IoT Based GAS Leakage Detection and Alarming system

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Declaration

This is to certify that this thesis entitled **"IoT Based Gas Detection and Alarming System"** is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronics Engineering of Sonargoan University in partial fulfillment of the requirements for the degree of Bachelor of Science in Department of Electrical and Electronics Engineering.

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ABSTRACT

Gas or liquefied petroleum gas (LPG) is a chemical substance resultant from petroleum and could be dangerous in industrial places or those that deal with this substance. Gas leakage causes many health issues. So, to prevent such catastrophes and in order to maintain a clean air environment, the workspace atmosphere should be frequently monitored and controlled. The proposed monitoring gas leakage detector system is based on Internet of Things (IoT) technology. Node MCU ESP8266 Wi-Fi is used to be the microcontroller for the whole system. The combustible gas sensor (MQ2) is used in order to detect the presence of methane (CH4) and carbon monoxide gas (CO). MQ2 sensor will detect the concentration of the gas according to the voltage output of the sensor and the ESP8266 will send the data reading from the gas sensor to Blynk IoT platform over an IOS phone; data visualization is done using Thing speak IoT Platform. Besides, a fan will immediately work upon the leakage occurs along with an alarming buzzer.

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Chapter 1
Introduction

1.1 Introduction

Safety plays a foremost part in our today's world and an automatic safety system must be employed in environments like institutions, hospitals, homes, industries, and workplaces. One of the precautionary measures one has to take to avoid the danger associated with the gas leakage is to install a gas leakage system detector at susceptible places. This paper presents a liquefied petroleum gas (LPG) leakage, monitoring system. The gas detector MQ-2 used in the design is responsible for capturing the gas that is leaking. A NodeMCU that is use acts as the brain of the whole research, it controls all the components used in the design. If the gas sensor detects a gas leakage, it will make an alarm-using buzzer and will send SMS messages to the registered mobile numbers with the help of the GSM module. The development of any kind of security system begins with the creation of man. To alert frightening information, man implements a form of a signal, through shouting and sound. He then later replaced it with the help of the clapping of hands and with the introduction of signals to inform society or to blowout a certain message if they are any kind of fire outbreak, abduction or burglary, during the early periods of some African society especially in my country Nigeria [1]. All such methods of notifications or warnings are necessary, undependable, and unmethodical. The earliest electronic fire, a security detection system was established by a man named William .F. Channing. Later on, an electrical electronics engineer called Mr. Moses .G. Farmer invented the construction of the alarm system. The alarm detector uses an automatic indicator box to label the position of the fire outbreak and was first lunch in Boston, United States of America. The advancement of the fire alarm detector by Dr. William was then followed by the advancement of distinctly beautiful and arduous intruder and fire security alarm system technology that is so many to measure. The most noteworthy among this security detection system technology is the use of remote signaling thief security alarm [2,3]. This kind of security alarm system was the first design in the early 1970s. They are always a high risk of leakage whenever gas is

used, threatening human properties and lives. Therefore, designing an affordable and lowcost gas leakage detector system can assist in decreasing the risk over several years. For the past years, there have been several accidents caused by liquefied petroleum gas (LPG) or methane leakages in industries or homes. This leakage of gases has led to the loss of several lives and properties through fire explosions and outbreaks. The use of modern technology is needed to give early warning signs to assure that adequate time is available to hamper probable peril. This system will detect the existence of gases such as liquefied petroleum gas (LPG) and methane in our environments, industries, schools, and hospitals. If they are a gas leakage of any kind and it can be a threat or harm to the society or people living in that environment, this sensor MQ-2 used in the circuit design will automatically detect it, the GSM modem used in the design will send a warning signal to the users whose numbers are registered to the system or to the monitoring organization that is monitoring or taking care of the building or the organization. This system also consists of a buzzer that will sound an alarm if they are leakage of the gas in the environment. This system can be used in various other places such as oil and gas pipelines, kitchens, gas storage facilities.

1.2 Method

This section of research handles the operation of the whole system. When the user activates the system, the Arduino will read the data when the MQ-2 sensor detects gas leakage. The NodeMCU will now activate the buzzer and LED. The GSM modem gets information from the NodeMCU and sends a short message service to the designated Mobile number registered in the system. Communication between the GSM modem and phone, AT command is applied to this research. This is because the GSM modem can merely comprehend AT command statements. From this, it can communicate with phones, computers, and NodeMCU. To complete this research, the whole component must work efficiently. The GSM modem acts as a medium to receive the instructions from the NodeMCU and Sends a message to the designated mobile number. C programming is used for the NodeMCU application to develop the program.

1.3 Outline of the project Book

- Chapter-1: Gives a brief introduction to the background of the project, objectives, and report organization.
- Chapter-2: Focuses on the theoretical background with literature review.
- Chapter-3: Focuses on the design of real-time based monitoring and required components and the working procedure of them.
- Chapter-4: Concludes the overall discussion about the software that is used here to design Circuit Diagram and creating programs with controlling software also.
- Chapter-5: discuss the block diagram, circuit diagram, working procedure, and full over view of proposed system.
- Chapter-6: includes the advantages, disadvantages, future work and conclusion also in this chapter.

Chapter 2
Theoretical background

2.1 Introduction

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play. Projections for the impact of IoT on the Internet and economy are impressive, with some anticipating as many as 100 billion connected IoT devices and a global economic impact of more than $11 trillion by 2025. The Internet of Things (IoT) is an important topic in technology industry, policy, and engineering circles. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities. The large-scale implementation of IoT devices promises to transform many aspects of the way we live. For consumers, new IoT products like Internet-enabled appliances, home automation components, and energy management devices are moving us toward a vision of the “smart home’’, offering more security and energy efficiency. IoT systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of “smart cities’’, which help minimize congestion and energy consumption. IoT technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors. Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and offices. The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. The hazardous gases like LPG and propane were sensed and displayed and notify each. If these gases exceed the normal level then an alarm is generated immediately and also an alert message (Email) is sent to the

authorized person through the INTERNET and used ARM development board. 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. The world has been moving at a fast pace to adapt the smartest technologies and connect everything, means everything. Various places like hotels, canteens, industries make use of flammable gases, for example, LPG, carbon dioxide, ammonia etc. to cater the best hospitality services to their customers. The use of these gases has no doubt made the technologies smarter but on the same side involves a risk factor which leads to a threat and damage to life. Hence, safety becomes a real concern. To this factor, a gas detection system was a necessity at such accident-prone locations so that the continuous monitoring of any kind of leakage can be detected irrespective of the human senses. The designed system continuously monitors the surroundings for any leakage and will send the alert to the user. With the help of an Ethernet shield module and Android application; it alerts the user about the environmental conditions like the temperature of that location and the gas level.

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. The gases being a toxic need to be monitored in such a way that an increase in their level needs to be known and proper precautions have to be taken.

2.2 Literature Review

In the year of 2008, LIU zhen-ya, WANG Zhen-dong and CHEN Rong, “Intelligent Residential Security Alarm and Remote Control System Based On Single Chip Computer”, the paper focuses on, Intelligent residential burglar alarm, emergency alarm, fire alarm, toxic gas leakage remote automatic sound alarm and remote control system, which is based on 89c51 single chipcomputer. The system can perform an automatic alarm, which calls the police hotline number automatically. It can also be a voice alarm and shows alarm occurred address. This intelligent security system can be used control the electrical power remotely through telephone. In the year of 2008,

Chen Peijiang and Jiang Xuehhua, “Design and implementation of Remote Monitoring System Based on GSM”, this paper focuses on the wireless monitoring system, because the wireless remote monitoring system has more applications a remote monitoring system based on SMS through GSM In the year of 2002, K. Galatsis, W. Wlodarsla, K. Kalantar-Zadeh and A. Trinchi,“Investigation of gas sensors for vehicle cabin air quality monitoring”, this paper focuses on, car cabin air quality monitoring can be effectively analyzed using metal oxide semiconducting (MOS) gas sensors. In this paper, commercially available gas sensors are compared with fabricated Moo3 based sensors possessed comparable gas sensing properties. The sensor has response 74% higher relative to the hest commercial sensor tested.

The gas detection system not only monitors the surroundings continuously but also prevents the further leakage of gas in the environment which minimizes the chance of fire. A gas leakage system makes use of an MQ2 sensor for detection of LPG leakage. The primary objective of the Gas leakage detection system is to detect the malfunctioning of the pressurized gas system in order to prevent the accumulation of the gases so that the explosion does not happen.

The system is divided into three modules-

Firstly, the MQ2 gas sensor senses any leaked gas. Secondly, signals are sent to the ARM with the help of these sensors. After this, an activation signal is sent to the devices that are connected externally with the help of the microcontroller. Lastly, various functions by devices like an exhaust fan, buzzer, and sprinkler are performed which activates the GSM module.

GSM Module and an ARM-based microcontroller i.e. LPC2148 are used by the gas detection system for end-to-end communication. Also, NodeMCU, a low-cost microcontroller is programmed in such a way that it receives the input data from sensors and hence controls a number of electrical appliances which are connected to output peripherals. To monitor the indoor environment, a regular communication with the help of Bluetooth between NodeMCU and smartphone is very much important.

The Gas leakage detection system uses an ATmega 328 microcontroller which has an MQ-2 sensor attached to it along with a thermostat. The MQ-2 sensor is an easy-to-use LPG sensor which helps in sensing the LPG, which is mainly composed of butane and propane. The sensor can detect any level of concentration of gas like from 200-10,000ppm operating at a temperature range from -10 to 50-degree Celsius. Wherever this system is integrated, these two devices sense the gas level and record the temperature of the surroundings. Once the gas level increases above a predefined level then the device sends an alert notification to the user and accordingly the user can control the devices with the help of relay for closing the gas valve.

2.3 Summary

An overall conclusion IOT based toxic gas detector, or IOT technology has come a long way since it was conceptualized two decades ago. It has become more efficient, more applicable to today's applications and smarter. The work presented in this project was directed towards pushing IOT technology to the next level. The work has presented solutions to several problems and issues that have not been addressed in previous work. The principle of operation of Operation of IOT based gas leakage and monitoring system was shown by operating the NodeMCU attached with embedded system with required input and output gas level with the help of gas sensors. This results in a more efficient in operation because it is connected to a common web page specially built to notify or email the responsible authority automatically so reduces the stress of constant monitoring. The choice of using a real time gas leakage monitoring and sensing the output levels of gas has been clearly observed by the help of this system.

Chapter 3
Hardwire

3.1 Required Components

Table I: Component List

S/L	Components Name	Quantity
01	Node MCU	1
02	5V SMPS	1
03	MQ-2 Gas Sensor	1
04	Buzzer	1
05	Cooling Fan	1
06	Transistor	1
07	Sun Board	Needed
08	Wire	Needed
09	2 Pin	1

3.1.1 NodeMCU

For the NodeMCU open-source firmware, there are open-source prototype board designs available. NodeMCU is a combination of the node and MCU (micro-controller unit). The firmware, rather than the associated development kits, is formally regarded as a component of the NodeMCU. NodeMCU is now available in two versions: ESP-12 in version 0.9 and ESP-12E in version 1.0, where E stands for improved.

The development board equips the ESP-12E module containing ESP8266 chip having Tensilica Xtensa® 32-bit LX106 RISC microprocessor which operates at 80 to 160 MHz adjustable clock frequency and supports RTOS.

There's also 128 KB RAM and 4MB of Flash memory (for program and data storage) just enough to cope with the large strings that make up web pages, JSON/XML data, and everything we throw at IOT devices nowadays.

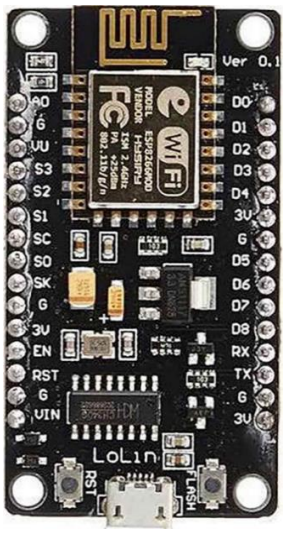


Figure 3.1: Node MCU WiFi module

The ESP8266 Integrates 802.11b/g/n HT40 Wi-Fi transceiver, so it can not only connect to a Wi-Fi network and interact with the Internet, but it can also set up a network of its own, allowing other devices to connect directly to it. This makes the ESP8266 Node MCU even more versatile.

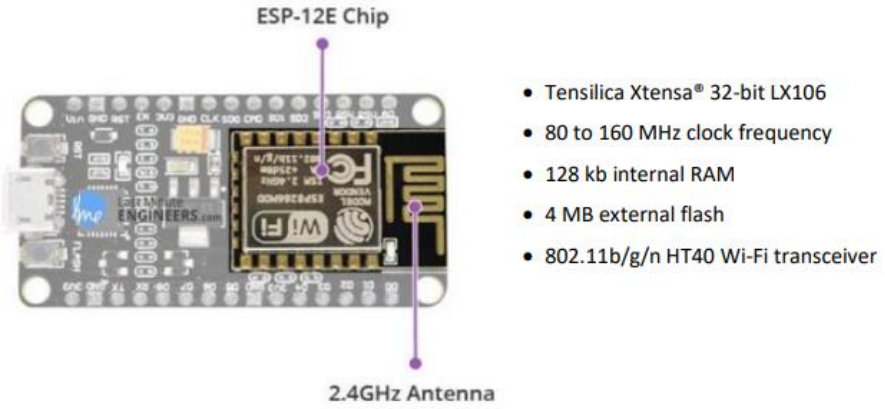


Figure 3.2: ESP 12E module in Node MCU Development board.

