POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

GAS LEAK DETECTOR WITH AUTOMATIC AIR EXHAUST AND NOTIFICATION VIA TELEGRAM

NAME: HARIVARASHAN A/L SURESH

REGISTRATION NO : 08DEP20F2028

JABATAN KEJURUTERAAN ELEKTRIK

SESSION 2 2021/2022

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This report submitted to the Electrical Engineering Department in fulfillment of the requirement for a Diploma in Electrical Engineering

JABATAN KEJURUTERAAN ELEKTRIK
SESSION 2 2021/2022

CONFIRMATION OF THE PROJECT

The project report titled " GAS LEAK DETECTOR WITH AUTOMATIC AIR EXHAUST AND NOTIFICATION VIA TELEGRAM " has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

Checked by:

Supervisor’s name :

Supervisor’s signature:

Date :

Verified by:

Project Coordinator name :

Signature of Coordinator :

Date :

“I acknowledge this work is my own work except the excerpts I have already explained to our source”

1. Signature : 

Name : HARIVARASHAN A/L SURESH

Registration Number : 08DEP20F2028

Date : 16.12.2022

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : **GAS LEAK DETECTOR WITH AUTOMATIC AIR EXHAUST AND NOTIFICATION VIA TELEGRAM**

SESSION: DECEMBER 2022

1. **I Harivarashan A/L Suresh**

   is a final year student of **Diploma in Electrical Engineering, Department of Electrical, Politeknik Sultan Salahuddin Abdul Aziz Shah**, which is located at **Persiaran Usahawan,40140 Shah Alam Selangor Darul Ehsan**. (Hereinafter referred to as 'the Polytechnic').

2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.

3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;
a) **Harivarashan A/L Suresh** .
(Identification card No: - 021028140973) ……

In front of me,. .....……
As a project supervisor, on the date:

ACKNOWLEDGEMENTS

I have taken efforts in this Project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them. I am highly indebted to (Name of your Organization Guide) for their guidance and constant supervision as well as for providing necessary information regarding the Project & also for their support in completing the Project.

I would like to express my gratitude towards my parents & member of (Organization Name) for their kind co-operation and encouragement which help me in completion of this Project. I would like to express my special gratitude and thanks to industry persons for giving me such attention and time.

My thanks and appreciations also go to my colleague in developing the Project and people who have willingly helped me out with their abilities.

ABSTRACT

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 business premises. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations. A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. Gas Detector where it can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to fix or leave.

This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals. Containment into any area where the gas should not be present must be avoided. Because a small leak may gradually build up an explosive concentration of gas, leaks are very dangerous. Nowadays, existing gas detector is less effective in usage because the user can only detect the gas leakage when they test by using gas detector. It is dangerous since gas leakage must be identified from early of the leak. That is why the Gas Leakage Detector with Notifier System was invented to avoid the fire or explosion occur in the houses or premises. This kind of gas detector will detect the gas continuously as long as there is power supply.

This project used Microcontroller Arduino UNO at the processor where it process the input from the sensor and to GSM module to communicate with the user by sending an alert through SMS. The buzzer will ring until its dangerous concentration of gas is achieved. The benefit of these projects is to prevent the earlier stage of fire because of unattended cooking without a human supervision, could prevent the explosion because of gas leakage.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

The usage of gas brings great problems in the domestic as well as working places. This inflammable gas such as Liquidized petroleum gas (LPG), is excessively used in the house and at workplaces. The leakage of the gas causes destructible impact on the lives and as well as to the heritage of the people LPG is the terminology for Liquefied Petroleum Gas.

The gas is made up of hydrocarbon gases comprising of Propane and Butane. LPG is prepared by refining petroleum or "wet" natural gas, and is almost entirely derived from fossil fuel sources, being manufactured during the refining of petroleum (crude oil), or extracted from petroleum or natural gas streams as they emerge from the ground. As it is a gas, it does not pose ground or water pollution hazards, but it can cause air pollution. As its boiling point is below room temperature, LPG will evaporate quickly at normal temperatures and pressures and is usually supplied in pressurized steel vessels.

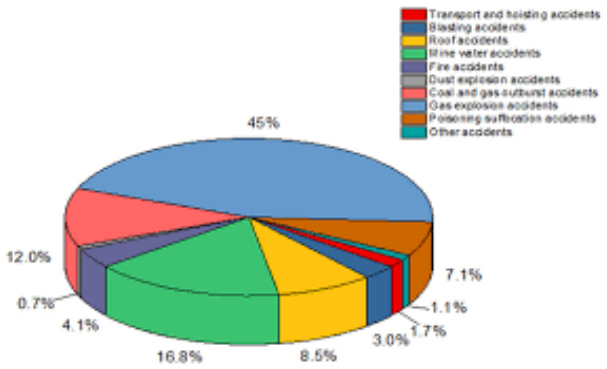

Figure 1.1 Gas leak accidents statistics in Malaysia year 2019

LPG is also colorless and odorless. However, for safety reasons, an odorant is added to LPG for easy detection of any gas leakage. LPG is heavier than air, unlike natural gas, and thus will flow along floors and tend to settle in low spots, such as basements. There are two main dangers from this. The first is a possible explosion if the mixture of LPG and air is within the explosive limits and there is an ignition source.

The second is suffocation due to LPG displacing air, causing a decrease in oxygen concentration. Lately, gas leakage problem is highly become current issues that be the main causes of fire burning. This project is produced to detect any leakage of cooking gas and it will alert the user about leakage. User will get the alert in SMS. By using this project it will reduce the accident of fire and explosion. It also helps the early detection of gas before the concentration of gas reaches the dangerous level.

1.2 Background Research

The usage of the gas brings great problems in the domestic as well as working places. The inflammable gas such as Liquidized petroleum gas (LPG), which is excessively used in the house and at work places. The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. So, by keeping it in the concept of the project we have determined to develop an examining system which finds the leak of LPG gas and protects the work places by taken correct precaution at correct time.

This system provides the information such as when a gas leakage is noticed, sensors of in the project are used to notice the gas leakage and immediately turns ON the buzzer for the danger indication. Buzzer is a clear indication of gas leakage. By the detection of the hazardous gas the alerting message reached to the person who has control over it from the Arduino. Detection of the gas leakage is important and halting leakage is important equally. The main objective of this project is that it is extremely accurate with a least cost, this project system is best to detect gas leakage and also warn people around by buzzer beep sound and an Message is been send to the responsible person for preparatory safety calculations. (Lloyd, 2013).

1.3 Problem Statement

(LPG) Liquefied Petroleum Gases are established in the whole world. LPG is used for cooking in home or hotel. Some gas-based industries also use LPG. The procedure of installing LPG-based system is very tight but still it could not give 100% guarantee that the LPG-system will not have a leakage. Although humans have great intellectual, they cannot detect the presence of natural gases as fast as sensors. So, the usage of gas sensing system is hugely demanded to give real-time monitoring of gas systems. In some cases, gas leakage is capable of fire that can demolish human property. A large fire scale could also cause serious injury or death. This is because the fire station could have acquired delayed information about the fire break out.

The products that are in the market now function as gas detectors. It is only capable of detecting a gas and triggering an alarm. The real problem is that when the alarm is triggered but if the owner is not at home or nearby, the person does not have any knowledge of the gas leakage happening. Thus, this project will be able to resolve the problem mentioned. This is because this project “GAS LEAK DETECTOR WITH AUTOMATIC AIR EXHAUST AND NOTIFICATION” can sense the presence of LPG and take action. Besides that, it gives information more efficiently as it can send a notification to the user.

Figure 1.2 LPG related accidents in Malaysia from year 2016 to 2022

1.4 Research Objectives

The main objective of this Project is to design a Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram

More specifically the principle objective of this research are:

1.4.1 To design a system that can detect the presence of Liquefied Petroleum Gas
1.4.2 To implement MQ5 gas leak detector in the project
1.4.3 To develop a project that can prevent LPG gas leakage using Air Exhaust fan

1.5 Scope of Research

1.5.1 This Project is focusing homes, factories and restaurants
1.5.2 The emphasis is to alert the user when LPG gas leakage is detected
1.5.3 The main controller is using Arduino Uno Microcontroller

1.6 Project Significance

A preventive measure that can be taken to avoid the danger with gas leakage is to install a gas leakage detector at vulnerable locations. Gas leakage problem has become current issues that be the main causes of fire burning. This project is produced to detect any leakage of cooking gas and it will alert the user about leakage. User will get the alert in Telegram. By using this project, it will reduce accidents of fire and explosion. It also helps the early detection of gas before the gas reaches a dangerous level.

1.7 Chapter Summary

Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram is a design that detects the presence of LPG gas in a area often as part of a safety system. It detects gas leakage continuously. When leakage occurs, it will alert the user about leakage in Telegram. The buzzer will ring to give alert to the people who are there in the house or premises. Then to deal with the situation 2 Air exhaust fans with be switched on to let fresh air in and send the leaking LPG gas away.

CHAPTER 2

2 LITERATURE REVIEW

2.1 Introduction

This chapter will provide a details about the previous research and current project that have been made by using reference sources and guidelines as journals, internet, article writing, blog and scientific studies to get an idea about the project design, conception and any information that related to improve the project. With a differences concept and design, there are other creation and innovation of projects done by the other people. The research that is related to this project also covered in this chapter

2.2 Characteristics of liquified petroleum gas (LPG)

LPG is a mixture of butane and propane. Likewise, each one can come separately or in different percentages of mixture. This means that each liquefied gas has its own unique characteristics depending on how it has been mixed and manufactured. However, they also share many similarities, which we will discuss below.

2.2.1.1 They have no smell or color

Considering that both butane and propane gas share this characteristic, it is expected that LPG will also have it. You won't have to worry about bad smells; however, it is more dangerous as leaks are difficult to detect. That is why a substance with a distinguished odor is usually added.

