# DETECTION AND MONITORING OF HARMFUL GASES

A Mini Project Work

Submitted in partial fulfilment of the requirements for the award of the degree of

**BACHELOR OF TECHNOLOGY**

**IN**

**ELECTRONICS AND COMMUNICATION ENGINEERING**

By


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**AUTONOMOUS**

**SCHOOL OF ENGINEERING**

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**2022-2023**

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# CERTIFICATE

This is to certify that the project report entitled **"DETECTION AND MONITORING OF HARMFUL GASES"**being submitted by

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in partial fulfillment for the award of the Degree of Bachelor of Technology in Electronics & Communication Engineering to the Jawaharlal Nehru Technological University, Hyderabad is a record of bonafide work carried out under my guidance and supervision. 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

We hereby declare that the result embodied in this project report entitled "**DETECTION AND MONITORING OF HARMFUL GASES**" is carried out by us during the year 2022-2023 for the partial fulfilment of the award of **Bachelor of Technology** in **Electronics and Communication Engineering,** from **ANURAG GROUP OF INSTITUTION**. We have not submitted this project report to any other Universities / Institute for the award of any degree.

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# ABSTRACT

Harmful gas leakage accidents are the main reason for workers death in industries which work mainly using chemicals. Gas leakage can be easily detected and controlled by using latest trends in information technology by applying internet of things. This project intended to avoid industrial accidents and to monitor harmful gases and to intimate alert message to safety control board of industry using Arduino Uno R3 and internet of things. Ardunio Uno R3 board is used as central microcontroller which is connected with sensor. Such as temperature, gas sensor, alcohol sensor which can continuously monitor respective environmental parameters. Hence this device may be used as multi gases detection apparatus more over the rate of response is high. An alarm is produced instantly if the level of the gases goes above the normal level means indication through the internet specific receiver section. Data received by sensor is stored in internet which can be used for further processing and it can be analyzed for improving safety regulations. This model can be future extended for providing better living environment for people in and around industries with a pollution controlled environment.

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# 1. INTRODUCTION

## 1.1 INTRODUCTION

The technology is growing day by day. With this rise in technology we have not succeeded to take care of our environment in which we live.Thus we have polluted the surrounding, thereby decreasing the quality of the environment we live. Even though there are many types of pollution such as water, soil and air pollution, out of these air pollution acts as the major problem as the other can be detected visually and by taste, but the toxic air cannot be detected as it can be colourless, odourless and tasteless. Hence there is an increasing demand for the environmental pollution control and monitoring systems. In the view of the ever-rising pollution sources with hazardous chemicals, these systems should have the provisions to detect the sources quickly. Hazardous gases are one that causes health problems, but are also used in industries in large quantities.These gases have to be monitored such that rise in the normal level of them could be detected and suitable safety measures can be taken. But the present systems available are not so handy, are expensive and hard to implement. So an embedded system is designed using ATmega 328 Microcontroller, for the purpose of detection of toxic gas leakage, which in turn neglects the dangers that have adverse effects on human lives.The toxic gases like carbon monoxide, methane and LPG are mentioned here. The system is reasonable and can be easily implemented in the chemical factories and in localities which is surrounded by the chemical industries or plants. The system also has the provision to provide real-time monitoring of concentration of the gases which is present in the atmosphere. As this method is automatic the information can be given rapidly. such that human lives can be saved in time.These days harmful gases leakage is the main reason for industrial accidents and depths of workers in industries. Pollutants released by industries in to atmosphere is also a cause for the environmental pollution and such the reason greatly effects humans and animals health by minimizing the levels of oxygen and increasing the levels of harmful gases like ammonia, carbon monoxide, nitrogen trifluoride, sulfur hexafluoride etc,, .These gases are mainly the reason for increasing the no of pollutants in atmosphere. These environmental pollutants are mainly released by industries working with chemicals. Industries management only

have a eye on profits and consider environmental safety as least priority which in turn affects the atmosphere and industrial workers health who are living in and around industries as the level of harmful gases are high around industrial areas compared to normal living places. As the population depends more on usage of oil, gas and coal for generating energy to meet the energy demand by increasing population the release of harmful pollutants increases day by day .it is observed that about a 1.1 billion of human population respiration is done through unhealthy air and recorded 7 million deaths occur globally .Industries started peoples or industries owner fully focus on the profit oriented. They do not focus on the workers, people safety and environment safety also. Generally industries are located in the outside cities. But some industries are located at the middle of the cities and village because of the transport reasons or for the availability of raw materials. Due to human error and machine failures etc. gas leakage accidents occur often but ceases many workers in to death beds. Gas leakage and detection of gas leakages and harmful gases in and around industries and can be effectively handled by using sensors and automation. Here we developed a basic model for detection of harmful gases and measurement of harmful gases and notifying the workers of industry by sms in case any gas leakage is occurred in any sector of the industry.

## 1.2 AIM OF THE PROJECT

To develop a basic model for detection of harmful gases and measurement of harmful gases on a self-calibrated ppm scale and notifying the workers of industry by sms in case any gas leakage is occurred in any sector of the industry.

