A Project Report on

"GAS LEAKAGE MONITORING & ALERTING SENSOR"

Submitted in partial fulfilment

For the award of the Degree in

BACHELOR OF COMPUTER APPLICATION

By

RAVI KUMAR

ENROLLMENT NUMBER- AJU/191079

Under the esteemed guidance of

Mr. AKASH KUMAR BHAGAT

Prof. Dr. ARVIND KUMAR PANDEY

ARKA JAIN UNIVERSITY

JAMSHEDPUR, JHARKHAND

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

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JAMSHEDPUR, JHARKHAND

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

CERTIFICATE

This is to certify that the project entitled **"GAS LEAKAGE MONITORING & ALERTING SENSOR"** is a bona-fide work of **RAVI KUMAR** bearing Registration Number: **AJU/191079** submitted in partial fulfilment of the requirements for the award of degree in BACHELOR OF COMPUTER APPLICATION (BCA) from ARKA JAIN UNIVERSITY, JHARKHAND.

Internal Guide

Head of the Department

University Seal

Date: 25/5/22

IT DEVELOPER

IT ENGINEERS

Ref. No: ITD-IP-0222-019 **Date:** 20-02-2022

PROJECT INTERNSHIP LETTER

TO WHOM IT MAY CONCERN

This is to certify that Mr. **Ravi Kumar**, a student of ARKA JAIN University, Jharkhand, Jamshedpur has successfully completed his Project Internship/Training (Virtual) with our organization as an **Arduino Project** during the period of October 2021 to January 2022.

The topic of the project was:

"Gas Leakage Monitoring & Alerting Sensor"

The code and equipments used for project development was Embedded C, Node MCU ESP8266 WIFI Module, MQ2 Gas Sensor, DHT11 Temperature and Humidity Sensor, BreadBoard, Buzzer, LED Lights, Jumper Wires.

During this period of internship/training, he was found to be honest, creative & able to perform all his duties perfectly on the project.

We wish him all the best in all his future accomplishments.

For IT DEVELOPER

IT DEVELOPER INDIA

(Authorized Signatory)

ABSTRACT

Safety plays an important role in today's world as accidents are prone to happen anywhere. Places that make use of flammable and not easily detectable gases are prone to occurrences of accidental fires. 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. Internet of Things (IOT) is a futuristic technology that deals with the interconnection of components and provides the basic criterion for fulfilling the needs of developing the apparent systems for specific area. The automation of daily chores can be made possible by this. In the proposed Gas leakage detection sensor we are using IOT for monitoring the flammable. This is made possible by using NodeMcu that interfaces with the gas sensor, buzzer to alarm, Wi-Fi shield to send data over the server for the android application to fetch those data form database and alert accordingly if the threshold crosses the limit to close the gas valve if there is high leakage or say the threshold limit is crossed. The system will detect the Gas leakage with the help of installed gas sensors in different places and inform NodeMcu board which will carry necessary operations like ringing the buzzer, informing the user, closing the gas valve and ensuring safety. In case of any leakage detection, it will alert the user via a buzzer and there will be an instant notification prompted in the mobile with the help of Wi-Fi shield and an android application. The application will alert the user about the environment conditions such as Gas level (Low/High), Humidity and Temperature of that location. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation. This proposed system also includes an alerting system for the users. The system is based on a sensor that easily detects a gas leakage.

KEY WORDS: leakage, notification, system, database, installed, sensor.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to several individuals and organization for supporting me throughout the completion of my project. First of all it is a genuine pleasure to express my profound gratitude and deep regards to my mentor **MR AKASH BHAGAT sir** and our **HOD MR ARVIND PANDEY sir** for his enthusiasm, patience, insightful comments, helpful information, practical advices and unceasing ideas that have helped me tremendously at all times in my Project and writing of these thesis. His immense knowledge, profound experience and professional expertise in Backend have enabled me to complete this project successfully. Without his support and guidance, this project would not have been possible.

I am also thankful to our respected teachers and all faculty members for loving inspiration and timely guidance. I also wish to express my sincere thanks to the Department of Computer science & Information technology of **ARKA JAIN UNIVERSITY** for accepting this project.

Thanks for all your encouragement!

DECLARATION

I hereby declare that the Project report entitled **"GAS LEAKAGE MONITORING & ALERTING SENSOR"** done at **ARKA JAIN UNIVERSITY** has not been in any case duplicated to submit to any other university for the award of any degree. To the best of knowledge other than me, no one has submitted to any other university.

This project is done to partial fulfilment of the requirement for the award of the degree of **BACHELOR OF COMPUTER APPLICATION (BCA)** which is to be submitted as final semester project of our curriculum.

Signature RAVI KUMAR
25/05/2022

(RAVI KUMAR)