2.2.1.2 It is dense, but not toxic.

LPG is not toxic to our body. This means that you can inhale it for a long time without suffering any kind of ailment or deterioration. However, it is necessary to emphasize that it can displace oxygen, so it is not recommended to breathe it for a long time. The good news is that it is heavier than air, so it is usually kept in low areas.

2.2.1.3 Cheap and accessible

Apart from having an affordable price, LPG usually has a great performance compared to other fuels. This means that you do not have to pay such high bills or so frequently when acquiring it.

2.2.1.4 Highly flammable

Many types of gases are flammable, and LPG is no exception. This means that if it meets any type of electricity source or fire; it will burn instantly.

LPG - Propane Boiling Point Water boils at 100°C or 212°F, becoming a gas (steam). In contrast, LPG (propane) boils at -42°C or -44°F, becoming gas vapor. LPG stays liquid because it is under pressure in a gas cylinder.

2.2.2 Previous Research

Gas leak detectors measure and indicate the concentration of gases in air with different technologies. To prevent toxic exposure and fire, gas detectors are often battery operated devices used for safety purposes. They are manufactured as portable or stationary (fixed) units and work by signifying high levels of gases through a series of audible or visible indicators, such as alarms, lights or a combination of signals.

While many of the older, standard gas detector units were originally fabricated to detect one gas, modern multifunctional or multi-gas devices can detect several gases at once. Some detectors may be utilized as individual units to monitor small workspace areas, or units can be combined or linked together to create a protection system as detectors measure a specified gas concentration, the sensor response serves as the reference point or scale.

When the sensor's response surpasses a certain pre-set level, an alarm will activate to warn the user. There are various types of detectors available, and the majority serves the same function to monitor and warn of a dangerous gas level

2.3 Existing Gas Detector

2.3.1 Ultrasonic Area Gas Detectors

A gas detector that uses a microphone to listen to the noise from leakages to detect leaks, instead of gas concentrations. It utilizes the acoustic sound generated from gas releases in open well-ventilated areas for determining if a leak exists.
Ultrasonic gas detectors are unaffected by changing wind directions, gas dilution, and the direction of the gas release. The ultrasonic gas leak detector coverage is between 4 and 20 m (13–65 ft) in radius around the detector for gas leaks with a leak rate (mass flow rate) of 0.1 kg/s. The variation of detection coverage is since the detector's alarm trigger level will have to be set different in a high-noise area compared to a low-noise area. In other words, in a high-noise area (e.g., a gas compressor area) the ultrasonic gas leak detector will have a detection radius of 6–8 m (20–26 ft) for 0.1 kg/s gas leaks where it will have 10–12 m (33–39 ft) detection radius at normal plant noise for the same leak rate of 0.1 kg/s. The devices are usually configured to screen out ambient noises that could produce a false alarm by conducting a baseline noise survey for the instrument. The response time to detect a leak is reported to be less than 1 s.

2.3.2 XP-3000 Series Portable Gas Detector

The compact and light weight XP-3000 Series detectors are designed to quickly and accurately display gas concentrations of up to 5 flammable gases. The LCD display, which comes with a backlight feature, displays both a digital as well as an analogue reading for easy and fast reading. The ppm range detectors also poses super-sensitive detection capability to detect the slightest trace of gas leaks. All XP-3000 Series comes with a powerful built-in sampling pump, capable of drawing air samples from up to 30m. Extended battery life also allows usage of up to 30 hours. The primary features of the XP-3000 Series Detectors are:

- Comes with robust, quick-connect sampling hose, probe and dust/moisture trap
- Audible and visual alarms
- Dual Range readings (High and Low) with auto-switching feature

2.4 Existing Gas leak Detector issues

Faulty gas detection instruments can be fatal. There are many factors in the workplace that can cause a gas detector to fail. Here are the issues:

1. Environmental

Dirt, dust and water impact. These physical effects can block gases and vapors from entering the sensor chamber preventing detection of the gases. This can be either within the sensor area, sampling pump or sample lines.

2. Physical Affects

Dropping and other abuse can damage the instrument from working properly or at least change the ability of the detector to measure accurately.

3. Gas Exposure

High gas exposure will change the calibration curve of the sensors causing false or inaccurate readings. Extremely high concentrations can kill the sensor's ability to measure gas. Further, many sensors can fail but not provide a warning that they have failed. In fact, many provide a zero (0) indication on the meter reading which suggests they are working correctly when they are not.

4. Temperature Affect

Storing instruments in an environment which is either too cold or too hot can affect the ability of the sensors to measure accurately.

5. Moisture

Moisture condensing on or in sensor: this can happen to oxygen sensors when moisture condenses in the capillary tube in the sensor. It will cause the sensor to fail.

6. Calibration Drift

All sensors from all manufacturers drift over time. Calibration brings the sensor back into equilibrium and provides accurate readings

2.3.2 Microcontroller

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.

Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers (PCs) designed to control small features of a larger component, without a complex front-end operating system (OS).

2.3.3 Programmable Logic Control (PLC)

A programmable logic controller (PLC), or programmable controller is an industrial digital computer that has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, machines, robotic devices, or any activity that requires high reliability, ease of programming, and process fault diagnosis. Dick Morley is considered as the father of PLC as he had invented the first PLC, the Modicon 084, for General Motors in 1968.

PLCs can range from small modular devices with tens of inputs and outputs (I/O), in a housing integral with the processor, to large rack-mounted modular devices with thousands of I/O, and which are often networked to other PLC and SCADA systems.

They can be designed for many arrangements of digital and analog I/O, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.

2.3.4 Arduino

Arduino is an open-source platform used for building electronics projects.
Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in

order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the microcontroller into a more accessible package.

2.4 Chapter Summary

In this chapter, the reasons why this project has been selected are explained. There are many case studies stated and related to this project regarding improving gas detectors. Existing gas detectors are exposed to contaminants like dirt and dust, the gas sensor will have problems. Existing gas detectors are not well sheltered compared to this project. The risk of fault can occur if the gas detector is exposed to high temperatures or humid air for too long. These factors will cause the sensor not to operate.

CHAPTER 3

3 RESEARCH METHODOLOGY

3.1 Introduction

To realize this Project as a product that ready to use with safety characteristic, a very comprehensive plan is undertaking. A step by step procedure is done so that the Project can be completed in time. This step is very important step in the implementation of this project to ensure the project is successfully completed at set times. Furthermore, in this chapter, there are many methods used in order to finish the project. In producing a project, this step that must be taken before the project is completed. These steps should be done with the utmost precision in order to produce a quality project.

The result of this project, there are some steps have been made. The next topic is topics selection. Selection of topics is very first step before starting work encountered work related to the project. The project title should be appropriate to the level sought diploma as a final project for the course Diploma in Electrical Engineering. In addition, the selection of appropriate projects to help power the creative and innovative thinking as well as it symbolizes the level of consciousness of a person. After the project is selected, the title of the project should be selected based on its ability to attract others to know more about the project closely. Tittle that attracts the attention of others symbolizes the initial status of the project. After an appropriate tittle is chosen, the step that must be taken is to choose components to the project to be made. This is because the materials are difficult to be found will have an impact on the projects to be made because it will probably take a long time to get it.

3.2 Project Design and Overview.

As mention in the previous chapter, the designed controller is using a closed-loop system with Arduino Uno as the main controller