# 2. LITERATURE SURVEY

This system using limited gases sensor and limited radiation sensor these sensors are collecting data transmitting using Wi-Fi module. Most dangerous area accidents occur time intimated data sending speed is high must need. Wi-Fi module using transmitting and receiving data range is high and extendable as possible. The poisonous gas and leakage monitoring process of the system marked with the importance of real-time detection and control of the poisonous gas so as to automate the controlling and monitoring system for real time utilization. The existing system used zigbee module transmitting and receiving information data bit rate is 250 kilobits per second. This system is mainly using Wi-Fi module transmitting and receiving information data bit rate is 54 megabits per second. We use Wi-Fi module for getting information very quickly to reach desired designation or location peoples or related government officers.

# 3. METHODOLOGY

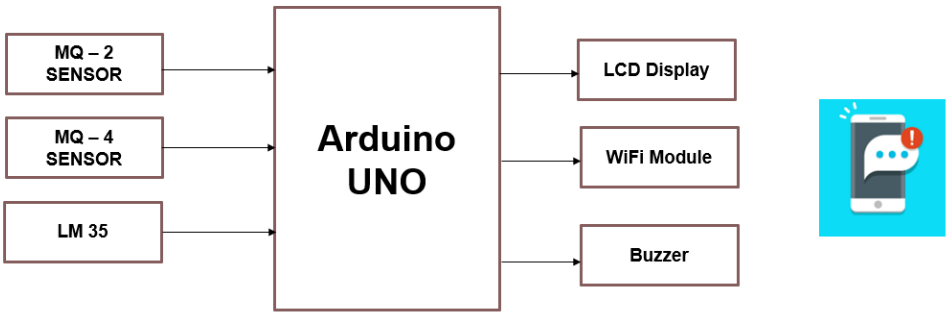


Fig 3.1 : Block Diagram of System

The functionality of system is divided into three main steps. In the initial step, the gas leakage is detected by the gas sensor. This detects the gas leakage and gives the signal to the microcontroller. After that in second step the microcontroller receives the signal, which sends by gas sensor. It sends activation signal to other external devices attached such as LCD display .The LCD display will show which gas is actually detected. The input which are the gas es are sensed through the particular gas sensors. In this system sensors for detecting Methane, LPG and carbon monoxide are used. Then this sensed value is passed to the Programmable Interface Controller. The signals that are sensed are analog in nature and are converted into digital form by the analog to digital convertor which is built inside the PIC.The names of the gases which have been sensed are then displayed on the LCD

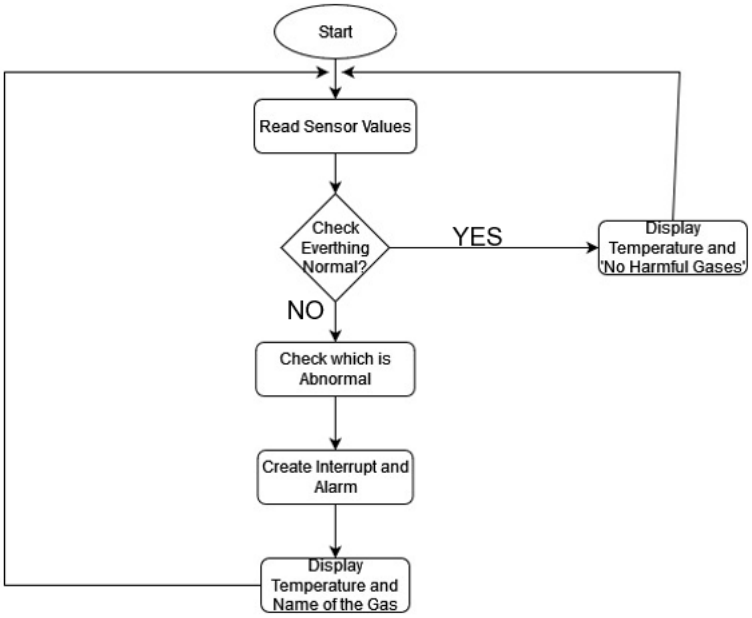


Fig 3.2: Flowchart of the System

Sensors continuously monitors the gases in the surrounding. While continuously monitoring if any gas level exceed the range to that of normal range in air the alert will be enhanced and a SMS notification will be posted to safety control board of organization and even to the workers mobile station only if required. In figure 3.2 we can see that the sensor will check that if everything is normal or not. If not an alarm will be created and alert the workers and display the values in LCD Display.

# 4. HARDWARE AND SOFTWARE REQUIREMENTS

## 4.1 ARDUINO UNO

### 4.1.1 Introduction

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer which is shown in Fig.4.1.

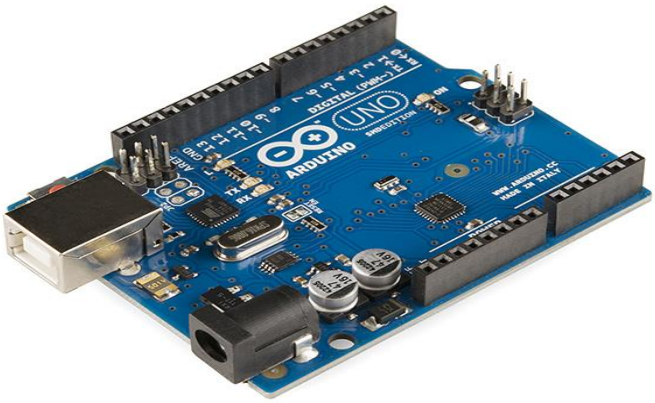


Fig. 4.1: Arduino UNO

### 4.1.2 Atmega328 Microcontroller

The atmega8535 is a low-power cmos 8-bit microcontroller based on the avr enhanced risc architecture. By executing powerful instructions in a single clock cycle, the atmega8535 achieves throughputs approaching 1 mips per mhz allowing the system designed to optimize power consumption versus processing speed.