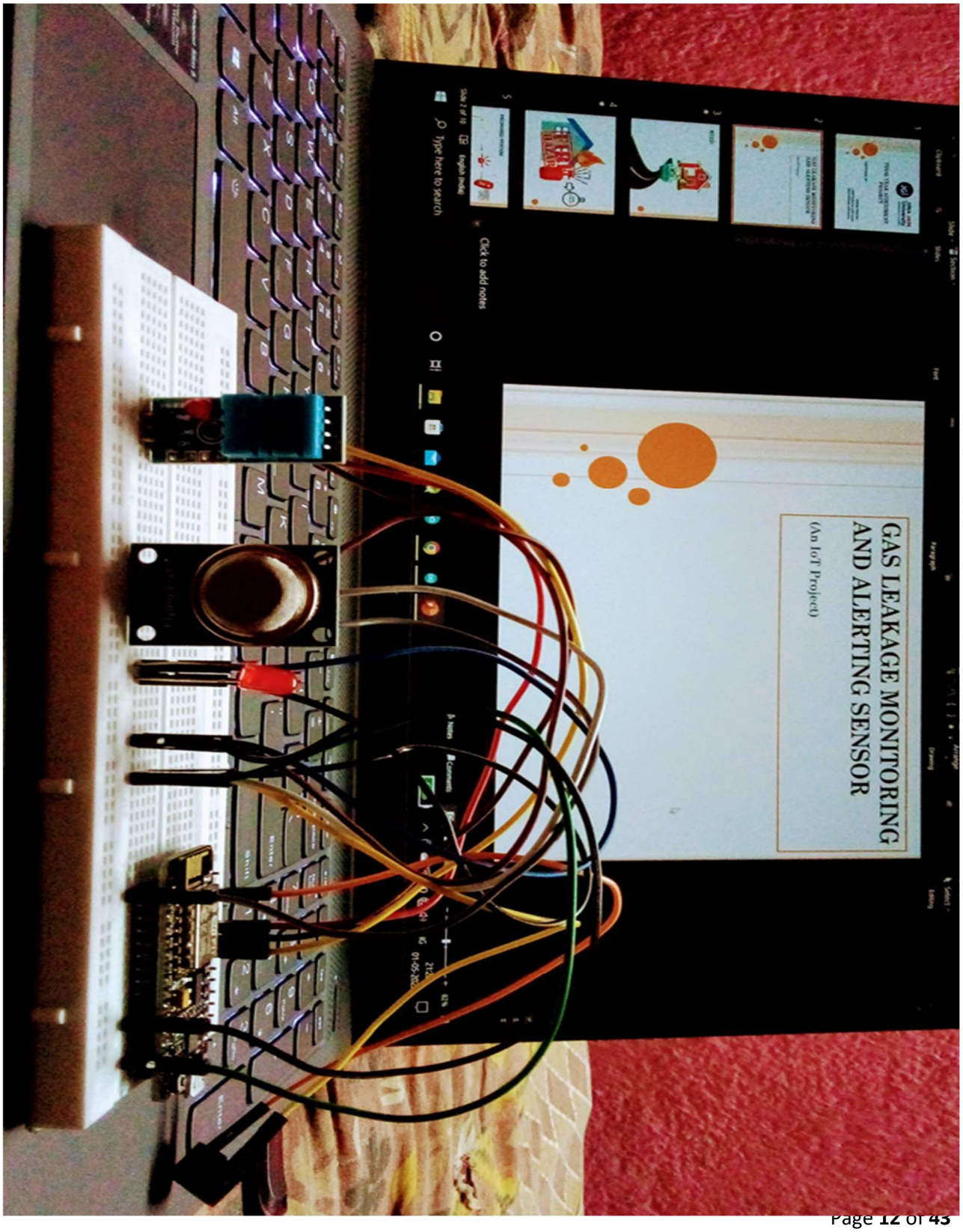
TABLE OF CONTENTS

CHAPTER-1

1.1 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 meager harm to the environment. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage. This energy source is primarily composed of propane and butane which are highly flammable chemical compounds. These gases can catch fire easily. In homes, LPG is used mainly for cooking purposes. When a leak occurs, the leaked gases may lead to an explosion. Gas leakage leads to various accidents resulting in both material loss and human injuries. Home fires have been occurring frequently and the threat to human lives and properties has been growing in recent years. The risks of explosion, fire, suffocation are based on their physical properties such toxicity, flammability, etc. 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 it is necessary to install good safety equipments that insure safety of these places of education and work. The proposed system will continuously monitor the surroundings for any leakage. In this chapter a low-cost advanced sensor-based gas leakage detector, alert and control system is proposed and discussed. The system is very efficient, user friendly, portable, small in size and cost effective. This model consists of a MQ-2 gas sensor and a controller in the form of a NodeMCU ESP8266. This model incorporates both the services of hardware and software, with the hardware aspect dealing with physically interfacing of the MQ-2 gas sensor to the NodeMCU ESP8266 and software aspect dealing with calibration of the gas sensor through the use of Arduino IDE software. Through the use of this software, the desired code was uploaded into the NodeMCU ESP8266 to calibrate the analogue signal which the MQ-2 gas sensor detects and converts it into a digitalized form for easy reading. The MQ-2 gas sensor was calibrated into three varying levels, the LOW, MODERATE and HIGH gas concentrations for ranges between 0- 250ppm, 250-300ppm and above 300ppm respectively

1.2 VIEW OF THE PROPOSED SYSTEM



1.3 OBJECTIVES OF THE SYSTEM

- The objective of gas detection is not only to detect hazardous gases but also to monitor the surroundings continuously to prevent the further leakage of gas in the environment to minimize the chances of fire.
- The IoT based system is designed in such a way that the sensors are active throughout until switched off. These sensors sense the surrounding gases and constantly send the reading to the server, as the reading crosses the threshold of any hazardous gas leakage in the surrounding the buzzer or alarm rings.
- A gas leakage detector becomes vital and helps to protect people from the dangers of gas leakage and toxic gasses via sensors and send the monitored frequencies to the server. Toxic gases are one that cause serious health impacts, but are also used in industries in large quantities. Therefore these gasses have to be monitored in a basic time interval so as to prevent hazardous accidents.In future, smart buildings infrastructure will support bi-directional communication standards, which will allow continuous interaction between the utility, the consumer and the controllable device that we install. For the project this was possible by the means of Android application which helps the user facilitate the near surrounding of the device.

CHAPTER-2

2.1 TYPES OF COMPONENTS USED

HARDWARE COMPONENTS

A. ESP8266 WIFI MODULE

B. MQ2 GAS SENSOR

C. DHT11 TEMPERATURE AND HUMIDITY SENSOR

D. BREAD BOARD

E. BUZZER

F. LED LIGHT

G. JUMPER WIRES (MALE TO MALE & MALE TO FEMALE)

SOFTWARE REQUIRED

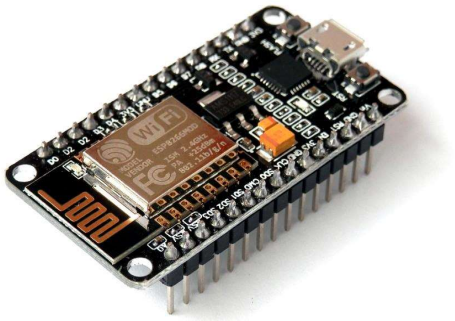
a. ARDUINO.CC

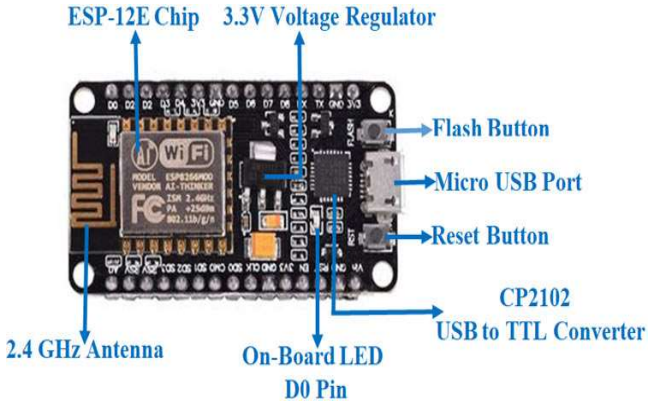
LANGUAGE USED

A- EMBEDDED C

2.2DESCRIPTION OF COMPONENTS USED IN THIS PROJECT

1. ESP-8266 MICROCONTROLLER:





The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

Here, Instead of using Generic ESP8266 board we are using NODE MCU (Micro Controller Unit) board which provides open source software and hardware development environment that builds around a very inexpensive SoC (System-on-a-Chip) called the ESP8266.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy

minimal PCB area. The ESP8266 supports 2G, 3G for VoIP applications and Bluetooth co-existence interfaces. It also enables microcontrollers to connect to 2.4 GHz WI-Fi, using

IEEE 802.11 bgn. They can be used with ESP-AT firmware to provide Wi-Fi connectivity to the external host MCUs or it can be used as a self –sufficient MCU by running an RTOS based SDK.

