IoT Based LPG Gas Leakage & Fire Detection with Monitoring and Controlling System

This paper has been submitted to the Department of Electrical & Electronic Engineering of **Daffodil International University** in partial fulfillment of the requirement for the Degree of Bachelor of Science in Electrical and Electronic Engineering**.**

Submitted By:

Hadiul Islam **I'D: 192-33-958**

Md.Sohel Rana **I'D: 192-33-981**

Supervised By:

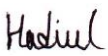
Md.Sohel Rana
Lecturer
Department of Electrical and Electronic Engineering
Daffodil International University (DIU)

Letter of Transmittal

The Supervisor
Department of EEE
Daffodil International university
Ashulia Model Town, Khagan, Ashulia, Dhaka

Subject: Submission of Project report.
Dear Sir,
Please find enclosed the project report entitled "**IoT Based LPG Gas Leakage & Fire Detection with Monitoring and Controlling System"**. The study has been carried out in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical & Electronic Engineering.
In carrying out the study, we have followed supervisor's advice and collected required information from several textbooks, reference books, web sites and other sources. We thinkyou will find it useful and informative. We would be glad to furnish you further explanations or clarifications if required.

Sincerely yours,



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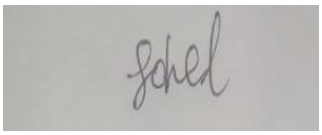
Hadiul Islam
ID:192-33-958



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MD.Sohel Rana
ID:192-33-981

Declaration

We do hereby solemnly declare that the work presented in this report entitled ““**IoT Based LPG Gas Leakage & Fire Detection with Monitoring and Controlling System**”” has been carried out by us and has not been previously submitted to any other university, college or organization for an academic qualification, certificate or diploma/degree.

We hereby warrant that the work that has been presented here does not breach any existing copyright.We further undertake to indemnify the university against any loss or damage arising from breach of the foregoing obligations.

Authors,

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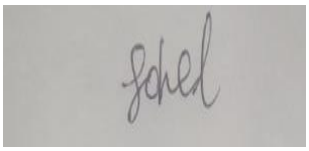
ID:192-33-958



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MD.Sohel Rana
ID: 192-33-981

Certificate

This is to certify that the report entitled is ““**IoT Based LPG Gas Leakage & Fire Detection with Monitoring and Controlling System**”” the valid record of the work done by Hadiul Islam ID: 192-33-958, MD.Sohel Rana, ID: 192-33-981 for partial fulfillment of the requirement of the Degree of Bachelors of Science in Electrical and Electronic Engineering (**EEE**) Daffodil International University.

This work has been carried out under my guidance and is a Bonafede record of valid works carried out successfully.

Faculty Guide

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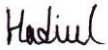
Md. Sohel Rana
Lecturer
Department of Electrical and Electronic Engineering
Daffodil International University(DIU)

Acknowledgement

We would like to express our greatest gratitude to the people who helped and supported usthroughoutthis work. First and foremost we would like to thank our honorable supervisor **Md.Sohel Rana**, Lecturer of the Department of EEE(DIU), for giving us enormous support, advices and valued guidance concerning this thesis.Next, We would like to thank our family and friends for their valuable support to complete this thesis. Finally, we would like to express our heartiest gratefulness to Almighty Allah for His heavenly blessings. Without his blessings it would not possible to complete our work successfully.

Thank you all

Authors,



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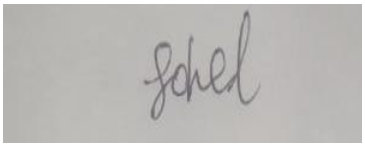
ID:192-33-958



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MD.Sohel Rana
ID:192-33-981

Abstract

Accidental explosions are not uncommon in homes that can be associated with gas leaks, and storage of explosive materials such as propane. In the modern world, people have adopted LPG (Liquid Petroleum Gas) supply system for cooking. During use of LPG system and during fire, numerous incidents happen around us which can lead to the death of people. Hazards due to gas leakage are dangerous and can get out of control if not dealt with in time. But these gas leaks often go unnoticed and there should be some way to monitor them so that quick action can be taken. To prevent this from happening knowingly or unknowingly, this document warns the user about leakage detection and leakage of LPG cylinders in special areas like kitchens. Besides detection of LPG leakage, this document provides LPG, fire, temperature and humidity alerts to user.This document mainly deals with the development of a gas leak and fire detector and gives booking notifications to the user which can prevent major accidents and save time for LPG booking.

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Chapter 1: Introduction

1.1 Introduction

Safety plays a vital role in today's world as accidents ar at risk of happen anyplace.Places that build use of combustible and not simply detectable gases ar at risk of prevalence of accidental fires.The apps of Things could also be a futurist technology throughout that interconnection of devices and so the web is projected.The automation of the numerous daily chores ar typically modification by this .Within the projected lpg gas detection system, we'll build use of IoT to sight discharge and alert the user at the side of preventing any further discharge of the gas.Lpg gases ar one that cause serious health impacts, however are also utilised in industries in giant quantities. These gases got to be monitored; such increase among the conventional level of them may be known and correct precautional measures ar typically taken. Node MCU ar attending to be accustomed perform the required task by interfacing LPG gas detector, Flame detector, temperature and wetness detector, buzzer and liquid crystal {display|LCD|digital display|alphanumeric display} to display, apps to send alert message to the user via Associate in Nursing robot application. The system can sight the lpg gas discharge and hearth by victimization gas detector with flame detector and it will inform the microcontroler board which may perform the more actions i.e. ringing buzzer.The individuals among the neighborhood can also be enclosed simply just in case of Associate in Nursing emergency.MQ6 LPG gas detector is utilized for input. A 5V buzzer is connected at the side of the circuit to purpose the user offline . The gas discharge event could involve danger for all times . There ar several deaths around the world because of gas discharge. Thus, it's ensured that one doesn't got to worry regarding the gas discharge changing into therefore intense and out of management that it will causes injury to life or the surrounding surroundings and conjointly notifying and alerting the staff or residents regarding the gas discharge. This module is extraordinarily simple to interface with microcontrollers and easily accessible in market by name "LPG Gas and hearth detector Module".Besides, we'll be able to monitor the temperature and wetness through show and net.

1.2 Problem Statement

The need of a gas and fireplace detection system is not solely to look at the setting incessantly however conjointly should stop the any outpouring of gas inside the setting to attenuate the chances of hearth.Leakage of any type of gas has become a haul in gift times whether or not it's with relation to a domestic social unit, factory, kitchens in restaurants, canteens, etc. A gas outpouring detection system makes use of gas sensors (depending on the requirement of the place). The projected system makes use of Associate in Nursing MQ-6 detector for detection of LPG outpouring. the primary objective of this project is to provide a very distinctive means that for safely sleuthing Associate in Nursingy malfunction of a controlled facility thus on stop accumulation of flamable gases so as that harm or explosion due to such an accumulation of gases is prevented.

1.3 Objective of the Project

The main objective of this project is to "IoT Based LPG Gas Leakage & Fire Detection with Monitoring System'' Project for The main purpose is to create a smart system so that we can take many benefits from one project.

- Automatic LPG Gas and Fire detection system.
- Creating quick solution systems.
- Able to solve without anyone's help.
- There is no cost after the initial costs.
- The specialist team is not required for deployment.
- The data group we receive will be monitored from anywhere and can be viewed at the project site.

1.4 Background of the Project

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 IoT Based LPG Gas Leakage & Fire Detection with Monitoring System.The idea behind our project is to give a solution as soon as a gas leakage and fire is perceived apart from activating the sounding alarm.In addition to this, the authorized LCD display . Besides, we will be able to monitor the temperature and humidity through display and internet .We have worked to improve the network system in this place.In this place we have created a system that can be monitored from anywhere. If these fire and gases exceed the normal level then an alarm is generated immediately and also an alert notification (software) is sent to the authorized person through the Internet and used Node MCU

Microcontroller development board.A software designed so that we can monitor from anywhere.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.As soon as the fire starts, the water pea will start and the fan will start as soon as the gas leakage occurs.

1.5 IoT System

The Internet of Things (IoT) is a collection of interconnected computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UID) and the ability to transfer data over networks without the need for human-to-human interaction. or human-to-computer interaction. The definition of Internet of Things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors and embedded systems.