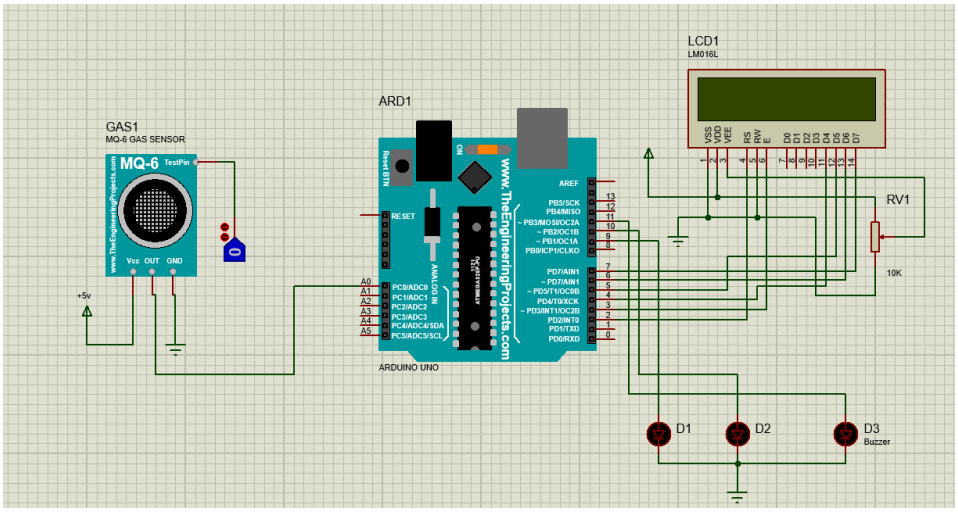

Figure 3.2.1.1 Arduino in Proteus

3.2.1 Block Diagram of the Project

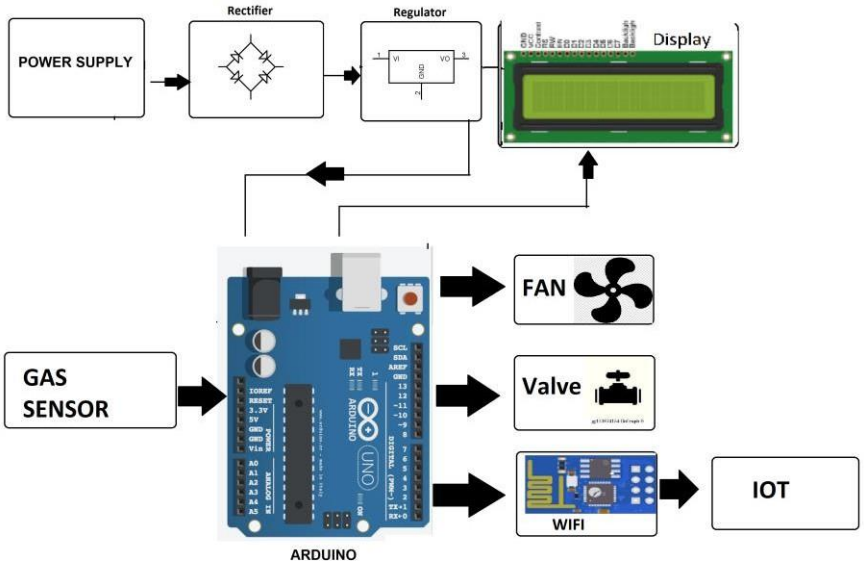

Figure 3.2.1.2

3.2.2 Flowchart of the Project 2

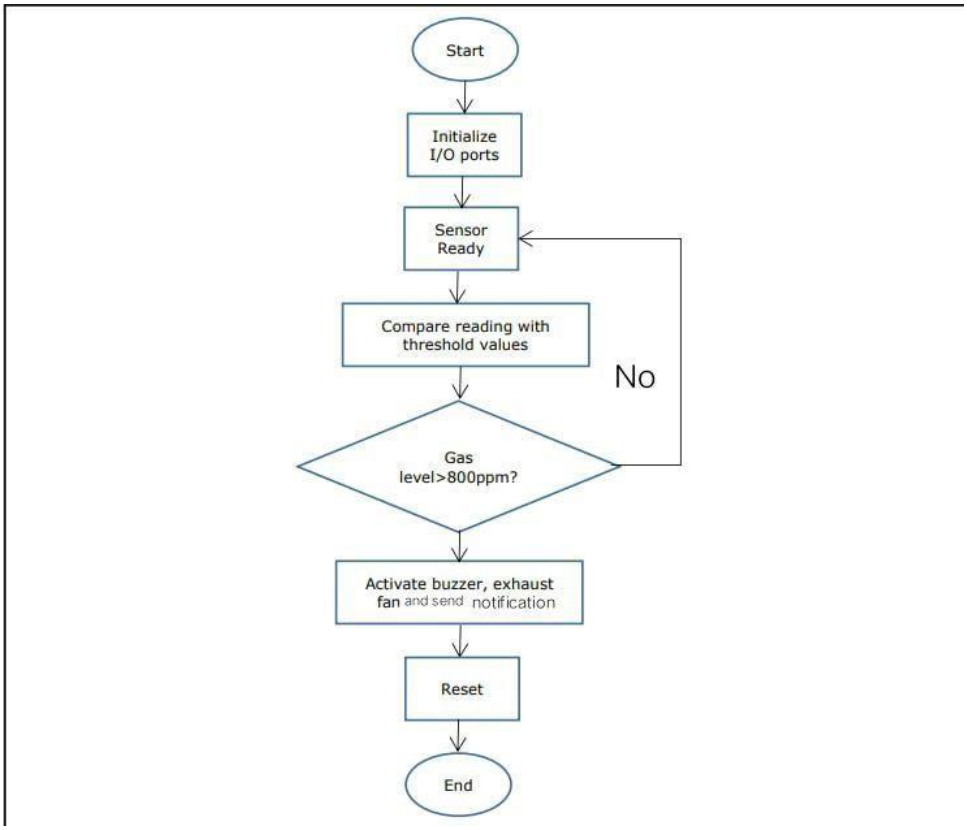

Figure 3.2.2.1

3.3 Project Hardware

As mentioned in the previous chapter, the designed controller is using Arduino Uno as the heart of this project.

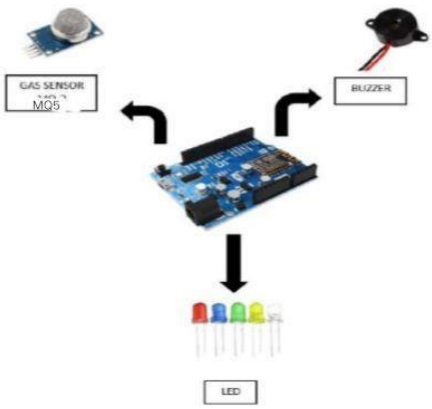

Figure 3.3.1

In this project, the input is the MQ-5 gas sensor. It will detect gas leaks from the gas tank and Arduino Uno will be the processor. If the sensor detects the gas, the buzzer will have a sound and a Telegram Notification will send a notification to the use

3.3.1 Schematic Circuit

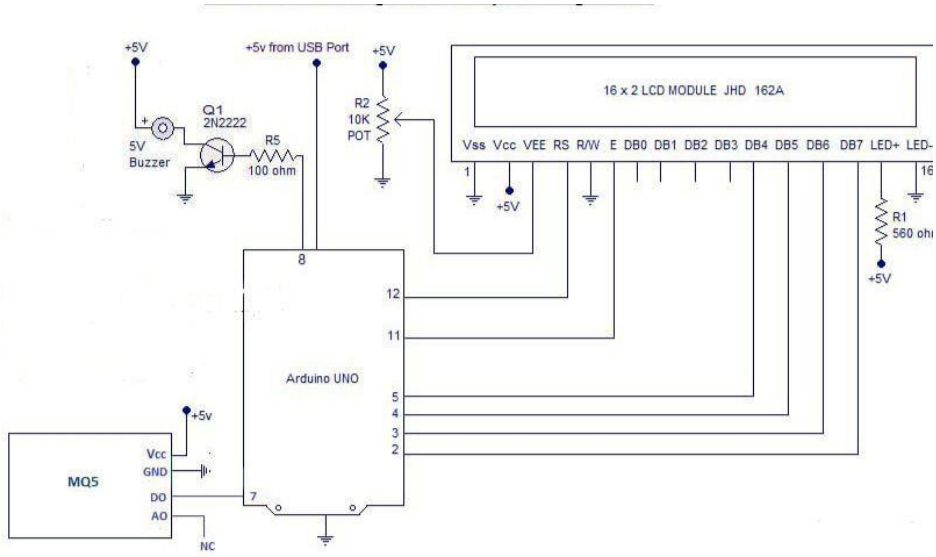

Figure 3.3.1.1

3.3.2 Description of Main Component

3.3.2.1 Component 1

Arduino Uno - The hardware component of an Arduino board is a programmable circuit board that is also known as a microcontroller. A microcontroller is a small computer with a processor, memory, and other peripherals designed for embedded applications. Arduino Uno is also the heart of this project as it controls all actions in the project.

3.3.2.2 Component 2

MQ5 Gas Sensor - The Gas Sensor is a sensor which detects gas and smoke with concentration between 300ppm and 10000ppm. He can detect butane, propane, methane, alcohol, hydrogen and smoke. He can be only used Inside, at ambient temperature. He has 2 pins for the power, 1 pin for the analogic value and 1 pin for the digital value

3.3.2.3 Component 3

Exhaust Fan - An exhaust fan is a fan which is used to control the interior environment by venting out unwanted odors, particulates, smoke, moisture, and other contaminants which may be present in the air. Exhaust fans can also be integrated into a heating and cooling system. Common locations for exhaust fans include bathrooms and kitchens, and these fans are usually very easy to install, so they can be situated in many other locations as well

3.3.3 Circuit Operation

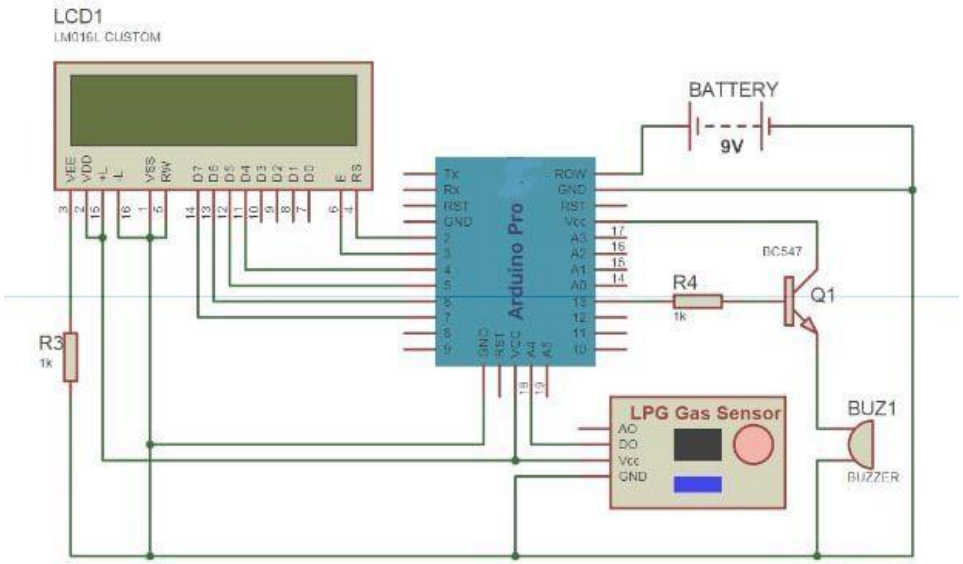

Figure 3.3.3.1 Circuit Operation

3.4 Project Software

3.4.1 Flowchart of the System

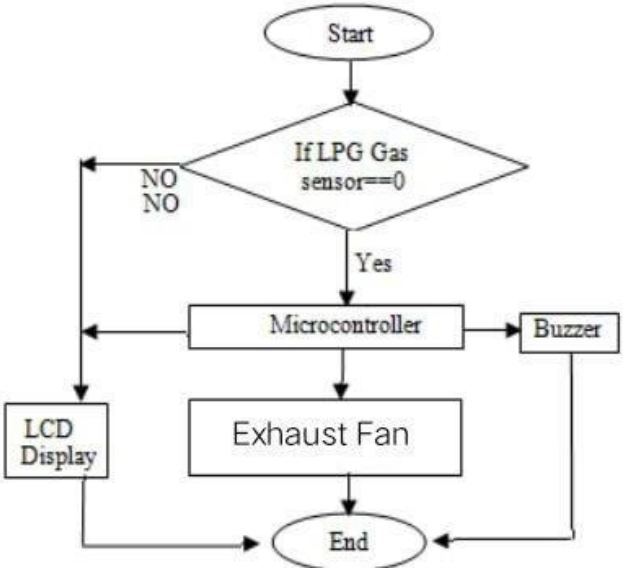

Figure 3.4.1.1 Flowchart

3.4.2 Description of Flowchart

Flowchart in a logical sequence, or structure is a graphical representation of a production process. The purpose of a flow chart of the process of working with a project or a common language or reference point is provided.