ESP8266 SPECIFICATIONS

ESP8266	**DESCRIPTION**
1- CORE	1
2- ARQUITECTURE	32 BITS
3- CLOCK	Xtensa LX106 80-160MHz
4- WiFi	IEEE802.11 b/g/n support for WPA and WPA2
5- BLUETOOTH	No
6- RAM	160KB-64KB Instruction-96KB Data
7- FLASH	Extern QSPI- 512KB A 4MB
8- GPIO	16
9- DAC	0
10-ADC	1
11-INTERFACES	SPI-12C-UART-12S

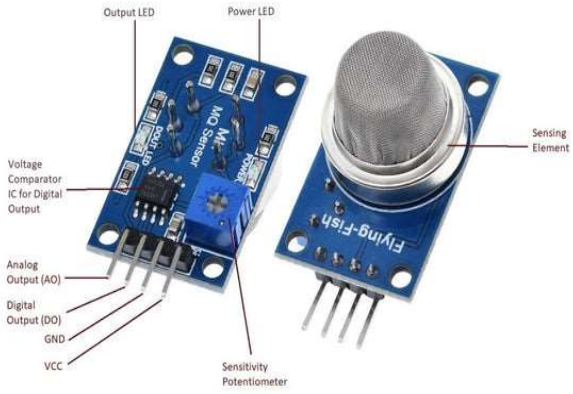
APPLICATIONS OF NODE-MCU ESP8266:

The ESP8266 modules are commonly found in the following IoT devices:

- Smart security devices which include surveillance cameras and smart locks

- Smart energy devices such as HVACs and thermostats
- Smart industrial devices including Programmable Logic Controllers (PLCs)
- Smart medical devices which include wearable health monitors

2. MQ2 GAS SENSOR:



MQ2 gas sensor is also known as Chemi-resistor. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas. This sensor is useful for gas leakage detection in home and industry. It is used to therefore detect combustible gas and smoke. The output voltage from the Gas sensor increases when the concentration of gas. They are very useful for detecting equipments in family and various industries which are suitable for the detection of Smoke, Alcohol, LPG, CNG, PNG and natural gas. These kinds of sensors are electronic devices which are used for interaction with the outer environment. With the advent in technology these are available as both analog and digital forms.

MQ2 is a metal oxide semiconductor type gas sensor. Concentrations of gas in the gas are measured using a voltage divider network present in the sensor. This sensor works on 5V DC voltage. It can detect gases in the concentration of range 200 to 10000ppm. Through the years they have become a crucial part of our safety systems.

WORKING PRINCIPLE OF MQ2 SENSOR...

It is an electronic sensor which is used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide. This sensor contains a sensing element, mainly aluminium-oxide based ceramic, coated with Tin dioxide, enclosed in a stainless steel mesh. Sensing element has six connecting legs attached to it. Two leads are responsible for heating the sensing element; the other four are used for output signals.

Oxygen gets adsorbed on the surface of sensing material when it is heated in air at high temperature. Then donor electrons present in tin oxide are attracted towards this oxygen, thus preventing the current flow.

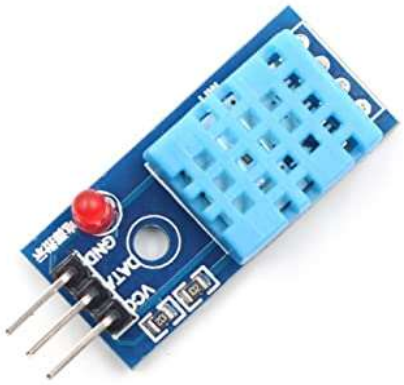
When reducing gases are present, these oxygen atoms react with the reducing gases thereby decreasing the surface density of the adsorbed oxygen. Now current can flow through the sensor, which generated analog voltage values.

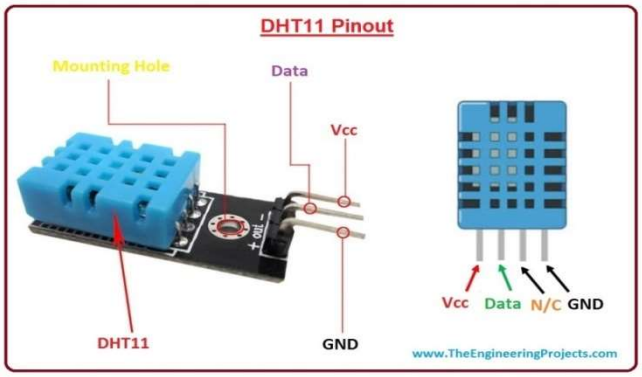
These voltage values are measured to know the concentration of gas. Voltage values are higher when the concentration of gas is high.

APPLICATIONS OF THE MQ-2 SENSOR

- These sensors are used to detect the presence of gases in the air such as methane, butane, LPG and smoke but they are unable to distinguish between gases. Thus they cannot tell which gas it is.
- This sensor is also used for the air quality monitoring, gas leak alarm and for maintaining environmental standards in hospitals. In different industries these are used to detect the leakage of various types of harmful gases.
- The module version of this sensor can be used without interfacing to any microcontroller and is also useful while detecting only one particular gas. Therefore some of the alternatives of the MQ-2 gas sensor are as MQ-6, M-306A and AQ-3 sensors.

3. DHT-11 TEMPERATURE & HUMIDITY DETECTION SENSOR





The DHT-11 sensor is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. You can get new data from it once every 2 seconds, so when using the library from Adafruit, sensor readings can be up to 2 seconds old. It is a commonly used Temperature and Humidity sensor which comes with a dedicated NTC for measuring temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with the other microcontrollers.