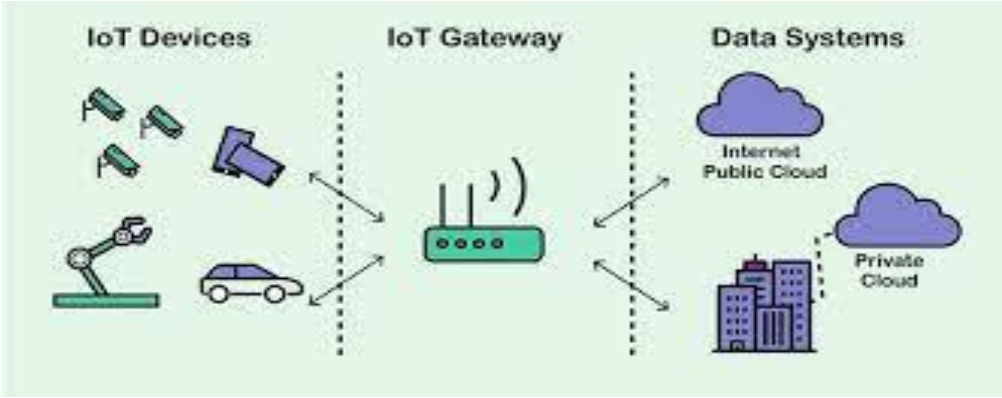

Fig-1.1: IoT System

Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation) and others contribute to enabling the Internet of Things. In the consumer market, IoT technology is synonymous with products related to the concept of "IoT-based LPG Gas Leakage and Fire Detection with Monitoring and Controlling System", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that Supports one or more common ecosystems and can be controlled by devices connected to that ecosystem, such as

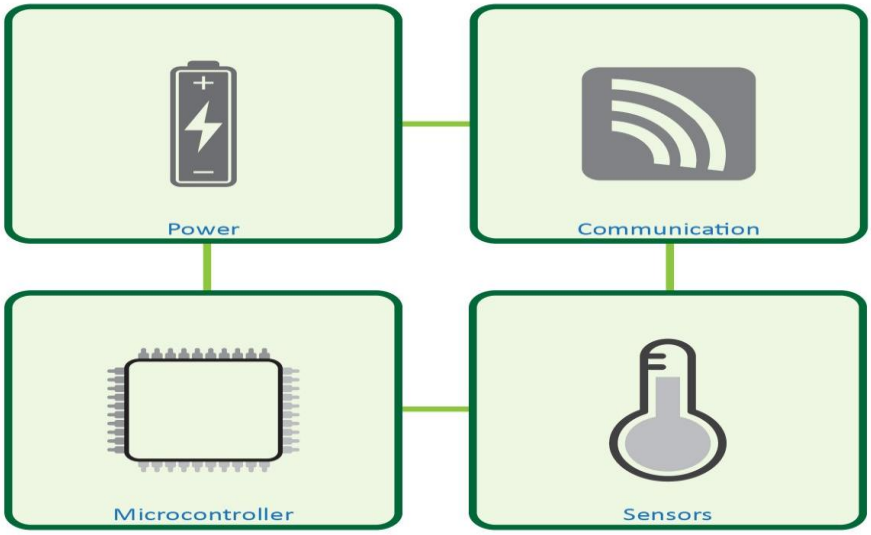

Fig-1.2: Block Diagram of IoT

smart phones and smart speakers**.** There are several serious concerns about the dangers of the growth of IoT, especially in terms of privacy and security; And as a result, industry and government actions began to address them.

1.5 Methodology

Basically, the design and development of this project is divided into two main parts which are hardware architecture and software details. In hardware architecture, circuit designs were developed and project prototypes were built. During software development, the entire prototype was run through programming code.

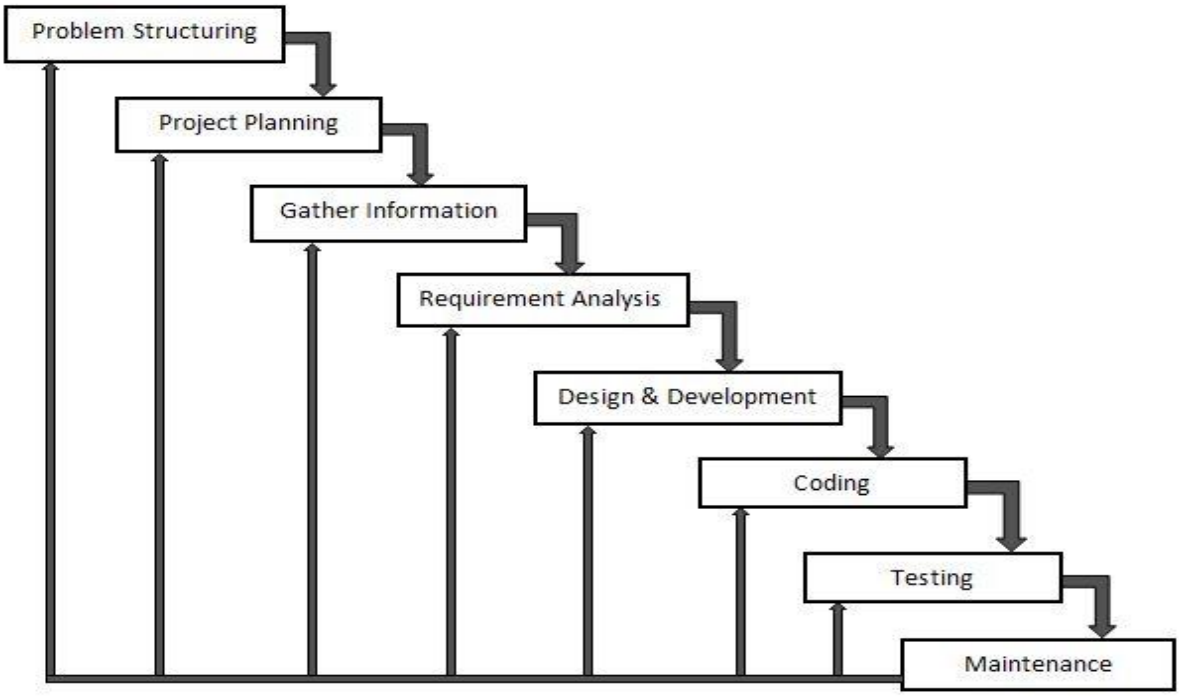

Fig-1.3: Methodology

1.6 Motivation for Project

A poorly motivated team has been known to unravel even the best project plans. A good project manager knows how to harness the initial excitement that comes with starting a project and use it to maintain motivation – leading to success throughout the project lifecycle. We now know that contemporary project managers must be more than just schedule and contract managers. They need excellent skills to handle the complex human elements that have the potential to bring down any project.

1.7 Project Management

Management of any project can be briefly disintegrated into several phases. Our project has been decomposed into the following phases:

Experimentation: This phase involves the discussion of equipment required for the project. Study of related already existing projects, gathering necessary theoretical knowledge. It also involved figuring out the coding part by creating simple algorithms and flowcharts to design the entire process.

Design: This phase was, designing the layout of the application and incorporating the required features. This involves installing the complete hardware assembly and calibration for the Pixhawk flight controller. The power strip was designed to connect home appliances that can be controlled via GPIO pins.

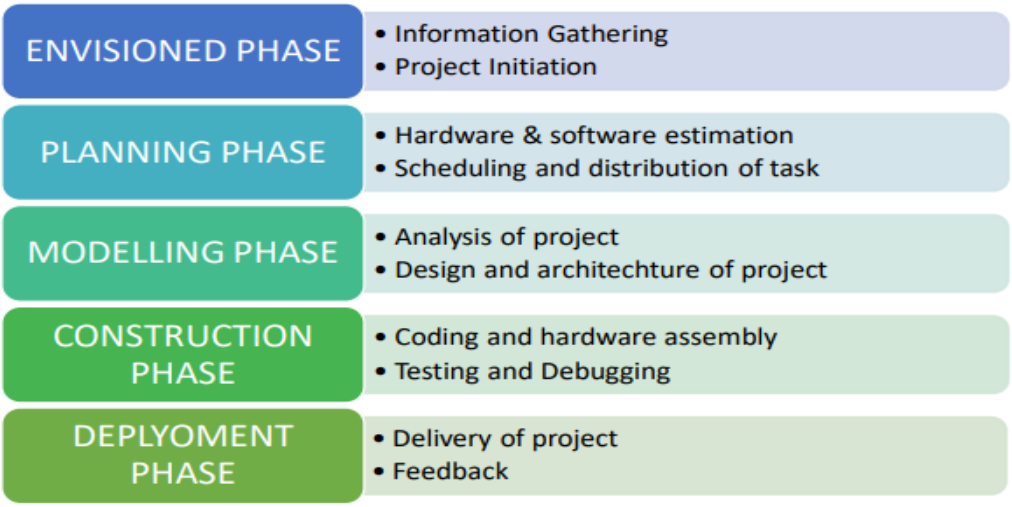

Fig-1.4: Project Management

Development and Testing: This step was the development of the application. The remote device was connected to the Pixhawk flight controller via a wireless network and the entire prototype was tested to identify and remove bugs.

Real world Testing: The prototype was ready for real-world testing and integrated with various real-time electrical appliances.

Chapter 2: System Design

2.1 Introduction

LPG is an acronym or abbreviation for Liquefied Petroleum Gas. Like all fossil fuels, it is a non-renewable supply of energy. It is extracted from fossil oil and gas. LPG

Square Measurement Hydrocarbons are mostly composed of three or four carbon atoms. The common parts of LPG are therefore, square measure gas (ClHa) and alkanes (CaHro).Small concentrations of alternative hydrocarbons can additionally bet on LPG supply and the way it is made, parts in addition to hydrocarbons can be additionally gifted. LPG is highly flammable and thus should be kept away from sources of ignition and in a well-ventilated area, so that any runoff can be safely dispersed.LPG vapor is heavier than air so care should be taken throughout storage to ensure that no run sinks to the bottom and accumulates in a district that is low and difficult to disperse. LPG gas is mainly gas and alkanes and is odorless in natureThe smell we notice after running is actually a completely different agent, called the alkyl radical mercaptan. When this substance leaves the gas excess storage terminal.
The main purpose of the paper is to detect gas leakage and fire in houses, hotels, schools and other domestic areas and warn the people nearby. Nowadays gas and fire sensors are used worldwide in the fields of safety, health, materials etc. This paper is an implementation of this using MQ-6 gas sensor, flame sensor and DHT22 temperature sensor.The MQ-6 sensor is commonly used to detect gas leakage for various applications and the DHT is used to measure the humidity and temperature of the surrounding area. The device also displays the amount of leakage and humidity and temperature on an LCD display.MQ-6 gas sensor detects gas concentration in ppm and outputs analog value which can be converted to digital signal using inbuilt analog to digital converter of node MCU. The paper allows the user to set low, medium and dangerous levels for leakage based on the same digital measurement. The intensity value is compared with two predefined thresholds and based on that, it classifies the leakage into three different classes of concentration.