The avr core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the arithmetic logic unit (alu), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional cisc microcontrollers.

### 4.1.3 Features

- High-performance, low-power avr® 8-bit microcontroller
- Advanced risc architecture
  - 131 powerful instructions – most single-clock cycle execution
  - 32 x 8 general purpose working registers
  - Fully static operation
  - Up to 16 mips throughput at 16 mhz
  - On-chip 2-cycle multiplier
- High endurance non-volatile memory segments
  - 32k bytes of in-system self-programmable flash program memory
  - 1024 bytes eeprom
  - 2k byte internal sram
  - Write/erase cycles: 10,000 flash/100,000 eeprom
  - Data retention: 20 years at 85°c/100 years at 25°c(1)
  - Optional boot code section with independent lock bits
  - In-system programming by on-chip boot program true read-while-write operation
  - Programming lock for software security
- Jtag (ieee std. 1149.1 compliant) interface
  - Boundary-scan capabilities according to the jtag standard
  - Extensive on-chip debug support

- Programming of flash, eeprom, fuses, and lock bits through the jtag interface

❖ Peripheral features
- Two 8-bit timer/counters with separate prescalers and compare modes
- One 16-bit timer/counter with separate prescaler, compare mode, and capture mode
- Real time counter with separate oscillator
- Four pwm channels
- 8-channel, 10-bit adc
- 8 single-ended channels
- 7 differential channels in tqfp package only
- 2 differential channels with programmable gain at 1x, 10x, or 200x
- Byte-oriented two-wire serial interface
- Programmable serial usart
- Master/slave spi serial interface
- Programmable watchdog timer with separate on-chip oscillator
- On-chip analog comparator

❖ Special microcontroller features
- Power-on reset and programmable brown-out detection
- Internal calibrated rc oscillator
- External and internal interrupt sources
- Six sleep modes: idle, adc noise reduction, power-save, power-down, standby and extended standby

❖ I/o and packages
- 32 programmable i/o lines
- 40-pin pdip, 44-lead tqfp, and 44-pad qfn/mlf

❖ Operating voltages
- 2.7 - 5.5v for atmega8535l
- 4.5 - 5.5v for atmega8535

❖ Speed grades
- 0 - 8 mhz for atmega8535l
- 0 - 16 mhz for atmega8535

❖ Power consumption at 1 mhz, 3v, 25°c for atmega8535l
- Active: 1.1 ma

- Idle mode: 0.35 ma
- Power-down mode: < 1 μa

The pin diagram of the ATMEGA 328P is depicted in Fig 4.2.

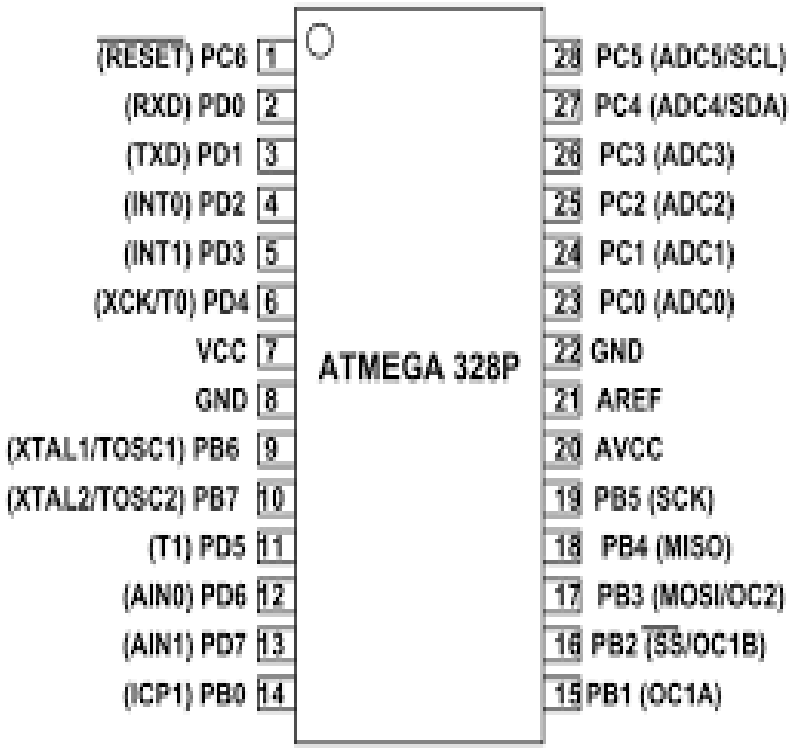


Fig. 4.2: Pin diagram of ATMEGA 328P

## 4.2 MQ – 2 GAS SENSOR

### 4.2.1 Introduction

Gas sensors (also known as gas detectors) are electronic devices that detect and identify different types of gasses. They are commonly used to detect toxic or explosive gasses and measure gas concentration. Gas sensors are employed in factories and manufacturing facilities to identify gas leaks, and to detect smoke and carbon monoxide in homes. Gas sensors vary widely in size (portable and fixed), range, and sensing ability. They are often part of a larger embedded system, such as hazmat and security systems, and they are normally connected to an audible alarm or

interface. Because gas sensors are constantly interacting with air and other gasses, they have to be calibrated more often than many other types of sensors.