It comes with a 4.7K or 10K resistor, which we will need to use as a pull up from the data pin to VCC.

SPECIFICATIONS:

- Operating voltage- 3 to 5V power and I/O
- Operating Current- 2.5mA max current use during conversion (while requesting data)
- Humidity range- Good for 20-80% humidity readings with 5% accuracy
- Temperature range- Good for 0-50 °C temperature readings +-2 °C accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing
- RoHS compliant

APPLICATIONS OF THE DHT-11 SENSOR

- This sensor is used in various applications such as humidity and temperature values in heating, ventilation and air conditioning systems.
- It is also used as a preventive measure in homes where people are affected by humidity.
- Offices, cars, museums, greenhouses and industries use this sensor for measuring humidity values and as a safety measure.
- The compact size and sampling rate made this sensor popular among the hobbyists.

4. JUMPER WIRES

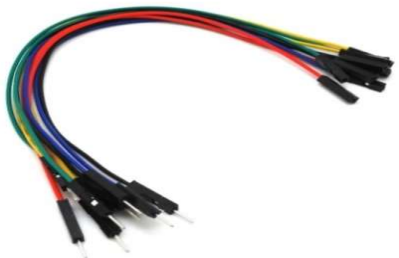
Jumper wires are simply wires that have nector pins at each end, allowing them to be used to connect two points to each other without soldering. The term simply refers to a conducting wire that establishes an electrical connection between the two points in a circuit. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. They are used to connect two points in a circuit. It is a type of material which are extremely handy components to have on hand, especially when prototyping. Jumper wires are smaller and more bendable corrugated cable which is used to connect antennas and other components to the network cabling. It is also used for making connections between items on our breadboards and the nodemcu header pins. They are also considered to modify a circuit or in diagnosing problems in the circuit. Jumper wires are also best used to bypass a part of the circuit which does not consider a resistor and is suspected to be bad.

4. a. TYPES OF JUMPER WIRES

Jumper wires typically come in three versions:

- Male–to-Male jumper
- Male-to-Female jumper
- Female-to-Female jumper

The difference between each is in the end point of the wire. The male connector is refered to as a plug which has a solid pin for the centre conduction. Female connector is referred as a jack and also has a centre conductor with a hole in it to accept the male pin. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

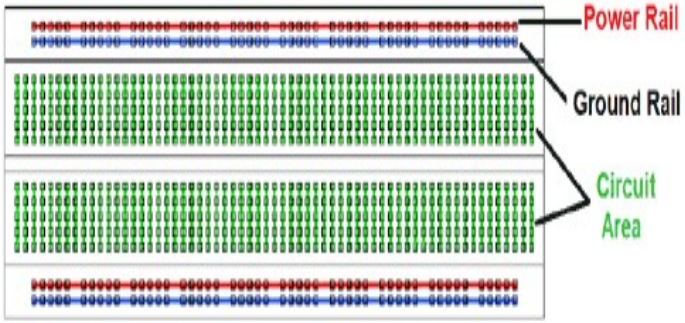


4. b. WHAT DOES THE COLOUR MEAN?

Though jumper wires come in a variety of colours, the colours don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colours can be used to your advantage in order to differentiate between types of connections, such as ground or power. The colour of the wire is just an aid for helping to keep track of what is connected to which. Difference in the colour doesn't affect the operation of the circuit.

Therefore the colours can be used to our advantage for differentiating the different types of the connections in circuit.

5. BREAD BOARD



A **BREADBOARD** or protoboard, is a construction base for prototyping of electronics. Originally the word referred to a literal bread board, a polished piece of wood used when slicing bread. It is basically a rectangular plastic board with a bunch of tiny holes in it. These holes basically let us easily insert electronic components to prototype. They are mostly used for making temporary circuits for testing or by trying to try up an idea. In the 1970s the solder less breadboard (a.k.a. plug board, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these. They are one of the most fundamental pieces when learning how to build circuits. It enables developers to easily connect components or the wires to the rows and columns of internally connected spring clips underneath the perforated

plastic enclosures. Most of the engineers still use the breadboards for more basic circuits and some have taken these components to the extreme and also built the entire working computers and even graphical outputs.

Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solderless breadboards are also popular with students and in technological education. Older breadboard types did not have this property. A strip board (Veroboard) and similar prototyping printed circuit boards, which are used to build semi-permanent soldered prototypes or one-offs, cannot easily be reused. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

Compared to more permanent circuit connection methods, modern breadboards have high parasitic capacitance, relatively high resistance, and less reliable connections, which are subject to jostle and physical degradation. Signalling is limited to about 10 MHz, and not everything works properly even well below that frequency.

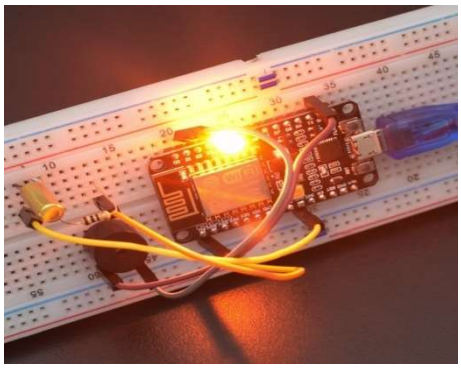
6. BUZZER

Arduino buzzer is also called a piezo buzzer. It is basically a tiny speaker that you can connect directly to an Arduino. It is basically an audio signalling device which may be mechanical, electromechanical or piezoelectric. They are a sounding device which converts audio signals into the sound signals. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect. Based on different designs they are able to generate

different sounds like alarm, music, bell and siren. The pin configuration of the buzzer is shown in the above diagram which includes two pins namely positive and negative. The positive terminal of this is represented with the + symbol or a longer terminal whereas the negative terminal is represented by – symbol or short terminal which is connected to the GND terminal.

Buzzer comes in different shapes and a size due to its go to nature buzzer is used in various home automation and IOT devices.

