CHAPTER 1

INTRODUCTION

Liquefied Petroleum Gas [LPG] is one of the most well-known cooking fuels used all over India. Other than being modest and effectively accessible, LPG is used as perfect fuel for cocking purpose. With the growth in the quantity of individuals utilizing this LPG fuel, it is the importance to give some security gauges which are required to be represented to lead the mishap of free life. The major accidents occurred during the utilization of LPG. There will be gas leaks while using LPG gas in India. And, we can see the leakage from the worn gas tubes or old gas pipes, so that they may burst which will lead to heavy leakage of gas. As we know that LPG is a flammable gas, it has the odor less behavior. Ethanethiol is also mixed up with unbelievable odor less LPG gas, so during leakage it can be seen efficiently [3]. These LPG Gas leakages have been raised from 0.72% of all the kitchen accidents to 10.74% of all the kind of kitchen accidents. The LPG section weights nearly 4kg to 7kg at where the burner is located near the section is most secured than that of the elastic pipes used has the risks of getting leakage which may create a way to the spillage of gas. A computer designed specific software used to detect the spillage part where the leakage has been occurred. This software will run in offline and used for mailing to the specified user. An LPG gas detector is used to detect the leakage of gas as fast it can, and it will be used as trigger for the whole system. The equipment used will get the best output with more advantages and it can be upgraded in future for any further applications like turning off the main power supply and also used for sending SMS to the user. This is present at the hotels and high-tech homes where they don‟t want any hazard happening in their surroundings.

Embedded System:

As the name signifies, an embedded system is embedded or builds into something else. Embedded systems encompass a variety of hardware and software components, which perform specific functions in host system, for example satellites, washing machine, handled telephones and automobiles. A few years ago, embedded technology existed in standalone

devices such as vending machines and copiers that did their jobs with little regards for what went on around them. But as technology advance to connect devices to the internet and to each other, the potential of embedded technology has increased.

Embedded software:

Embedded Software on the internet of things is contributing to the development of intellectual system (sensors, mechanisms, machines, devices, ect..,) all connected in one computing network for receiving and processing the data that will help in increase the productivity among various industries or which will contributes to the end user's comfort. It includes both components suppliers such as controllers, microprocessor, processor, sensors, ect., and the manufacturer products such as industrial equipment, consumers electronics, cars, bikes, ect. Embedded software has paved the way in opening the next industrial revolution which is popularly known as the industrial internet of things. Programming industrial internet of Things enables intelligent, connected machines to aggregate, captures and analyze the data in the production process. Equipped with visibility and actionable information, plant managers and engineers can focus on optimizing operational design and maintenances processes. Embedded software is a system that resides within an electrical system that consists of a sensor based inputs system, a microcontrollers, and an output actuators.

The Internet of things (IoT) is a futuristic technology where interconnection of devices and the internet is proposed. As the safety keeps an important concern, the proposed gas detection system makes use of IoT to detect the leakage and alert the user for preventing the leakage

CHAPTER 2

EXISTING SYSTEM

Liquefied Petroleum Gas leakage in home or any other gases leakage in companies and industries etc., it is very dangerous to all. In existing system if any gases are leakage in home or any places, the gas sensor will detect the gas and send to NodeMcu and the message will be send from the NodeMcu to user. When the gas leakage in home, the power supply is turn on in condition accident is occur on there. In this system, if any gas leakage occur only message send to user but did not turn off the power supply. The system is no use for human and home appliances. In this system only send message to user by blynk. For lives security and satisfaction of social obligations, and keeping in center the dangerous examples of impacts and wounds because of spillage of gas in enterprises, vehicles and houses, a gas spillage framework has been structured whereby utilization of installed frameworks and association of Internet of things (IoT) in it, a framework is gotten that empowers us not exclusively to advise the concerned individual yet additionally hold onto any spillage of gas. In the paper, a framework has been proposed which diminish the odds of accidents and guarantee security by the virtue of existing electronics and technology.