2.2 Software Tools

The software used to program the microcontroller is open-source-software and can be downloaded for free from www.arduino.cc. With the help of this "Arduino software" we can write small programs with the microcontroller. These programs are called "Sketch". Finally the sketches are transferred to the microcontroller by USB cable More on that later on the subject of "programming".

- **Installation** Now one after another the Arduino software and the USB driver for the board have to be installed.

- **Installation and setup of the Arduino software**

1. We downloaded the Arduino software from www.arduino.cc and installed it on the computer (it was not connected to the PC). After that we open the software file and install the program named arduino.exe.

Two setups on the program are important and should be considered.

a) The board we want to connect must be selected in the arduino software. "Arduino Uno" is here known as "Arduino / Genuino Uno".

b) We need to choose the correct "serial-port" to tell the computer which port the board is connected to. This is only possible if the USB driver is installed correctly. This can be checked like this:
At this point the Arduino was not connected to the PC. If we now select "Ports", under the "Tools" field, we will already see one or more ports here (COM1/ COM2/ COM3…). The number of ports displayed does not depend on the number of USB ports on the computer. When the board is connected to the computer, we will find one more port.

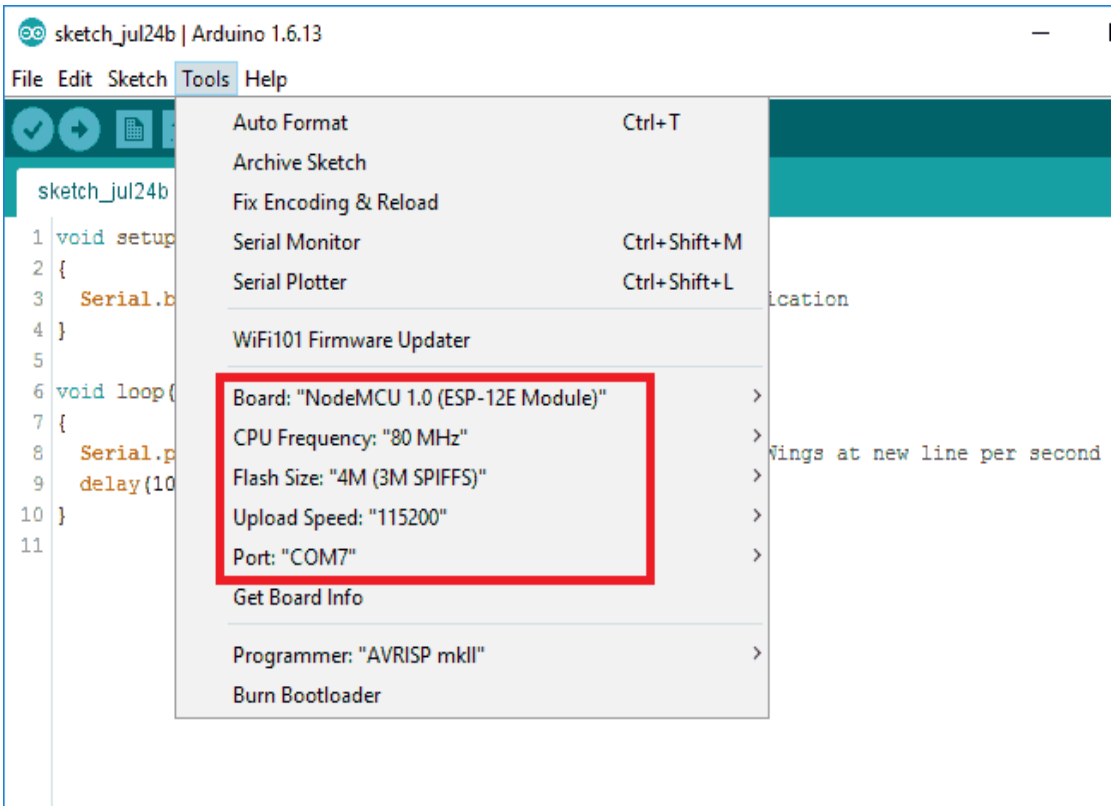

Fig- 2.1: Program Installation Process

2.3 Programming

The development cycle is divided into 4 phases:

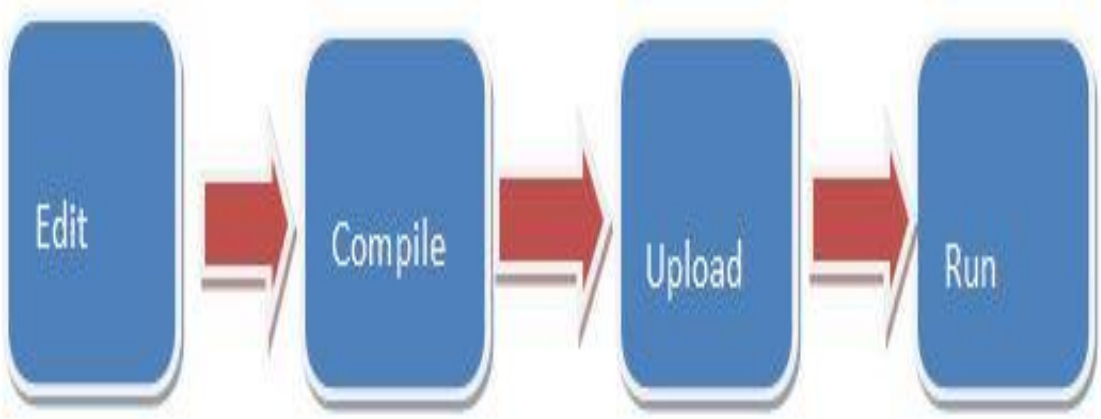

Fig-2.2: Flowchart of the Compiling Process

Compile: Compile means to translate the sketch into machine language, also known as object.
Code Run: Arduino sketch is executed as soon as terminates the step of uploading on the board.

2.4 Arduino Program Development

- Based on C++ without 80% of the instructions.
- A handful of new commands.
- Programs are called 'sketches'.
- Sketches need two functions:
- void setup ( )
- Void loop ( )
- Setup ( ) runs first and once.
- loop ( ) runs over and over, until power is lost or a new sketch is loaded.

2.5 Android Apps

Blynk software is primarily operated over the Internet. This software has a dedicated server for sending data. This software needs to be registered on the specified server, then login to the software with username and password. Data is sent to the server through the Internet head of the controller, the server software sends the data, which we can monitor from anywhere.

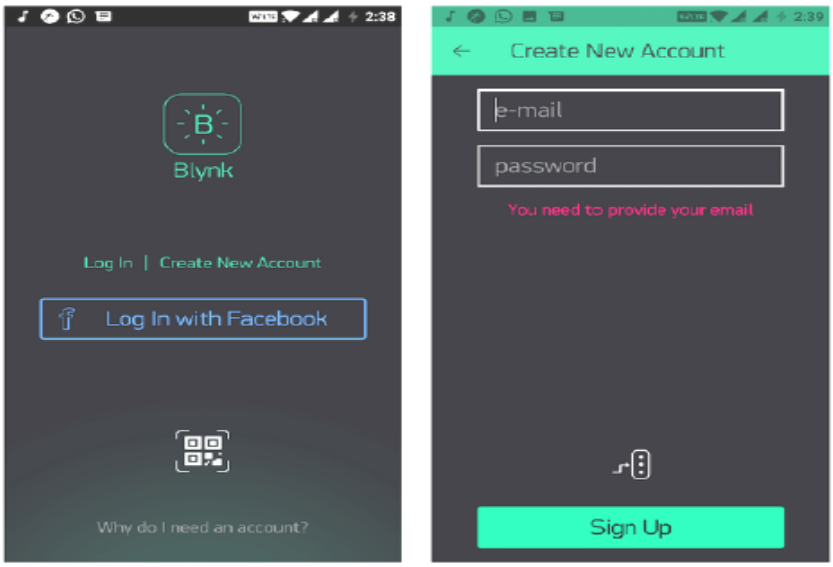

Fig-2.3: Blynk Android Webapps

2.6 Proposed Project in Proteus 8.9

Proteus 8 is the best simulation software for various designs with microcontrollers. It is popular mainly because it contains almost all microcontrollers. So it is a handy tool for electronics enthusiasts to test programs and embedded designs. You can simulate your microcontroller programming in Proteus 8 simulation software. After simulating your circuit in Proteus 8 software you can directly create the PCB design with it so that it can be an all in one package for students and hobbyists. So I think now you have a little idea about what Proteus software is.