7. LED LIGHTS

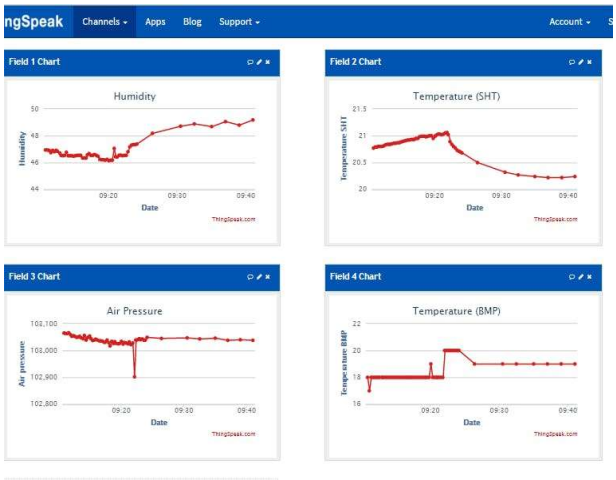


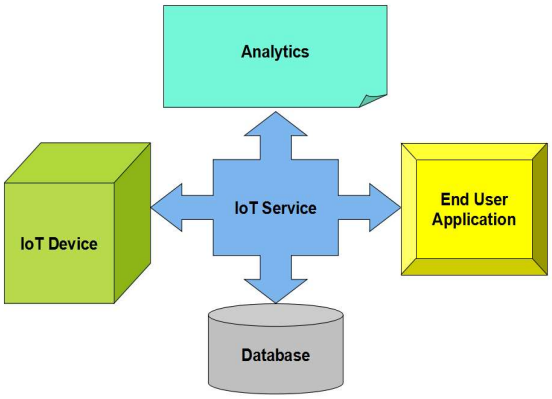
A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.[5] White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

LEDs are made in different packages for different applications. A single or a few LED junctions may be packed in one miniature device for use as an indicator or pilot lamp. An LED array may include controlling circuits within the same package, which may range from a simple resistor, blinking or color changing control, or an addressable controller for RGB devices. Higher-powered white-emitting devices will be mounted on heat sinks and will be used for illumination. Alphanumeric displays in dot matrix or bar formats are widely available. Special packages permit connection of LEDs to optical fibers for high-speed data communication links.

8. THINKSPEAK

What is Thing Speak used for?



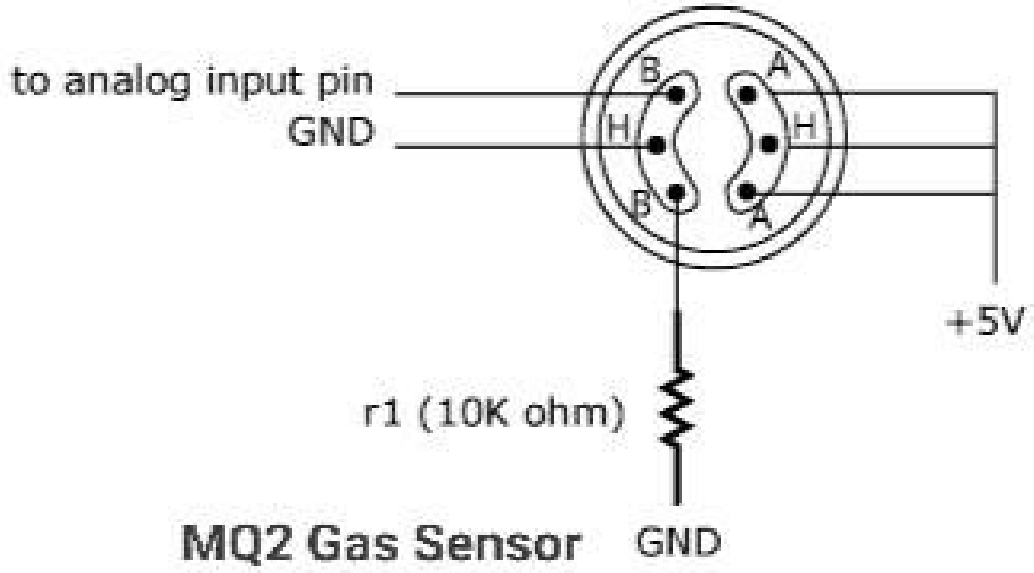


ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. It is an IoT based platform which lets us collect and store sensor data in the cloud and develop IoT applications. This app also records and shows data about various sensors connects to it via WIFI module and cloud. It supports various microcontrollers (Arduino, esp-8266 module etc). This is often used for prototyping and proof of concept IoT systems which require analytics. Features of ThinkSpeak include the real-time data collection, data processing, visualizations, apps and plug ins. It is often used in IoT based device to share its generated data to the cloud and store it.