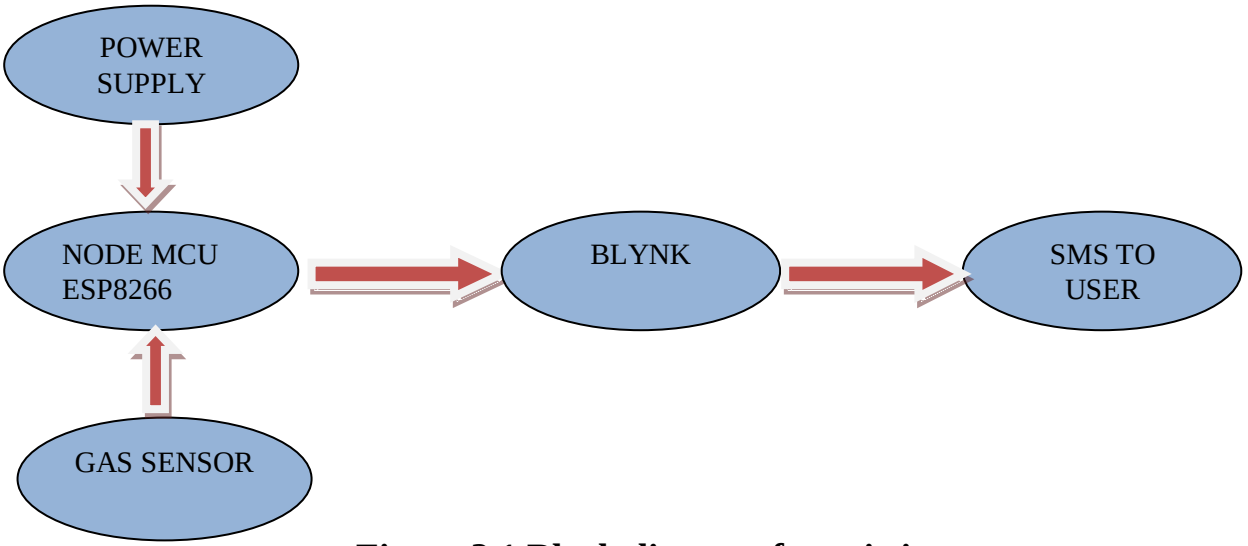


Figure 2.1 Block diagram for existing system

CHAPTER 3

PROPOSED SYSTEM

In this project, we are using NodeMcu ESP8266 as a controller. MQ6 gas sensor is used to detect the LPG gas. If the sensor detects the gas, it will turn off the power supply of home and turn on the exhaust fan , it used for to run out gas to outside of the home. The sensor value will continuously upload to the cloud.

A cost-effective, gas monitoring and security system is proposed in this work. In this system, the LPG leakage is detected through the gas sensor, NodeMcu and blynk. It also turns off the power supply and alerts the user by blynk app through the mobile phone. LPG (Liquid Petroleum Gas) is use almost in every house for cooking purpose. This gas is highly inflammable and need to be careful while using it. There are situations where accidents have occurred and huge damage has is done. In this article we will build a LPG gas detection system using MQ6 Sensor. The project NodeMcu ESP8266 IoT based LPG Gas Leakage to detect and send message to phone by using MQ6 gas sensor and Blynk. The gas level is decrease, the level is sensed by sensor and turn on the power supply automatically in existing time but in this project once the gas leakage detected and turn off the supply and turn on the supply did not decreased by gas level. The power supply turn on by using blynk app. This very safe to home appliances and avoid the accident to home.