The MQ2 sensor is one of the most widely used in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. Metal oxide sensors are also known as Chemiresistors because sensing is based on the change in resistance of the sensing material when exposed to gasses.The MQ-2 Sensor can be shown below in fig 4.3.


Fig 4.3: MQ-2 Gas Sensor

### 4.2.2 Features and Specifications of MQ-2 Gas Sensor

- Operating Voltage is +5V
- Can be used to measure or detect LPG, Alcohol, Propane, Hydrogen, CO and even methane
- Analog output voltage: 0V to 5V
- Digital Output Voltage: 0V or 5V (TTL Logic)
- Preheat duration 20 seconds
- Can be used as a Digital or analog sensor
- The Sensitivity of Digital pin can be varied using the potentiometer

## 4.3 MQ – 4 GAS SENSOR

### 4.3.1 Introduction

The MQ4 methane gas sensor is extremely used for detecting gas leakage at home or in industries like Methane (CH4) & CNG Gas. This gas sensor is highly responsive in very little time, so based on the sensitivity requirements; it can be adjusted through a potentiometer. This is an analog output sensor, used like a CNG (compressed natural gas) sensor within the series of MQ sensors.

MQ4 methane gas sensor is a MOS (metal oxide semiconductor) type sensor, used to detect the methane gas concentration within the air at either home or industries & generates output like analog voltage by reading it. Here, the range of concentration for sensing ranges from 300 pm – 10,000 ppm which is appropriate for the detection of a leak.The MQ-4 is shown in fig 4.4 below.

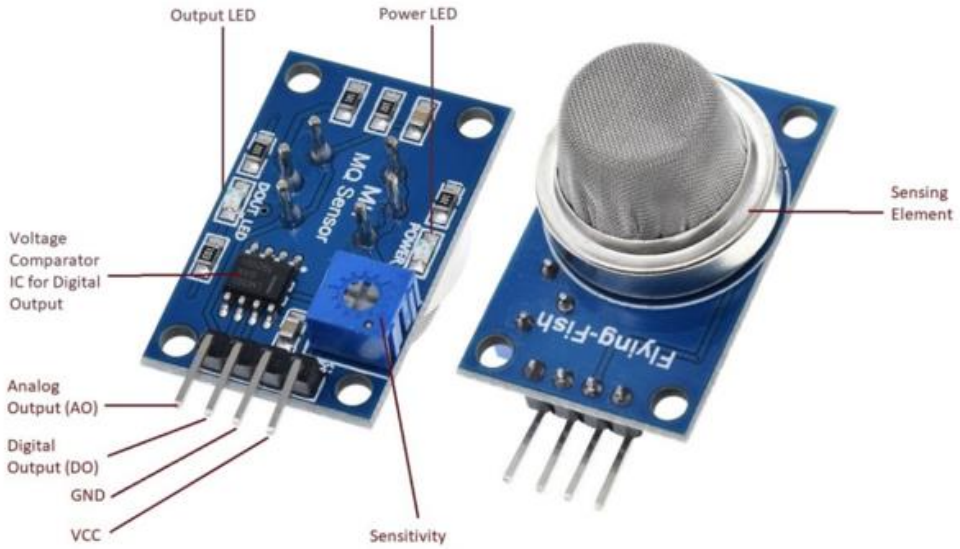


Fig 4.4: MQ-4 Gas Sensor

### 4.3.2 Features

- Good sensitivity to Combustible gas in wide range
- High sensitivity to $CH_4$, Natural gas.
- Small sensitivity to alcohol, smoke.
- Fast response Stable and long life
- Simple drive circuit

### 4.3.3 Specifications

- Sensor Type Semiconductor
- Power requirements: VCC - 5V±0.1
- DO output: TTL digital 0 and 1 (0.1 and 5V)
- AO output: 0.1-0 .3 V (relative to pollution), the maximum concentration of a voltage of about 4V
- Detection Gas: Natural gas/Methane
- Detection Concentration: 200-10000ppm (Natural gas / Methane)
- Interface: 1 TTL compatible input (HSW), 1 TTL compatible output (ALR)

- Heater consumption: less than 750mw
- Operating temperature: 14 to 122 °F (-10 to 50°C)
- RH Related humidity less than 95%Rh
- O2 Oxygen concentration is 21% (standard condition) - Oxygen concentration can affect sensitivity
- Load resistance: 20KΩ
- Sensing Resistance Rs: 10KΩ- 60KΩ (1000ppm $CH_4$)
- Preheat time:Over 24 hour
- Standard Encapsulation Bakelite, Metal cap

## 4.4 LM35 TEMPERATURE SENSOR

### 4.4.1 Introduction

LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of lm35 over thermistor is it does not require any external calibration. The coating also protects it from self-heating. Low cost and greater accuracy make it popular among hobbyists, DIY circuit makers, and students. Many low-end products take advantage of low cost, greater accuracy and used LM35 in their products. Its approximately 15+ years to its first release but the sensor is still surviving and is used in any products.The three pins of LM35 can be seen in fig 4.5.