3.5 Prototype Development

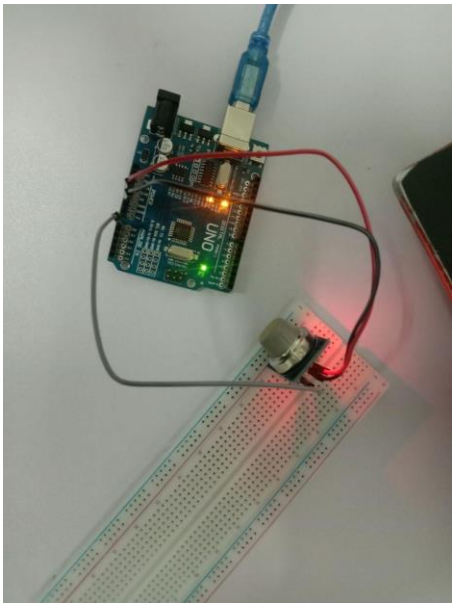

Figure 3.5.1 prototype development

3.5.1 Mechanical Design/Product Layout

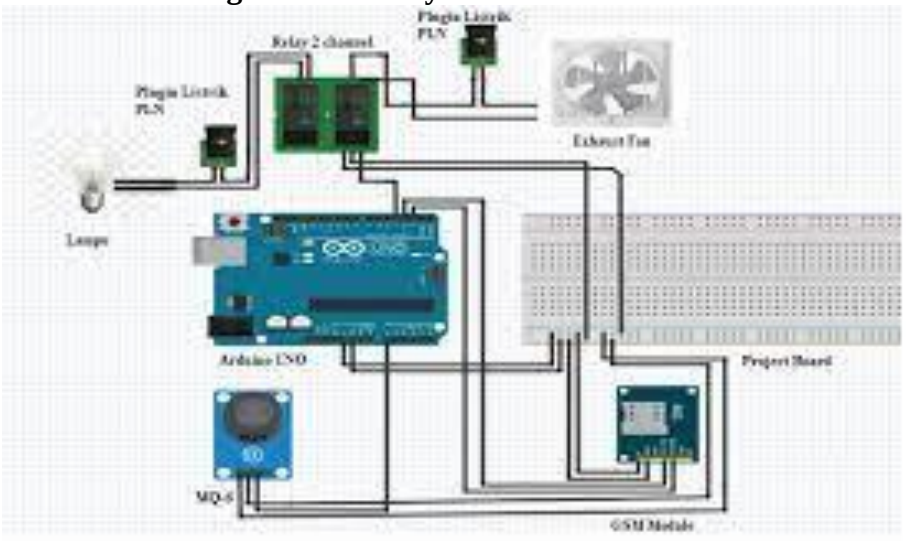

Figure 3.5.1.1

The gas sensor is the analog type that can be connected to the microcontroller. . LPG sensor senses any gas leakage from storage the output of this sensor goes high (analog voltage). The signal is monitored by the Arduino Uno microcontroller and it will identify the gas leakage. Now the microcontroller is turned on LED and Buzzer. After this, the controller sends messages as „GAS LEAKAGE‟ to registered mobile no. There are also used a temperature sensor which is a sense the temperature If the temperature is above a certain defined level, again the notification is sent to register the user. All data displayed on the LCD.

3.6 Sustainability Element in The Design Concept

The sensor-enabled solution helps prevent the high risk of gas explosions and affecting any casualties within and outside the premises. The gas sensors help detect the concentration of the gases present in the atmosphere to avoid hazardous consequences like fire breakouts. IoT networks are well-known for their low energy consumption and low power transmission, which allows the assets to operate for a longer duration and generate precise data information. An IoT-powered gas monitoring 20 solution works through sensors that (provide accurate data regarding the presence of toxic gases in the atmosphere. It is a very useful system to implement in industries or plant facilities to avoid catastrophic explosions. With the help of a gas monitoring solution, you can successfully measure temperature and humidity in the atmosphere, which results in improved plant facilities and ensures employee health safety

• To detect gases that are lighter than air (e.g., methane and ammonia), detectors should be mounted at a high level and preferably use a collecting cone.
• To detect heavier-than-air gases (e.g., butane and sulfur dioxide), detectors should be mounted at a low level.

• Consider how escaping gas may behave due to natural or forced air currents; mount in ventilation ducts if appropriate.

• When locating detectors, consider the possible damage caused by natural events, such as rain or flooding. For detectors mounted outdoors, use the weather protection assembly.
• Use a detector sunshade if locating a detector in a hot climate and in direct sun

• Consider the process conditions. Butane and ammonia, for instance, normally are heavier than air, but if released from a process line that is at an elevated temperature and/or under pressure, the gas may rise rather than fall.
• Detectors should be positioned a little way back from high pressure parts to allow gas clouds to form. Otherwise, any leak of gas is likely to pass by in a high-speed jet and not be detected.
• Consider ease of access for functional testing and servicing.

• Detectors should be installed at the designated location with the detector pointing downwards to ensure that dust or water will not collect on the front of the sensor.
• When sitting open path infrared devices, ensure that there is no permanent obscuration or blocking of the IR beam. Some types of short-term blockage may be accommodated.
• Ensure the open path devices are mounted to sturdy structures that are not susceptible to vibration.

3.7 Chapter Summary

At the end of this chapter, this study requires the use of components that are suitable to the work that must review. The uses of appropriate research methods are very important for the results of studies in accordance with the objectives and research questions. It is also important that the validity of the study was not disputed by the other parties. In chapter 4, all data that have been obtained using this methodology is analyzed carefully.

CHAPTER 4

4 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents a comparative analysis between the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram, and two other gas detection technologies, namely Ultrasonic Area Gas Detectors and XP-3000 Series Portable Gas Detectors. The aim of this analysis is to assess the strengths and weaknesses of each technology in terms of their functionality, effectiveness, and applicability in different scenarios. By understanding the unique features and capabilities of each system, we can gain insights into the advantages offered by the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram.

The Ultrasonic Area Gas Detectors are known for their ability to detect gas leaks over large areas, making them suitable for industrial environments. However, their effectiveness may be limited in residential settings where precise localization and immediate notification are crucial. Similarly, the XP-3000 Series Portable Gas Detectors offer portability and flexibility, but they may lack advanced notification capabilities and continuous monitoring features.

In contrast, the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram, designed specifically for residential use, focuses on early detection of gas leaks and automatic activation of the air exhaust system. It utilizes infrared technology and the theory of infrared absorption to detect various toxic and poisonous gases at specific wavelengths. The integration with the Telegram messaging platform enables instant alerts to be sent to users, ensuring timely response and evacuation if necessary. The system also provides real-time monitoring and a user-friendly interface for ease of operation.

The integration of Telegram notifications into the gas Leak Detector with Automatic Air Exhaust project represents a pivotal enhancement in its operational capabilities. Telegram notifications provide real-time alerts and remote monitoring, enabling rapid responses to gas leaks, even from off-site locations. This feature fosters efficient communication and collaborative decision-making among team members. Additionally, Telegram's support for multimedia content enriches the project's ability to assess and address gas leak incidents promptly. In summary, the inclusion of Telegram notifications significantly elevates the project's effectiveness in managing and mitigating gas leaks, enhancing overall safety and response

capabilities.

4.2 Results and Analysis

In this chapter, the analysis of data collected through self-administered questionnaires and the findings related to the research questions. The data was obtained from 20 respondents, consisting of 15 males and 5 females, who completed the questionnaires.

All 20 questionnaires received were usable and met the inclusion criteria discussed in the previous chapter. The primary objective of the data analysis is to identify, describe, and explore the relationship between our Gas Detector with Notifier System and existing gas detectors available in the market.

The questionnaires were divided into two parts: Part A focused on gathering demographic information about the respondents, such as their gender, age, occupation, and their previous experiences with gas leakage at home. This information will help us understand the respondents' backgrounds and experiences.

Part B of the questionnaire included questions specifically related to our product. The aim was to gather opinions from the respondents regarding the usefulness, effectiveness, and marketability of our product. Through these questions, we sought to obtain public opinions and feedback to improve our marketing strategies.

By analyzing the data obtained from the questionnaires, we will be able to determine the frequency of gas leakages experienced among the 20 respondents and gain insights into the respondents' perspectives on our product. This analysis will contribute to improving our understanding of customer needs and preferences, allowing us to make informed decisions regarding product enhancements and marketing efforts.

4.3 Discussion

The analysis of the data and research findings reveals important insights regarding the Gas Leak Detector with Automatic air Exhaust and notification via Telegram and its relationship with existing gas detectors in the market. The discussion will focus on key findings and their implications for the product.