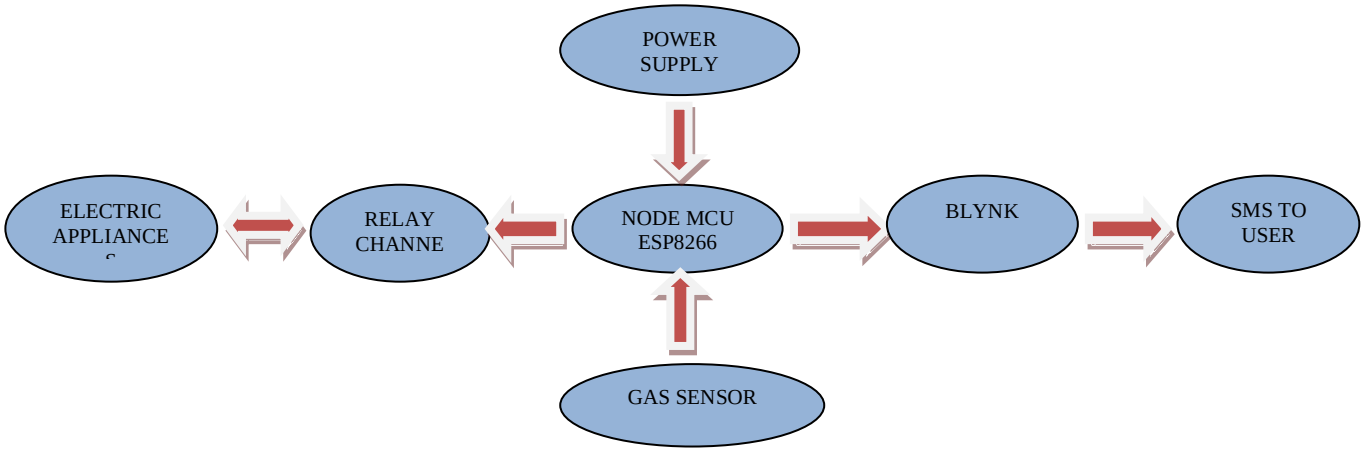


Figure 3.1 Block diagram for proposed system

CHAPTER 4

CIRCUIT DIAGRAM

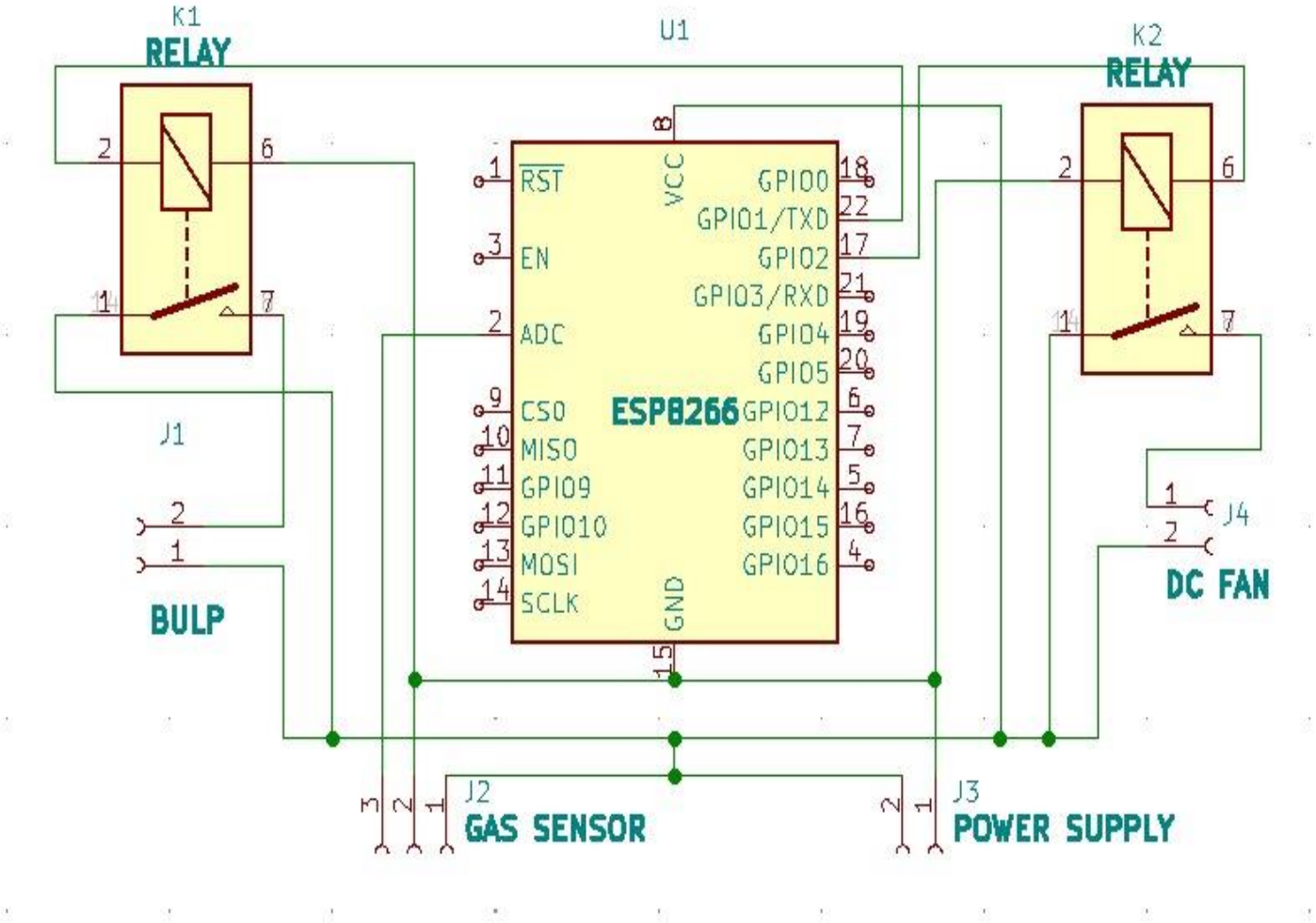


Figure 4.1 Circuit Diagram for working system

CHAPTER 5

COMPONENTS

5.1 NodeMcu (ESP8266):

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 (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge.

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. GPIO 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 APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the document section below you will find many resources to aid you in using the ESP8266, even instructions on how to transform this module into an IoT (Internet of Things).

