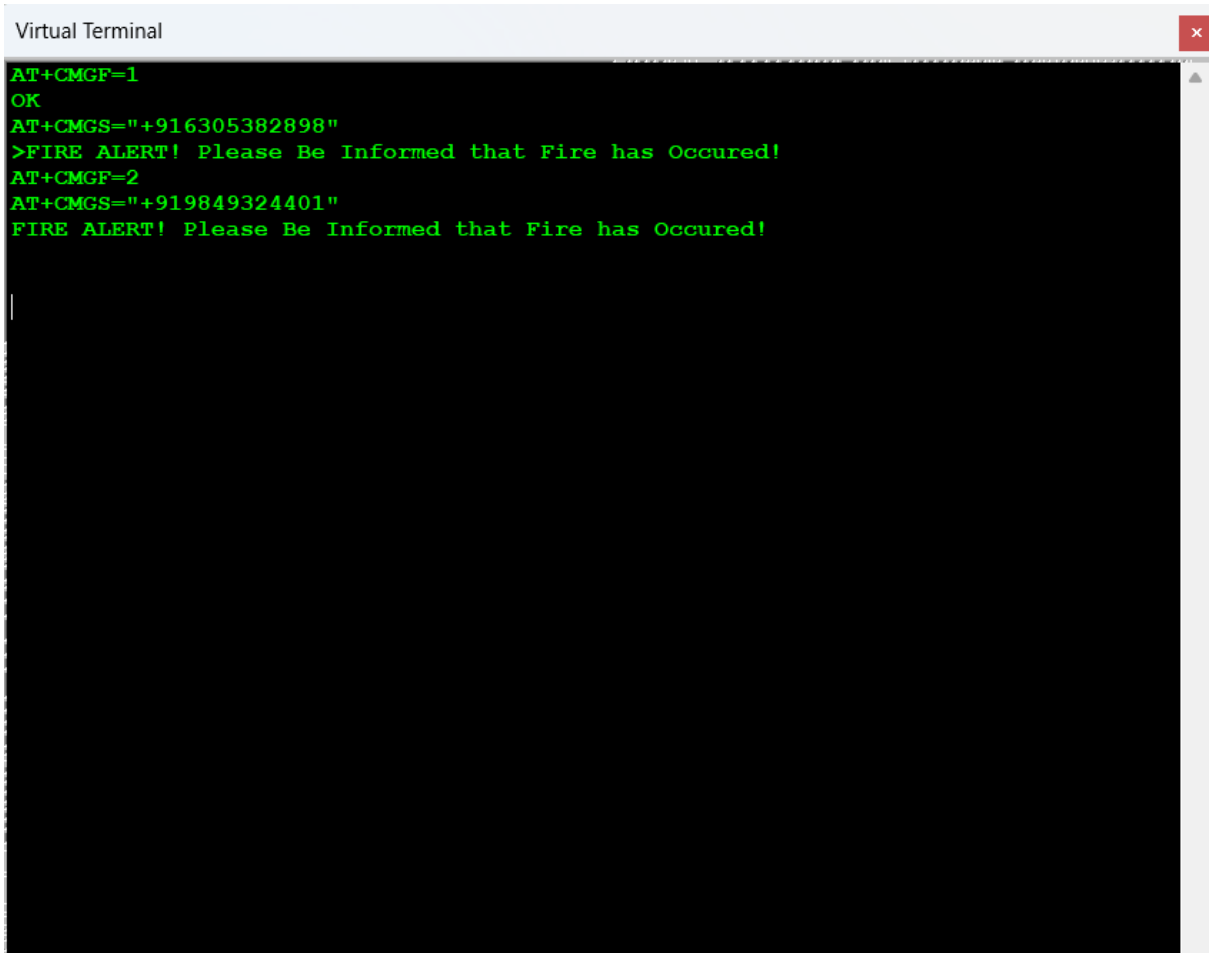


Fig: sending message to 2 numbers

CHAPTER 6
CONCLUSION AND FUTURE SCOPE

CONCLUSION:-

Hence, the leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. So, the system consists of Alarm unit which is Buzzer gives an audible sign of the presence of LPG volume. The sensors are widely used to detect essence of propane, iso-butane, LPG and even smoke. If the LPG sensor senses gas leak from workplace or home, sensor output goes to active low (logic 0) condition. The Arduino UNO turns on the LCD and buzzer. It even turns on the GSM modem after that, it continues to send messages SMS to mobile number specifically mentioned in the program of the source code for alerting danger to the people and the LPG safety device is used to turn off the gas supply by using this system we can reduce gas leakage accidents. In danger situations we are able to save the life by using this system

FUTURE SCOPE:-

The Future scope of the project is adding more software based intelligent functions with this system. This is an automatic gas detection, control and alert system. In future this system will have a feature where it can notify the emergency services if any accidents happen. A mobile app and web based app for real time monitoring also will be added. In the user app for this system many smart features will be added. The overall features will make the system safer for the users. The system will be optimized for use in many places like the car, the home, industries and many other places. After designing the final prototype with smart multifunctional features, the system will be implemented in real life scenario.

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