Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF GAS LEAKAGE DETECTOR WITH IoT

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Bachelor of Electrical Engineering Technology with Honours

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DEVELOPMENT OF GAS LEAKAGE DETECTOR WITH IoT

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A project report submitted
in partial fulfillment of the requirements for the degree of
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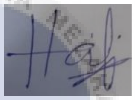
DECLARATION

I declare that this project report entitled “Development of gas leakage detector with IoT” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

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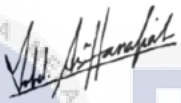

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Date : 13/1/2023

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Co-Supervisor :

Name (if any)

Date :

DEDICATION

Special thanks to my beloved family

My supervisor

My colleague

ABSTRACT

The issue of gas leakage and fire continues to be a key impediment to building a comprehensive, safe, and sustainable kitchen model in the growing smart home designs. On the other hand, in this digital era, security has been a huge concern. In metropolitan areas, most kitchens are tiny and lack appropriate ventilation. Spillage of gas raises the chance of a fire, death, or a blast in such a situation. Smart management systems, gas leak detection systems, and fire detection systems should all be created to address this problem. The Arduino ESP32 microcontroller was used to create a smart gas detection system utilising a variety of sensors such as gas sensors, flame sensors, and actuators (exhaust fan, buzzer). When a gas leak is detected, the client will be notified by SMS and an application. The suggested system can detect gas leaks and can also take additional actions to reduce gas concentrations using auto air ventilation. The proposed strategy will aid in improving safety, lowering mortality tolls, and reducing environmental harm.

ABSTRAK

Isu kebocoran gas dan kebakaran terus menjadi penghalang utama untuk membina model dapur yang komprehensif, selamat dan mampan dalam reka bentuk rumah pintar yang semakin berkembang. Sebaliknya, dalam era digital ini, keselamatan telah menjadi kebimbangan besar. Di kawasan metropolitan, kebanyakan dapur adalah kecil dan kekurangan pengudaraan yang sesuai. Tumpahan gas meningkatkan peluang kebakaran, kematian atau letupan dalam keadaan sedemikian. Sistem pengurusan pintar, sistem pengesanan kebocoran gas dan sistem pengesan kebakaran semuanya harus diwujudkan untuk menangani masalah ini. Pengawal mikro Arduino ESP 32 digunakan untuk mencipta sistem pengesanan gas pintar menggunakan pelbagai penderia seperti penderia gas, penderia nyalaan dan penggerak (kipas ekzos, buzzer). Apabila kebocoran gas dikesan, pelanggan akan dimaklumkan melalui SMS dan aplikasi. Sistem yang dicadangkan boleh mengesan kebocoran gas dan juga boleh mengambil tindakan tambahan untuk mengurangkan kepekatan gas menggunakan pengudaraan udara automatik. Strategi yang dicadangkan akan membantu dalam meningkatkan keselamatan, menurunkan kadar kematian, dan mengurangkan bahaya alam setikar.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Professor Madya Mohd Ariff Bin Mat Hanafiah for his precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) for enables me to accomplish the project. Not forgetting my fellow colleague, my course mate for the willingness of sharing his thoughts and ideas regarding the project.

My highest appreciation goes to my parents for their love and prayer during the period of my study.

Finally, I would like to thank all the people who helped me in completing this project, fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

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LIST OF SYMBOLS

IoT	-	Internet of Things
WSN	-	Wireless Sensor Network

LIST OF ABBREVIATIONS

IoT	-	Internet of things
WSN	-	Wireless system network
	-	
	-	
	-	
	-	
	-	
	-	

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CHAPTER 1

INTRODUCTION

1.1 Background

Fires caused by gas leaks have escalated dramatically in recent years. According to the Malaysia Fire Department, there were 309 instances recorded in 2017 and 582 cases in 2018. Implementing an Internet of Things (IoT) system that can detect and monitor any gas leaks that may occur in the house and alert the user is one of the methods that can be used to solve this problem.