BLOCK DIAGRAM OF NODEMCU (esp8266)

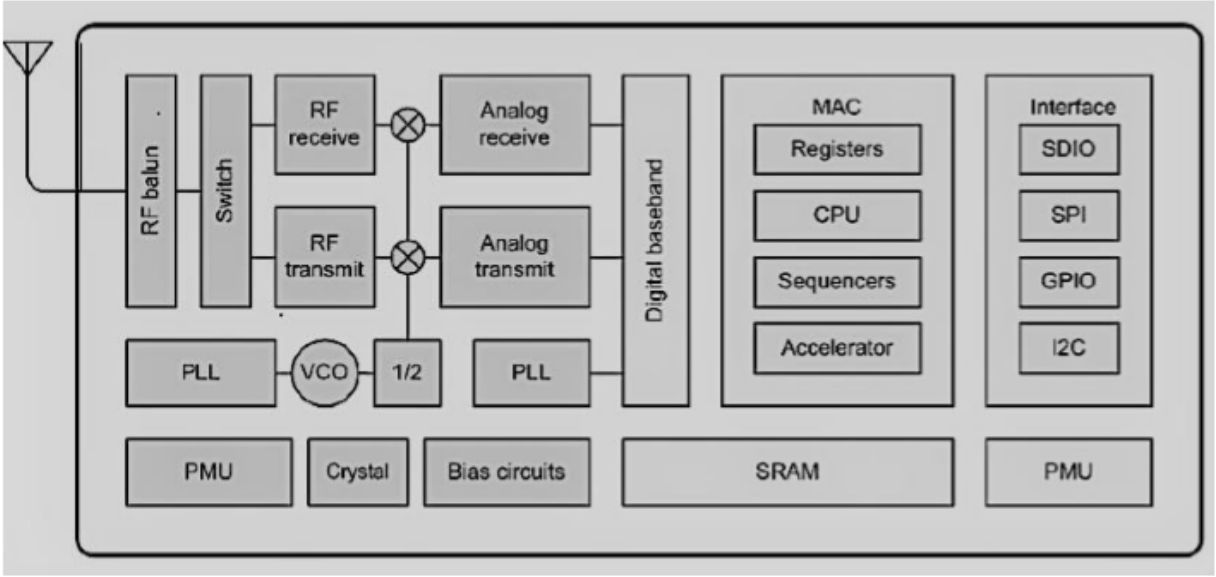


Figure 5.1(a) Block Diagram for NodeMcu

PIN DIAGRAM:

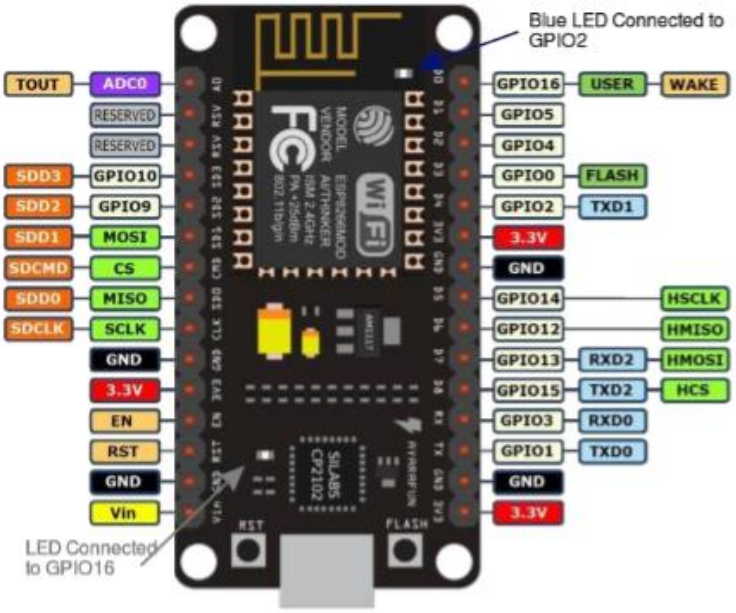


Figure 5.1(b) Pin details for NodeMcu

NODEMCU SPECIFICATION:

The NodeMcu is available in various package styles. Common to all the designs is the base ESP8266 core. Designs based on the architecture have maintained the standard 30-pin layout. Some designs use the more common narrow (0.9″) footprint, while others use a wide (1.1″) footprint – an important consideration to be aware of. The most common models of the NodeMcu are the Amice (based on the standard narrow pin-spacing) and the LoLin which has the wider pin spacing and larger board. The open-source design of the base ESP8266 enables the market to design new variants of the NodeMcu continually.

NODEMCU PIN SPECIFICATIONS:

Power pins there are four power pins. VIN pin and three 3.3V pins. VIN can be used to directly supply the NodeMcu/ESP8266 and its peripherals. Power delivered on VIN is regulated through the onboard regulator on the NodeMcu module – you can also supply 5V regulated to the VIN pin 3.3V pins are the output of the onboard voltage regulator and can be used to supply power to external components GND The ground pins of NodeMcu/ESP8266 12PINS are used to connect I2C sensors and peripherals. Both I2C Master and I2C Slave are supported. I2C interface functionality can be realized programmatically, and the clock frequency is 100 kHz at a maximum. It should be noted that I2C clock frequency should be higher than the slowest clock frequency of the slave device. GPIO PINS NodeMcu/ESP8266 has 17 GPIO pins which can be assigned to functions such as I2C, I2S, UART, PWM, IR Remote Control, LED Light and button programmatically. Each digital enabled GPIO can be configured to internal pull-up or pull-down, or set to high impedance. When configured as an input, it can also be set to edge-trigger or level-trigger to generate

CPU interrupts.