Firstly, the data analysis highlighted the opinions of customers regarding the usefulness, effectiveness, and marketability of our product. The feedback provided valuable information on areas where the Gas Leak Detector with Automatic air Exhaust and notification via Telegram excelled and areas that may require improvement. This feedback will guide us in refining the product to better meet customer needs and expectations. Additionally, the analysis shed light on the customers' experiences with gas leakage at home. Understanding the frequency and severity of these incidents is crucial in designing an effective gas detection system. The findings can help us identify potential gaps in existing safety systems and highlight the importance of early detection and notification in preventing accidents and mitigating risks.

Figure 4.3.1 Telegram

Incorporating Telegram notifications into the gS Leak Detector with Automatic Air Exhaust project adds a crucial layer of real-time communication and control. When a gas leak is detected, Telegram can swiftly transmit alerts to designated recipients, ensuring rapid response and mitigation efforts. This feature facilitates remote monitoring, enabling users to stay informed and make timely decisions regardless of their physical location. Additionally, Telegram's group chat functionality fosters seamless communication among team members, promoting collaborative problem-solving during emergency situations. The platform's support for multimedia content, such as images and videos, enhances the ability to visually assess and address gas leaks, aiding in decision-making. Overall, integrating Telegram notifications streamlines communication and bolsters the project's effectiveness in managing gas

leak incidents.

Figure 4.3.2 Notification

The notification system in the gas Leak Detector operates by instantly sending alerts to designated recipients through Telegram when a gas leak is detected. These alerts provide real-time information about the situation, allowing for immediate responses to mitigate the leak. This system ensures that relevant personnel can stay informed and take timely actions, whether they are on-site or remotely located, thereby enhancing safety and response efficiency.

Moreover, the demographic information collected from the respondents' provided insights into the target audience for our product. Understanding the demographics, such as age and occupation, can assist in tailoring marketing strategies and reaching the appropriate customer segments effectively.

The analysis of customer opinions and preferences also uncovered opportunities for further development and innovation. By identifying areas where customers expressed a desire for additional features or improvements, we can prioritize research and development efforts to enhance the product's performance and overall customer satisfaction.

It is important to acknowledge that the analysis was based on a limited sample size and may not represent the entire market. Therefore, further research and validation are recommended to ensure the generalizability of the findings. Additionally, ongoing customer feedback and engagement will be crucial in continuously improving the Gas Leak Detector with Automatic air Exhaust and notification via Telegram

CHAPTER 5

5 CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Leaks can pose significant risks in both industrial and residential environments. Timely detection of gas leaks is crucial to prevent accidents, fires, and potential harm to individuals. This project focuses on the development of a Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram, specifically designed for residential use. The objective of this project is to enhance safety measures in homes by providing an effective and user-friendly gas detection system.

The Gas Leak Detector utilizes the theory of infrared absorption and advanced sensor technology to detect various toxic and poisonous gases, such as Sulphur, Carbon Monoxide, Nitrogen Dioxide, and others. The incorporation of infrared wavelengths enables the detection of these gases at specific levels, ensuring accurate and reliable results. This feature distinguishes the Gas Leak Detector from conventional detectors, which primarily focus on combustible gases.

The project aims to improve upon existing gas detection systems by introducing automatic air exhaust activation. In the event of a gas leak, the system automatically triggers the air exhaust system to expel the leaked gases, minimizing the risk of ignition and further dispersion. Additionally, the integration of the Telegram messaging platform enables immediate alerts to be sent to users, allowing for prompt evacuation and necessary actions to mitigate potential hazards.

By focusing on the residential setting, this project addresses a critical gap in gas detection systems. Many existing technologies are designed for industrial environments, overlooking the specific needs of households. The Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram provides an essential safety solution tailored to the unique requirements of homes, where early detection and quick response are vital.

In this project, we will explore the implementation of advanced sensor technology, develop robust algorithms for gas detection, and integrate the system with automatic air exhaust mechanisms. The effectiveness of the Gas Leak Detector will be evaluated through rigorous testing and validation procedures, ensuring its reliability and accuracy in detecting gas leaks.

By enhancing gas leak detection capabilities, this project aims to reduce the risk of accidents, protect lives, and safeguard residential properties. The findings and outcomes of this project will contribute to the advancement of gas detection technology for residential environments, promoting a safer and more secure living

environment for individuals and families.

In the following chapters, we will delve into the methodology, design considerations, implementation details, and evaluation results of the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram, providing a comprehensive overview of this innovative and essential safety solution for residential gas detection.

5.2 Conclusion

In conclusion, while there may be more technologically advanced gas detectors available for industrial purposes, our project focuses specifically on residential use. Previous research has revealed a lack of safety systems installed in homes and considering the significant number of house fires reported over the years, it is crucial to prevent such incidents at an early stage.

The main objective of this project is to detect any leakage of cooking gas and promptly alert the user. The user receives a Telegram notification in the event of a gas leak. Implementing this project can effectively reduce the risk of fire and explosions in residential settings. It also aids in the early detection of gas leaks before the gas concentration reaches dangerous levels.

Additionally, the survey conducted provided valuable insights and feedback from respondents, which allowed us to identify areas for improvement in our product. The results indicated a clear correlation between the respondents' answers and their preferences for the product. Analyzing the data obtained from the questionnaires enables us to understand customer needs and determine the aspects that require further improvement.

5.3 Suggestion for Future Work

For improvement in the future, some additional features could be added in order to increase the performance and capability of the circuit. Some recommendations are briefly explained below:

5.3.1 Expanded Gas Detection Range: The model could be trained to detect a broader range of gases beyond just combustible ones. By incorporating data on toxic and poisonous gases such as Sulphur, Carbon Monoxide, Nitrogen Dioxide, and others, the model could become more versatile and useful in various applications.

5.3.2 Advanced Sensor Technology: Upgrading the sensor technology used in the model can lead to improved detection capabilities. Newer sensors with higher sensitivity and selectivity for specific gases could be integrated into the system, allowing for more accurate and reliable detection.

5.3.3 Miniaturization and Portability: Making the gas detection model more compact and portable would enable its deployment in a wider range of settings. This could involve miniaturizing the sensor and associated electronics, optimizing power consumption, and developing a user-friendly interface for easy operation.

5.3.4 Regular Maintenance and Calibration Reminders: Implement a maintenance and calibration reminder system to ensure the gas leak detector functions optimally. This feature would help users keep track of necessary maintenance tasks and ensure accurate gas detection over time.

5.3.5 Battery Backup and Power Management: Incorporate a battery backup system to ensure continuous operation during power outages. Implement power management features to optimize power consumption and extend the battery life.

By incorporating these future suggestions, the gas leak detector project can be enhanced with advanced features, improved functionality, and better user experience.

5.4 Chapter Summary

This chapter explores future suggestions to enhance the functionality of a gas leak detector system equipped with automatic air exhaust and Telegram notification capabilities. The key recommendations include upgrading sensor technology for improved accuracy, integrating an automatic air exhaust system, enabling IoT connectivity for remote monitoring and control, implementing cloud-based data logging and analysis, utilizing machine learning for anomaly detection, integrating Telegram for instant notifications, facilitating remote monitoring and control via Telegram, incorporating battery backup and power management features, designing a user-friendly interface, and implementing maintenance and calibration reminders.

CHAPTER 6

6 PROJECT MANAGEMENT AND COSTING

6.1 Introduction

Effective project management and cost control are essential for the successful execution of any project, including the development of the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram. This section provides an overview of the project management approach and highlights the importance of cost management in achieving project objectives.

Cost management is a critical aspect of this project. A comprehensive cost analysis is conducted to determine the necessary resources, including materials, components, and any external services required. By closely monitoring expenses and adhering to a budget, the project aims to achieve cost-effective implementation.

Through effective project management and diligent cost control, the Gas Leak Detector project strives to deliver a functional and reliable solution within the specified parameters and serve as a valuable contribution to the final year report