Fig 4.5: LM35 Temperature Sensor

### 4.4.2 Features and Specifications of LM35

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guarantable (at +25°C)
- Rated for full −55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 μA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1⁄4°C typical
- Low impedance output, 0.1 W for 1 mA load

## 4.5 LM7805 VOLTAGE REGULATOR

### 4.5.1 Introduction

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. The 7805 Voltage Regulator IC is a commonly used voltage regulator that finds its application in most of the electronics projects. It provides a constant +5V output voltage for a variable input voltage supply. The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So our 7805 will provide a +5V output voltage. The internal block diagram of 7805 is shown in fig 4.6.

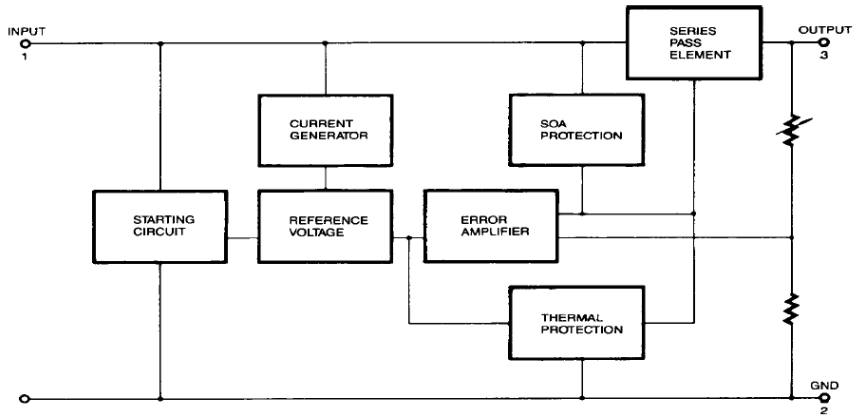


Fig 4.6:Internal Block Diagram of 7805

### 4.4.2 Features of LM7805

- 5V Positive Voltage Regulator
- Minimum Input Voltage is 7V
- Maximum Input Voltage is 25V
- Operating current($I_Q$) is 5mA
- Internal Thermal Overload and Short circuit current limiting protection is available.
- Junction Temperature maximum 125 degree Celsius

## 4.6 ESP8266 WiFi MODULE

### 4.6.1 Introduction

Esp8266 Wifi Module is a low power consumption of the UART-Wifi module and ultra low power consumption technology, designed especially for mobile devices and IoT applications,user's physical device can be connected to a Wifi wireless network, internet or intranet communication and networking capabilities. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 WiFi module can easily be interfaced with microcontrollers board (i.e. Arduino UNO) via Serial Port.

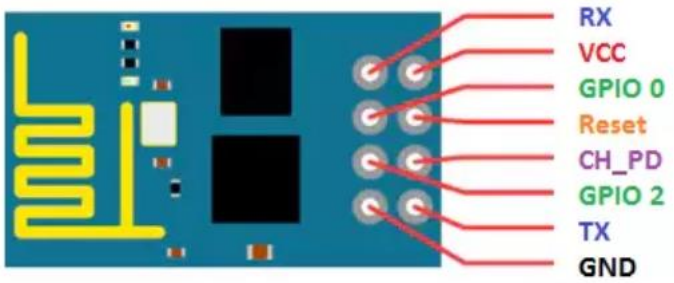


Fig 4.7: Pinout Diagram of ESP8266 Module

ESP8266 Pinout consists of 8 pins in total and can be seen in above fig 4.7, which are:

| | | |
|---|---|---|
| RX | - | Serial Receiver Pin |
| Vcc | - | Power Pin (+3.3 V; can handle up to 3.6 V) |
| GPIO 0 | - | General-purpose I/O No. 0 |

| | | |
|---|---|---|
| RST | - | Reset |
| CH-PD | - | Chip power-down |
| GPIO 2 | - | General-purpose I/O No. 2 |
| TX | - | Serial Transmitter Pin |
| GND | - | Ground |

### 4.6.2 Features and Specifications of ESP8266

- Integrated low power 32bit MCU
- Integrated 10bit ADC
- Integrated TCP/IP protocol stack
- Operating temperature range : -40 ° C ~ 125 ° C
- Frequency range : 2.4GHz - 2.5GHZ
- Operating voltage : 3.0v~3.6v
- Operating current: Average value 80mA
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLL, regulators, and power management units
- Supports antenna diversity
- WiFi 2.4 GHz, support WPA/WPA2 Security
- Network protocol : IPv4, TCP/UDP/HTTP/FTP
- SDIO 2.0, (H) SPI, UART, I2C, I2S, IRDA, PWM, GPIO
- STBC, 1x1 MIMO, 2x1 MIMO
- A-MPDU & A-MSDU aggregation and 0.4s guard interval
- Deep sleep power <10uA, Power down leakage current < 5uA
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)
- +20dBm output power in 802.11b mode

## 4.7 16x2 LCD DISPLAY

### 4.7.1 Introduction

The term LCD stands for Liquid Crystal Display that uses a plane panel display technology, used in screens of computer monitors & TVs, smartphones, tablets, mobile devices, etc. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters (16×2=32) in total & every character will be made with 5×8 (40)

Pixel Dots. So the total pixels within this LCD can be calculated as 32 x 40 otherwise 1280 pixels.