ADC CHANNEL The NodeMcu is embedded with a 10-bit precision SAR ADC. The two functions can be implemented using ADC. Testing power supply voltage of VDD3P3 pin and testing input voltage of TOUT pin. However, they cannot be implemented at the same time. UART Pins NodeMcu/ESP8266 has 2 UART interfaces (UART0 and UART1) which provide asynchronous communication (RS232 and RS485), and can communicate at up to 4.5 Mbps. UART0 (TXD0, RXD0, RST0 & CTS0 pins) can be used for communication. However, UART1 (TXD1 pin) features only data transmit signal so, it is usually used for printing log. SPI pins NodeMcu/ESP8266 features two SPIs (SPI and HSPI) in slave and master modes. These SPIs also support the following general-purpose SPI

Features:

 4 timing modes of the SPI format transfer

 Up to 80 MHz and the divided clocks of 80 MHz

 Up to 64-Byte FIFO

SDIO pins NodeMcu/ESP8266 features Secure Digital Input/output Interface

(SDIO) which is used to directly interface SD cards. 4-bit 25 MHz SDIO v1.1

and 4-bit 50 MHz SDIO v2.0 are supported. PWM pin the board has 4 channels of Pulse Width Modulation (PWM). The PWM output can be implemented programmatically and used for driving digital motors and LEDs. PWM frequency range is adjustable from 1000 μs to 10000 μs (100 Hz and 1 kHz).Control pin are used to control the NodeMcu/ESP8266. These pins include Chip Enable pin (EN), Reset pin (RST) and WAKE pin.

 EN: The ESP8266 chip is enabled when EN pin is pulled HIGH. When pulled LOW the chip works at minimum power.

 RST: RST pin is used to reset the ESP8266 chip.

 WAKE: Wake pin is used to wake the chip from deep-sleep.

5.2 RELAY:

Relay Working: Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC). A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal. The input voltage of the relay signal ranges from 0 to 5V.

REALY CIRCUIT:

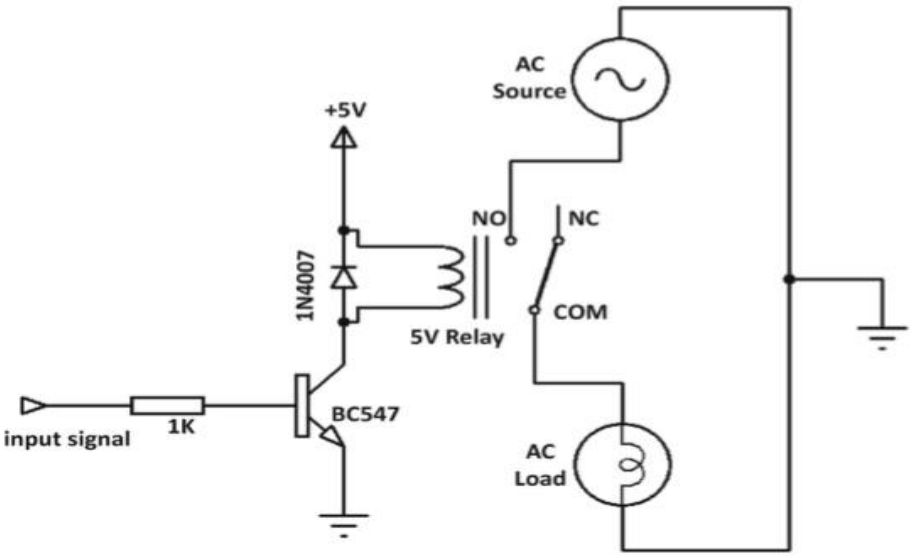


Figure 5.2(a) Relay circuit

RELAY MODULE: (**Two Channel**)

Figure 5.2(b) Two channel relay module

5.3 GAS SENSOR:

Introduction to gas sensor;

A gas sensor is a device which detects the presence or concentration of gases 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 concentration of the gas can be estimated**.**

MQ6 GAS SENSOR:

Figure 5.3 MQ6 Gas Sensor

The type of gas the sensor could detect depends on the sensing material present inside the sensor. Normally these sensors are available as modules with comparators as shown above. These comparators can be set for a particular threshold value of gas concentration. When the concentration of the gas exceeds this threshold the digital pin goes high. The analog pin can be used to measure the concentration of the gas.