The Internet of Things has grown in popularity as a result of its capacity to minimise human effort and make life easier. The Internet of Things (IoT) is a technology in which a physical thing is connected to a system and can be accessed over the internet to allow interaction and data exchange between the system and the connected physical object. IoT is also employed in a gas leakage monitoring system to assist users in monitoring, detecting, and being alerted when a gas leak occurs in their house. One sort of technology that is typically implemented in smart home systems is a gas leakage monitoring system.

Propane and Butane gas make up liquid petroleum gas (LPG), which is often used for cooking. It has the potential to cause explosions, which is exceedingly dangerous. Ethane (C_2H_6) and Pentane (C_5H_{12}) are also present in LPG, but their quantities are much lower than those of Propane and Butane. Humans may be harmed as a result of the disclosure.

Arduino, Raspberry Pi, and PIC microcontrollers are examples of control devices that may be utilised to construct IoT-based systems. Using Arduino, this project created an IoT-based gas leakage monitoring and warning system. Arduino UNO is a low-cost,

adaptable, and simple-to-use open-source programmable microcontroller board that may be used in a range of electrical projects. This board may be used to operate relays, LEDs, servos, and motors and can be interfaced with other Arduino boards, Arduino shields, and Raspberry Pi boards.

1.2 Problem Statement

LPG (short for Liquid Petroleum Gas) makes cooking easy, fast and economical. It is also a cleaner and more efficient way of cooking with several benefits. LPG is easy to control with instant on and off. That is also the reason why most professional kitchens still use gas stoves and cook with flame rather than electronic stoves. With a simple turn of the dial, the flame gets bigger or smaller so that the change in heat is immediate and precise.

LPG is convenient and safe to use. It also ensures less wasted heat. As you turn off your gas cooktop, the flame is extinguished and the heat source vanishes, not so with an electric stove which continues to emit heat after it is switched off. LPG stoves also emit less overall heat than any other cooking device, thus keeping your kitchen temperature unaffected.

Moreover, as a human never know if there any mishaps happen without unexpected. Thus, is project provided a signal conditioning of the Arduino EPS32 is done by output signal of the sensor, provided input to Arduino. Result is noticed when the gas is present the buzzer will make the sound. At the same time there will message be sent to the phone of the user.

There are also some mechanisms use to reduce the risk of fire and gas suffocation. For example, exhaust fan used to the clear gas leakage to outside so that there no harm occurs if human smell in. other than that, there will a clip that will automatically stop the leakage from spreading even more.

1.3 Project Objective

a) To analyse the presence of LPG leakage as a part of the important aspect of the project.

b) To design a project that can sent SMS alert to inform the authorized person.

c) To install an exhaust fan to work an auto ventilation fan to clear the smoke and spilled gas.

1.4 Scope of Project

For this project, the scope has been outlined to be able to design and develop a prototype of a development of gas leakage detector with IoT. The restraint of this project is only for house which LPG gas as main gas for cooking. This prototype use Arduino ESP32 as the microcontroller that will gas sensor, buzzer that are linked to the application. The microcontroller must be using a programming code to run the hardware which used an Arduino IDE platform to create the code. Next, extra features like flame sensor to detect the presence of flame and ventilation fan to remove the gas/smoke leakage.

1.5 Thesis Outline

There are five chapters in this thesis report. The thesis's first chapter is an introduction. The thesis's second chapter is a literature review, which will look at past projects as well as articles linked to current one. The third chapter will go through the approach and how it was utilised to finish the job. The fourth chapter will go through the project's outcome. Finally, the fifth chapter will explain the project's conclusion and recommendations.

CHAPTER 2

LITERARUTE REVIEW

2.1 Introduction

One of the most important aspects before beginning a project is to do a literature study. The prior study project will be reviewed with observations in this chapter. The past project information that we gathered on the internet will assist the project in running smoothly according to the plan. Literature reviews must be conducted to have a better knowledge. This chapter will go through some of the past work that has been done on the subject.