Peripheral I/O

The ESP8266 Node MCU has total 17 GPIO pins broken out to the pin headers on both sides of the

development board. These pins can be assigned to all sorts of peripheral duties, including:

 ADC channel – A 10-bit ADC channel.

 UART interface – UART interface is used to load code serially.

 PWM outputs – PWM pins for dimming LEDs or controlling motors.

 SPI, I2C & I2S interface – SPI and I2C interface to hook up all sorts of sensors and peripherals.

 I2S interface – I2S interface if you want to add sound to your project.

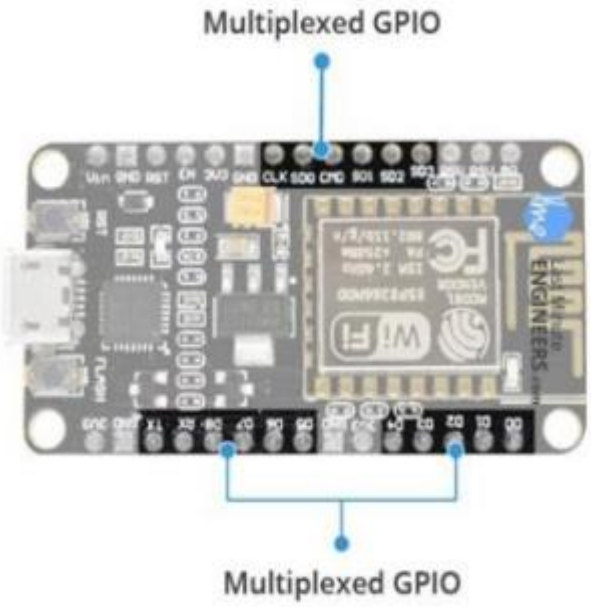


Figure 3.3: GPIO pins on Node MCU development board.

On Board Switches and LED Indicators

The ESP8266 Node MCU features two buttons. One marked as RST located on the top left corner is the Reset button, used of course to reset the ESP8266 chip. The other FLASH button on the bottom left corner is the download button used while upgrading firmware. The board also has a LED indicator which is user programmable and is connected to the D0 pin of the board. As a result of the pin multiplexing feature (Multiple peripherals multiplexed on a single GPIO pin), a single GPIO pin can act as PWM/UART/SPI.

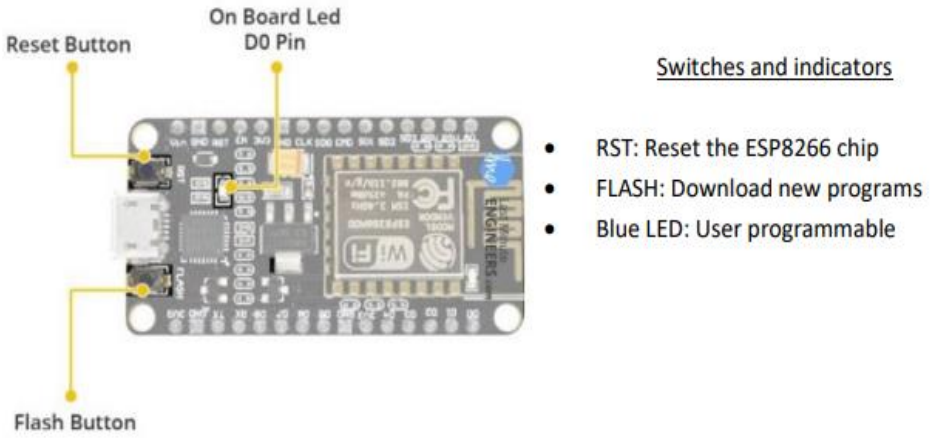


Figure 3.4: ON board switches and LED indicators.

Serial Communication

The board includes CP2102 USB-to-UART Bridge Controller from Silicon Labs, which converts USB signal to serial and allows your computer to program and communicate with the ESP8266 chip.

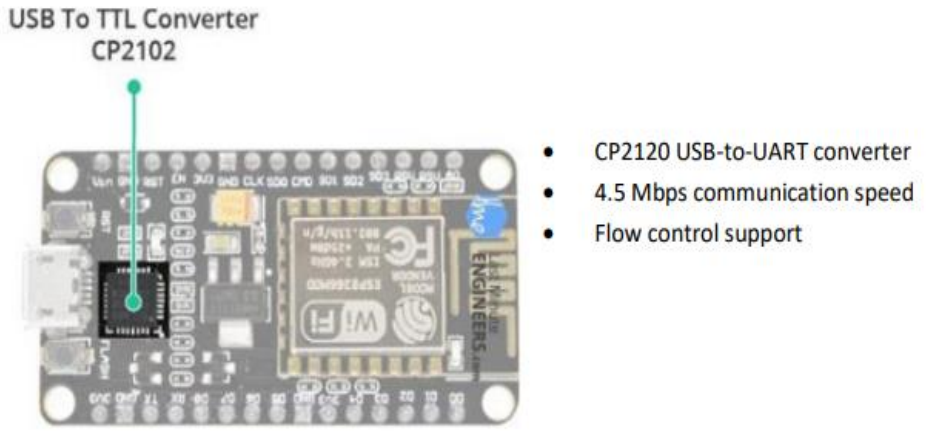


Figure 3.5: CP2120 on Node MCU development board.

Installation of Node MCU

Mostly these days devices download and install drivers on their own, automatically. Windows doesn't know how to talk to the USB driver on the Node MCU so it can't figure out that the board is a Node MCU and proceed normally. Node MCU Amica is an ESP8266 Wi-Fi module based development board. It has got Micro USB slot that can directly be connected to the computer or other USB host devices. Ti has got 15X2 header pins and a Micro USB slot, the headers can be mounted on a breadboard and

Micro USB slot is to establish connection to USB host device. It has CP2120 USB to serial converter. In order to install CP2120 (USB to serial converter), user is needed to download the driver for the same. Once user downloads drivers as per its respective operating system, the system establishes connection to Node MCU. The user needs to node down the COM post allotted to newly connected USB device (Node MCU) from device manager of the system. This com port number will be required while using Node MCU Amica. As the CP2120 driver is been installed, the Node MCU can be programmed using Arduino IDE software by coding in embedded C. this requires ESP8266 board installation in Arduino IDE from board manager, and assigning communication port.

3.1.2 SMPS 5V

The use of switched mode power supplies eliminates the drawbacks of linear power supplies, including their poorer efficiency, necessity for large-value capacitors to prevent ripples, and bulky, expensive transformers, among others.



Figure 3.6: SMPS (5V, 5A)

It is simple to comprehend how SMPS works if you are aware that the transistor used in LPS is used to control the voltage drop while the transistor in SMPS is utilized as a controlled switch.

Working:

The working of SMPS can be understood by the following figure.

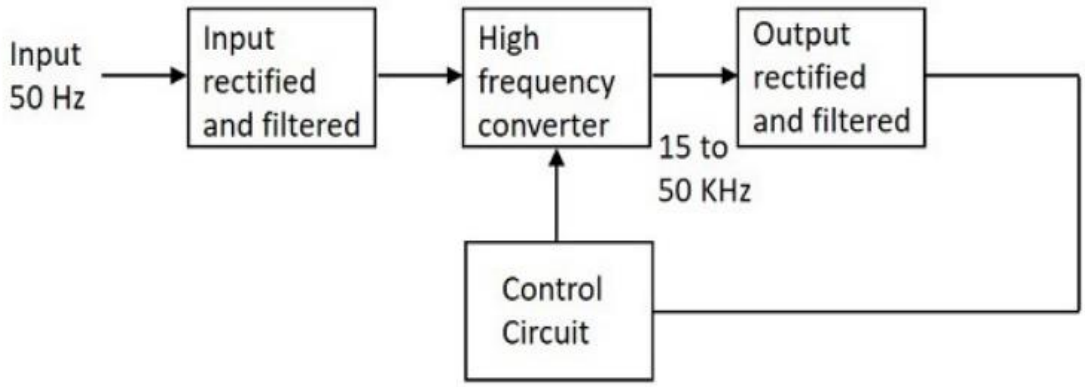


Figure 3.7: Working Procedure of SMPS (5V, 5A)

Let's attempt to comprehend what occurs at each phase of the SMPS circuit.

Input Stage

Without utilizing a transformer, the rectifier and filter circuit combination receives the 50 Hz AC input supply signal directly. The capacitor's capacitance value should be greater to withstand the input fluctuations because this output will exhibit a great deal of change. The primary switching component of the SMPS receives this unregulated dc supply.

Switching Section

A rapid switching device, like a MOSFET or power transistor, is utilized in this section. It responds to changes in voltage by turning ON and OFF, and its output is attached to the transformer's primary here. The transformer utilized here is substantially smaller and lighter than the ones used for 60 Hz supply. They are more efficient, which results in a better power conversion ratio.

Output Stage

The output signal from the switching part is once more rectified and filtered to provide the required DC voltage. This controlled output voltage is delivered to the feedback-based control circuit. The output is derived after accounting for the feedback signal.

Control Unit

This unit is the feedback circuit which has many sections. Let us have a clear understanding about this from the following figure.

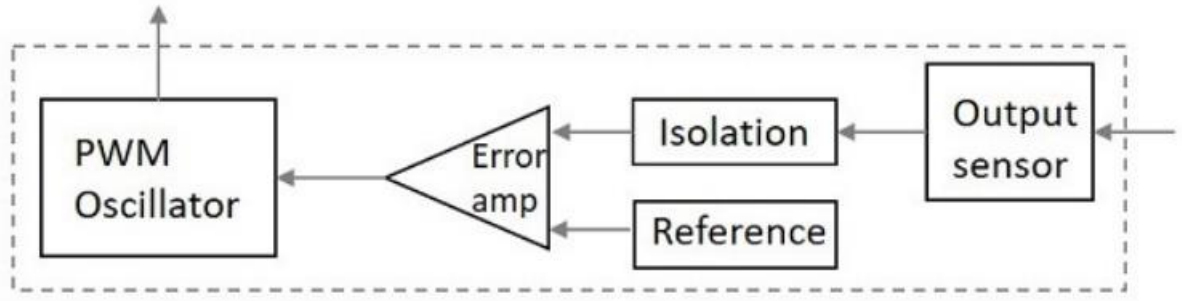


Figure 3.8: Control Unit

The internal components of a control unit are shown in the above figure. The signal is picked up by the output sensor, which connects it to the control system. Any rapid spikes shouldn't harm the circuitry because the signal is segregated from the other section. The signal and a reference voltage are both sent as one input to the error amplifier, a comparator that compares the incoming signal with the necessary signal level. The ultimate voltage level is maintained by adjusting the chopping frequency. The error amplifier's output, which determines whether to increase or reduce the chopping frequency, is used to control this. A fixed frequency standard PWM wave is generated by the PWM oscillator.

By taking a closer look at the following figure, we may gain a better understanding of how SMPS operates in its entirety.

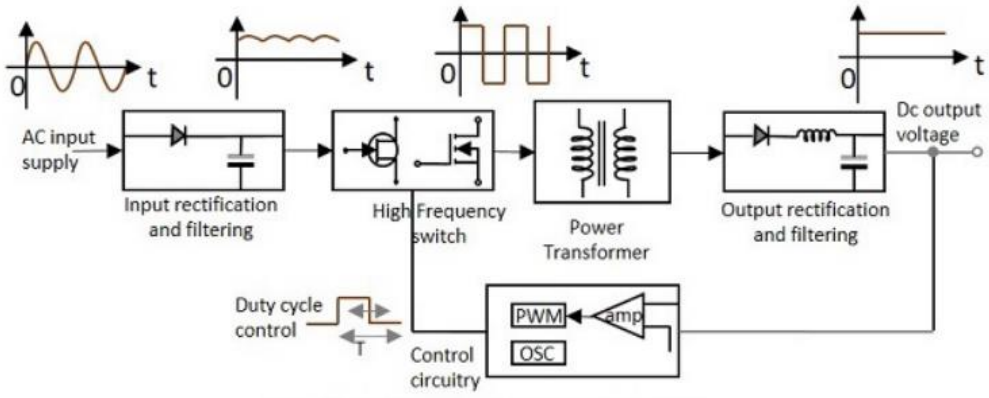


Figure 3.9: Functional Block Diagram of SMPS

The SMPS is typically utilized in situations where switching between voltages is not at all problematic and where system efficiency is crucial. There are a few things to keep in mind when it comes to SMPS. Those are

- Because the SMPS circuit is switched-operated, voltages continuously change.
- The switching device is used in cutoff or saturation mode.
- The feedback circuitry's switching period regulates the output voltage.
- By changing the duty cycle, switching time can be altered.
- The high efficiency of SMPS is due to the fact that it continuously changes its input to regulate the output rather than dissipating extra power as heat.

Disadvantages

There are few disadvantages in SMPS, such as

- Due to high frequency switching, there is noise.
- The circuit is intricate.
- Electromagnetic interference is produced.

Advantages

The advantages of SMPS include,

- The effectiveness is between 80 and 90%.
- Less power is wasted and less heat is produced.
- Less harmonic feedback entering the power supply mains.
- The apparatus is small and portable.
- The price of production is decreased.
- A provision for supplying the necessary quantity of voltages.

Applications

The SMPS has a wide range of uses. Computer motherboards, cell phone chargers, HVDC measurements, battery charges, central power distribution, automobiles, consumer electronics, laptops, security systems, space stations, etc. all use them.