### 4.7.2 Features and Specifications

- The display bezel is 72 x 25mm
- Number of columns – 16
- Number of rows – 2
- Number of LCD pins – 16
- Characters – 32
- It works in 4-bit and 8-bit modes
- Pixel box of each character is 5×8 pixel
- Font size of character is 0.125Width x 0.200height
- The operating voltage of this display ranges from 4.7V to 5.3V
- The operating current is 1mA without a backlight

### 4.7.3 Pin Configuration

The pin diagram of 16x2 LCD can be seen in fig 4.8 and the pin configuration is discussed below :

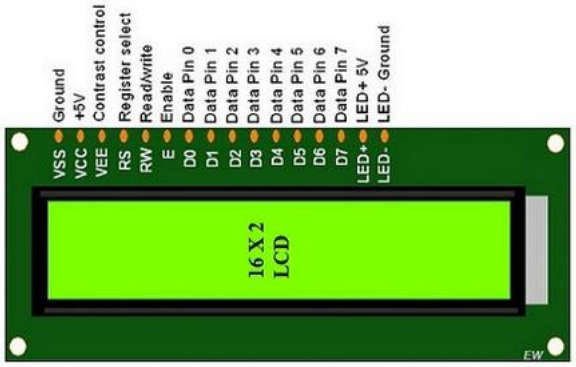


Fig 4.8: Pin Diagram of 16x2 LCD

- Pin1 (Ground): This pin connects the ground terminal.

- Pin2 (+5 Volt): This pin provides a +5V supply to the LCD
- Pin3 (VE): This pin selects the contrast of the LCD.
- Pin4 (Register Select): This pin is used to connect a data pin of an MCU & gets either 1 or 0. Here, data mode = 0 and command mode =1.
- Pin5 (Read & Write): This pin is used to read/write data.
- Pin6 (Enable): This enables the pin must be high to perform the Read/Write procedure. This pin is connected to the data pin of the microcontroller to be held high constantly.
- Pin7 (Data Pin): The data pins are from 0-7 which are connected through the microcontroller for data transmission.
- Pin8 – Data Pin 1
- Pin9 – Data Pin 2
- Pin10 – Data Pin 3
- Pin11 – Data Pin 4
- Pin12 – Data Pin 5
- Pin13 – Data Pin 6
- Pin14 – Data Pin 7
- Pin15 (LED Positive): This is a +Ve terminal of the backlight LED of the display & it is connected to +5V to activate the LED backlight.
- Pin16 (LED Negative): This is a -Ve terminal of a backlight LED of the display & it is connected to the GND terminal to activate the LED backlight.

## 4.8 BUZZER

### 4.8.1 Introduction

An audio signalling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers,

alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.


Fig 4.9: Buzzer Pin Configuration

The pin configuration of the buzzer is shown in figure 4.9. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

### 4.8.2 Specifications

- Color is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15mA

## 4.9 ARDUINO IDE

### 4.9.1 Introduction

Arduino programs are written in the Arduino Integrated Development Environment (IDE). Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program in Arduino language) for different Arduino boards. The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language. After the sketch is written in the Arduino IDE, it should be uploaded on the Arduino board for execution.

### 4.9.2 Basic program

The structure of Arduino program is pretty simple. Arduino programs have a minimum of 2 blocks - Preparation & Execution, each block has a set of statements enclosed in curly braces:

```
void setup( )
{
statements-1;
.
.
.
statement-n;
}

void loop ( )
{
statement-1;
.
.
.
statement-n;
}
```

Here, setup ( ) is the preparation block and loop ( ) is an execution block.

The setup function is the first to execute when the program is executed, and this function is called only once. The setup function is used to initialize the pin modes and start serial communication. This function has to be included even if there are no statements to execute.

```
void setup ( )
{
pinMode (pin-number, OUTPUT); // set the 'pin-number' as output
pinMode (pin-number, INPUT);     // set the 'pin-number' as output
}
```

After the setup ( ) function is executed, the execution block runs next. The execution block hosts statements like reading inputs, triggering outputs, checking conditions etc..

In the above example loop ( ) function is a part of execution block. As the name suggests, the loop( ) function executes the set of statements (enclosed in curly braces) repeatedly.

```
Void loop ( )
{
digitalWrite (pin-number,HIGH); // turns ON the component connected to 'pin-number'
delay (1000);                    // wait for 1 sec
digitalWrite (pin-number, LOW); // turns OFF the component connected to 'pin-number'
delay (1000);                    //wait for 1sec
}
```

Note: Arduino always measures the time duration in millisecond. Therefore,whenever you mention the delay, keep it in milli seconds.