2.2 Past Studies

Nagib Mahfuz, Shawan Karmokar and Md. Ismail Hossain Rana they develop a multilayer warning system with a gas detecting mechanism that is adequate. The suggested electronic gadget also has the ability to monitor real-time gas leakage circumstances, as well as SMS query and warning functions, according to them.[1]

Afsana Mim Anika projects Develops five major issues which were gas spillage location, fire detection and auto ventilation, alarm system (SMS, Notification through flexible application) and water syphoning framework.[2]

Brij Bhushan Sharma, Pankaj Vaidya and Nagesh Kumar tried to make a project that used to minimize the effects of LPG leakage, many systems have been proposed. Gas leak detection system is a process of identifying potentially dangerous gas leaks using sensors and creating an appropriate electronic device.[3]

Next, Shawkat Jahan, Md. Minhajul Azmir and Md. Mahafuzul Islam, their research paper shows how an IoT-based gas leakage monitoring system was utilised to build and

execute a smart cooker. As a result, even if the user is away from home, he or she will be warned and will be able to take the required precautions to avoid an accident.[4]

Md. Tarikul Islam Juel, Md. Sajid Ahmed and Tabassum Islam project was to monitor the fire risk factors from the server in some particular places by using this device based on IoT.[5]

Prasanta Pratim Bairagi, and Prof. (Dr.) L. P. Saikia developed a project to spot the gas leakage using gas sensor and keeps track of the weight of the cylinder by using load sensor. Other than that, it also calculated the weight of the remaining gas in the cylinder and when it crosses the low level, instinctively sends SMS to the registered mobile no and displays it on LCD display to inform users.[6]

Priyanka Sankpal, Sourabh Jamadagni, Nikita Chougule and Shailesh Gurav project was gas leakage and fire detection is the process of using sensors to detect potentially dangerous gas leaks and fires. The sensors then transmit an SMS over GSM to inform others. When the sensor senses gas or fire, it generates a voltage, which is then sent to the Raspberry Pi as an input. When gas and fire are detected, the GSM sends an SMS.[7]

Sourav Debnath, Samin Ahmed, Suprio Das, and Abdullah-Al Nahid they create a project with the primary goal of sensing the LPG gas that causes the fire and detecting the presence of the fire, as well as sensing smoke flowing out of the light. At the same time, the project is a practical, cost-effective, and reasonable undertaking.[8]

Sony Shrestha, V. P. Krishna Anne, and R. Chaitanya project was a system that uses a gas sensor, a fire sensor, and a load cell to detect gas leakage, fire, and continually monitor the amount of gas in a cylinder In addition, the user will receive a notice indicating that the gas in the cylinder is soon to run out. The user will be notified through SMS or phone call if there is a gas leak or a fire.[9]

Lastly, S. Z. Yahaya, M. N. Mohd Zailani, Z. H. Che Soh, and K. A. Ahmad project was an ability to construct an IoT-based gas leakage monitoring system utilising the Node MCU as the control device and the Blynk application as the IoT platform to detect and monitor gas leakage at home and alert the user's smartphone.[10]

2.3 Why IoT is the choice?

Figure 2.1 Internet of Things (IoT)

IoT is critical to the advancement of technology since it causes a significant shift in our professional and personal life. IoT provides considerable consumer value and usefulness to users as a fully linked and integrated environment. As a result, it is critical for engineering students to understand and practise it. And starting with mini/final year projects on IoT is an excellent place to start. Table below show the different between IoT, and WSN.

Table 2.1 Different between IoT and WSN

Characteristics	**Internet of Things**	**Wireless Sensor Network**
Type of Nodes	Thin	Thin
Area to scale	Large region	Large region
Communication Specification	Active and Passive	Passive
Identifying Object	Must	Disable

2.4 The need of Gas leakage detector system

For a variety of reasons, gas leak detection services are necessary, the most significant of which is public health. Combustible gases can cause fires or explosions in your home or workplace, causing harm to you, your family, friends, or coworkers. Due to cumulative exposure, gas leaks have the potential to cause long-term health concerns. In rare circumstances, gas leaks may be silent killers.