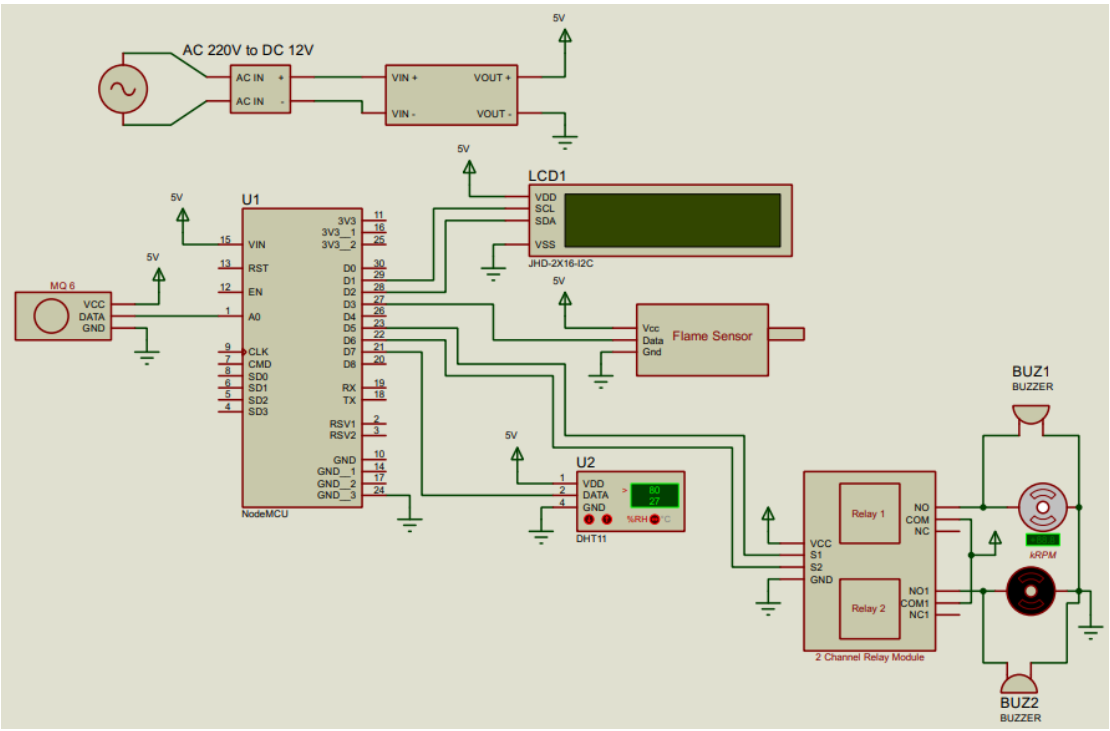

Fig-2.4: User Interface of Proteus 8.9

2.7 Literature Survey

Abhijirathi et al (2013); Introduced a Golem based on the Automatic Gas Detection and Indication Golem. Their schematics show a mini mobile golem capable of monitoring gas leaks in unsafe locations. Golem instantly scans whenever a gas leak occurs at a specific location and sends the information to the Golem Mobile via wireless communication like Bluetooth.We have a tendency to develop a golem app for the golem primarily based on good phones that can receive knowledge directly from the golem via bluetooth. The app alerts with a sign whenever a gas leak occurs and we can even control the Golem movement via Bluetooth with text commands exploiting it as a voice command.Previous mobile robots have supported heterogeneous technologies such as GSM, GPS, Net based etc., but the most disadvantage of this prototype was the absence of communication especially in the area. So, with the rapid development and tremendous changes in technology we have enough strategies to eradicate the earlier problems.Wireless communication protocols play an important role in gift trends. Bluetooth, Wi-Fi, Zigbee, etc., we tend to use one of the simplest features of good phones, i.e., Bluetooth technology to control and monitor parameters driven by a golem.

In SlideShare Document (2014); They have already introduced a Golem and mobile application, the system image has impressively proven its usability and capabilities in an intensive series of tests. The drive unit, navigation system and, therefore, complementary detector systems performed excellently throughout the test. Moreover, it helps avoid the practice of human inspectors in all potentially hazardous environments.However, before activity in industrial settings, many developments are required (eg, explosion protection, package development, etc.), and if truth be told, legal issues should be processed before activity in business settings. Nevertheless, it is certain that AN autonomous, mobile gas detection and leak localization golem is feasible these days and can significantly increase safety.

Manichandana Simrah et.al (2019); in this paper they told about their research on leakage detection and analysis of leakage point in the gas pipeline system. In this paper they gave various model which used SCADA I/F Model: The SCADA system has the function of transferring the acquired data from a pipeline system to Transient Simulation Model every 30 seconds.

Pal-Stefan et.al (2008); Several old and new technologies have been introduced to detect gas. Techniques suggested in it are nontechnical, acoustic method, optical method and active method. The study says a wide range of techniques are available for gas detection. However, each application has some limitations.

Transient Simulation Model: Transient flow is simulated using exact numerical methods based on actual data. Pressure and temperature serve as independent variables to obtain mean pressure and mean temperature.

Rahul Nalawade et al., (2018); In this paper ARM7 is primarily a machine-driven high-performance system used for LPG refill booking and outpouring detection. It reduces resistance to outpouring. The microcontroller sends a message "Emergency Alert: LPG gas outpouring detected in your home via GSM module to the required cell numbers and hence displayed on the digital display. This technique detects the outpouring of LPG. Alerts patrons concerned about leaks via SMS and the system can turn off the capabilityofferedr as an emergency live, where the alarm is activated.

Scribed document (2013) mentions how LPG gas is important, although LPG is an important choice for every social unit, its leakage can lead to a disaster. Monitor square meter variety product leaks to warn of LPG leaks and prevent any miss there. Here we have developed Associate Degree Arduino based LPG Gas Detector Alarm.If there is a gas leak, this technique detects it and generates an alert by a buzzer connected to the market with the associated degree circuit. This technique is easy to build and the World Health Organization has some physics and programming data to build it .

2.8 Time Plan

The following tables define the main tasks in the project introduction and project itself.

T1	Project Definition	1 Week
T2	Collecting data	11 Weeks
T3	Analysis	7 Weeks
T4	Theoretical calculation	4 Weeks
T5	Documentation	10 Weeks
T6	Prepare for presentation	2 Weeks

Table- 01: Time Scheduled Table for Project Introduction

The time of the project introduction is scheduled over 16 weeks, table 2 shows how the work was scheduled over this time:

Week / Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T1																
T2																
T3																
T4																
T5																
T6																

Table-02: Time Plan Table for Project Introduction

The following table defines the main tasks in the project:

T1	Collecting data	3 Week
T2	Implementation	10 Weeks
T3	Analysis	5 Weeks
T4	Building and testing the system	8 Weeks
T5	Documentation	10 Weeks
T6	Prepare for presentation	2 Weeks

Table-03: Time Scheduled Table for Project

The time of the project is scheduled over 16 weeks, table 4 shows how the work was scheduled over this time:

Week / Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T1	■	■	■													
T2			■	■	■	■	■	■	■	■	■	■				
T3				■	■	■	■	■								
T4							■	■	■	■	■	■	■	■		
T5					■	■	■	■	■	■	■	■	■	■		
T6															■	■

Table-04: Time Plan Table for Project

Chapter 3: Hardware Implementation

3.1 Introduction

The latest trend is the development of smart homes all over the world. Home automation has become very affordable and lots of people, industries have started automating daily routines like lighting, fans, temperature setting etc. A gas and fire detector can be a device that often detects the presence of gas in the surroundings. As part of a security system.This factor results in the need to install gas detection systems in such accident-prone locations for continuous monitoring of any gas leaks that cannot be detected by human senses. The proposed system will continuously monitor the environment for any leakage. Just in case of any leakage detection, it will alert the user through a market and using internet module and an android application;It will alert the user about environmental conditions like gas level and temperature of that installation location through apps notification In this proposed system we have used Node MCU development board, flame sensor and DHT11 temperature and humidity sensor. In this project the system is completely powered by the power supply.The main goal of IoT based LPG gas leakage detector and monitoring system. The above block diagram includes LCD display, MQ-6 sensor, flame sensor, buzzer, DHT11 sensor and Node MCU. We have used Node MCU microcontroller as a programming device.