6.2 Gant Chart and Activities of the Project

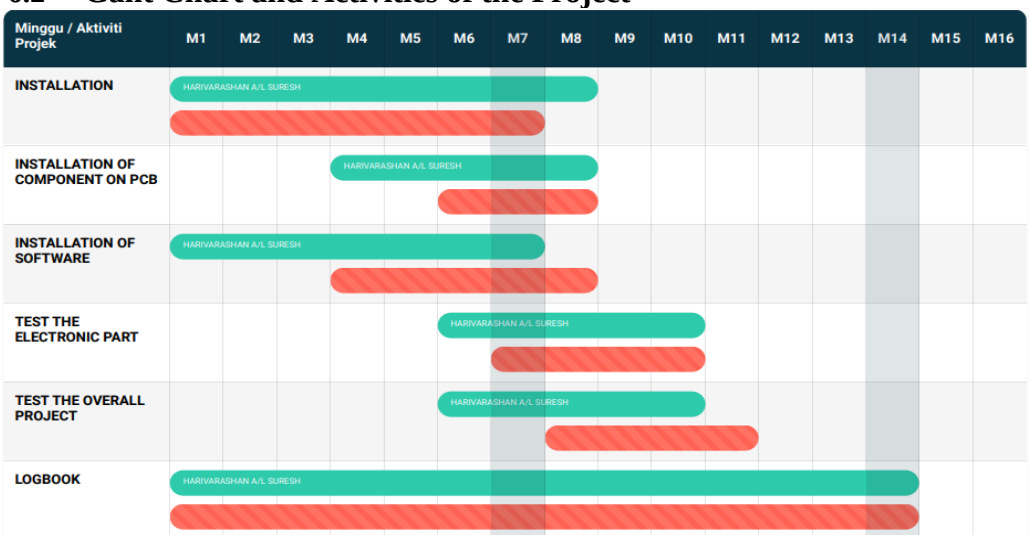

Figure 6.2.1

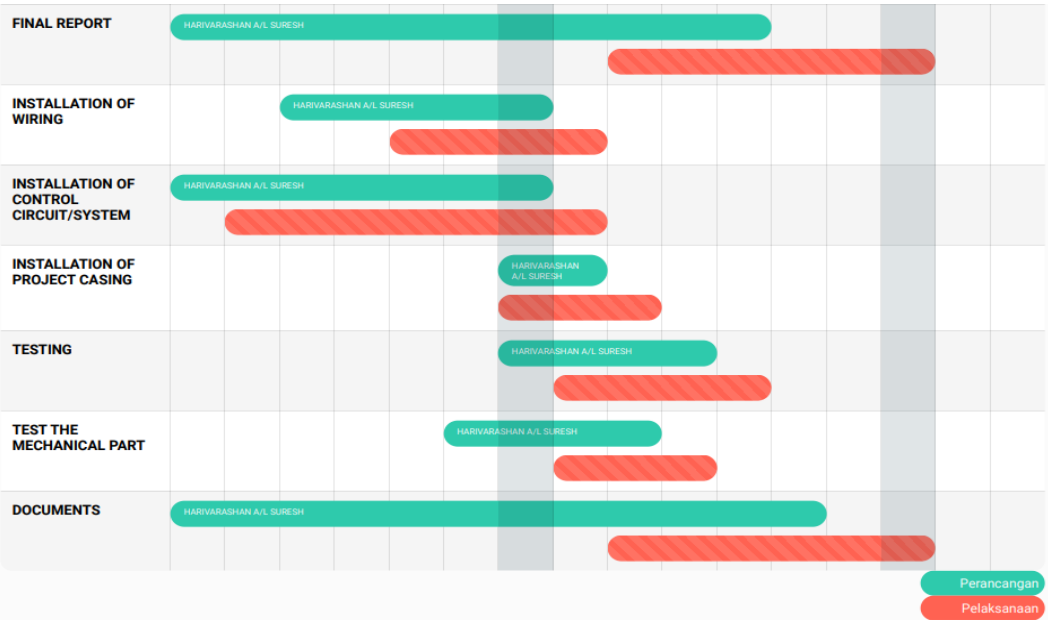

Figure 6.2.2

6.3 Milestone

The project was accomplished through a series of milestones. These milestones represented key achievements and progress points throughout the project's timeline. They served as important checkpoints to track the project's development and ensure that it stayed on track.

Research and Planning: During the initial phase of the project, extensive research was conducted to gather information on gas detection technology, infrared absorption theory, and relevant safety regulations. This research formed the basis for designing the gas leak detector and developing a comprehensive project plan.

Design and Development: Following the research phase, the focus shifted to the design and development of the gas leak detector. This involved designing the circuitry, integrating appropriate sensors, and programming algorithms to enable accurate gas detection. Additionally, an automatic air exhaust mechanism and a notification system via Telegram were developed to enhance the functionality of the detector.

Prototyping and Testing: Once the initial design was complete, the gas leak detector was prototyped and subjected to rigorous testing. The prototype underwent extensive evaluations to ensure its functionality, reliability, and effectiveness in detecting different types of gases. Various testing scenarios were employed to assess its performance and trigger appropriate alerts.

Integration and Optimization: After successful testing, the gas leak detector underwent integration, bringing together all the components into a cohesive system.

This included integrating the sensor, communication system, and automatic air exhaust mechanism. The system was optimized to improve accuracy, responsiveness, and energy efficiency.

Validation and Evaluation: The integrated gas leak detector underwent a thorough validation process to verify its performance and compliance with safety standards. Real-world scenarios were simulated to evaluate its effectiveness in detecting gas leaks and providing timely notifications. The detector's performance and reliability were assessed to ensure it met the intended objectives.

Documentation and Reporting: The final milestone involved documenting the entire project, capturing the design process, testing results, challenges encountered, and lessons learned. A comprehensive report was prepared, summarizing the project's objectives, methodologies, and outcomes. This documentation served as a valuable reference for future improvements and provided a record of the project's achievements.

By successfully achieving these milestones, the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram project progressed systematically, resulting in the development of a reliable and efficient gas detection solution.

6.4 Cost and Budgeting

No.	Component and materials	The unit price	Quantity	Total
1	Arduino UNO set	RM 23.50	1	RM 23.50
2	Air Exhaust fan	RM 50.00	2	RM 100.00
3	MQ5 gas senor	RM7.00	1	RM 7.00
4	Buzzer	RM 3.50	1	RM 3.50
5	LCD Display	RM 25.90	1	RM 25.90
6	IC sockets	RM 5.00	1	RM 5.00
7	WIFI module	RM 30	1	RM 30
8	PCB AND Breadboards	RM 7.90	2	RM 15.80
9	Other omponents	RM50.00	-	RM50.00
			Total:	**RM 260.70**
	List of other costing			
1	Transportation			
2	Postage			
3	Craft Work			
4	Internet			
5	Application			
			Total:	**RM50.00**
			Overall total	**RM310.70**

Figure 6.5.1

6.5 Chapter Summary

The project management involved several key phases and milestones. The project began with thorough research and planning, which laid the foundation for the subsequent stages. Design and development followed, focusing on circuitry design, sensor integration, and algorithm programming. Prototyping and testing were then carried out to assess the functionality and reliability of the detector. Integration and optimization involved bringing all components together into a cohesive system and refining its performance. Validation and evaluation were conducted to verify the detector's effectiveness in real-world scenarios. Finally, the project concluded with comprehensive documentation and reporting of the entire process.

Throughout these stages, careful attention was given to meeting the project objectives and ensuring compliance with safety standards. Milestones were reached by achieving successful outcomes in each phase, such as completing research, designing and testing the detector, integrating components, and validating its

performance. Effective project management techniques were employed to ensure a systematic and organized approach to the development process. The project management and execution were carried out diligently, resulting in the successful creation of the Gas Leak Detector with Automatic Air Exhaust and Notification via Telegram.

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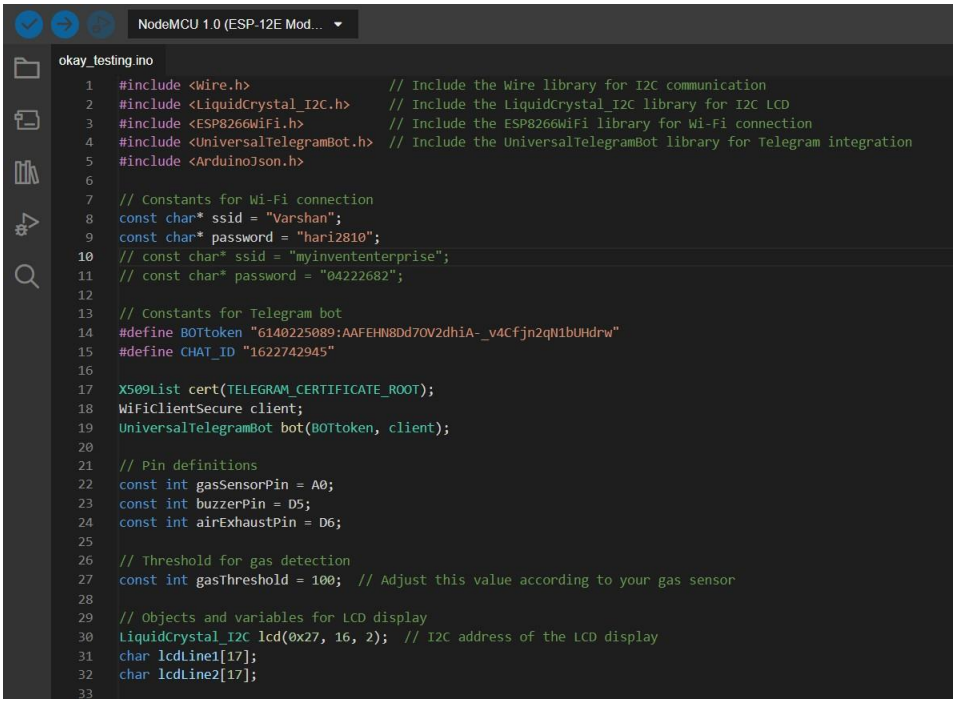
7 APPENDICES

APPENDIX A- DATA SHEET

http://repository.psa.edu.my/bitstream/123456789/3134/1/GAS%20DETECTOR.pdf

APPENDIX B- PROGRAMMING




```
#include <Wire.h>                 // Include the Wire library for I2C communication
#include <LiquidCrystal_I2C.h>    // Include the LiquidCrystal_I2C library for I2C LCD
#include <ESP8266WiFi.h>          // Include the ESP8266WiFi library for Wi-Fi connection
#include <UniversalTelegramBot.h> // Include the UniversalTelegramBot library for Telegram integration
#include <ArduinoJson.h>

// Constants for Wi-Fi connection
const char* ssid = "Varshan";
const char* password = "hari2810";
// const char* ssid = "myinvententerprise";
// const char* password = "04222682";

// Constants for Telegram bot
#define BOTtoken "6140225089:AAFEHN8Dd7OV2dhiA-_v4Cfjn2qN1bUHdrw"
#define CHAT_ID "1622742945"

X509List cert(TELEGRAM_CERTIFICATE_ROOT);
WiFiClientSecure client;
UniversalTelegramBot bot(BOTtoken, client);

// Pin definitions
const int gasSensorPin = A0;
const int buzzerPin = D5;
const int airExhaustPin = D6;

// Threshold for gas detection
const int gasThreshold = 100;  // Adjust this value according to your gas sensor

// Objects and variables for LCD display
LiquidCrystal_I2C lcd(0x27, 16, 2);  // I2C address of the LCD display
char lcdLine1[17];
char lcdLine2[17];
```