Types of SMPS

The Switched Mode Power Supply (SMPS) circuit is made to convert an unregulated DC or AC voltage into a regulated DC output voltage. SMPS come in four main categories, including:

- DC to DC Converter
- AC to DC Converter
- Fly back Converter
- Forward Converter

The input section's AC to DC conversion component distinguishes between a DC to DC converter and an AC to DC converter. Low power applications make advantage of the fly back converter. Additionally, there are two converters—Buck and Boost—among the SMPS types that can change the output voltage in response to demands. Self-oscillating fly-back converters, Buck-boost converters, Cuk, Sepic, etc. are examples of the other type of SMPS.

3.1.3 Buzzer

There are many electric bells, alarms, and buzzers available on the market for alarm reasons, each with a variety of functions and pricing.



Figure 3.10: Typical buzzer arrangement.

The buzzer being utilized in this project has enough alarm sound to be used in a fire alarm system. It is a 5-12 V buzzer. Although a louder buzzer would have been preferable, their operating voltages are high, and we only had a supply on the board that could go as high as 12V.

3.1.4 NPN Silicon Transistors (BC547N)

A high-performance switching device, the BC547N NPN Silicon Transistor was employed in this project. It has a maximum collector-base voltage of 50 V, a maximum collector-to-emitter voltage of 45 V, a maximum emitter-to-base voltage of 5 V, a maximum collector current of 100 mA, and a maximum collector power dissipation of 500 mW when the input signal is zero. This transistor is used in my project as a high power IGBT / N-MOS gate driver circuit component. Its switching frequency is 300 MHz. In Figure 3.4, a typical BC547N NPN silicon transistor is seen.

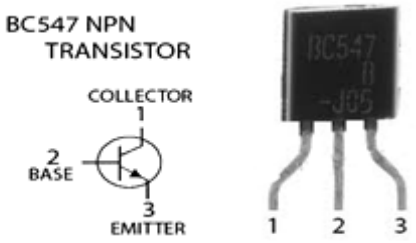


Figure 3.11: Typical BC547N silicon transistor.

3.1.5 MQ-2 Gas Sensor

The 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.

Monoxide concentrations ranging from 200 to 10000 ppm. Note that the MQ2 gas sensor detects multiple gases, but cannot identify them! That is normal; most gas sensors operate in this manner. Therefore, it is best suited for measuring changes in a known gas density rather than detecting which one is changing.



Figure 3.12: MQ-2 Receiver

The MQ2 gas sensor operates on 5V DC and consumes approximately 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon.

Internal structure of MQ2 Gas Sensor

The MQ2 is a heater-driven sensor. It is therefore covered with two layers of fine stainless steel mesh known as an “anti-explosion network”. It ensures that the heater element inside the sensor does not cause an explosion because we are sensing flammable gasses.



Figure 3.13: MQ-2 over view

It also protects the sensor and filters out suspended particles, allowing only gaseous elements to pass through the chamber. A copper-plated clamping ring secures the mesh to the rest of the body.

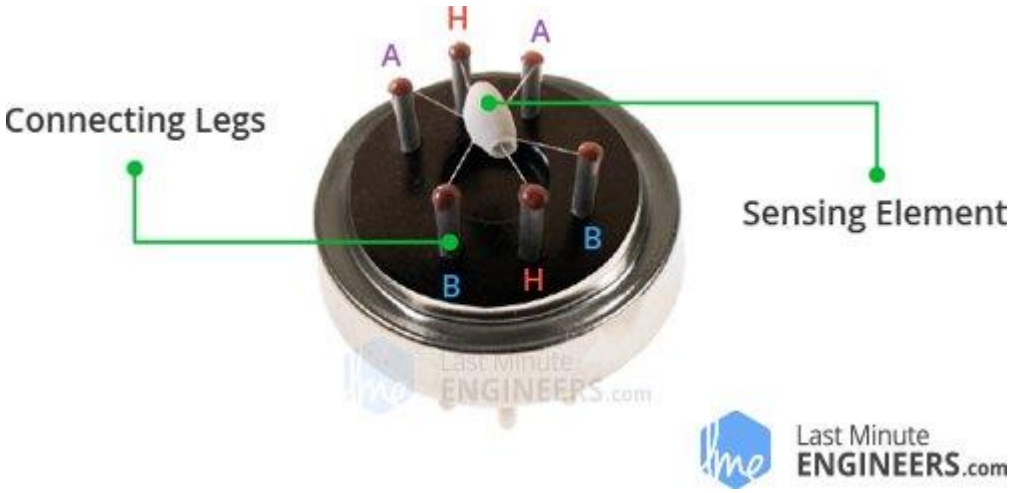


Figure 3.14: MQ-2 Inner view

When the outer mesh is removed, the sensor looks like this. The sensing element and six connecting legs that extend beyond the Bakelite base form the star-shaped structure. Two (H) of the six leads are in charge of heating the sensing element and are linked together by a Nickel-Chromium coil (a well-known conductive alloy).

The remaining four signal-carrying leads (A and B) are connected with platinum wires. These wires are connected to the body of the sensing element and convey slight variations in the current flowing through the sensing element.

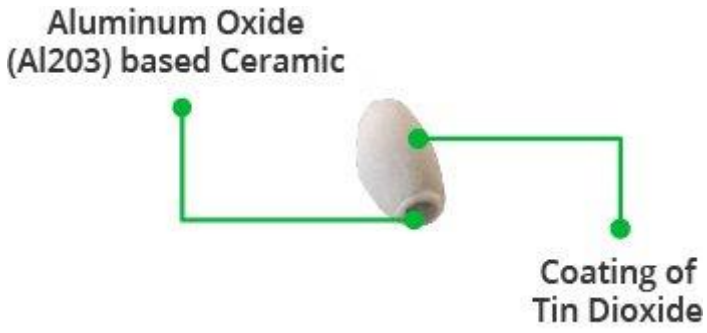


Figure 3.15: MQ-2 Tubular Sensor

The tubular sensing element is made of Aluminum Oxide (AL2O3) based ceramic with a Tin Dioxide coating (SnO2). Tin Dioxide is the most important material because it is sensitive to combustible gasses. The ceramic substrate, on the other hand, improves heating efficiency and ensures that the sensor area is continuously heated to the working temperature.

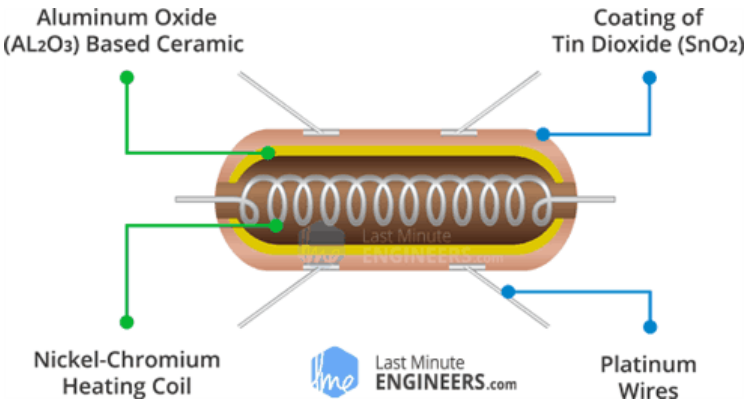


Figure 3.16: MQ-2 Tubular inner view

To summarize, the Heating System is composed of a Nickel-Chromium coil and an Aluminum Oxide-based ceramic, while the Sensing System is composed of Platinum wires and a Tin Dioxide coating.

How Does a Gas Sensor Work?

When a SnO2 semiconductor layer is heated to a high temperature, oxygen is adsorbed on the surface. When the air is clean, electrons from the conduction band of tin dioxide are attracted to oxygen molecules. This creates an electron depletion layer just beneath the surface of the SnO2 particles, forming a potential barrier. As a result, the SnO2 film becomes highly resistive and prevents electric current flow.

In the presence of reducing gasses, however, the surface density of adsorbed oxygen decreases as it reacts with the reducing gasses, lowering the potential barrier. As a result, electrons are released into the tin dioxide, allowing current to freely flow through the sensor.

MQ2 Gas Sensor Module Hardware Overview

The MQ2 gas sensor is simple to use and has two different outputs. It not only provides a binary indication of the presence of combustible gasses, but also an analog representation of their concentration in air.

The sensor’s analog output voltage (at the A0 pin) varies in proportion to the concentration of smoke/gas. The higher the concentration, the higher the output voltage; the lower the concentration, the lower the output voltage. The animation below shows the relationship between gas concentration and output voltage.

This analog signal is digitized by an LM393 High Precision Comparator and made available at the Digital Output (D0) pin.

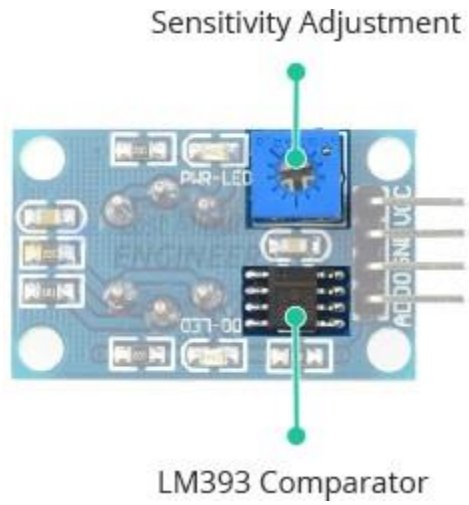


Figure 3.17: LM393 IC

The module includes a potentiometer for adjusting the sensitivity of the digital output (D0). You can use it to set a threshold so that when the gas concentration exceeds the threshold value, the module outputs LOW otherwise HIGH.

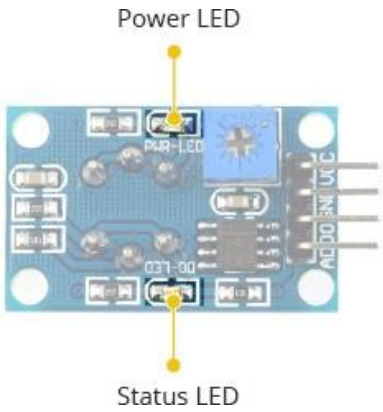


Figure 3.18: LM393 LED

In addition, the module has two LEDs. The Power LED illuminates when the module is turned on, and the Status LED illuminates when the gas concentration exceeds the threshold value.

3.1.6 SIM 800l GSM Module

TheSIM800l module is used to send the data from the microcontroller unit to the mobile phone by using AT commands. First put the SIM card in the SIM slot given in the SIM800l module. The receiver and transmitter pins of this module is connected to the transmitter and receiver pins of the ARDUINO board and also connect the ground and VCC pins of both ARDUINO and SIM800l modules.

At the heart of the module is a SIM800L GSM cellular chip from SimCom. The operating voltage of the chip is from 3.4V to 4.4V, which makes it an ideal candidate for direct LiPo battery supply. This makes it a good choice for embedding into projects without a lot of space.



Figure 3.19: Different part of GSM Module

All the necessary data pins of SIM800L GSM chip are broken out to a 0.1″ pitch headers. This includes pins required for communication with a microcontroller over UART. The module supports baud rate from 1200bps to 115200bps with Auto-Baud detection.

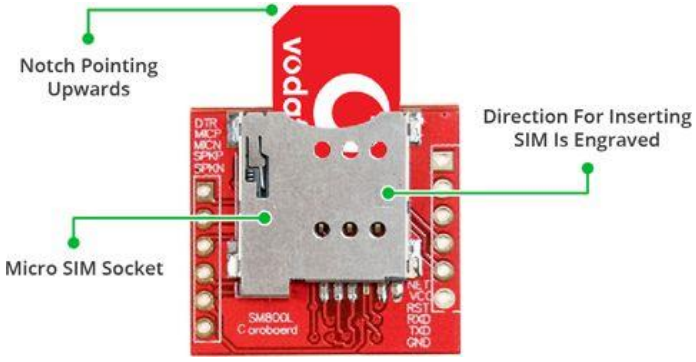


Figure 3.20: SIM inserting Procedure

The module needs an external antenna to connect to a network. The module usually comes with a Helical Antenna and solders directly to NET pin on PCB. The board

also has a U.FL connector facility in case you want to keep the antenna away from the board.

There's a SIM socket on the back! Any activated, 2G micro SIM card would work perfectly. Correct direction for inserting SIM card is normally engraved on the surface of the SIM socket.

This module measures only 1 inch² but packs a surprising amount of features into its little frame. Some of them are listed below:

- Supports Quad-band: GSM850, EGSM900, DCS1800 and PCS1900
- Connect onto any global GSM network with any 2G SIM
- Make and receive voice calls using an external 8Ω speaker & electret microphone
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Scan and receive FM radio broadcasts
- Transmit Power:
- Class 4 (2W) for GSM850
- Class 1 (1W) for DCS1800
- Serial-based AT Command Set
- FL connectors for cell antennae
- Accepts Micro SIM Card

There There is an LED on the top right side of the SIM800L Cellular Module which indicates the status of your cellular network. It'll blink at various rates to show what state it's in:



Figure 3.21: Blink every 1s time

The module is running but hasn't made connection to the cellular network yet.



Figure 3.22: Blink every 2s time

The GPRS data connection you requested is active.



Figure 3.23: Blink every 3s time

The module has made contact with the cellular network & can send/receive voice and SMS.

An antenna is required to use the module for any kind of voice or data communications as well as some SIM commands. So, selecting an antenna could be a crucial thing. There are two ways you can add an antenna to your SIM800L module.

The first one is a Helical GSM antenna which usually comes with the module and solders directly to NET pin on PCB. This antenna is very useful for projects that need to save space but struggles in getting connectivity especially if your project is indoors.