CHAPTER-3

3.1 SCHEMATIC DIAGRAMS OF THE SENSOR

MQ2 GAS SENSOR PIN WIRING DIAGRAM



BLOCK DIAGRAM

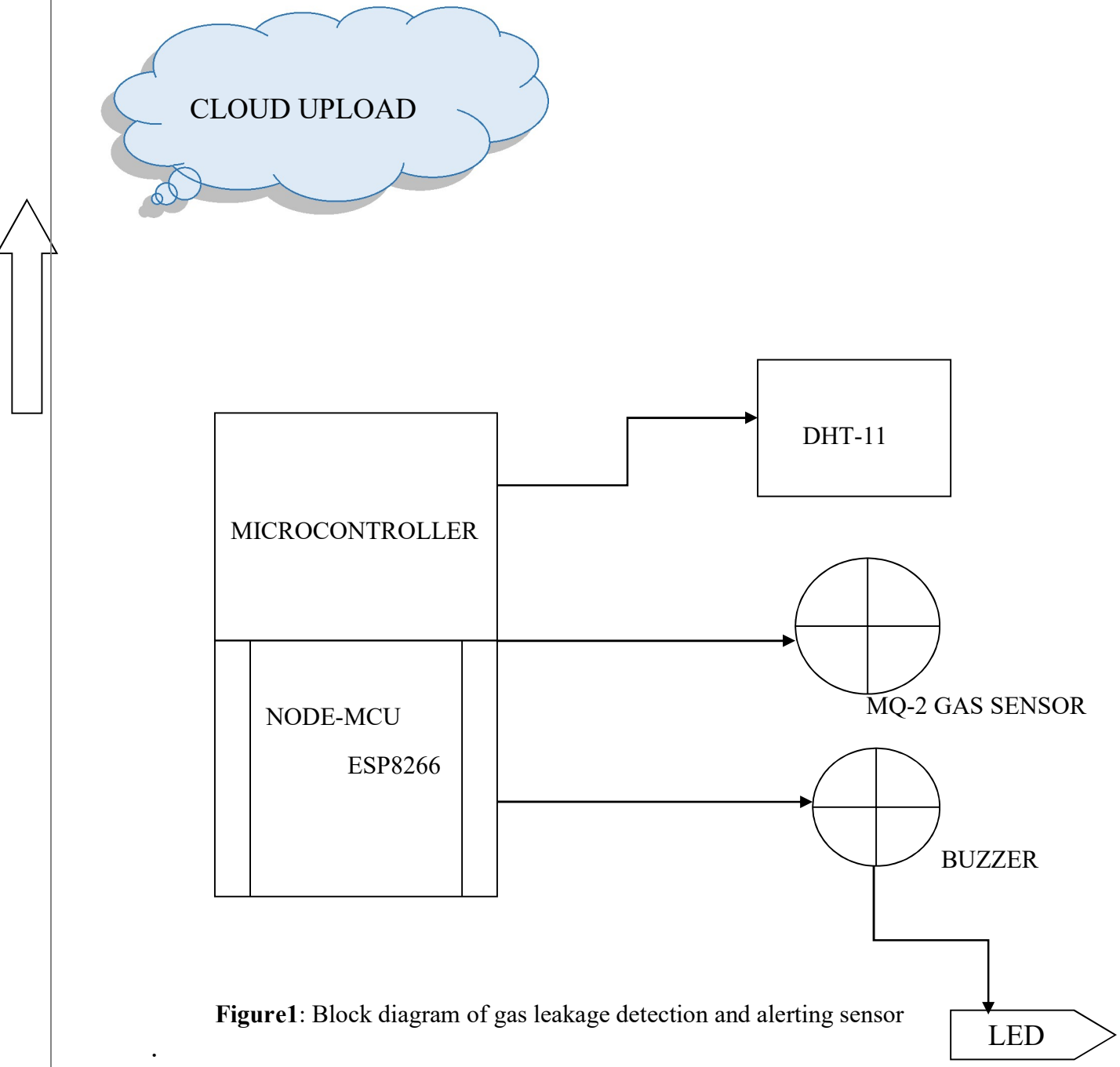
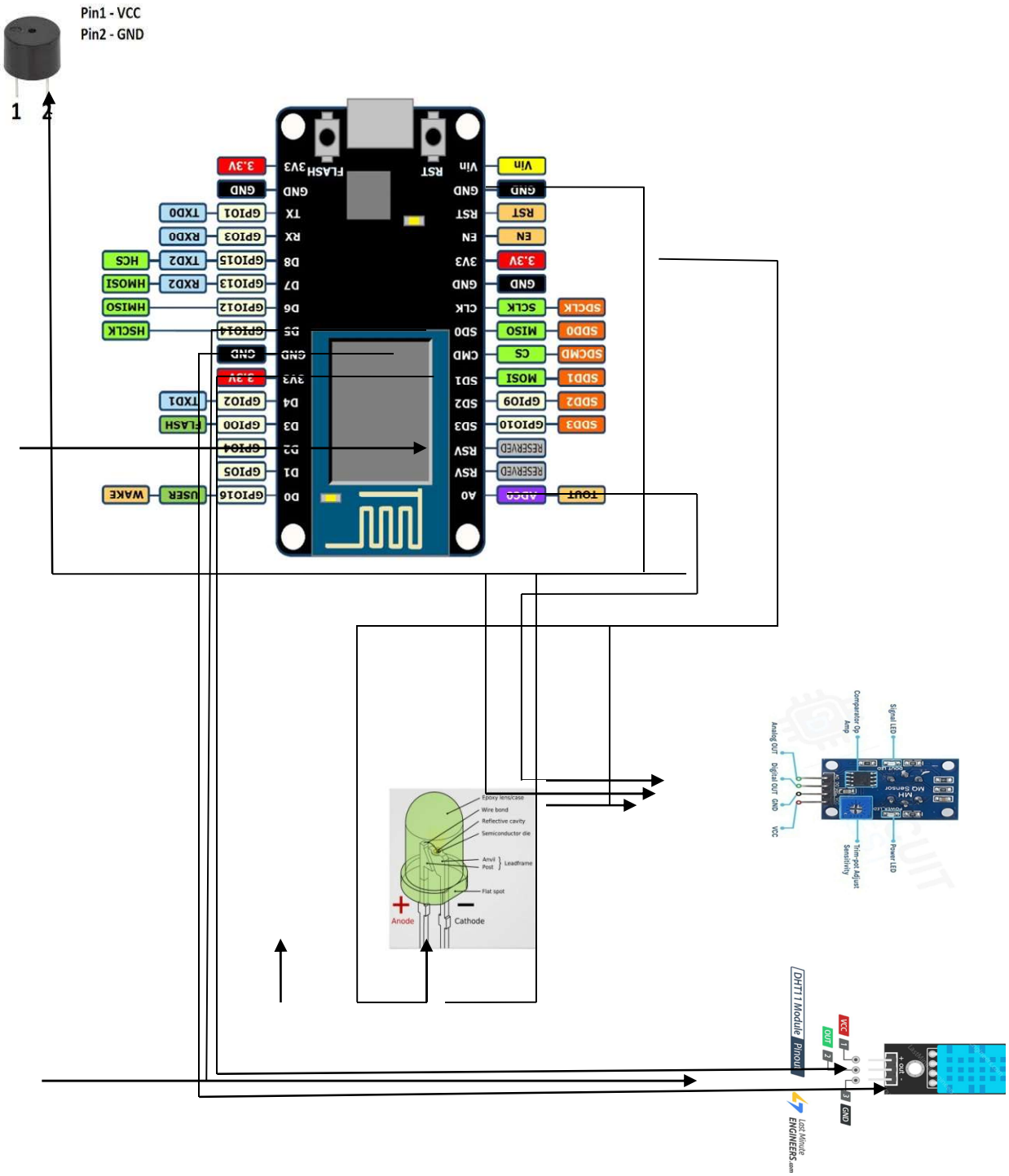


Figure1: Block diagram of gas leakage detection and alerting sensor

.