3.2 Block Diagram of This Project

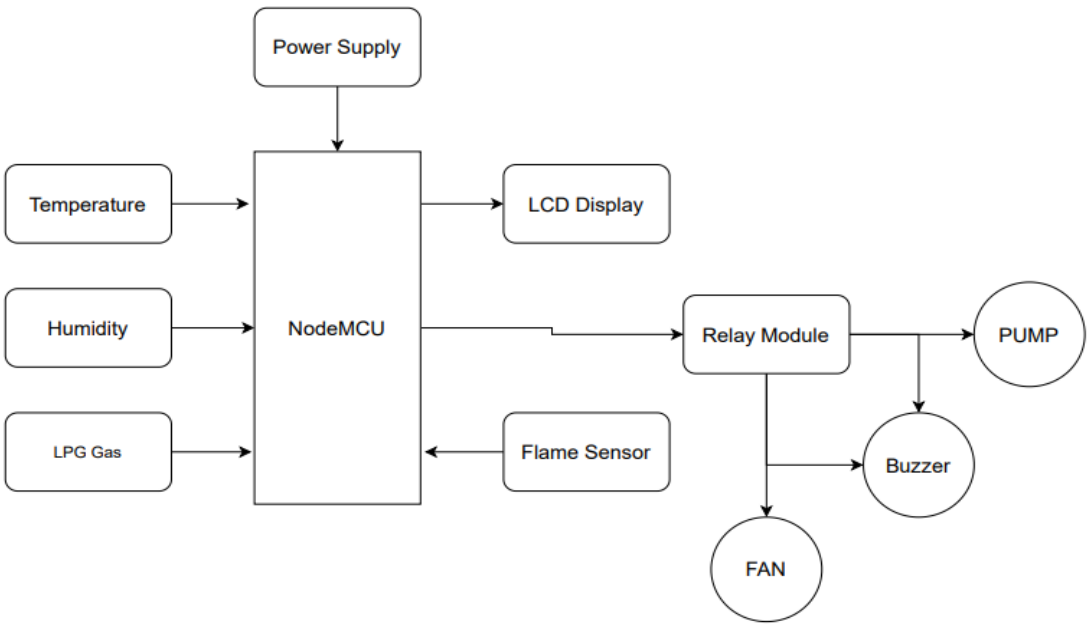

Fig-3.1: Block Diagram

3.3 Circuit Diagram of This Project

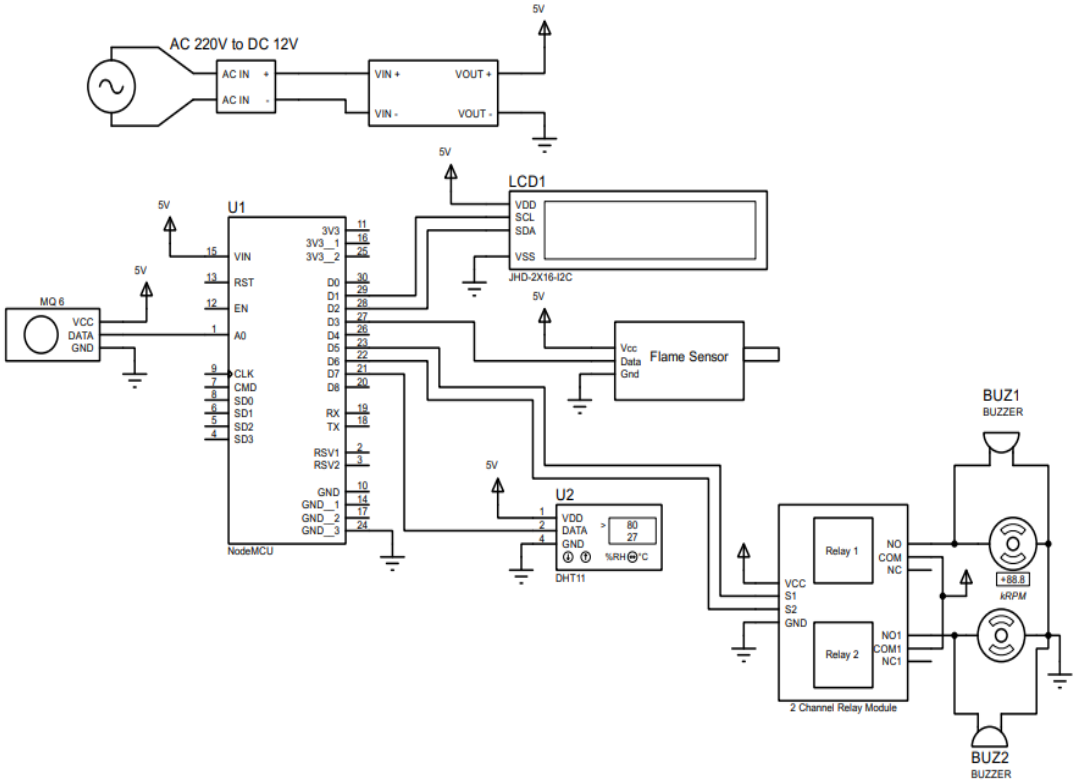

Fig-3.2: Circuit Diagram

3.4 The list of Devices used in the Project is Given Below

- Node MCU.
- Buck Module.
- Adaptor.
- LCD Display.
- DHT-11 Sensor.
- Flame Sensor.
- MQ-6 Sensor.
- Buzzer.
- Pump Motor.
- Relay Module.

3.5 Node MCU

NodeMCU is an open source IoT platform It consists of firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware based on the ESP-12 module. By default the term "NodeMCU" refers to firmware rather than development kits. The firmware uses the Lua scripting language. It is based on the eLua project,

and built on the Espressif Non-OS SDK for the ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.The NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, [citation needed] widely used in IoT applications (see related projects). NodeMCU started on 13 October 2014, when Hong committed the first modem-firmware file to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang committed another ESP8266 board gerber file, called devkit v0.9.

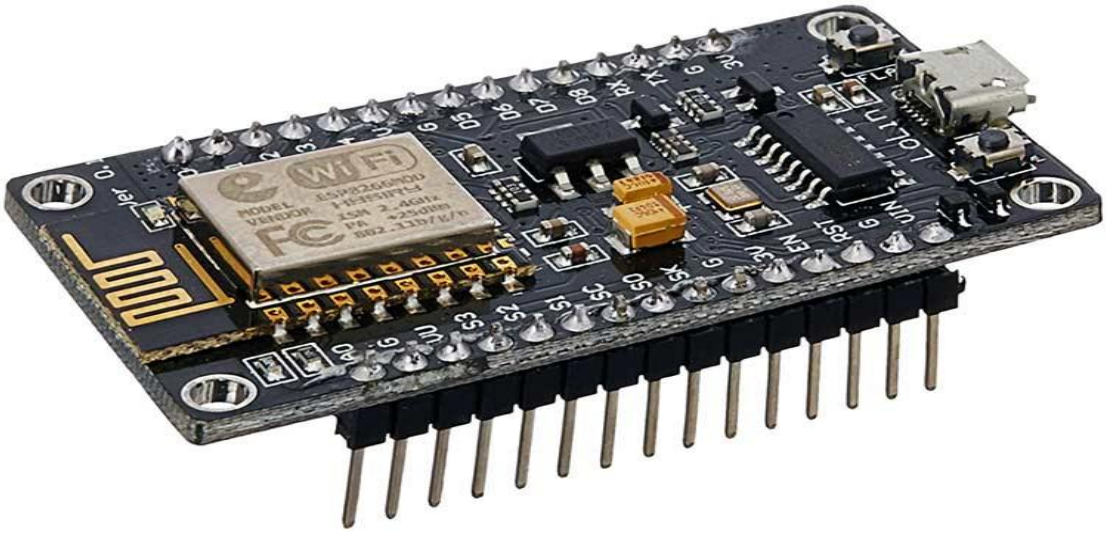

Fig-3.3: Node MCU

3.5.1 Technical Specifications

♣ Power input: 4.5V ~ 9V (10VMAX), USB-powered
♣ Transfer rate: 110-460800bps
♣ Support UART / GPIO data communication interface
♣ Support Smart Link Smart Networking
♣ Working temperature: -40°C ~ + 125°C
♣ Drive Type: Dual High-Power H-Bridge
♣ No need to download resetting
♣ A great set of tools for ESP8266 development
♣ Flash Size: 4MByte
♣ Lowest cost WI-FI

3.6 Buck Module

The LM2596 series regulator is a unique integrated circuit that provides all the active functions for a step-down (buck) switching regulator, capable of driving a 3-A load

with excellent line and load regulation. These devices are available in specific output voltages. 3.3 V, 5 V, 12 V, and an adjustable output version. Requiring a minimal number of external components, these controllers are easy to use and include internal frequency compensation and a fixed frequency oscillator.The LM2596 series operates at a switching frequency of 150 kHz, thus allowing smaller filter elements than would be required with lower frequency switching regulators. Available in a standard 7-pin TO-220 package with various lead twist options and a 7-pin TO-263 surface mount package.

Fig-3.4: LM2596 Voltage Converter

3.7 Adapter

12V 5A Micro Power Adpater. For using with Arduibo /Raspberry Pi 3 Model A+/B/B+/Zero and running any other high current devices.

3.7.1 Specifications

- Input: 100V - 240V AC, 50Hz/60Hz.
- Output: 12V 5A.

Fig-3.5: Adapter

3.8 LCD Display

A liquid crystal display (LCD) is a flat display that uses the light modulating properties of liquid displays. They are common in consumer devices such as video players, gaming devices, watches, telephones, computers, calculators, etc.

A (20×4) LCD panel consists of 20 columns and 4 rows.It can show upto 16 characters in 2 lines.

You may want to have a look on these similar products:

1. LCD Display (20×4) with Header soldered
2. LCD display module (20×4)
3. LCD display module advanced (20×4)
4. 3 wire LCD module (20×4)
5. I2C LCD Display (20×4)
6. Arduino LCD keypad shield
7. LCD Display (20×4)

Pin	Function
VSS	connected to ground
VDD	connected to a +5V power supply
VO	to adjust the contrast
RS	A register select pin that controls where in the LCD's memory you are writing data to. You can select either the data register, which holds what goes on the screen, or an instruction register, which is where the LCD's controller looks for instructions on what to do next.
R/W	A Read/Write pin to select between reading and writing mode
E	An enabling pin that reads the information when High level (1) is received. The instructions are run when the signal changes from High level to Low level.
D0-D7	to read and write data
A	Pins that control the LCD backlight. Connect A to 3.3v.
K	Pins that control the LCD backlight. Connect K to GND.