Figure 3.24: Use a Helical GSM antenna

You can snap-fit this antenna to small connector located on the top-left corner of the module. This type of antenna has a better performance and allows putting your module inside a metal case – as long the antenna is outside.



Figure 3.25: Use a Long Antenna

One of the most important parts of getting the SIM800L module working is supplying it with enough power.

Depending on which state it's in, the SIM800L can be a relatively power-hungry device. The maximum current draw of the module is around 2A during transmission burst. It usually won't pull that much, but may require around 216mA during phone calls or 80mA during network transmissions. This chart from the datasheet summarizes what you may expect: Since SIM800L module doesn't come with onboard voltage regulator, an external power supply adjusted to voltage between 3.4V to 4.4V (Ideal 4.1V) is required. The power supply should also be able to source 2A of surge current, otherwise the module will keep shutting down. Here are some options you can consider to correctly power your GSM module.

The SIM800L GSM/GPRS module is a miniature GSM modem that can be integrated into a large number of IoT projects. You can use this module to accomplish almost anything that a normal cell phone can do such as sending SMS messages, making phone calls, connecting to the Internet via GPRS, and much more.

To top it all off, the module supports quad-band GSM/GPRS networks, which means it works pretty much anywhere in the world. The chip's operating voltage ranges from 3.4V to 4.4V, making it an ideal candidate for direct LiPo battery supply. This makes it a good option for embedding in projects that are short of space. All the necessary data pins of the SIM800L GSM chip are broken out to a 0.1″ pitch headers, including the pins required for communication with the microcontroller over the UART. The module supports baud rate from 1200bps to 115200bps with auto-baud detection. An external antenna is needed for the module to be connected to the network. The module usually comes with a helical antenna that can be soldered onto the module. The board also features a U.FL connector in case you want to keep the antenna away from the board. An antenna is required to use the module for any type of voice or data

communication. So selecting an antenna can be a crucial thing. There are two ways to add an antenna to the SIM800L module.

3.1.7 Buck Converter

Buck Converter is a type of chopper circuit that is designed to perform step-down conversion of the applied dc input signal.



Figure 3.26: Buck Converter

In the case of buck converters, the fixed dc input signal is changed into another dc signal at the output which is of lower value. This means it is designed to produce a dc signal as its output that possesses a lower magnitude than the applied input.

3.1.8 Servo Motor

The A servo motor is an electromechanical device that produces torque and velocity based on the supplied current and voltage. A servo motor works as part of a closed loop system providing torque and velocity as commanded from a servo controller utilizing a feedback device to close the loop. The feedback device supplies information such as current, velocity, or position to the servo controller, which adjusts the motor action depending on the commanded parameters.



Figure 3.27: Servo Motor

Servo motors are available in an extensive variety of types, shapes and sizes. The term servo was first used in 1859 by Joseph Facort, who implemented a feedback mechanism to assist in steering a ship with steam to control the rudders. A servo motor is part of a servo mechanism consisting of three key elements – a motor, a feedback device, and control electronics. The motor can be AC or DC, brushed or brushless, rotary or linear, and of any size. The feedback device can be a potentiometer, Hall-effect device, tachometer, resolver, encoder, linear transducer, or any other sensor as appropriate. Completing the servo system is the control electronics that powers the motor and compares the feedback data and command reference to verify that the servo motor is operating as commanded. There are many types of servo motor applications, from simple DC motors used in hobby applications (such as model airplanes) to sophisticated brushless motors driven by complex motion controllers used for multi-axis machining centers. One example of a common servo mechanism is a vehicle cruise control that consists of an engine (the motor), a speed sensor (feedback), and electronics to compare the vehicle speed with the set speed. If the vehicle slows down, the sensor feeds this data to the electronics which, in turn, increases the gas to the engine to step up the speed to the desired set point – a simple closed loop system.

Chapter 4
Software

4.1 Arduino IDE

To write code and upload it to Arduino boards, utilize the open-source Arduino IDE program. The IDE application is suitable for a variety of operating systems, including Windows, Mac OS X, and Linux. It supports the programming languages C and C++. This phrase alludes to an Integrated Development Environment.

In the Arduino IDE, writing a program or piece of code is frequently referred to as "sketching." We must connect the Genuino and Arduino board with the IDE in order to upload the sketch that was developed in the Arduino IDE program. The sketch's file extension is ".ino."

The Arduino IDE looks like:

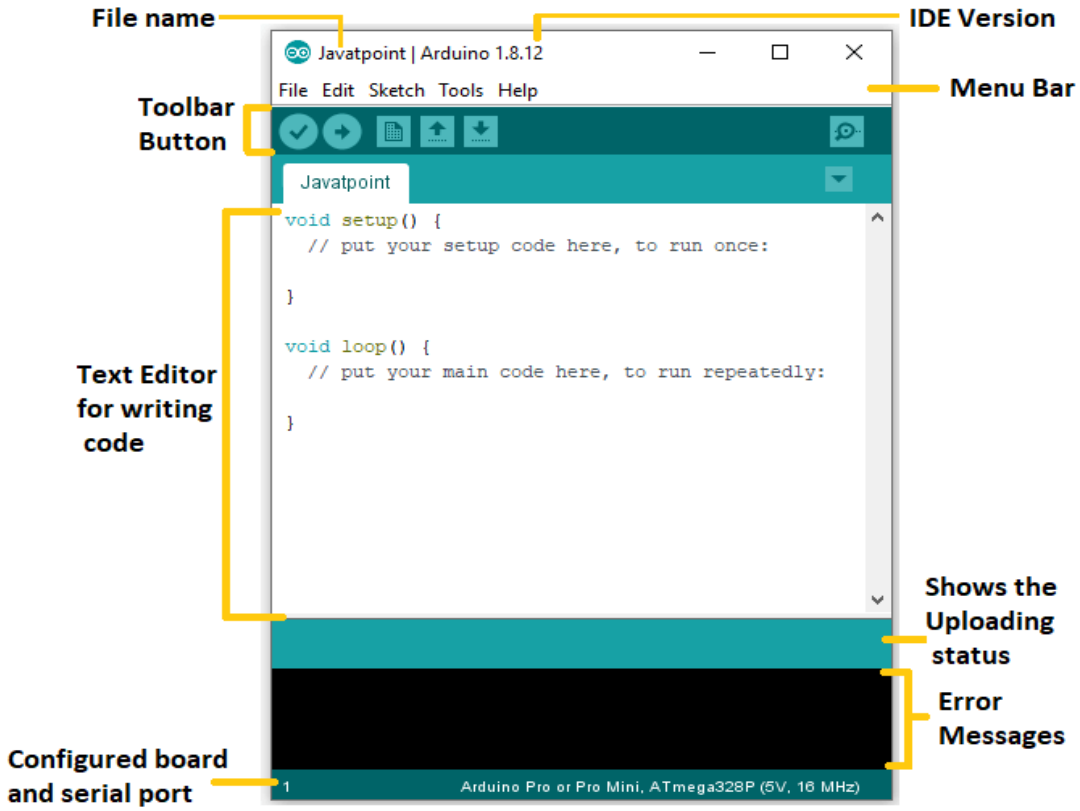


Figure 4.1: Javatpoint

Toolbar Button

The New, Open, Save, Upload, and Verify icons are all that are visible on the toolbar. It is displayed below:

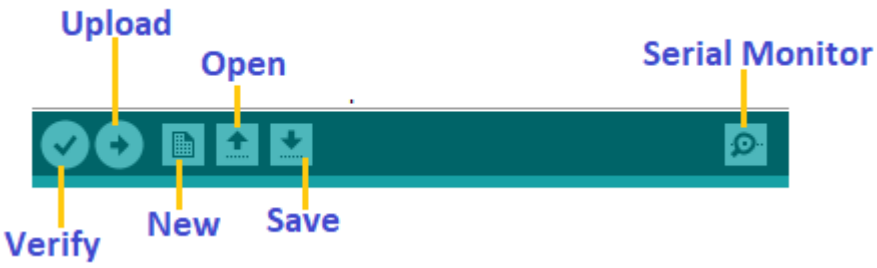


Figure 4.2: Toolbar Button

Upload

When you press the Upload button, a compilation and execution of our on-screen code takes place. The connected board is then updated with the new code. Before submitting the sketch, we must make sure that the proper board and ports have been selected.

We also need a USB connection to connect the board to the PC. Once the aforementioned processes have been finished, choose the Upload button from the toolbar.

The most recent Arduino boards have a feature that automatically resets them before an upload. On the earlier boards, there is a Reset button that needs to be pressed. As soon as the uploading is finished, the Tx and Rx LEDs will start to blink.

The notice will appear in the error window if the uploading fails.

Using the Arduino Boot loader, we can upload our program without any additional hardware. A boot loader is referred to as a brief program that is loaded into the board's microcontroller. PIN 13 will cause the LED to flicker.

File

When we click on the File button on the Menu bar, a drop-down list will appear. It is shown below:

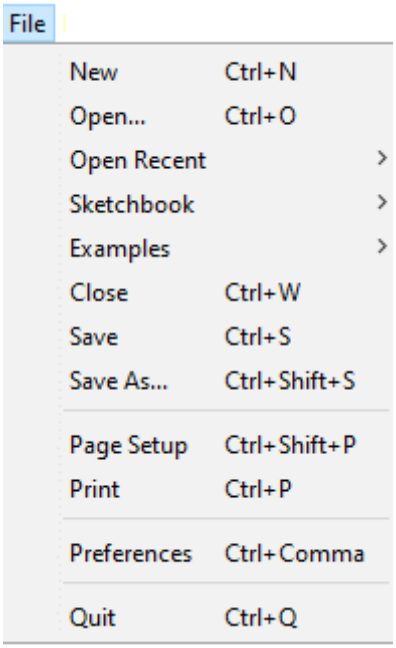


Figure 4.3: File

Let's discuss each option in detail.

New

When you click New, a new window is opened. The already existing sketch is left in place.

Open

It enables opening the sketch, which may be viewed in the computer drivers and folders.

Save

The current sketch can be saved by using the save button. Additionally, it saves any adjustments made to the current sketch. The "Save As..." window will open if the file name is not given.

Save As...

By pressing the "Save As..." button, we can save the sketch under a different name. The name can also be adjusted appropriately.

Page Setup

For printing, it enables specifying the page margins, orientation, and size. This is how the "Page Setup" window will look:

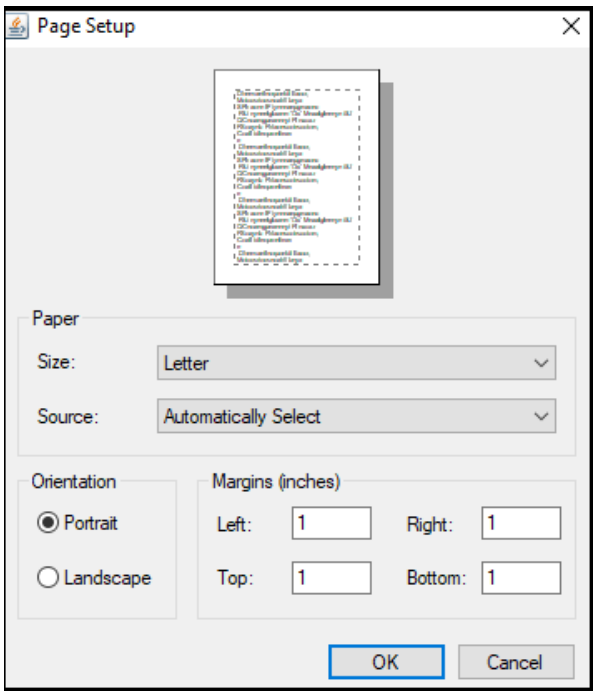


Figure 4.4: Page Setup

Print

It gets the current sketch ready for printing in accordance with the options put out in the 'Page Setup'.

Preferences

It enables the Arduino IDE's customisation options.

Quit

To close every IDE window, press the Quit button. When we launch the Arduino IDE, the same closed sketch will be reopened.

Edit

A drop-down list shows when we click the Edit button on the Menu bar. It is displayed below:

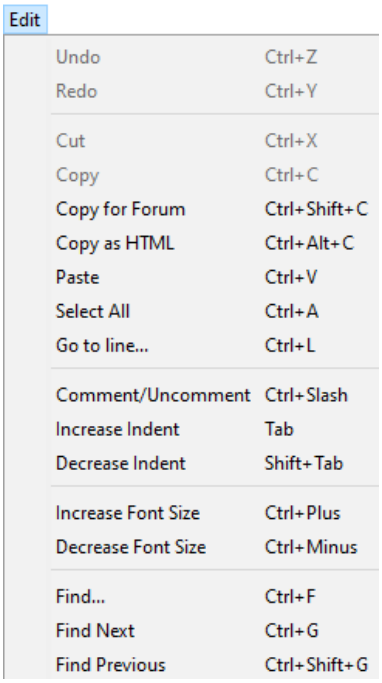


Figure 4.5: Edit

Let's discuss each option in detail.

Undo

The latest change made to the sketch during editing can be undone using the Undo button.

Redo

To undo the most recent change made to the sketch while editing, press the Redo button.

Cut

It enables us to take certain text out of the written code. Additionally, the text gets copied to the clipboard. Additionally, that text can be pasted anywhere in our sketch.

Copy

The chosen text is duplicated in this process. Additionally, the text gets copied to the clipboard.

Copy for Forum

The selected text is copied to the clipboard using the "Copy for Forum" button, making it ready for forum posting.

Copy as HTML

The selected text can be copied as HTML to the clipboard by clicking the "Copy for Forum" button. It is ideal for web page embedding.

Paste

The selected text from the clipboard is pasted at the designated cursor point using the Paste button.