CIRCUIT DIAGRAM

Figure2: Circuit diagram of gas leakage detection and alerting sensor



3.2INSTALLED LIBRARIES IN ARDUINO.CC FOR THIS PROJECT…

1. ESPORA BY ARDUINO VERSION (1.4.0)
2. ETHERNET BUILD IN BY ARDUINO (2.0)
3. FIRMATA BY GITHUB.COM VERSION (2.5.8)
4. GSM BY ARDUINO VERSION (1.0.6)
5. LIQUIDCRYSTAL BY ARDUINO (1.0.7)
6. IFT BUILD IN BY ARDUINO VERSION (1.0.6)
7. TEMBOO BY ARDUINO VERSION (1.2.1)
8. STEPPER BY ARDUINO VERSION (1.1.3)
9. SD BUILDS IN BY ARDUINO VERSION (1.2.4)
10. WIFI BUILD IN BY ARDUINO VERSION (1.2.7)
11. ADAFRUIT CIRCUIT PLAYGROUND BUILD IN BY ARDUINO VERSION (1.11.3)
12. ADAFRUIT UNIFIED SENSOR BY ADAFRUIT VERSION (1.1.5)
13. DHT SENSOR LIBRARY FOR ESPx BY ARDUINO VERSION (1.18.0)
14. MQ UNIFIED SENSOR BY MIQUEL CALITA VERSION (3.0.0)

3.3COMPILED CODES

```
//#include <DHT.h>  // Including library for dht


#include "DHTesp.h" // Click here to get the library: http://librarymanager/All#DHTesp

#include <ESP8266WiFi.h>


String apiKey = "1GOTA5I7PDMTFARX";      // Enter your Write API key from ThingSpeak


const char *ssid =  "Galaxy M01 Core5060";      // replace with your wifissid and wpa2 key

const char *pass =  "12345678";

const char* server = "api.thingspeak.com";


//#define DHTPIN 0          //pin where the dht11 is connected


//DHT dht(DHTPIN, DHT11);
```

```
#ifdef ESP32
#pragma message(THIS EXAMPLE IS FOR ESP8266 ONLY!)
#error Select ESP8266 board.
#endif

int buzzer = D2;
int smokeA0 = A0;

// Your threshold value. You might need to change it.
intsensorThres = 220;

DHTespdht;

WiFiClient client;

void setup()
{
Serial.begin(115200);
      delay(10);
```

```
      //dht.begin();


Serial.println("Connecting to ");
Serial.println(ssid);



WiFi.begin(ssid, pass);


     while (WiFi.status() != WL_CONNECTED)
    {
          delay(500);
Serial.print(".");
    }
Serial.println("");
Serial.println("WiFi connected");



// READING DHT AND MQ SENSORS
pinMode(buzzer, OUTPUT);
pinMode(smokeA0, INPUT);
```

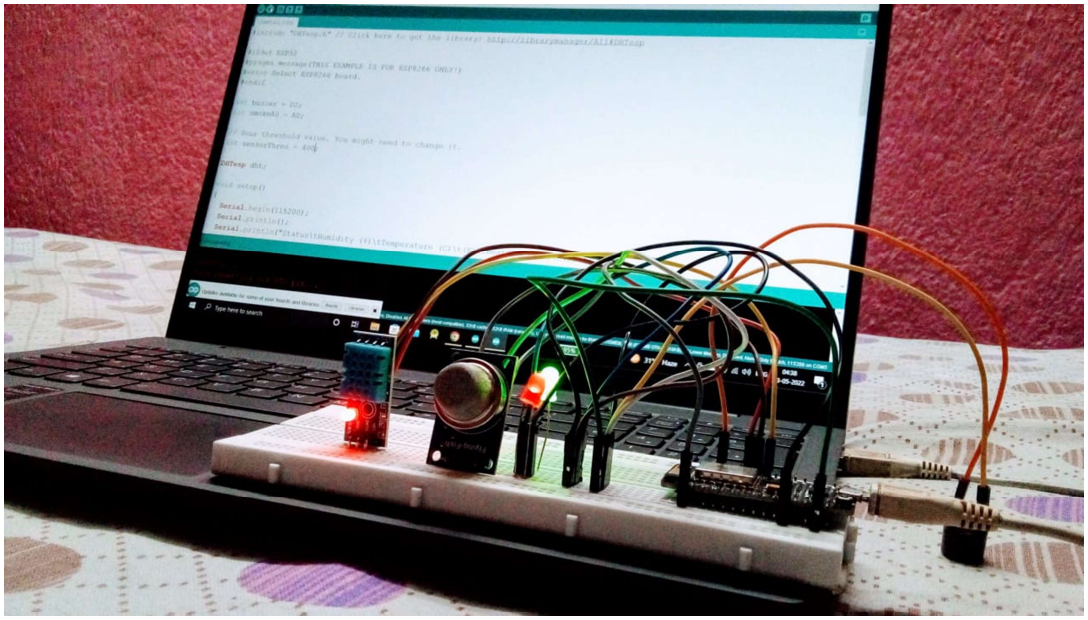
```
Serial.println();
Serial.println("Status\tHumidity (%)\tTemperature (C)\t");
    String thisBoard= ARDUINO_BOARD;
Serial.println(thisBoard);



dht.setup(14, DHTesp::DHT11); // Connect DHT sensor to GPIO 17


}


void loop()
{
    delay(dht.getMinimumSamplingPeriod()); /* Delay of amount equal to sampling period */
    float h = dht.getHumidity();/* Get humidity value */
    float t = dht.getTemperature()-36*5/9;/* Get temperature value */


   //float h = dht.readHumidity();
   //float t = dht.readTemperature();
```