Table 05: LCD Display Outline

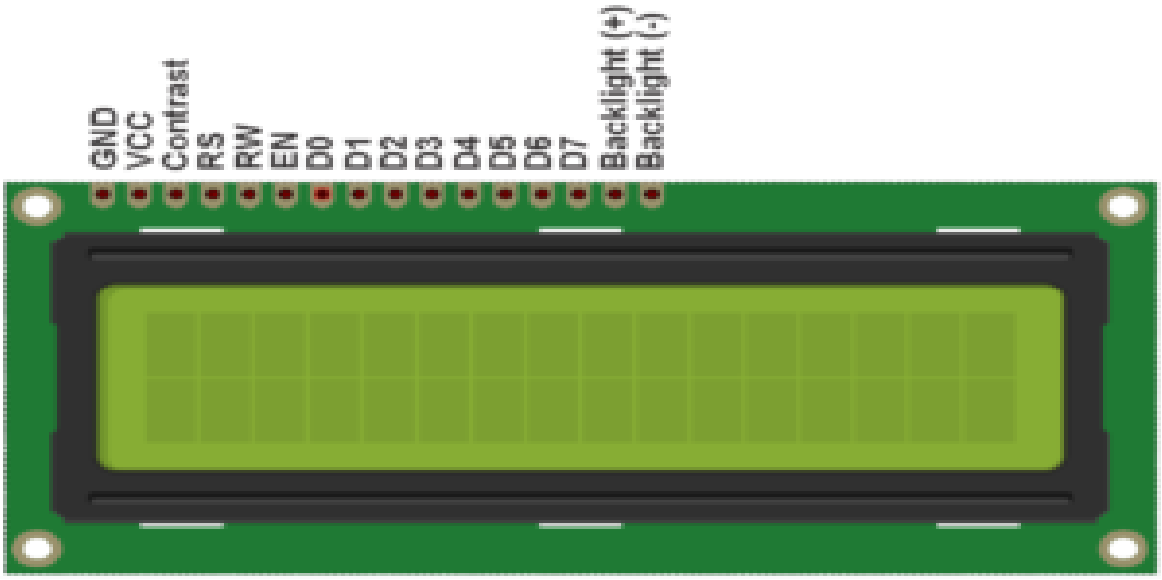

Fig-3.6: LCD Display

3.9 DHT-11 Sensor

The DHT11 humidity and temperature sensor module is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the ambient air and outputs a digital signal on the data pin (no analog input pin needed). It's very easy to use, and libraries and sample code are available for the controller.This DHT11 humidity and temperature sensor module is easy to connect to the microcontroller as it includes the pull-up resistors required to use the sensor. Only three connections need to be made to use the sensor - Vcc, Gnd, and Output. We have also included the requirement to connect the DHT11 to a microcontroller.

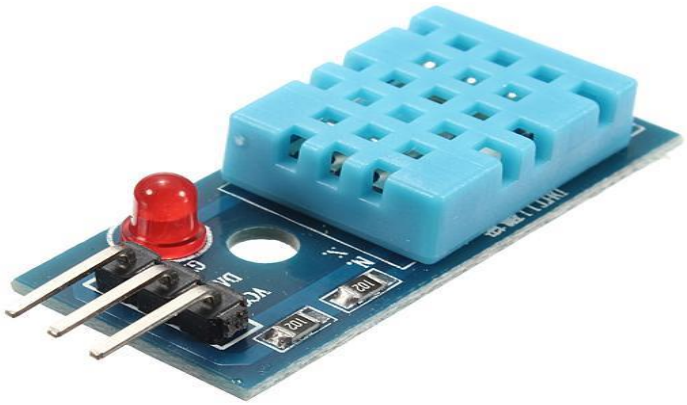

Fig-3.7: DHT-11 Sensor

3.9.1 Technical Specifications

- Input Supply Voltage (VDC): 3.3 ~ 5.
- Supply Current (mA): measurement 0.3mA standby 60μA.
- Temperature measurement range: 0~50 degrees.
- Temperature measurement error: ±2 degrees.
- Humidity measurement range: 20%~95%RH.
- Humidity measurement error: ±5%RH.

3.10 Flame Sensor

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. The response to a detected flame depends on the installation but may include sounding an alarm, disabling a fuel line (such as a propane or natural gas line), and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to ensure that the furnace is operating properly; It can be used to shut down the ignition system although in many cases they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector because it is used to detect flames.

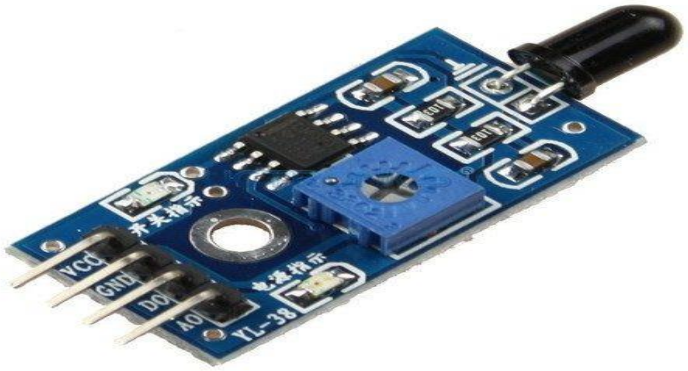

Fig-3.8: Flame Sensor

3.10.1 Technical Specifications

♣ Output Channels: 1
♣ Power supply: 3.3/5V
♣ Built in a potentiometer for sensitivity control.
♣ Onboard signal output indication, the output effective signal is high, at the same time the indicator lights, the output signal can directly connect to the microcontroller IO.
♣ The detection angle is about 60 degrees, the flame spectrum is particularly sensitive.
♣ The most sensitive sensor is flame, constant light is also a response, usually used for fire alarm purposes.

3.11 MQ-6 Sensor

The MQ-6 Liquefied Petroleum Isobutane Propane Gas Sensor Module is a great way to add basic gas sensing to your project at a reasonable price. TheMQ-5 Methane LPG Liquid Propane Gas Sensor Module Particulate Sensor uses a buzzer to sense any detected particles that are even present in the air!
This is an easy-to-use MQ-6 liquefied petroleum isobutane propane gas sensor module, suitable for sensing LPG (consisting mostly of propane and butane) in air.The MQ-6 can detect gas concentrations from 200 to 10000ppm. The MQ-6 Liquefied Petroleum Isobutane Propane Gas Sensor Module Particulate Sensor uses a potentiometer to change the detection range of the sensor!

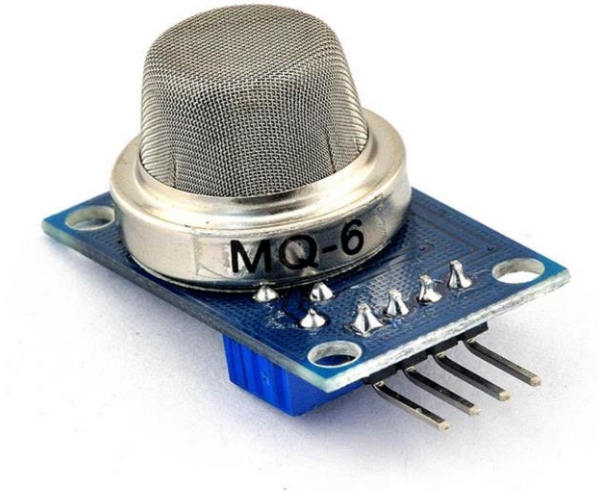

Fig-3.9: MQ-6 Sensor

3.11.1 Technical Specifications

- Model: MQ-6
- Operating Voltage: 5V DC
- Detecting Range:200-10000 ppm
- Relative Humidity:<95% RH

3.12 Buzzer

This 5v active buzzer produces a continuous beep/tone when powered by a DC source. This type of buzzer requires only ON/OFF type input.

Fig-3.10: Buzzer

3.13 Pump Motor

DC 5V Pump Mini water pump For Fountain Garden Mini water circulation System.

3.13.1 Specifications

- DC Voltage:2.5-6V.
- Maximum lift:40-110cm / 15.75"-43.4".
- Flow rate:80-120L/H.
- Outside diameter of water outlet: 7.45mm / 0.3" (our 7mm inner diameter tube is ok for this pump).
- Inside diameter of water outlet: 4.7mm / 0.18".
- Diameter: Approx. 24mm / 0.95".
- Length: Approx. 45mm / 1.8".
- Height: Approx. 33mm / 1.30".
- Material: Engineering plastic.
- Driving mode: brushless dc design, magnetic driving.

Fig-3.11: Pump Motor

3.14 Relay Module

A relay is an electrically operated device. It consists of a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output contactor). It is often used in automatic control circuits.Simply put, it is an automatic switch that controls a high-current circuit with a low-current signal.The advantages of a relay lie in its operability, stability, long-term reliability and low inertia in small volume. It is widely adopted in power protection, automation technology, sports, remote control, reconnaissance and communication devices as well as electro mechanics and power electronics devices.Generally speaking, a relay has an induction part that can reflect input variables such as current, voltage, power, resistance, frequency, temperature, pressure, speed and light etc. It has an actuator module (output) that can energize or de-energize. Connection of regulated circuit.Between the input section and the output section there is an intermediary

section which is used to connect and disconnect the input current as well as activate the output. When the rated value of the input (voltage, current and temperature etc.) is above the critical value, the relay controlled output circuit will be energized or de-energized.
NB: : A relay input can be divided into two categories: electrical quantities (including current, voltage, frequency, power, etc.) and non-electrical quantities (including temperature, pressure, speed, etc.)