Figure 7.1 Project Coding

```
void setup() {
  // Initialize Serial communication
  Serial.begin(115200);
  configTime(0, 0, "pool.ntp.org");  // get UTC time via NTP
  client.setTrustAnchors(&cert);     // Add root certificate for api.telegram.org

  // Attempt to connect to Wifi network:
  Serial.print("Connecting Wifi: ");
  Serial.println(ssid);

  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, password);

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

  Serial.println("");
  Serial.println("WiFi connected");
  Serial.print("IP address: ");
  Serial.println(WiFi.localIP());

  bot.sendMessage(CHAT_ID, "Bot started up", "");

  // Initialize LCD display
  lcd.begin();
  lcd.print("Gas Detector");
  lcd.setCursor(0, 1);
  lcd.print("Initializing...");
```

Figure 7.2 Project Coding

```
  // Initialize air exhaust
  pinMode(airExhaustPin, OUTPUT);

  // Set initial LCD display messages
  snprintf(lcdLine1, sizeof(lcdLine1), "Gas: %s", "Safe");
  snprintf(lcdLine2, sizeof(lcdLine2), "Level: %d ppm", 0);
  lcd.clear();
  lcd.print(lcdLine1);
  lcd.setCursor(0, 1);
  lcd.print(lcdLine2);
}

void loop() {
  // Read gas sensor value
  int gasLevel = analogRead(gasSensorPin);

  // Update LCD display
  snprintf(lcdLine2, sizeof(lcdLine2), "Level: %d ppm", gasLevel);
  lcd.setCursor(0, 1);
  lcd.print(lcdLine2);

  // Check if gas level exceeds threshold
  if (gasLevel > gasThreshold) {
    // Turn on buzzer and air exhaust
```

Figure 7.3

```
    digitalWrite(buzzerPin, HIGH);
    digitalWrite(airExhaustPin, LOW);

    bot.sendMessage(CHAT_ID, "GAS detected!!", "");

    // Turn off buzzer and air exhaust
    digitalWrite(buzzerPin, LOW);
  } else {
    digitalWrite(airExhaustPin, HIGH);
  }

  delay(10);  // Adjust the delay as needed
}
```

Figure 7.4

2.1 APPENDIX C- PROJECT MANUAL/PRODUCT CATALOGUE

KEMENTERIAN PENGAJIAN TINGGI

POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

USER MANUAL

GAS LEAK DETETOR WITH AUTOMATI AIR EXHAUST AND NOTIFIATION VIA TELEGRAM

Figure 2.1

BLOK DIAGRAM

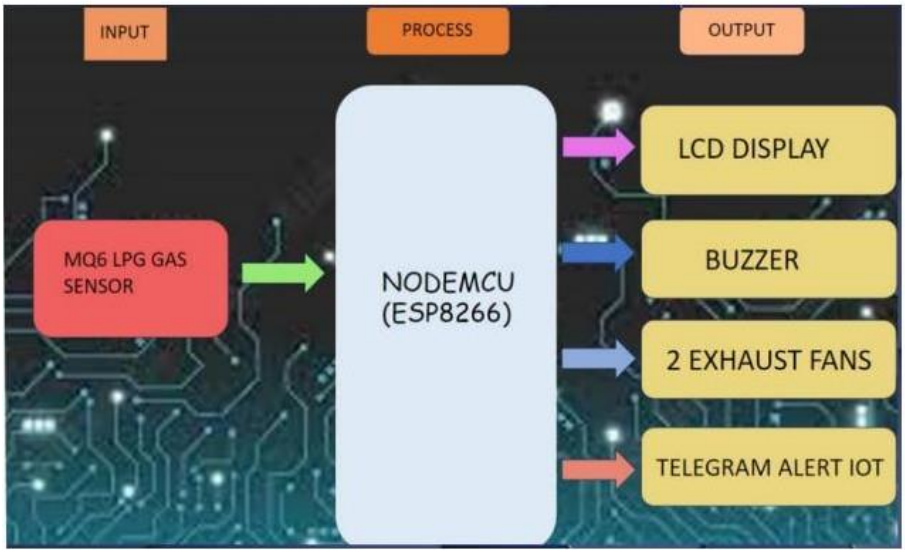
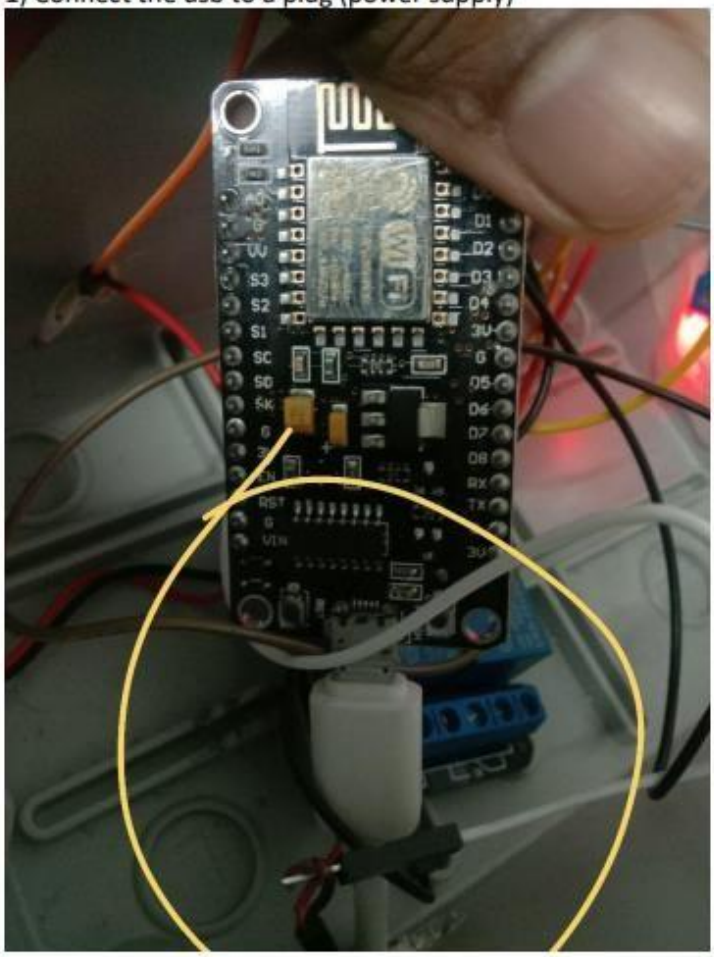


Figure 2.2

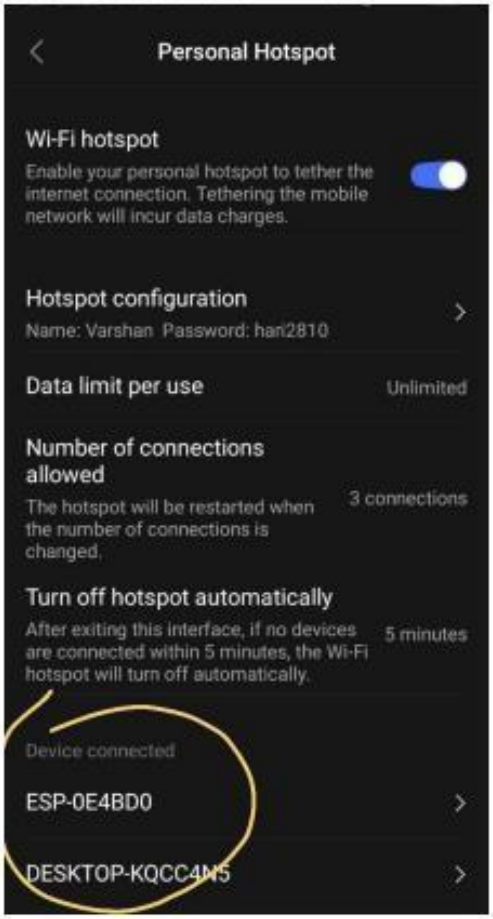
Set-up the Node mcu to connect Telegram app

1) Connect the usb to a plug (power supply)