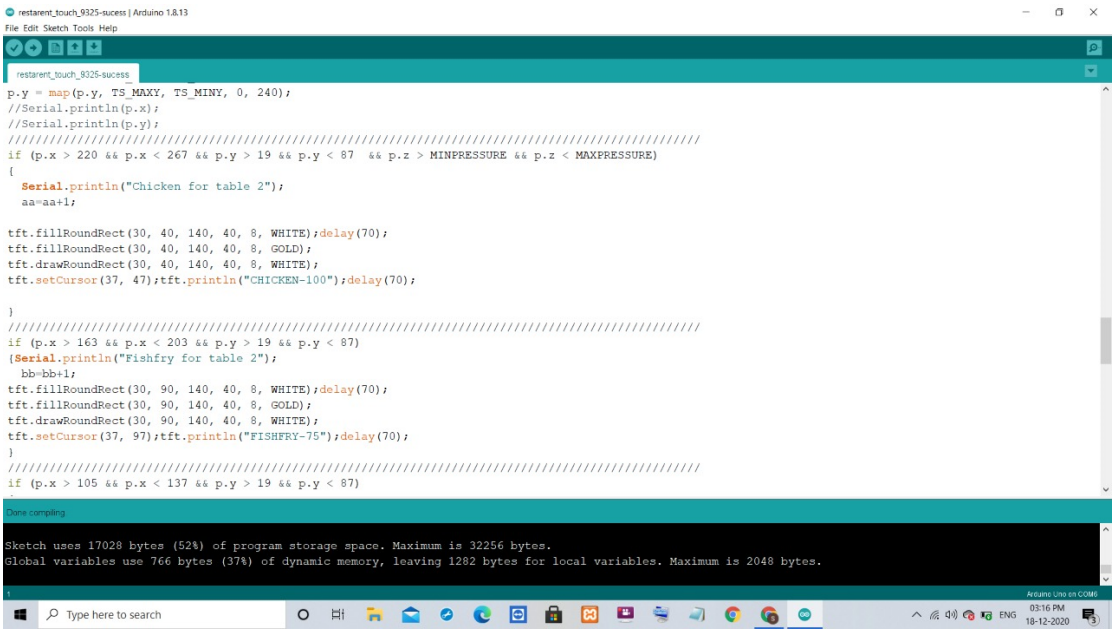


Fig.4.10: Arduino programming platform

# 5. RESULTS & DISCUSSION

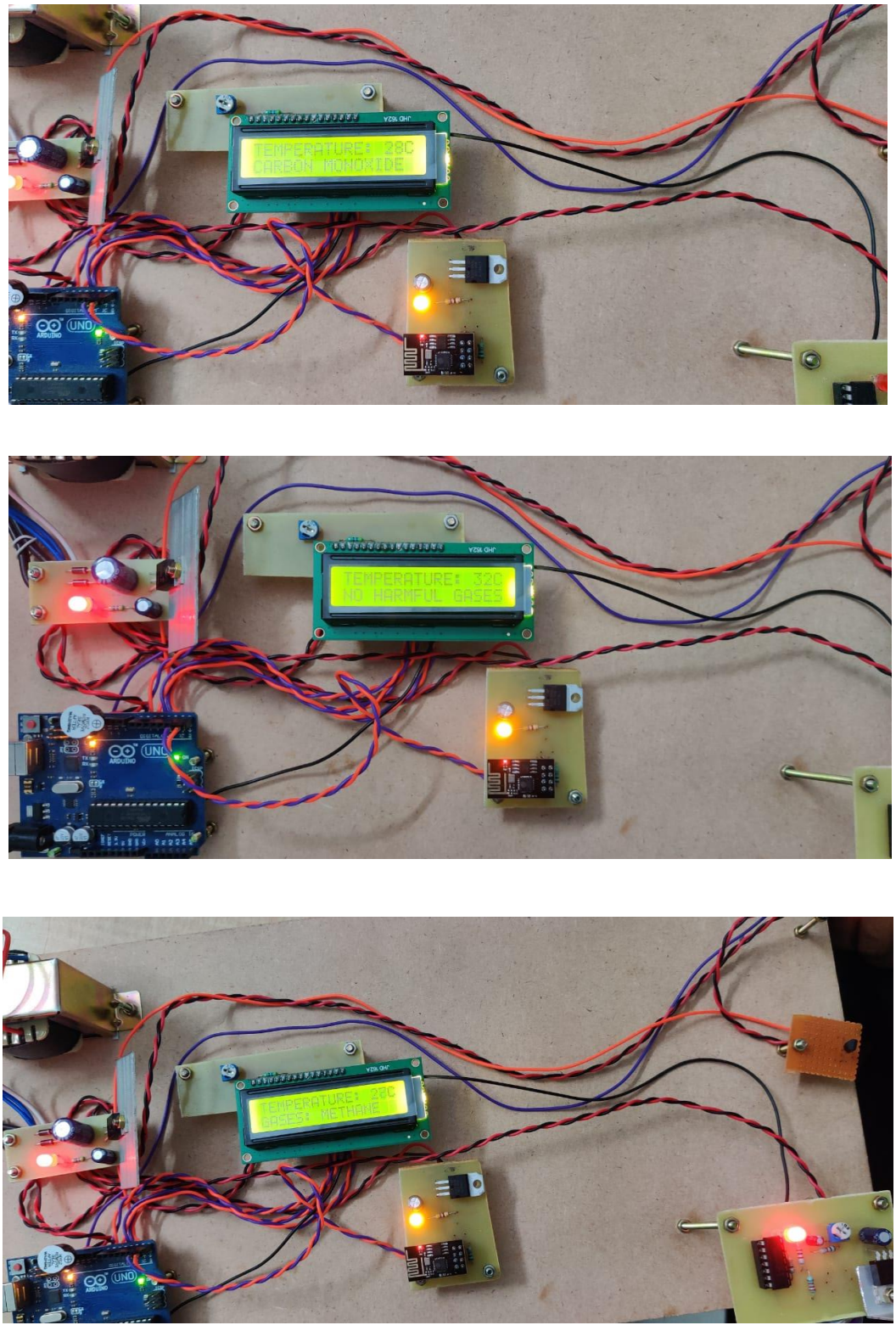


Fig 5.1: LCD displaying the Temperature and the type of Gas Detected

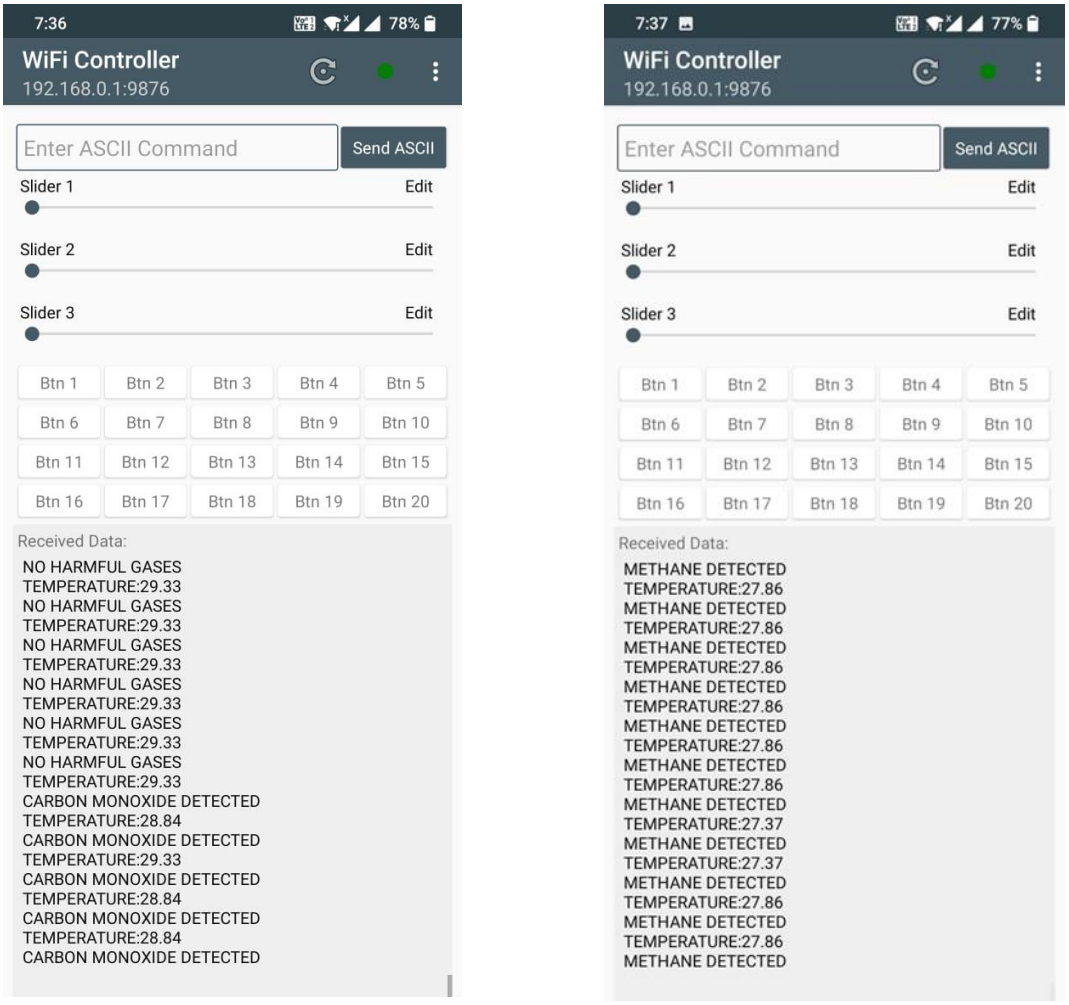


Fig 5.2: Messages sent through Wi-Fi Module

The prototype has been tested by sensing a small amount of LPG, Methane and carbon monoxide gas near to the sensor.MQ-4 and MQ-2 gas sensor detects Methane, LPG and carbon monoxide gas and sends a signal to the microcontroller. After that microcontroller send an active signal to turn on the Buzzer and also sends a message using Wi-Fi Module. Simultaneously the LCD will display the Temperature and the names of the Detected Gases.

# 6. CONCLUSION & FUTURE SCOPE

## CONCLUSION

Hazardous gas detection device which uses an embedded system has been implemented. In this system we have describe a new approach for gas leakage detection system at a low concentration. The leakage is detected with the help of MQ-2 and MQ-4gas sensors. Sensor sends a signal to microcontroller. In the next step microcontroller sends an active signal to other externally connected devices. A quick response rate is provided by this system. With the help of this system the critical situations can be solved quickly over the manual methods which require large amount of time.

## FUTURE SCOPE

# CHAPTER – 7. REFERENCES

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[4]Embedded System ” ISSN: 2248-9622 Vol. 2, Issue 6, November- December 2012, pp.1180-1183.

# CHAPTER – 8. APPENDICES