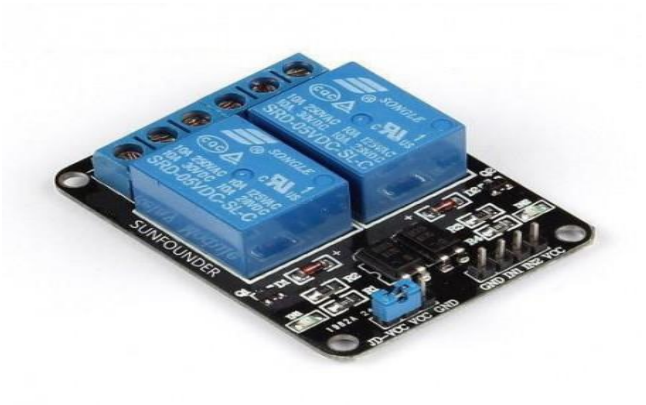

Fig-3.12: Relay Module

3.14.1 Features

The features of 1-Channel Relay module are as follow:

♣ Security is good. In power systems and high voltage systems, lower currents can control higher ones.
♣ 1-channel high voltage system output, meeting single channel control needs.
♣ Wide range of controllable voltages.
♣ Being able to control high load current, which can reach 240V, 10A
♣ With one normally open (NO) contact and one normally closed (NC) contact

3.14.2 Interface Specifications

The output contacts of a relay (including NO, NC, and the common port) works as a SPDT – Single Pole Double Throw switch. Its operating principle is as follow: VCC-----5V,

GND----for ground

IN1 connects to the control valve which output 3V-5V

Output contacts: connect to applications
Interface Connecting and Setting:

Arduino board (any versions), wires, LED, 5v power supply. Software resource:

Arduino IDE the one-channel relay can be programmed to realize the open and close automatically. NB: customers can use any software or firmware to control the module as long as the IN1 of which can input a voltage of 3V-5V.

you can do further development with the development tool you like as well as test it in the way of testing firmware. Firmware test: after the connection as in picture1-4, pay attention to the blink of LED, listen to the flicker of relay when it is working.

Software test code:

```
 void setup () {
  pin Mode (7, OUTPUT);
  }
  void loop () {
 pin Mode (7, OUTPUT);
 delay (2000);
 digital Write (7, LOW);
 delay (2000);
 }
```

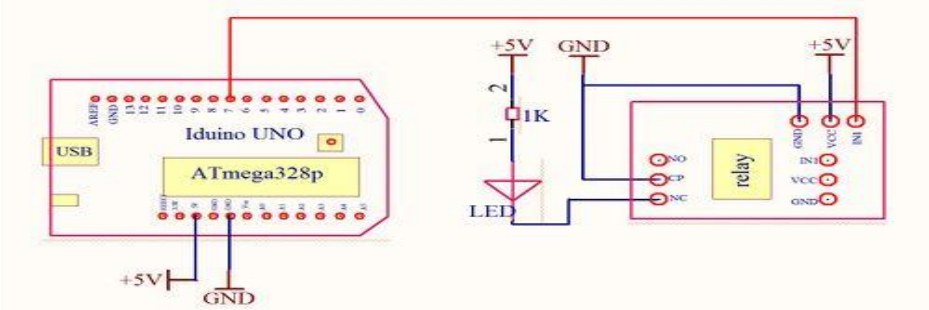

Fig-3.13: Sematic of Relay Module

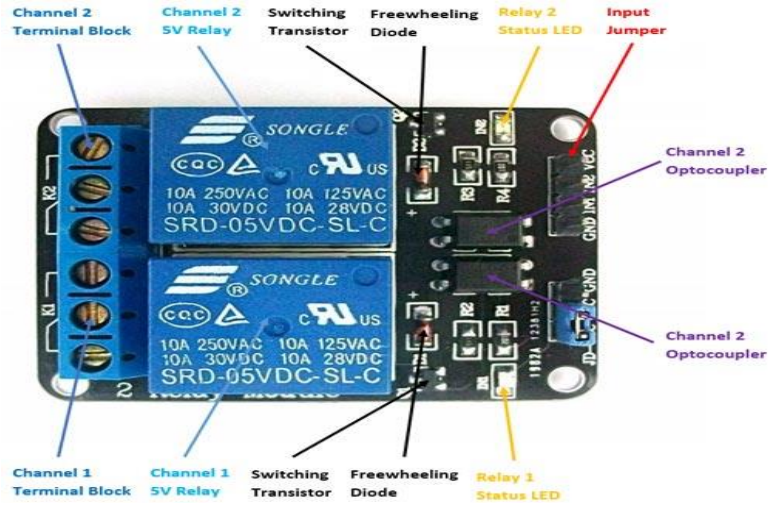

Fig-3.14: Pin out of Relay Module

Chapter 4: Experimental Results

4.1 Introduction

Gas leakage and fire is a foremost trouble in every man or woman life. If the leakage is now not detected at formerly stage it might also lead to many consequences like human loss, property loss etc. To avoid these losses every person need to note the leakage priory .Our assignment is to enforce protection device for detecting LPG Gas leakage and Fire. When there is a leakage we can realize it by using sensors and Sounds Buzzer, showing LCD display, sends an alert message to lawful candidate/family individuals and, if the leakage Intensity Increases then it sends the alert with Buzzer sound and exhibiting LCD show for rescue.Besides, we will be able to monitor the temperature and humidity through display and internet .We have worked to improve the network system in this place.In this place we have created a system that can be monitored from anywhere. If these fire and gases exceed the normal level then an alarm is generated immediately and also an alert notification (software) is sent to the authorized person through the Internet and used Node MCU Microcontroller development board. As soon as the fire starts, the water pea will start and the fan will start as soon as the gas leakage occurs.