Select All

It chooses all of the sketch's text.

Go to line...

The cursor is moved to the requested line's position.

The window will appear as:

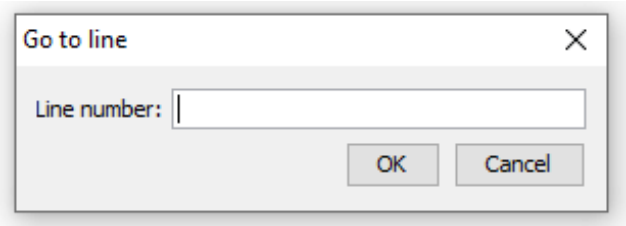


Figure 4.6: Go to line

Comment/Document

The comment mark (//) can be added or removed from the beginning of a line by using the Comment/ Document button.

Increase Indent

It is employed to insert a space at the beginning of the designated line. The text is shifted to the right by the spacing.

Decrease Indent

The space at the beginning of the provided line is subtracted or removed using this command. The text is shifted to the left by the spacing.

Increase Font Size

The written text's font size is enlarged.

Decrease Font Size

The written text's font size is shrunk as a result.

Find...

It is utilized to locate the desired text. The text can also be changed. The text in the drawing is highlighted.

The window will appear as:

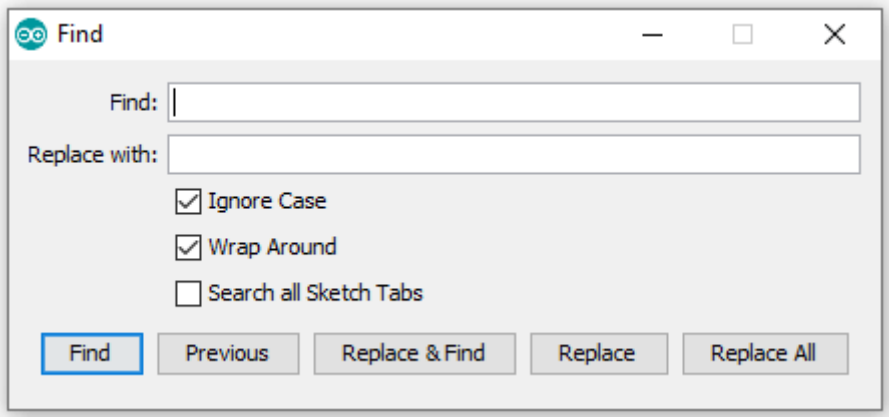


Figure 4.7: Find

Find Next

The following word, which was entered into the "Find..." window, is highlighted. If there is no such word, no highlighted text will appear.

Find Previous

It draws attention to the preceding term that has been entered into the "Find..." window. If there is no such word, no highlighted text will appear.

Sketch

A drop-down menu shows when we click the Sketch button on the Menu bar. It is displayed below:

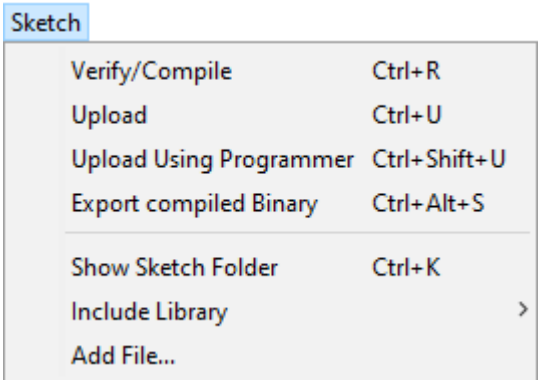


Figure 4.8: Sketch

Let's discuss each option in detail.

Verify/Compile

While compiling, it will look for code mistakes. The IDE also reports on the RAM in the terminal area.

Upload

The code is configured to the chosen board through the port using the Upload button.

Upload Using Programmer

It is used to replace the board's built-in boot loader. By selecting the "Upload Using Programmer" option, we can use the Flash memory's entire storage capacity. To do this, we must restore the Boot loader and transfer it to the USB serial port using the Tools-> Burn Boot loader option.

Export compiled Binary

It has the ability to save.hex files and can be archived. .hex files can also be uploaded to the board using other programs.

Show Sketch Folder

It opens the folder containing the most recent sketch or line of code.

Include Library

Include Library contains a number of Arduino libraries. After the hash symbol (#), the libraries are added to our code at the beginning. Additionally, libraries from.zip files can be imported.

Add File...

The Add File. button is used to add the created file in a new tab on the existing file. For example, let's add 'Blink' file to the 'Java point' file. The tab will now appear as:

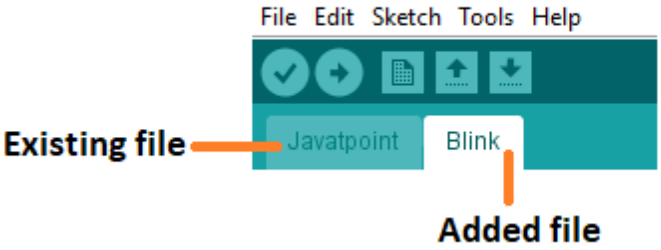


Figure 4.9: Added file

Alternately, we can choose the Delete option from the little triangle to remove the associated file from the tab.

Tools

A drop-down menu shows when we click the Tools button on the Menu bar. It is displayed below:

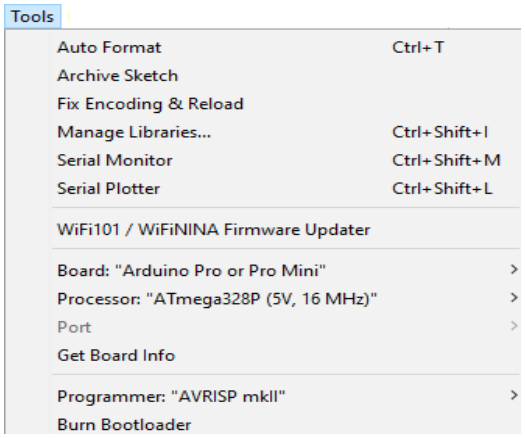


Figure 4.10: Tools

Let's discuss each option in detail.

Auto Format

Using the Auto Format button, the written code is formatted. for example, by using open and closed curly brackets in the code.

Archive Sketch

The latest recent sketch or piece of code is preserved as a.zip file. The sketch and the preserved directory have the same organizational layout.

Fix Encoding and Reload

The difference between the operating system's char maps and the editor's char map encoding can be fixed with this button.

Manage Libraries...

It displays the most recent list of all the installed libraries. The Arduino IDE can also receive a new library by using this option.

Serial Monitor

With the attached board on the port, it enables data exchange.

Serial Plotter

Using the Serial Plotter button, a plot of the serial data is displayed. The Arduino IDE has it already configured.

WiFi101/WiFi NINA Firmware Updater

It is used to check and update the Wi-Fi firmware on the connected board.

Board

From the selection of boards, one must select the board. It is important that the selected board resemble the board that is connected to the computer.

Processor

The processor is shown based on the board that was selected. The board is updated after each selection.

Port

It is made up of the physical and virtual serial devices on our machine.

Get Board Info

It offers information on the selected board. We must select the appropriate port before gathering data about the board.

Programmer

We must select the hardware programmer before programming the board. It is required when we don't use the onboard USB serial connection. Additionally, burning the Boot loader requires it.

Burn Boot loader

A boot loader for the microcontroller is present on the board. The option was advantageous when we purchased the microcontroller without the boot loader. Before burning the boot loader, we must make sure the selected board and port are legitimate.

Help

The menu bar's Help button will display a drop-down list when we click it. It is displayed below:

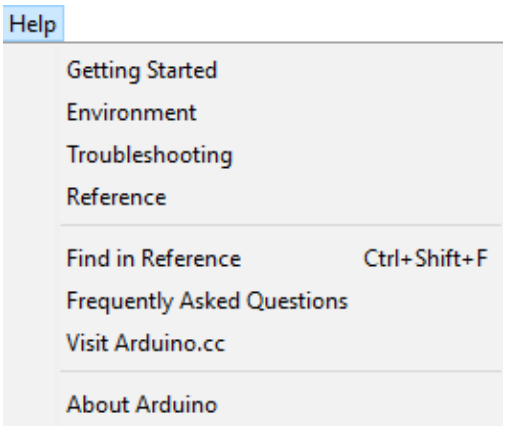


Figure 4.11: Help

The Arduino IDE comes with a number of easily accessible publications that are included in the Help area. There are several options included in it, like Getting Started, Environment, Troubleshooting, Reference, etc. We can also take into account the graphic up top, which displays all of the Help section's options. You can also access some papers, like "Getting started" and "Reference," without an internet connection. It will take us directly to the Arduino official website.

4.2 Proteus 8 Professional

This serves as a succinct overview of the Proteus application. Below, you'll find a list of this application's unique qualities and benefits. We hope that this post will provide you with the most thorough and practical explanation of how to use Proteus 8 Professional.

You desire to examine the circuit diagram. It would seem like a good idea to view the circuit layout, but huge circuit boards make this difficult. Alternately, you may attempt printing a circuit schematic (PCB) and testing it, but this requires a lot of time-consuming steps. Using Proteus 8 Professional seems to be the best option. A program used to plot, draw PCBs, and simulate schematics is called Proteus 8 Professional.

Features of Proteus 8 Professional

Diagram drawing:

On Proteus 8 Professional, diagramming is quite simple. Select the desired information by clicking "select device," then draw the wire by clicking on the electrical output or Vcc, Ground, etc.

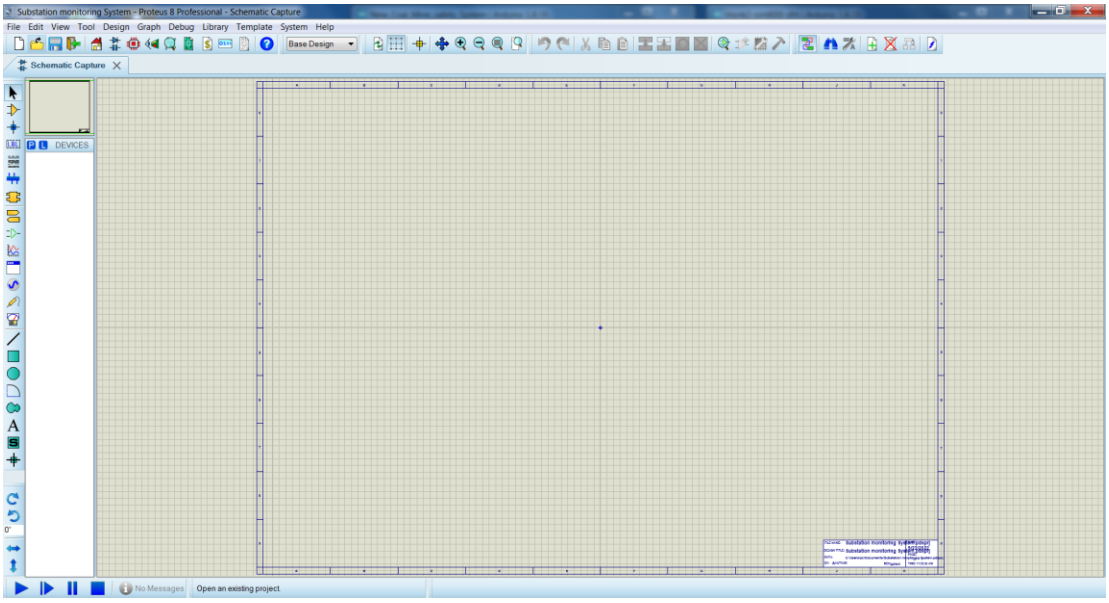


Figure 4.12: Diagram drawing

On Proteus 8 Professional, diagramming is quite simple. Select the desired information by clicking "select device," then draw the wire by clicking on the electrical output or Vcc, Ground, etc.

Simulation

Has the circuit been finished? Proteus 8 Professional's simulation tool may show the circuit in its greatest intricate detail. Run the simulation or each table are the two options available for this feature. Circuit board is displayed in "Running Simulation" at average speed (if the circuit is not too complicated). Every time you click, "Running each table" will run every circuit board. The repair of digital circuits can benefit from this modification. Microcontroller simulation is possible. Each microcontroller will be described depending on its own architecture, such as PIC24, dsPIC33, 8051, Arduino, or ARM7. You can get the compiler and dump a hex file into the Proteus microcontroller. In addition, real-time modeling is integrated with

devices like switches, resistors, photoelectric resistors, and even voltmeters and ammeters.

PCB design

is a simple-to-use Proteus feature. You have the option of using Proteus or coming up with your own designs. Making your own design is simple; all you have to do is include the necessary information in the diagram and then construct the electrical circuit. It will automatically catch mistakes, so don't worry about breaching any design rules. Put the information in the appropriate position, and Proteus will execute it automatically if you desire. It will illustrate how to configure the circuit and select the best option. There is also a new custom "Auto placer" that demands you to design the board's shape and size in order to select the board size. The details are then automatically inserted into the mold after that.

Pros and cons Proteus 8 Professional

Advantages:

- You can interact with test run simulations, use switches, etc.
- There are virtual instruments available for measuring electricity.

Defect:

- User interface should be better.

4.3 Blynk App

You may build smartphone applications using Blynk that make it simple to communicate with microcontrollers or even complete computers like the Raspberry Pi. The Blynk platform's main goal is to make creating mobile phone applications incredibly simple. You'll learn in this course that creating a mobile application that can communicate with your Arduino is as simple as dragging a widget and setting up a pin. With Blynk, you can operate an LED or a motor with essentially no programming from your smartphone. Actually, the first experiment I'll show you in this course is this one. However, don't let this ease of use fool you into thinking that Blynk is only appropriate for simple tasks. Blynk is a robust and scalable tool that is used by hobbyists and the industry alike.