Gas sensor working:

The ability of a Gas sensor to detect gases depends on the chemiresister to conduct current. The most commonly used chemiresistor is Tin Dioxide (SnO2) which is an n-type semiconductor that has free electrons (also called as donor). Normally the atmosphere

will contain more oxygen than combustible gases. The oxygen particles attract the free electrons present in SnO2 which pushes them to the surface of the SnO2. As there are no free electrons available output current will be zero. The below gif shown the oxygen molecules (blue color) attracting the free electrons (black color) inside the SnO2 and preventing it from having free electrons to conduct current. When the sensor is placed in the toxic or combustible gases environment, this reducing gas (orange color) reacts with the adsorbed oxygen particles and breaks the chemical bond between oxygen and free electrons thus releasing the free electrons. As the free electrons are back to its initial position they can now conduct current, this conduction will be proportional the amount of free electrons available in SnO2, if the gas is highly toxic more free electrons will be available. These sensors are normally available as modules (shown right), these modules consist of the gas sensor and a Comparative IC. Now let's see the pin description of the gas sensor module which we will generally use with an Arduino. The gas sensor module basically consists of 4 terminals,

- Vcc – Power supply
- GND – Power supply
- Digital output – This pin gives an output either in logical high or logical low (0 or 1) that means it displays the presence of any toxic or combustible gases near the sensor.
- Analog output – This pin gives an output continuous in voltage which varies based on the concentration of gas that is applied to the gas sensor.

Advantages of gas sensors

- Used in industries to monitor the concentration of the toxic gases.
- Used in households to detect an emergency incidents.
- Used at oil rig locations to monitor the concentration of the gases those are released.
- Used at hotels to avoid customers from smoking.
- Used in air quality check at offices.
- Used in air conditioners to monitor the CO2 levels.
- Used in detecting fire.

 Used to check concentration of gases in mines.

 Breath analyzer.

5.4 POWER SUPPLY: (SWITCH MODE POWER SUPPLY)

A Power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters.

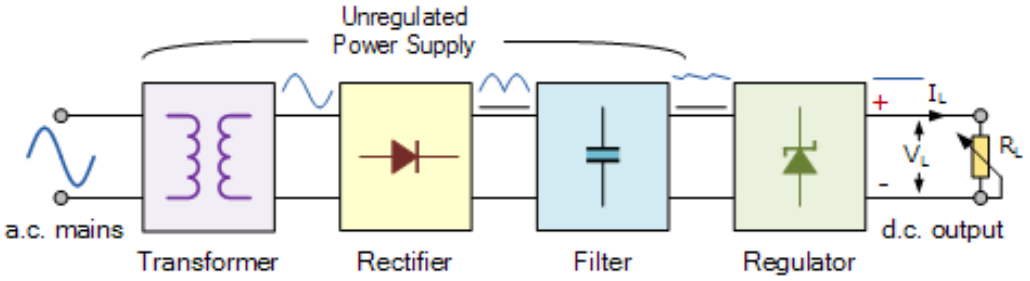


Figure 5.4(a) circuit diagram for power supply

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non-conduction state. SMPS regulator converts unregulated DC input voltage to a regulated and smooth DC output voltage at different voltage levels. So that the working of SMPS is based on the Chopper principle.

1. In the first stage, the incoming AC power runs through a rectifier and undergoes filtration to produce DC.

2. The SMPS works at high frequencies, so a high-frequency switch processes the DC signal, which creates a high-frequency pulsating DC signal.

3. The power transformer steps down the high-voltage DC signal to a DC signal of the appropriate level.

4. The stepped-down DC signal is rectified and filtered to a achieve a steady, constant DV output.

5. The control circuitry monitors the output voltage and adjusts the high-frequency switch on-the-fly to ensure a continuous output stream of the desired voltage.

5.5 LED: (LIGHT EMITTING DIODE)

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting light in the process. LEDs allow the current to flow in the forward direction and blocks the current in the reverse direction.

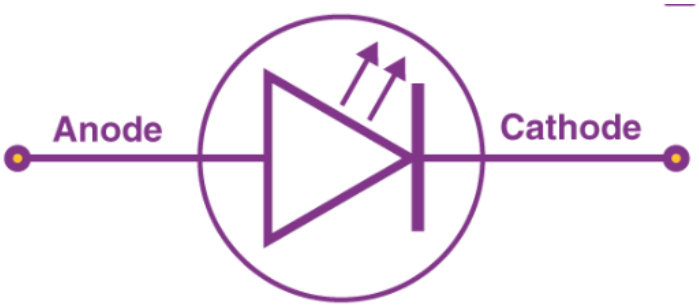


Figure 5.5 symbol for LED

Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased.