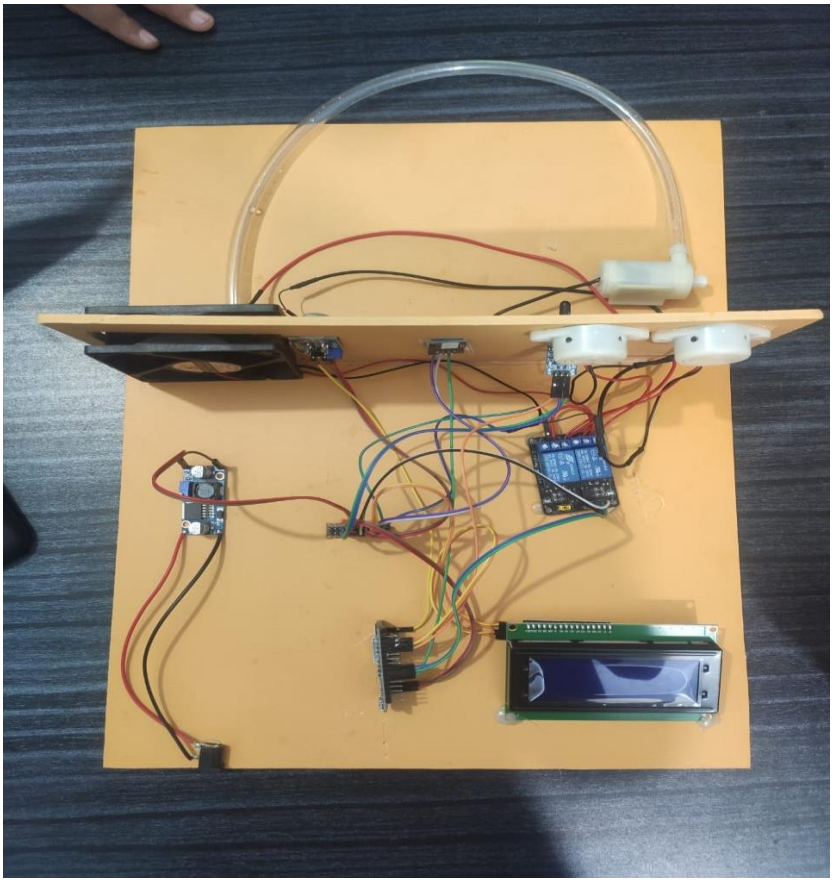

Fig-4.1: Project Picture

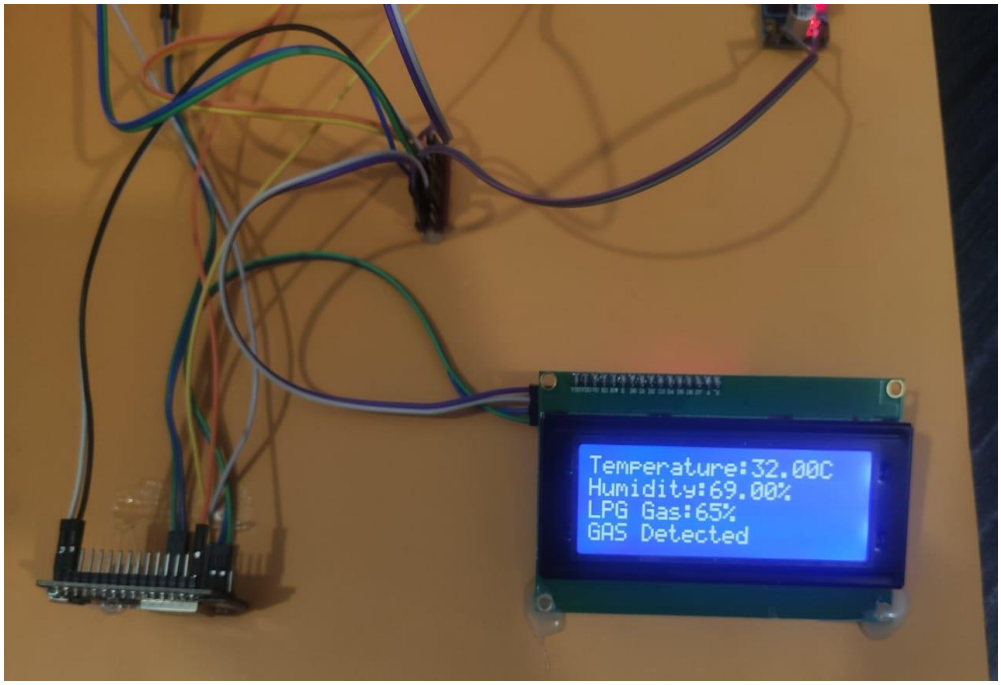

Fig-4.2: LCD Display Monitoring System

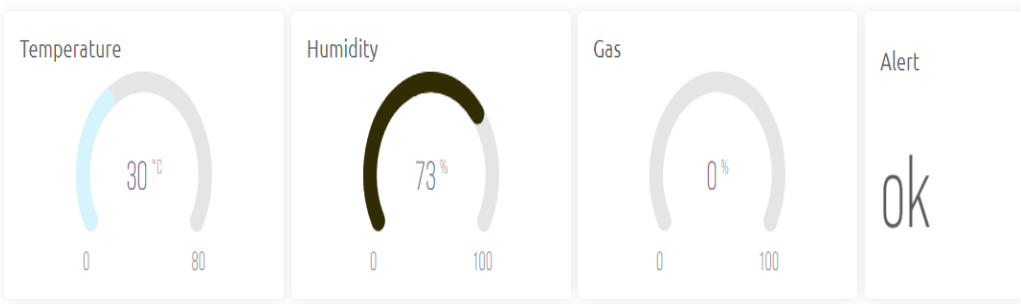

Fig-4.3: Apps Monitoring System

Chapter 5: Conclusion

5.1 Discussion

Ability to alert stakeholders about LPG gas leakages and fires with the ability to quickly detect and resolve issues. Future aspects of this detector include Wi-Fi module and a tripper circuit that increases system performance and provides more security to users. This detector has been successfully implemented and is easy to use and also a low cost product. The IoT system of this device ensures better safety in case of gas leak and fire.

5.2 Advantage

- Low cost.
- Does no harm to the environment.
- Can be placed anywhere.
- Ability to quickly identify and resolve problems.
- There is no cost after the initial costs.
- The specialist team is not required for deployment.
- The data group we receive will be monitored from anywhere and can be viewed at the project site.

5.3 Application

- Smart Home Automation.
- Industry.
- Corporate office.

5.4 Future Scope

- An SMS can be sent to authority notifying them with the temperature/humidity/LPG gas leakage parameters.
- This will allow the use of advanced sensors.

5.5 Conclusion

The project is considered a success, even at this stage there is no fabrication. The above problem statements will be solved, the implementation phase is pending to finish the work economically and this project will be successful because the materials used are not expensive.

References:

[1] Vaishnavi et.al (2014) "Intelligent LPG Leakage Detection", International Journal Of Scientific & Engineering Research, Vol. 5, Issue 11, 2014.

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[3] https://Www.Slideshare.Net/Abhijeetrathi/LpgDetection-Mechatronic-System

[4] https://Www.Scribd.Com/Document/436529826/Detection-Of-Lpg-Leakage-Using-Arduino-Pdf

[5] http://Www.Aut.Upt.Ro/~Palstefan.Murvay/Papers/Survey_Gas_Leak_Detection_Localization_Techniques.

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[7] Rahul Nalawade et.al (2018) "Iot Based Gas Leakage Detection and Alert Generation", International Journal of Future Revolution in computer science & communication engineering ISSN: 2454-4248, 2018, volume-4, Issue-5, 175-176.

[8] Vasudev Yadav, et.al. (2016), “A Review On Microcontroller Based Lpg Gas Leakage Detection & Controlling System Using Iot & Gsm Module” , IEEE 2nd International Conference On Electronics Technology (ICET), Published 2016, Corpus ID: 209328541.

[9] https://Www.Scribd.Com/Document/404213286/Microcontroller-Based-LPG-Leakage-Detect-1-Docx.

[10] “LPG Gas Weight and Leakage Detection System Using GSM” by Mr.Sameer Jagtap , Prajkta Bhosale, Priyanka Zanzane , Jyoti Ghogare in International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 4 Issue III, March 2016.

Appendix:

Program for Node MCU:

```
#define BLYNK_PRINT Serial

/* Fill-in your Template ID (only if using Blynk.Cloud) */
#define BLYNK_TEMPLATE_ID "TMPLY1H5qp3U"
#define BLYNK_DEVICE_NAME "LPG Gas and Fire Monitoring"
// #define BLYNK_AUTH_TOKEN "80KFghJBMM8h0RlZ7oWV6b_ayKwVCZA-"


#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include "DHT.h"
#include <LiquidCrystal_I2C.h>
#include <Servo.h>

LiquidCrystal_I2C lcd(0x27, 20, 4);

Servo myservo;
int pos = 0;


#define DHTPIN D7      // what digital pin we're connected to
#define DHTTYPE DHT11  // DHT 11
```

```
DHT dht(DHTPIN, DHTTYPE);

// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon).
char auth[] = "80KFghJBMM8h0RlZ7oWV6b_ayKwVCZA-";

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "student";
char pass[] = "iotstudent";

// int buzzer = D5;

int gas = A0;
int gasdata;

int fire = D3;
int firedata;

int gasalert = D6;
int firealert = D5;

void setup() {
  // Debug console
  Serial.begin(9600);
  // pinMode(buzzer, OUTPUT);
  pinMode(gas, INPUT);
  pinMode(firealert, OUTPUT);
  pinMode(gasalert, OUTPUT);

  digitalWrite(gasalert, HIGH);
  digitalWrite(firealert, HIGH);

  myservo.attach(D4);
  myservo.write(0);
  lcd.init();
  lcd.backlight();

  dht.begin();

  Blynk.begin(ssid, pass);

}
```

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

  float h = dht.readHumidity();
  float t = dht.readTemperature();
  firedata = digitalRead(fire);
  gasdata = analogRead(gas);



  //  Serial.println(t);
  //  Serial.println(h);

  delay(1000);
  lcd.clear();

  lcd.setCursor(0, 0);
  lcd.print("Temperature:");
  //  lcd.setCursor(6, 1);
  lcd.print(t);
  lcd.print("C");

  lcd.setCursor(0, 1);
  lcd.print("Humidity:");
  //  lcd.setCursor(6, 3);
  lcd.print(h);
  lcd.print("%");

  lcd.setCursor(0, 2);
  lcd.print("LPG Gas:");
  //  lcd.setCursor(6, 3);
  lcd.print(gasdata);
  lcd.print("%");

  if (firedata == 0) {

    digitalWrite(firealert, LOW);
    lcd.setCursor(0, 3);
    lcd.print("Fire Detected");
    Blynk.virtualWrite(V3, "Fire Detected");
    for (pos = 0; pos <= 180; pos += 1) {  // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
```

```
   myservo.write(pos);  // tell servo to go to position in variable 'pos'        // waits
15ms for the servo to reach the position
    }
    for (pos = 180; pos >= 0; pos -= 1) {  // goes from 180 degrees to 0 degrees
      myservo.write(pos);                 // tell servo to go to position in variable 'pos'
// waits 15ms for the servo to reach the position
    }

    for (pos = 0; pos <= 180; pos += 1) {  // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
      myservo.write(pos);  // tell servo to go to position in variable 'pos'       // waits
15ms for the servo to reach the position
    }
    for (pos = 180; pos >= 0; pos -= 1) {  // goes from 180 degrees to 0 degrees
      myservo.write(pos);                 // tell servo to go to position in variable 'pos'
// waits 15ms for the servo to reach the position
    }

    for (pos = 0; pos <= 180; pos += 1) {  // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
      myservo.write(pos);  // tell servo to go to position in variable 'pos'          // waits
15ms for the servo to reach the position
    }
    for (pos = 180; pos >= 0; pos -= 1) {  // goes from 180 degrees to 0 degrees
      myservo.write(pos);                 // tell servo to go to position in variable 'pos'
// waits 15ms for the servo to reach the position
    }



    digitalWrite(firealert, HIGH);  // digitalWrite(buzzer, HIGH);
      // delay(2000);
  }

if (firedata == 1) {
    Blynk.virtualWrite(V4, 0);
    Blynk.virtualWrite(V3, "ok");
  }


  if (gasdata >= 30) {

    lcd.print("GAS Detected");
    Blynk.virtualWrite(V3, "GAS Detected");
```

```
  }

  if (gasdata <= 29) {

    digitalWrite(gasalert, HIGH);
    Blynk.virtualWrite(V3, "ok");
  }
}
```