2. On the Hotspot

3. Connect to ESP-0E4BDO

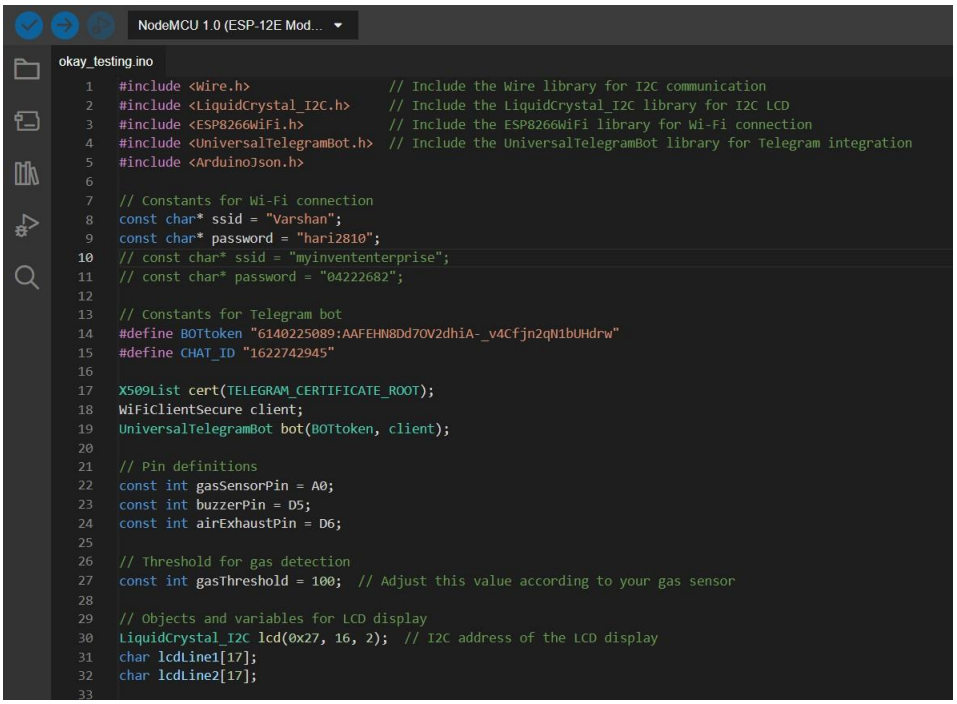


4. Open the TELEGRAM apps and see if the bot started up

5 Application ready to use

Information for user guide

Data	Information
ESP Wi-Fi Signal Strength	Line of sight; 500 meters Blocking vertical; 200 – 300 meters
Gas Level for Alert	<500 ppm Normal gas level: 100-150 ppm




```ino
#include <Wire.h>                // Include the Wire library for I2C communication
#include <LiquidCrystal_I2C.h>   // Include the LiquidCrystal_I2C library for I2C LCD
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const char* password = "hari2810";
// const char* ssid = "myinvententerprise";
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#define CHAT_ID "1622742945"

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WiFiClientSecure client;
UniversalTelegramBot bot(BOTtoken, client);

// Pin definitions
const int gasSensorPin = A0;
const int buzzerPin = D5;
const int airExhaustPin = D6;

// Threshold for gas detection
const int gasThreshold = 100;  // Adjust this value according to your gas sensor

// Objects and variables for LCD display
LiquidCrystal_I2C lcd(0x27, 16, 2);  // I2C address of the LCD display
char lcdLine1[17];
char lcdLine2[17];

void setup() {
  // Initialize Serial communication
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  configTime(0, 0, "pool.ntp.org");  // get UTC time via NTP
  client.setTrustAnchors(&cert);     // Add root certificate for api.telegram.org

  // Attempt to connect to Wifi network:
  Serial.print("Connecting Wifi: ");
  Serial.println(ssid);

  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {
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    delay(500);
  }

  Serial.println("");
  Serial.println("WiFi connected");
  Serial.print("IP address: ");
  Serial.println(WiFi.localIP());

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  lcd.print("Initializing...");
```

```
  // Initialize air exhaust
  pinMode(airExhaustPin, OUTPUT);

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  snprintf(lcdLine2, sizeof(lcdLine2), "Level: %d ppm", 0);
  lcd.clear();
  lcd.print(lcdLine1);
  lcd.setCursor(0, 1);
  lcd.print(lcdLine2);
}

void loop() {
  // Read gas sensor value
  int gasLevel = analogRead(gasSensorPin);

  // Update LCD display
  snprintf(lcdLine2, sizeof(lcdLine2), "Level: %d ppm", gasLevel);
  lcd.setCursor(0, 1);
  lcd.print(lcdLine2);

  // Check if gas level exceeds threshold
  if (gasLevel > gasThreshold) {
    // Turn on buzzer and air exhaust
```

```

      digitalWrite(buzzerPin, HIGH);
      digitalWrite(airExhaustPin, LOW);

      bot.sendMessage(CHAT_ID, "GAS detected!!", "");

      // Turn off buzzer and air exhaust
      digitalWrite(buzzerPin, LOW);
    } else {
      digitalWrite(airExhaustPin, HIGH);
    }

    delay(10);  // Adjust the delay as needed
  }
```

2.1 APPENDIX C- PROJECT MANUAL/PRODUCT CATALOGUE

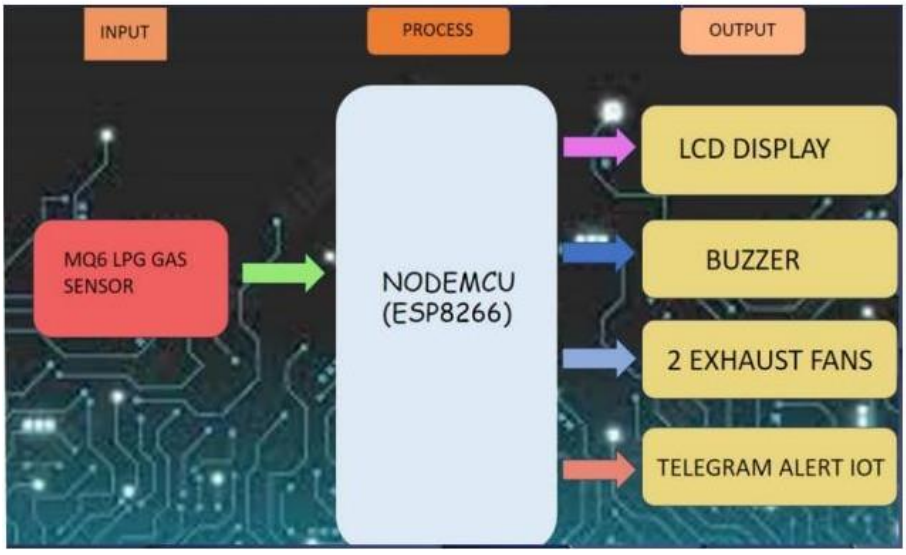
KEMENTERIAN PENGAJIAN TINGGI

POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

USER MANUAL

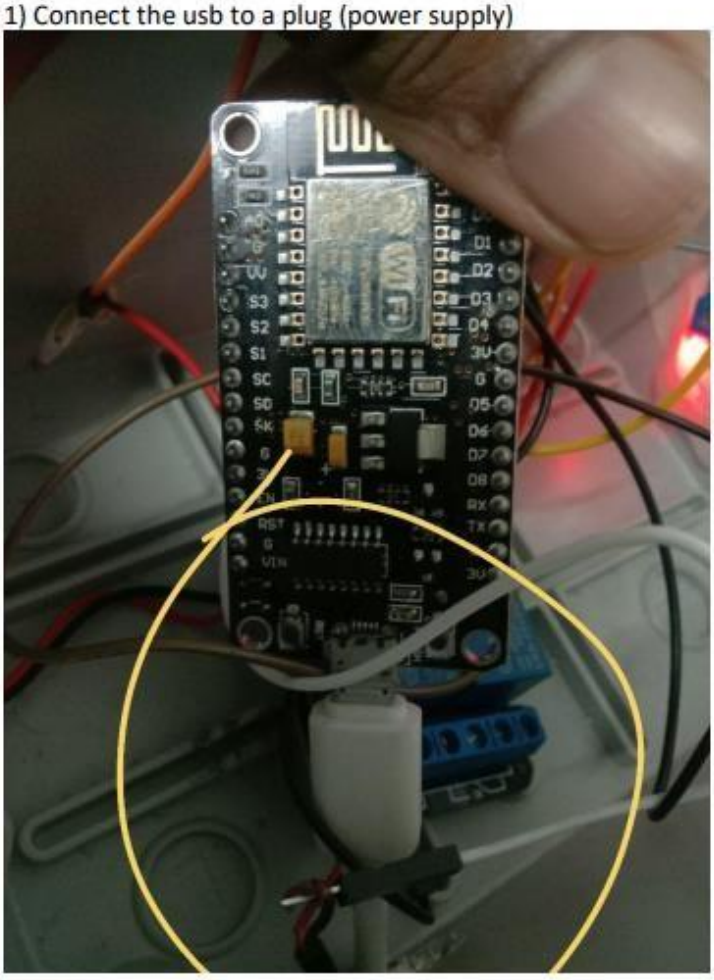
GAS LEAK DETETOR WITH AUTOMATI AIR EXHAUST AND NOTIFIATION VIA TELEGRAM

BLOK DIAGRAM



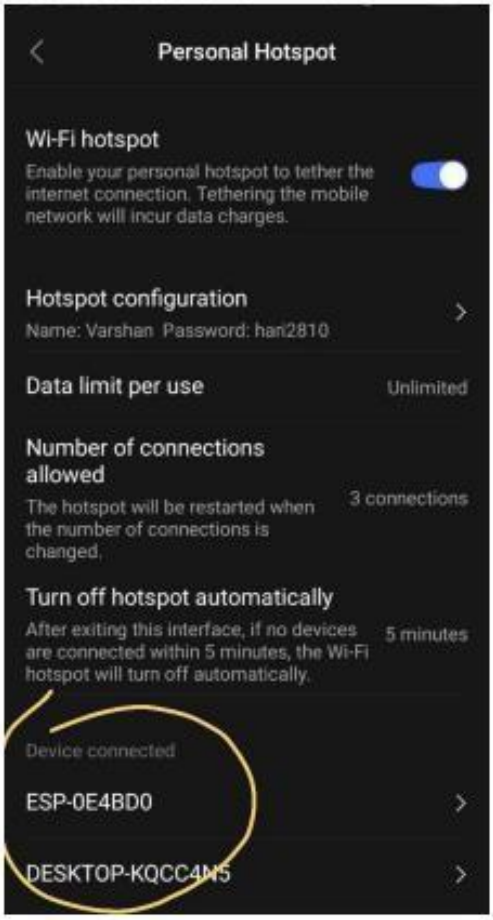
Set-up the Node mcu to connect Telegram app

1) Connect the usb to a plug (power supply)



2. On the Hotspot

3. Connect to ESP-0E4BDO



4. Open the TELEGRAM apps and see if the bot started up

5 Application ready to use

Information for user guide

Data	Information
ESP Wi-Fi Signal Strength	Line of sight; 500 meters Blocking vertical; 200 – 300 meters
Gas Level for Alert	<500 ppm Normal gas level: 100-150 ppm