5.6 EXHAUST FAN:

Figure 5.6 Exhaust fan

Exhaust fans help to quickly remove smoke and odors, making your indoor air more breathable. They help improve comfort – exhaust fans help maintain circulation and remove excess moisture, increasing your overall indoor comfort.

CHAPTER 6

SOFTWARE

6.1 ARDIUNO IDE SOFTWARE

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension. into the editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Arduino IDE Software

6.2 BLYNK PLATFORM:

The Internet of Things (IoT) connects devices and tools to the internet network to be controlled remotely through websites and Smartphone applications, as well as to control tools and instruments by means of codes and algorithms structures for artificial intelligence issues. IoT is used for smart home controlling to operate lamps or other home-use devices, it can also be used as a security system or as an industrial-use system. For example, to open or close the main building gate, to operate a fully automatic industrial machine, or even to control internet and communication ports. More ideas can be done using IoT technology. Huge industrial facilities or governmental institutions have many lamps. Employees sometimes forget to turn them off at the end of the day. Energy could be saved by letting the security control lighting of the building with IoT clouds or applications.

Blynk is an IoT platform that supports both IOS and Android while being compatible with a plethora of microcontrollers such as Node MCU (ESP), STM32, Arduino and Raspberry Pi over the Internet. The architecture of Blynk consists of three major components:

1) The Blynk application, which controls an embedded system and displays sensing data on widgets.

2) The Blynk server, which allows all cloud-based communications between smart phones and embedded systems

3) The Blynk libraries, which consist of various widgets to perform different control, display, and time management operations.

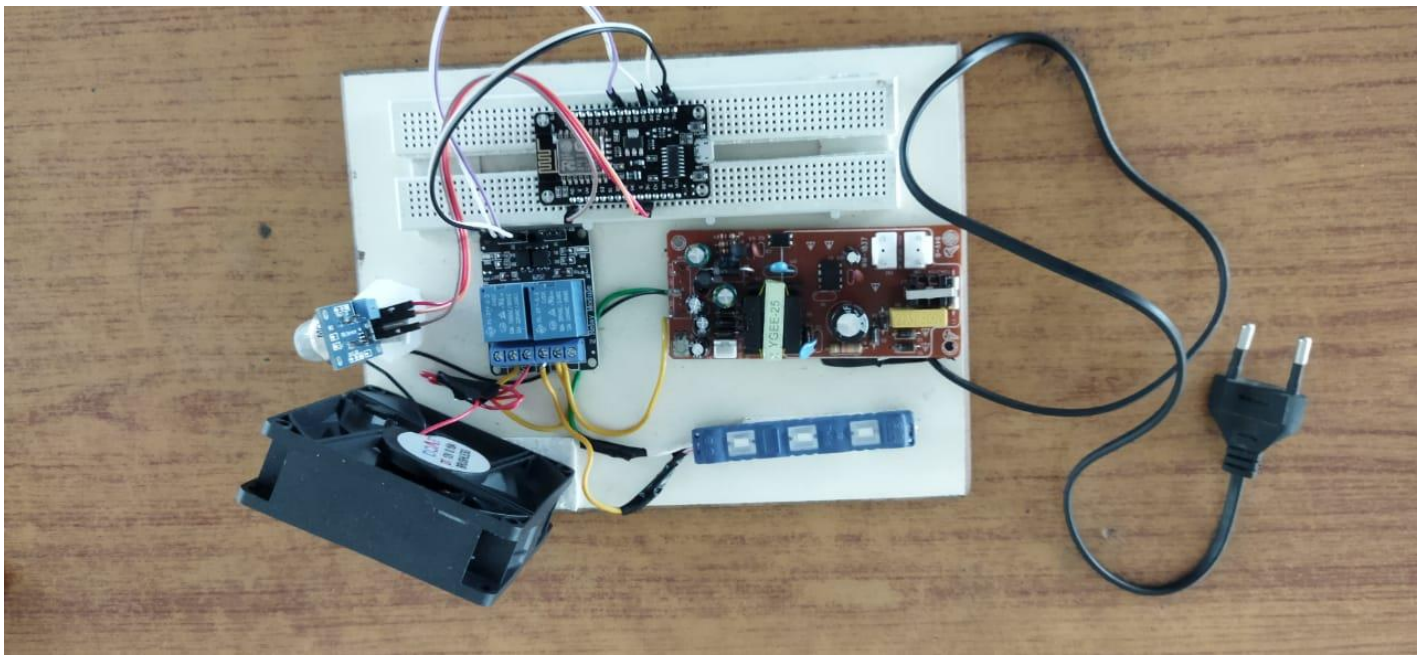
PROGRAM:

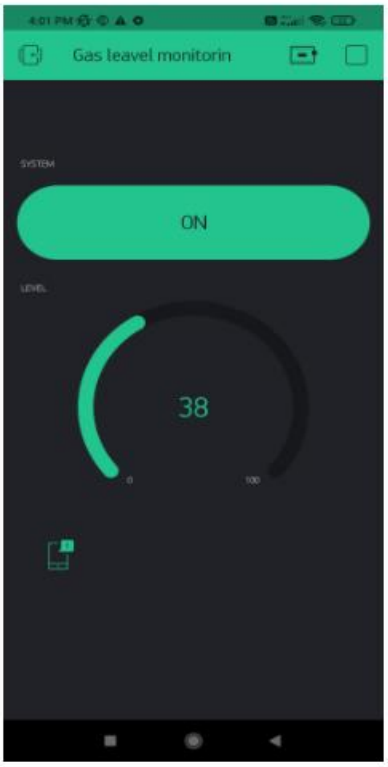
```
 #include <LiquidCrystal_I2C.h>
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);

char auth[] = "EJU6kmilB37Z9e_gM3837dU4JZIfx4zD";// Enter your Auth token
char ssid[] = "google";//Enter your WIFI SSIS
char pass[] = "google12345";//Enter your WIFI password
BlynkTimer timer;
int pinValue = 0;

#define Buzzer D5
#define light D8
#define Green D6
#define Red D7
#define Sensor A0

void setup() {
  Serial.begin(9600);
  lcd.backlight();
  lcd.init();
  pinMode(Green, OUTPUT);
  pinMode(Red, OUTPUT);
  pinMode(Buzzer, OUTPUT);
   pinMode(light, OUTPUT);
  pinMode(Sensor, INPUT);
  Blynk.begin(auth, ssid, pass);
  timer.setInterval(100L, notifiaction);
}
BLYNK_WRITE(V0) {
  pinValue = param.asInt();
}

void notifiaction() {
  int sensor = analogRead(Sensor);
  Serial.println(sensor);
  sensor = map(sensor, 0, 1024, 0, 100);
  if (pinValue == 1) {
   if (sensor <= 15) {
      digitalWrite(Green, HIGH);
```

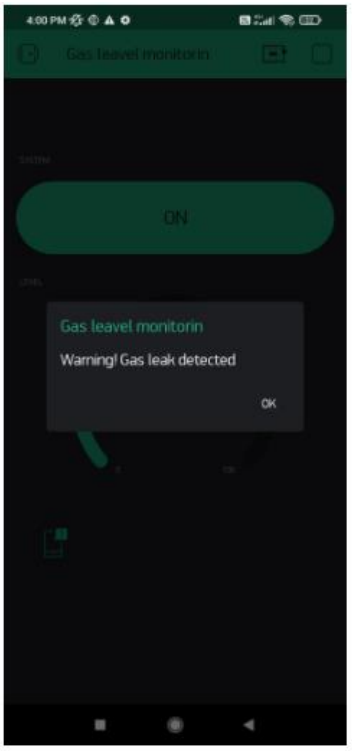
```
      digitalWrite(Red, LOW);
      digitalWrite(Buzzer, LOW);
      digitalWrite(light, LOW);
      lcd.setCursor(0, 1);
      lcd.print("Gas value Normal");
    } else if (sensor > 50) {
      Blynk.notify("Warning! Gas leak detected");
      digitalWrite(Green, LOW);
      digitalWrite(Red, HIGH);
      digitalWrite(Buzzer, HIGH);
      digitalWrite(light, HIGH);
      lcd.setCursor(0, 1);
      lcd.print("Gas value:High  ");
    }
    lcd.setCursor(0, 0);
    lcd.print("Value : ");
    lcd.print(sensor);
    Blynk.virtualWrite(V1, sensor);
  } else {
    digitalWrite(Red, LOW);
    digitalWrite(Buzzer, LOW);
    digitalWrite(light, LOW);
    digitalWrite(Green, LOW);
    lcd.clear();
  }
}

void loop() {
  Blynk.run();
  timer.run();
}
```

CHAPTER 7

HARDWARE IMPLEMENTATION







CHAPTER 8

CONCLUSION

The project proposed the development of IOT based gas monitoring and security system. The proposed system performs continuous real-time monitoring. Most of the fire accidents are caused because of a poor quality rubber tube or the regulator is not turned off when not us. Therefore the gas leakage system is very essential. During the gas leakage electric appliances are automatically turned off. So the gas leakage is prevented. Using gas sensor we can detect the gas leakage and turned off electric appliances. Home gas monitoring and security system has applications in homes, hotels, restaurants, as well as in industries. It is a tedious process to have continuous monitoring of LPG leakage, time of operation, usage, initial set up of the cylinder. To avoid all such situations, implementation of this proposed work called Home gas monitoring and security system using NodeMcu will be effective and beneficial.

CHAPTER 9

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