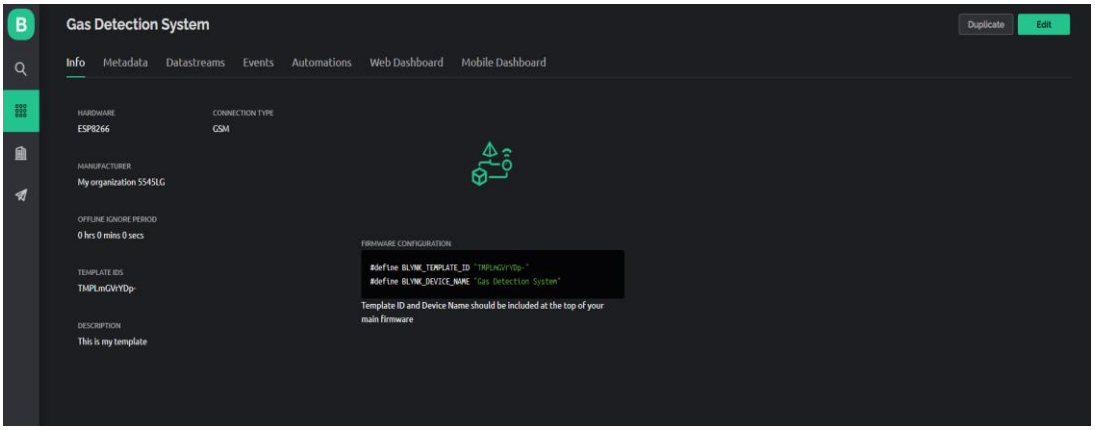


Figure 4.13: Info

While monitoring the soil humidity in your food garden, you can use it to adjust the water supply or open the garage door. You can also use it to control furniture that can recognize your habits, add IoT and AI to traditional industrial devices like boilers, and improve the reliability and security of oilfields. Blynk is free for both personal usage and prototyping. Their business strategy generates revenue by charging subscription fees to businesses that want to publish Blynk-powered apps for their hardware products or services.

The Blynk invention is the smartphone app. The Blynk app is actually an app editor.
It can be used to create one or several projects. The graphic widgets that can interface with one or more devices, such buttons, virtual LEDs, value displays, and even text terminals, are capable of being included in any project. You may use the Blynk library to directly control NodeMCU or ESP32 pins from your phone without writing any code at all.

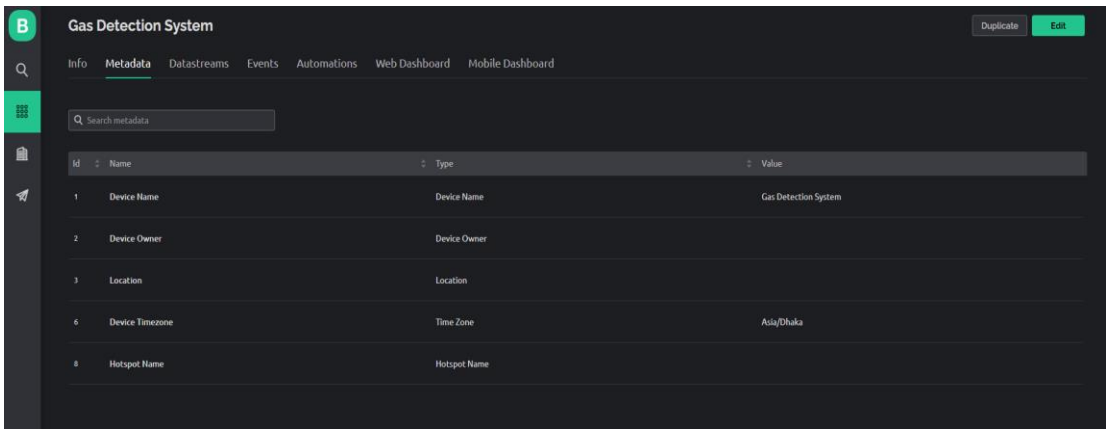


Figure 4.14: Metadata

A project can also be shared with friends or even clients so that they can access the linked devices but cannot edit the project itself. Consider creating a smartphone app that allows users to adjust the temperature, window coverings, and lighting from their device. Other family members can utilize the feature by being given access to the project.

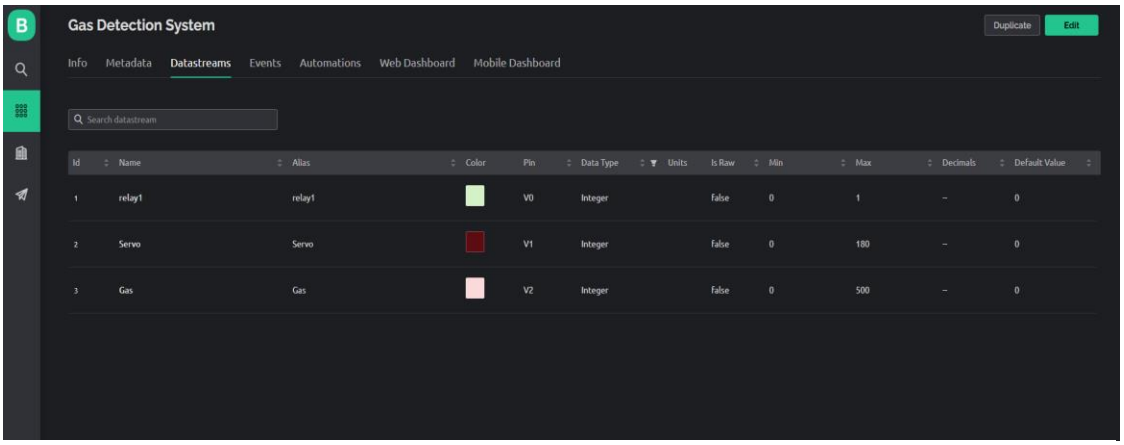


Figure 4.15: DataStream

The variety of devices and connectivity options that the Blynk platform offers astounds me. A Blynk library that targets a device and connectivity type combination is used to implement the support. For instance, you would use the "BlynkSimpleEthernet" library, which includes the Blynk firmware as well as the necessary networking functionality, if you wanted to utilize an Arduino Uno with an Ethernet shield.

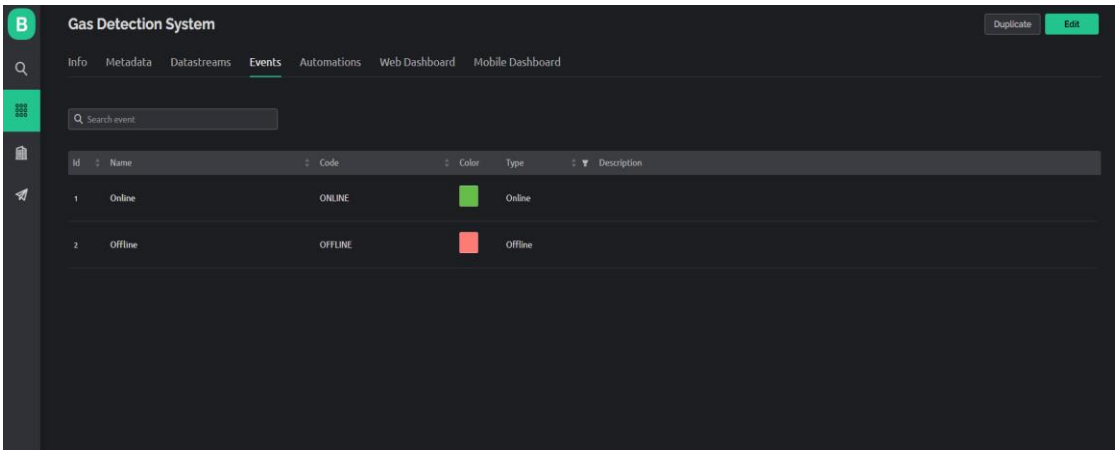


Figure 4.16: Events

Both sketches would utilize the identical Blynk infrastructure, including the physical pins that are a part of the Arduino's hardware and the virtual pins that are

implemented in software by the Blynk Platform. This indicates that, with a little forethought, you can create sketches that are simple to distribute among several target devices. A sketch created for an Arduino Uno could theoretically be converted to work on an Arduino MKR1010 with just minor changes. Non-microcontroller clients are also supported by Blynk. Because there are Blynk libraries for JavaScript, Python, and Lua, you can create client code in any of these three languages. Therefore, you are able to create a Blynk project that communicates with an Arduino and Python code that is running on a Linux virtual machine in the cloud. The potential is genuinely quite intriguing.

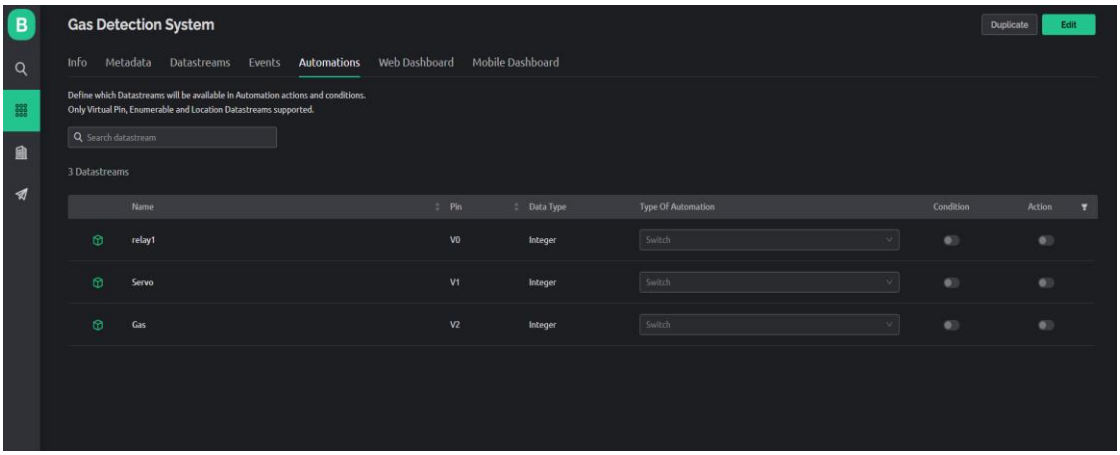


Figure 4.17: Automations

Unlike IoT platforms like IFTTT, Twillio, and even Adafruit IO, the whole Blynk server may be hosted privately, and your smartphone's Blynk app can be connected to it. For the majority of projects, the Blynk Cloud server is a great option because it is always available and ready to use. In order to get you started quickly in this course, we'll use the Cloud server for the first few tests. You'll see that the Cloud Blynk server has set restrictions, though. Some restrictions are caused by the server's topology. Depending on where you are in the world, the server may be on a different continent, which slows down connections between the app, the devices, and the server because of how long it takes for packets to transit the Internet.

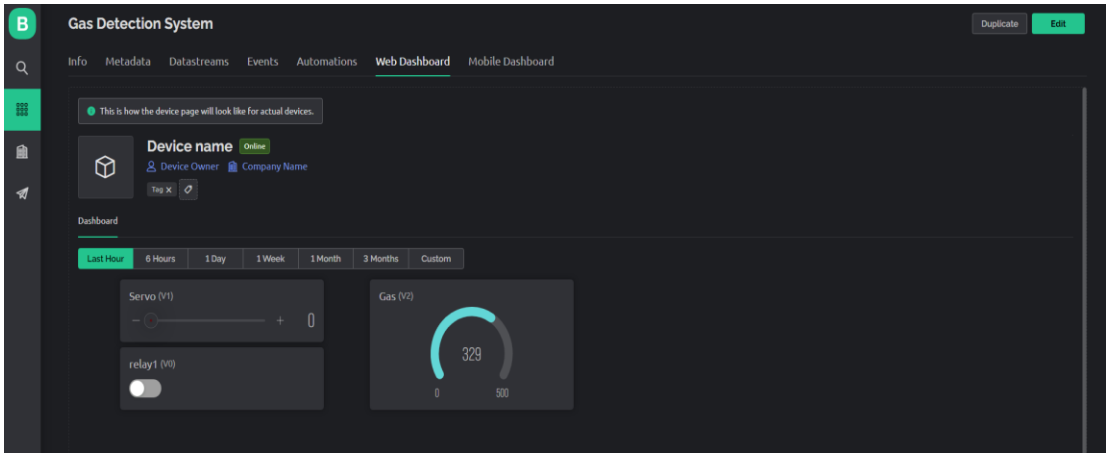


Figure 4.18: Web Deshboard

Another imposed restriction is that you can only employ a certain number of widgets on the Cloud server. Blynk is putting into place a pricing structure for its widgets based on the idea of "energy." You can start a new project on the cloud server with 1000 energy units. You might spend 200 units on an LED widget, leaving 800 units for other widgets. You can choose your own energy constraints on a private server. You can set up your server to provide new users 100,000 energy units. You are entirely in charge.

Of course, you can spend more money for energy units to use on the Cloud Blynk server, and this is a reasonable option to take into account, especially if your Blynk project's users are dispersed throughout the world.