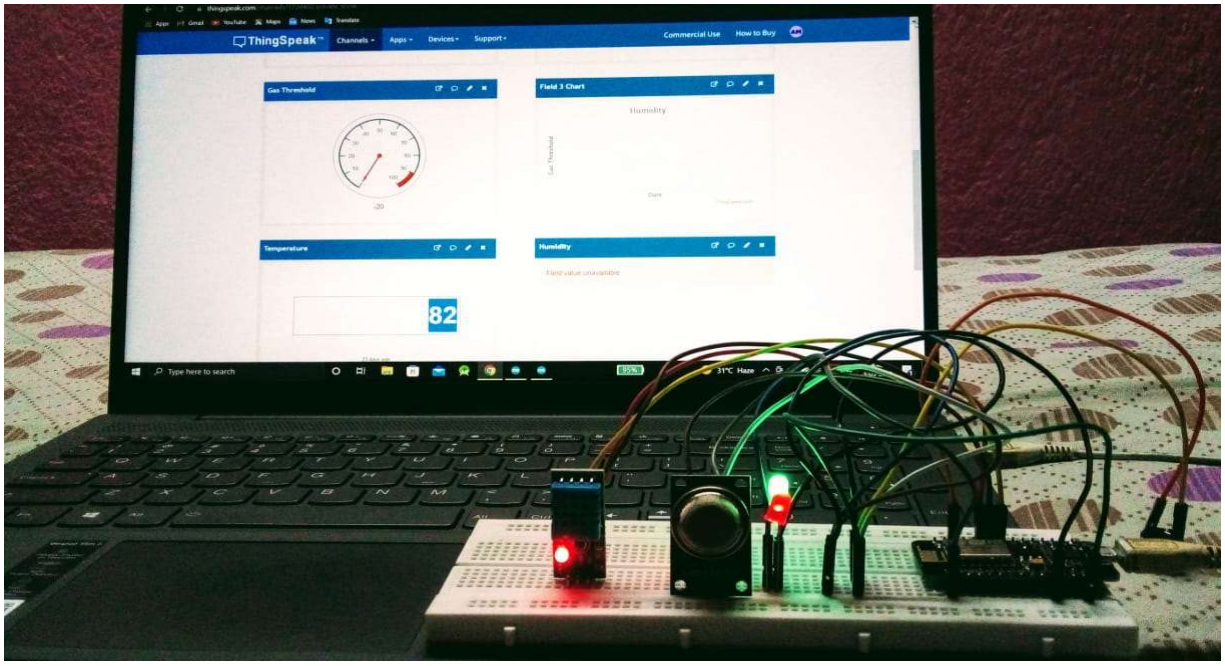
```
int g = analogRead(smokeA0);


Serial.print("Gas Threshold: ");
Serial.println(g);
      // Checks if it has reached the threshold value
      if (g >sensorThres)
      {
        tone(buzzer, 1000, 200);
      }
      else
      {
noTone(buzzer);
      }



            if (isnan(h) || isnan(t))
               {
Serial.println("Failed to read from DHT sensor!");
                    return;
```

```
}

if (client.connect(server,80)) // "184.106.153.149" or api.thingspeak.com
{

String postStr = apiKey;
postStr +="&field1=";
postStr += String(t);
postStr +="&field2=";
postStr += String(h);
postStr +="&field3=";
postStr += String(g);
postStr += "\r\n\r\n";

client.print("POST /update HTTP/1.1\n");
client.print("Host: api.thingspeak.com\n");
client.print("Connection: close\n");
client.print("X-THINGSPEAKAPIKEY: "+apiKey+"\n");
client.print("Content-Type: application/x-www-form-urlencoded\n");
client.print("Content-Length: ");
```

```
client.print(postStr.length());

client.print("\n\n");

client.print(postStr);


Serial.println("%. Send to Thingspeak.");

                    }

client.stop();


Serial.println("Waiting...");


  // thingspeak needs minimum 15 sec delay between updates

  delay(1000);

}
```

3.4OUTPUT AFTER COMPILATION OF CODE





✓ When the data is uploaded to the system

- ✓ As the threshold frequency increases the led starts blinking and buzzer makes sound in the above picture by sensing the leakage of gas.

RESULTS AND ANALYSIS

The various design modules of the liquefied Petroleum Gas Monitoring and Leakage Detection System Using NodeMCU ESP8266 and Wi-Fi Technology are outlined and discussed. The critical analysis and the various results recorded for the various models of the system which include the following LPG detection model, notification model and LPG leakage control model. This Model which involves the use of the MQ-2 gas sensor and NodeMCU ESP8266 which are primarily tasked with the detection of LPG gas in a particular confinement. The gas sensor which is very sensitive to LPG gas and also has a null sensitivity in clear air was successful used in the detection of LPG gas in this study. The Arduino IDE software which was used to calibrate the MQ-2 gas sensor was also implemented to show the varying gas concentration levels in a digitalized form.

3.5ADVANTAGES AND DISADVANTAGES OF THE SENSOR

❖ ADVANTAGES

- Insures safety from fire hazards and leakage hazards.
- Real time notification to the user's phone.
- Helps to get immediate gas leak alerts.
- It also helps in the detection of harmful gases.
- The benefit of a gas detection system is that it will provide you with 24/7 monitoring, and you can watch all areas

❖ DISADVANTAGES

- Need of connectivity for notifying the user using internet.

CHAPTER-4

4.1 ABOUT ARDUINO.CC

Arduino.cc is an open-source electronics platform based website uses to write, compile and upload codes to various IoT oriented boards such as (Arduino uno, nano, espmodules, arm boards etc.Arduino.cc also helps in providing libraries and source codes to various IoT oriented boards. This site also provides series of downloadable libraries which contains component oriented codes.

Over the years Arduino.cc has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals have gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments.

EMBEDDED C

Embedded C is a generic term given to a programming language written in C, which is associated with particular hardware architecture. Embedded C is an extension to the C language with some additional header files. Embedded C is an extension of C language and it is used to develop micro-controller based applications. The extensions in the Embedded C language from normal C Programming Language is the I/O Hardware Addressing, fixed-point arithmetic operations, accessing address spaces, etc. Embedded programming is an essential part of how IoT devices work. The language offers flexibility to developers apart from offering features like interoperability, rich libraries, and portability.

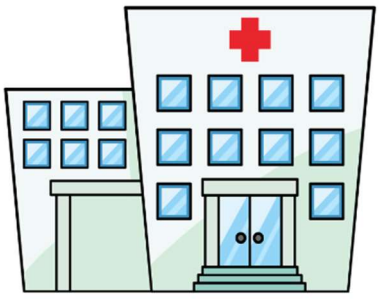
4.2 CAN BE USED AT:-

RESTAURANT

WORKPLACES

HOUSES

SCHOOL



HOSPITALS

4.3 CONCLUSION

The project entitled gas leakage monitoring and alerting sensor was completed successfully. The system has been developed with much cares and errors and as the same time it is efficient and less time consuming. The purpose of the project was to develop a system to detect various gases and alert about any potential threats. This project helps us gaining valuable information and practical knowledge on several topics like connecting board, implementing programs working, with various sensors and has practical knowledge of working module. The project also, helped us to learn about programming languages and understanding development phases of the project and software implementation. We learned how to develop and test hardware module and different features of a project. The proposed system will cost only USD 10 which is easily affordable even for poor people. In the open literatures it is noticed that much work has not been done for a smart gas detection system. In future, more advanced features will be integrated with this system which will provide users with more safety and relaxation. The proliferation of handheld devices has led to developments in the field of smart gas sensors, which has considerably widened their scope of application. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years.

4.4 REFERENCES

……. FOR EDP8266 MODULE PROGRAMING

Arduino.cc

Github/com

Embedded with c

Sparkfun

……For Arduino development kits

Amazon.in

ElectronicsComp.com

Rainbow electronics

……For development related helps

Youtube

Google

Arduin