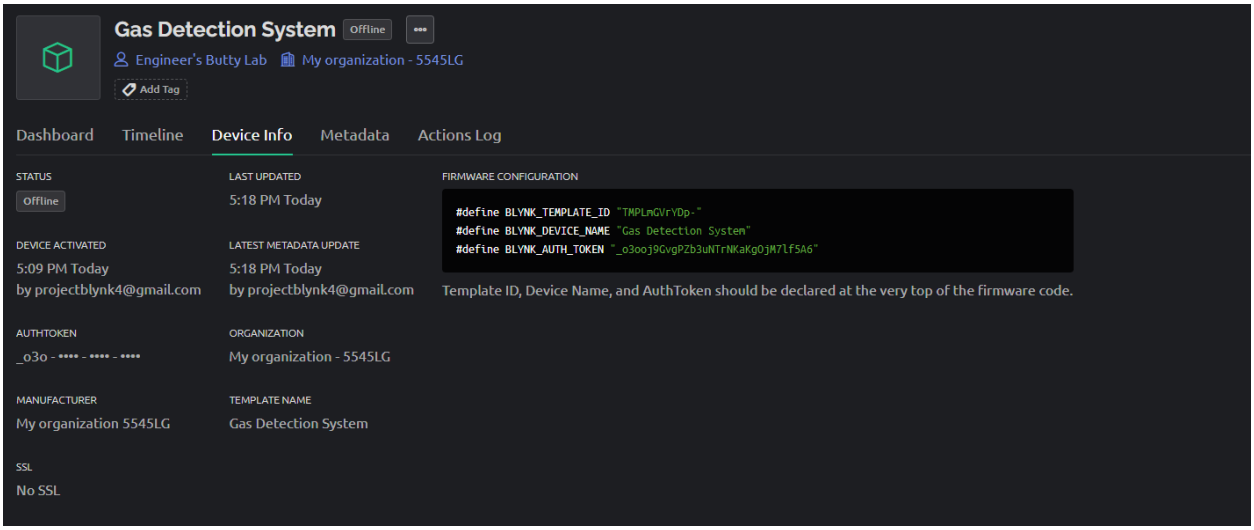


Figure 4.19: Device Info

However, a private Blynk server gives you additional benefits:

- Practically infinite energy units, allowing you to create any Blynk application you can imagine.
- Low latency, which is helpful when responsiveness is crucial when your program is used in a constrained space.
- Complete command over your data. You can manage your users carefully, store your own backups of your private server, move it to a new host, and use any security measures you like.

I'll demonstrate how to set up a personal Blynk server in this course so you can weigh the pros and cons. Any host that has a Java runtime environment can host an instance of the Blynk server. I use a $15 Raspberry Pi Zero W running the Raspberry Pi operating system in this lesson. Even though it only has a half-gigabyte of RAM, this PC is nevertheless able to operate the Blynk server flawlessly. Any Raspberry Pi, not just the Zero W, can be used with WiFi. In actuality, virtual machines and any Linux or Windows host are acceptable.

Chapter 5

Working Principle

5.1 System Block Diagram

This is the block diagram of this system. We used here a Node MCU in the middle of our block diagram. This module will control this total system.

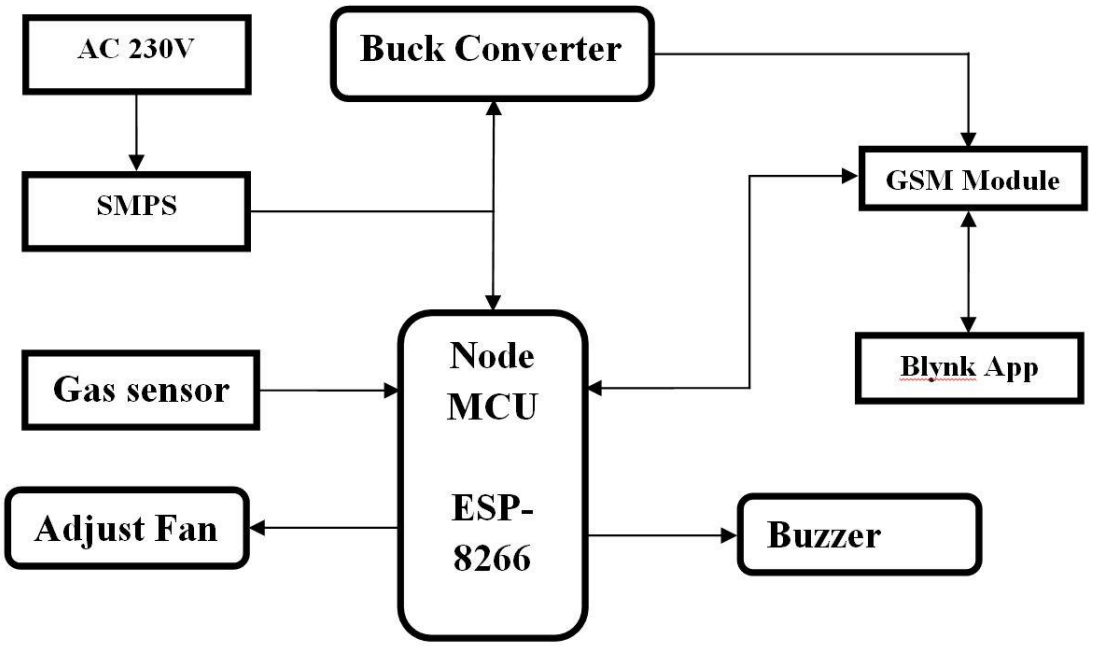


Figure 5.1: Block diagram of proposed system

In Figure 5.1, the methodology of the purposed protection strategy is illustrated with the use of block diagrams. The Node MCU serves as the plan's brain. Each block's circuit is described in detail below. Upper side in the left, we use here a AC 220V power supply and then we convert this AC voltage to DC Voltage by using a SMPS Converter. This SMPS take 230V AC and produce only 5V DC to our System. Upper side of Node MCU, We used here a buck Converter to reduce the voltage value to 3.30V -4.40V DC for make sure the perfect power supply for GSM Module. This GSM Module is called SIM800L also. To make sure the internet connection with any operator Company we use this GSM module here. It will helps us to control loads by

using Blynk app on Smart phone. In the bellow of SMPS, we use here a GAS sensor to detect the presence of GAS or Smoke in our Kitchen Room. When it will detect GAS or Smoke at that moment it will send data to our Node MCU and then Node MCU will inform Blynk app and Email user that GAS or Smoke is detected. On that time buzzer will run automatically. After getting the blynk app and Email notification, User need to control turn off the stove by using Blynk app. Adjustable fan also need to turn on using SMS command.

5.2 Complete Circuit Diagram

This is the Final Circuit diagram of our proposed system. This circuit diagram is designed by using Proteus Simulation Software. So, in this circuit diagram you see here that we included here a Node MCU. This Node MCU will control our total system by using arduino Program that program is created by using Arduino IDE software.

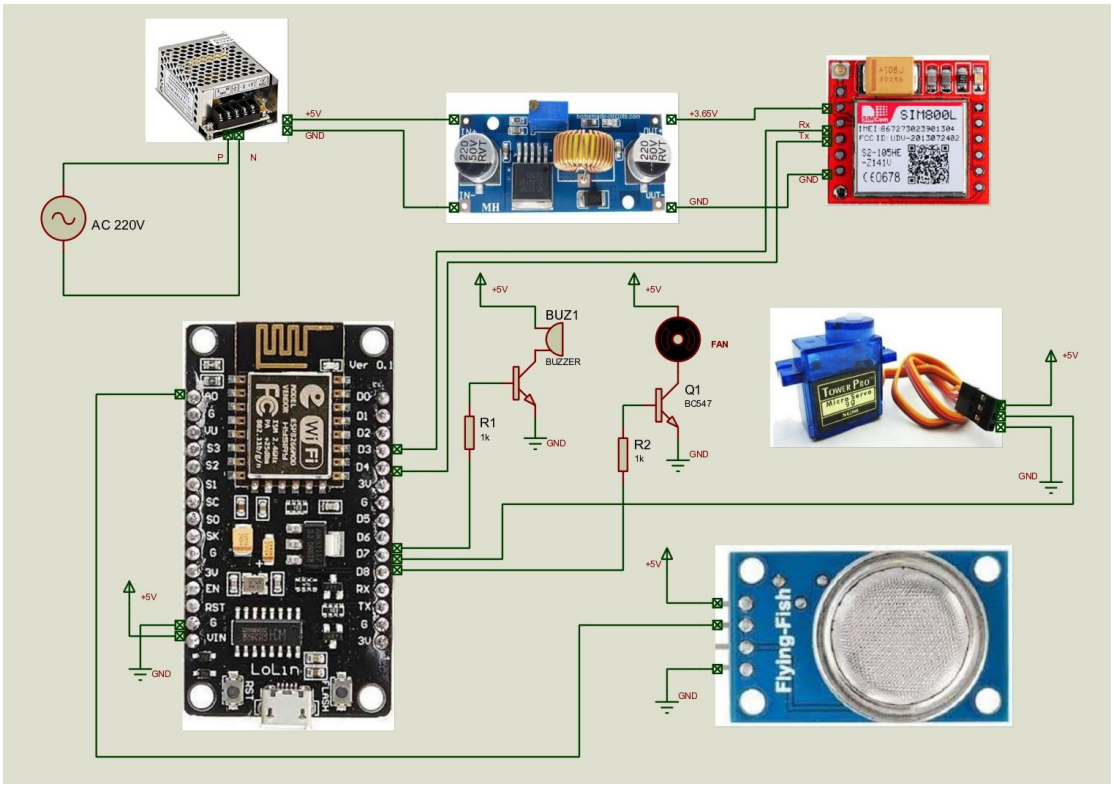


Figure 5.2: Complete circuit diagram of proposed system

In the Upper side in left, we use here an AC 220V power supply and then we convert this AC voltage to DC Voltage by using a SMPS Converter. This SMPS take 230V AC and produce only 5V DC to our System. We used here a buck Converter to reduce

the voltage value to 3.30V -4.40V DC for make sure the perfect power supply for GSM Module. This GSM Module is called SIM800L also. To make sure the internet connection with any operator Company we use this GSM module here. In the right side bellow, we use here a GAS sensor to detect the presence of GAS or Smoke in our Kitchen Room. When it will detect GAS or Smoke at that moment it will send data to our Node MCU and then Node MCU will send notification by using Blynk app and Email to user that GAS or Smoke is detected. On that time buzzer will run automatically. To control our buzzer and Adjustable fan we use here BC547 transistor. After getting the blynk app and Email notification, User need to turn off the stove by using Servo Motor. Adjustable fan also need to turn on using SMS command.

5.3 Hardware Implementation

This is the Full overview of our project. You see here that we added here a Power supply to provide required DC power supply for operating our all electronic components. We use here Node MCU to control our total system using a program that was created by Arduino IDE software.

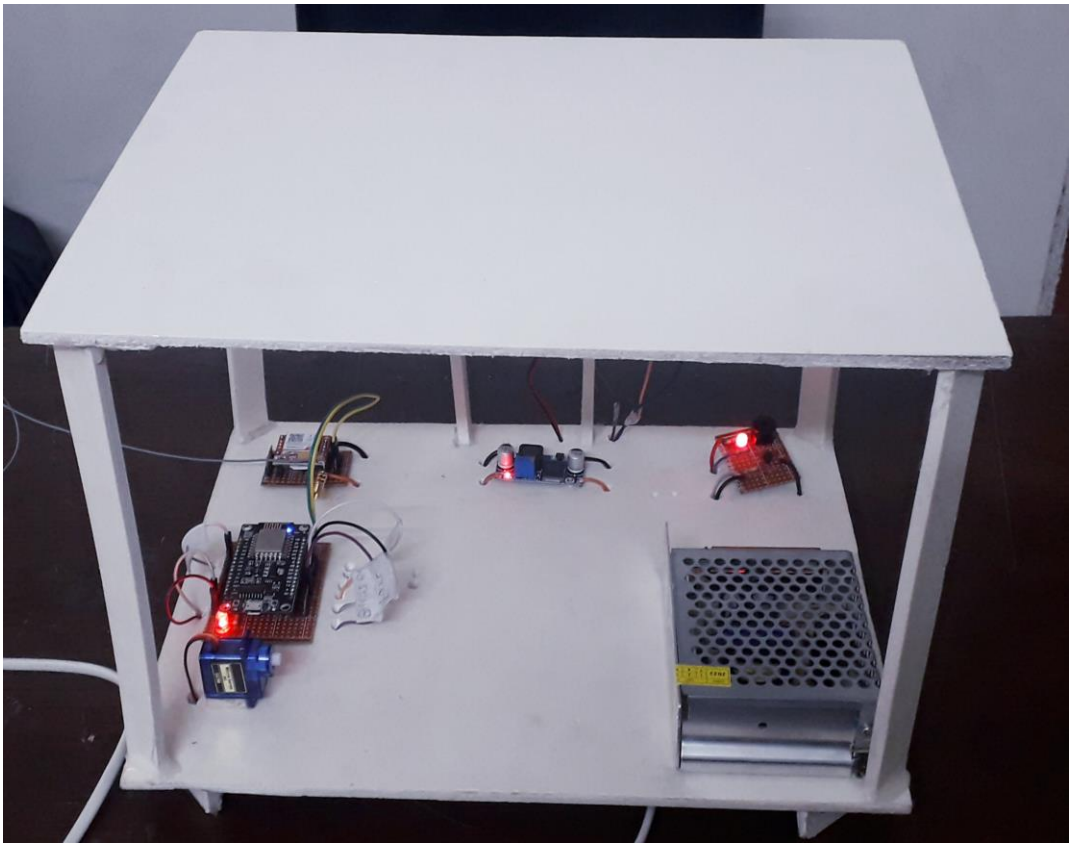


Figure 5.3: Full overview of our Project.

We need to control our stove switch from remote area by using our smart phone for that reason we use here a servo motor, that will be rotate as per instruction of slider from Blynk app. The internet connection are captured from any operator company like Banglalink, Grameen Phone, Airtel, Robi or Teletalk by using a GSM Module. We use here a SIM800L GSM module.

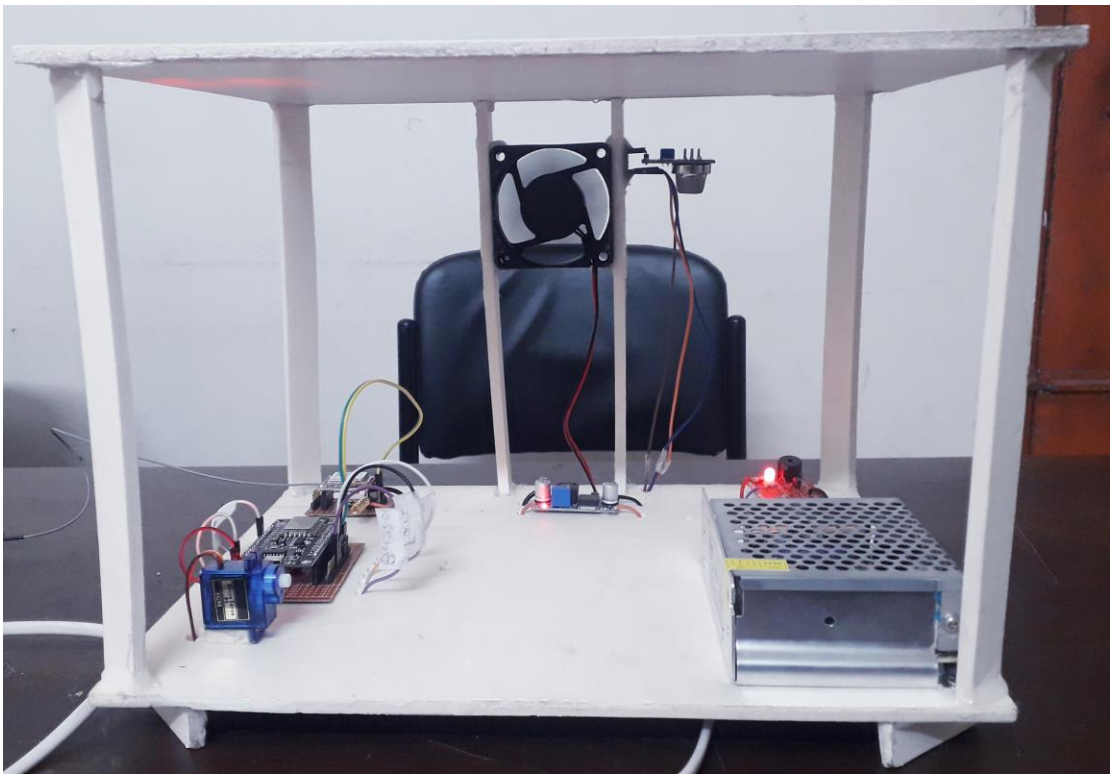


Figure 5.4: Front view of proposed system.

To make sure the power supply for our GSM module we use here a Buck converter that will reduce the output voltage from 3.30V to 4.40V and this is the perfect voltage rating for working properly. Here we use Gas sensor model named MQ-2. It will detect the presence of gas and send data to our Node MCU and Node MCU will take necessary steps like turn on Adjustable Fan and Buzzer. One Red LED will blink when Gas will be detected by MQ-2 Gas Sensor.

Chapter 6
Resultant Analysis

6.1 Results

In Bellow we try to show you the overview of blynk Dashboard overview. Here you see that one Gauge and one slider are shown here. Gauge is used here to show the value and level of detected Gas by this system. Slider which is name here as Servo is used here to control the switch of stove by using Smart phone with the help of Blynk app from remote area. It's showing on 6.1 number figure.

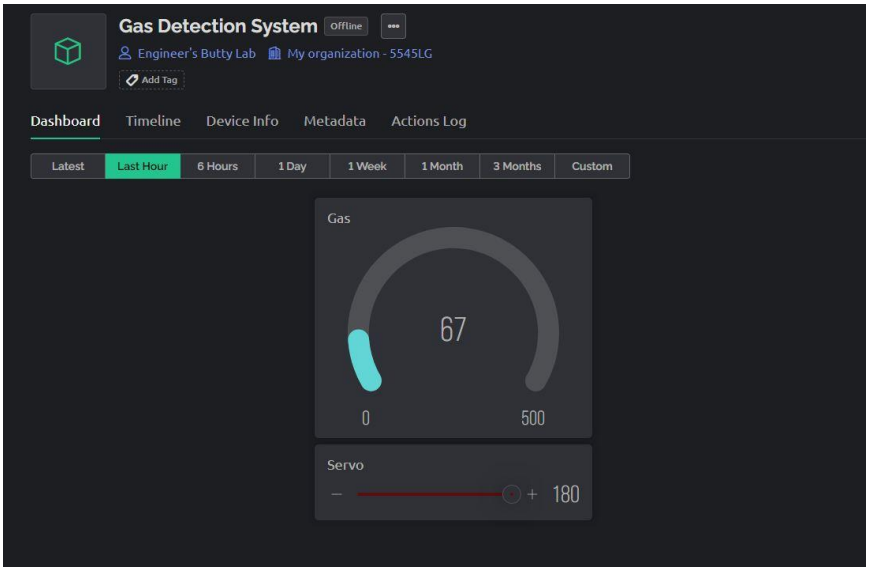


Figure 6.1: Blynk App Monitoring System

When gas will be detected by this proposed system at that moment our blynk app notify us about the presence of Gas in our kitchen room. Which is showing here in Figure 6.2.

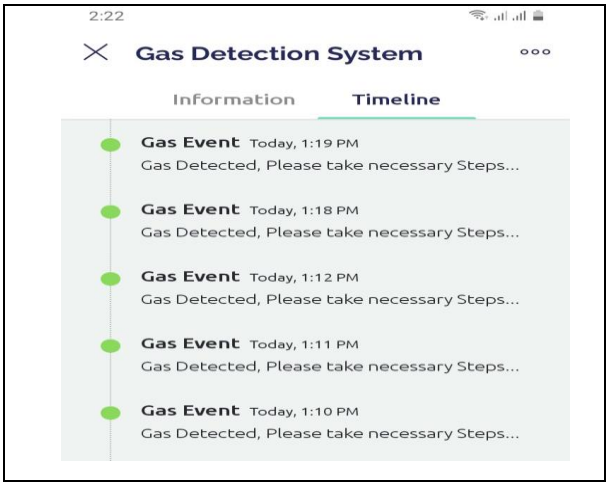


Figure 6.2: Blynk App Notification on Phone.

When gas will be detected by this proposed system at that moment our blynk app notify us by Sending E-mail to our gmail Account about the presence of Gas in our kitchen room.

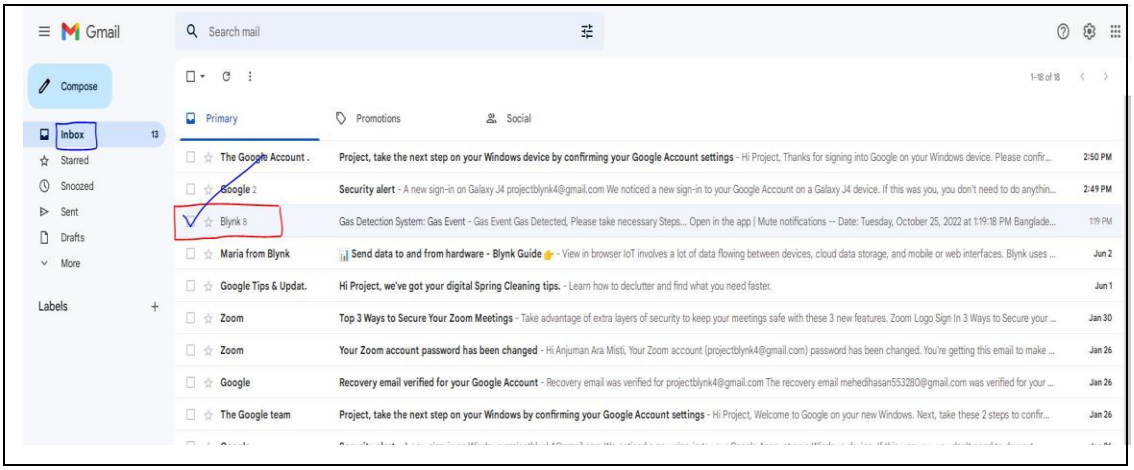


Figure 6.3: Blynk Notification in Gmail Inbox

In figure 6.3 is showing the inbox page of our gmail account and there we see that a E-mail are marked by red color border and blue color (√) marking. And the body of this E-mail are showing in bellow figure 6.4



Figure 6.4: E-mail Body of Blynk Notification.

Chapter 7
Discussion and Conclusion

7.1 Discussion

Testing was carried out by releasing LPG into the atmosphere around the MQ-2 sensor. The gas detector and response unit are there to detect it. The results of the test were carried out on the device at different times and days for the concentration of gas in the air around the sensor. The last four values are the case of an endless loop due to high gas concentration. The device was tested by placing the LPG device at different distances from the gas source. It was observed that when the LPG device was tested by placing it at different distances from the gas source, the response time of the LPG system decreased as the distance from the gas source increased. Also, it was observed that the sensitivity of the gas sensor was very high in clean air. The gas sensor sensitivity varied with temperature while the reference voltage remained constant over time. At constant gas concentration, the sensed voltage will always be constant. The gas sensor has a very fast response to gas since the time difference between test results with the same concentration is very small while the difference between the sensed voltages is very high, as escape could result in severe accidents which end in material losses and human injuries. Gas escape happens chiefly because of poor maintenance of apparatus and inadequate awareness of the individuals. Thus, LPG escape detection is useful to stop accidents and to avoid wasting human lives.

7.2 Advantages

There have many advantages of this gas detection system.

It’s used in house as LPG leakage Detection.

It also detects alcohols, so it is used as liquor Tester.

The sensor has excellent sensitivity combined with a quick fast response time.

The system is highly reliable, temper proof and secure.

Maintenance cost is very low for long run.

It’s possible to get instantaneous results and with high accuracy.

7.3 Disadvantages

It works only when at 5V power supply is given.

7.4 Applications

Protection from any gas leakage in house or Car

For safety from gas leakage in Gas transmission and distribution area.

For Safety from gas leakage in cooking gas, Fired appliance like Stoves and ovens.

7.5 Conclusion

The main aim of the research is to detect the leakage of the gas when the gas is above the certain requirement needed in the environment. When the user activated the system. The Arduino microcontroller will read the ACORS presence of gas in the environment i.e. when it detects above the required value needed. Then the GSM modem gets the data from the Arduino Microcontroller and sends SMS to the owner's handphone. To communicate between the GSM modem and handphone, AT command is applied to this project. It is because the GSM modem just can only understand AT command declaration. From this, it can communicate with a handphone, computer, and Arduino microcontroller.

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APPENDIX

A. Programming Codes for Proposed Project

```
#define BLYNK_PRINT Serial

#define BLYNK_TEMPLATE_ID "TMPLmGVrYDp-"
#define BLYNK_DEVICE_NAME "Gas Detection System"
#define BLYNK_AUTH_TOKEN "_o3ooj9GvgPZb3uNTrNKaKgOjM7lf5A6"

#define TINY_GSM_MODEM_SIM800

#include <TinyGsmClient.h>
#include <BlynkSimpleTinyGSM.h>

char auth[] = BLYNK_AUTH_TOKEN;

char apn[]  = "internet";
char user[] = "";
char pass[] = "";

int value = 0;
int depth =20;

#include <SoftwareSerial.h>
SoftwareSerial SerialAT(D4,D3); // RX, TX
TinyGsm modem(SerialAT);
#include <OneWire.h>
 #include<Servo.h>
Servo servo1;

#define ONE_WIRE_BUS 10 // DS18B20 on arduino pin2 corresponds to D4 on
physical board "D4 pin on the ndoemcu Module"
OneWire oneWire(ONE_WIRE_BUS);

#define sensor A0
#define buzzer D7
#define servo D6
#define relay D5



BlynkTimer timer;
#define INTERVAL 1000L
```

```
////////////////////////// Servo Control //////////////////////

BLYNK_WRITE(V3)
{
  int s0 = param.asInt();
  servo1.write(s0);
  Blynk.virtualWrite(V3, s0);
}




////////////////////////////////// SMOKE ////////////////////////////////

void SendSmokeData()
{
int sensorValue = analogRead(A0);

  Blynk.virtualWrite(V2,sensorValue);
  Serial.println(sensorValue);

  if(sensorValue>50)

 {

   Blynk.logEvent("gas_event");
   digitalWrite (D5,HIGH);
   digitalWrite (D7,HIGH);
    delay(3000);
  }

  else

  {

     digitalWrite (D5,LOW);
   digitalWrite (D7,LOW);

    delay(1000);
  }

}


/*****************************************************************************
****************
 *  setup() function
```

```
**************************************************************************
*************/
void setup()
{

  Serial.begin(115200);
  delay(10);

  SerialAT.begin(9600);

  delay(3000);
  servo1.attach(D6);
  pinMode(D5,OUTPUT);
  pinMode(D6,OUTPUT);
  pinMode(D7,OUTPUT);


  Serial.println("Initializing modem...");
  modem.restart();

  Blynk.begin(auth, modem, apn, user, pass);


 timer.setInterval(INTERVAL, SendSmokeData);


  //----------------------------------------------------------
}


/**************************************************************************
*****************
 *  loop() function

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