Furthermore, gas leaks are not only harmful to your health. Repairing gas leak damage may be expensive, time-consuming, and unpleasant, as well as expose you to potentially hazardous substances. If you don't have access to gas leak detection services to figure out what's causing the problem, the effects of the leak might return, costing you even more money.

Lastly, this project will create a mechanism that will be able to stop a gas leak if action is done quickly. As a consequence, property and life losses can be minimised.

2.5 Type of gas leakage detector for kitchen

2.5.1 HD1000 Home gas detector

The HD1000A Household Standalone Combustible Gas Detector was created to detect flammable gas leaks such as LPG, city gas, natural gas, methane, and so on. It uses complex electrical components and a very accurate advanced semi-conductor sensor to provide a high degree of functionality, dependability, and adaptability. The HD1000A series detectors are calibrated to alert before 7 percent LEL or as defined by the customer, and the built-in relay can control solenoid valves, sirens, or any other signal or danger management device.

Figure 2.2 HD1000 Home Gas

2.5.2 HD8200 Home gas detector

The HD8200 is a stand-alone detector that detects combustible gas (natural gas, propane), CO gas, and interior temperature. It has a voice alert and an LED display. It has a high-precision gas sensor with exceptional repeatability. The implementation may be used in a home, hotel, apartment, villa, supermarket, or other location to detect natural gas, LP gas, and pipe gas leaks in order to assure security and safety.

Figure 2.3 HD8200 Home gas detector

2.5.3 GSD600 Gas Leak Detector

When switch on the Amprobe GSD 600, it automatically calibrates and is ready to use in less than a minute. This sniffer pulls air through the hose and allows you to examine appliances and piping in your home, even in hard-to-reach regions, to locate the specific site of a suspected gas leak – useful if you're installing a gas appliance. If any gas is detected, a strip of LEDs will light up, and the machine will sound an audio alert.

Figure 2.4 GSD600 Gas Leak Detector

2.5.4 Alta HD2000 Home Gas Detector

The Alta HD2000 Home Gas Detector was created to detect combustible gas leaks such as natural, LPG, SNG and Propane gas. It uses complex electronic components and a very precise advanced semiconductor sensor to provide a high degree of usefulness, durability, and adaptability. The Alta HD2000 Home Gas Detector is calibrated to warn before 7 percent LEL or as specified by the customer, and it may control solenoid valves, sirens, and any other signal or alarm handling device with the built in relay.

Figure 2.5 Alta HD2000 Home Gas Detector

2.6 Type of Microcontroller

An embedded system's integrated circuit architecture is compact and capable of controlling a specific job. A microcontroller is a single chip that includes a CPU, memory, and input/output (I/O).

It's an embedded device that uses its central CPU to explain data received from its I/O to give instructions to a single function.

Basis	Arduino	Raspberry Pi
Design of the CPU	8-bit	64-bit
Grade of logic	Logic level is 5V	Logic level is 3V
Power Consumption	It uses around 200 MW of power	It uses around 700 MW of electricity.
According to	Microcontroller	Microprocessor

Table 2.2 Differences between Arduino and Raspberry Pi

Figure 2.6 Arduino Uno

Figure 2.7 Raspberry Pi

2.7 Smoke/Gas Sensor

The MQ2 smoke sensor can measure the amount of smoke in the air, which can occur during a gas leak. In addition, the price is reasonable and the item may be simply replaced if it breaks. Carbon monoxide is one of the gases that may be found in a kitchen (CO). It's colourless and odourless, making it difficult to tell apart from other gases. Carbon monoxide gas is extremely harmful since it has the ability to kill people without warning. When a person inhales gas, they may suffer a variety of symptoms depending on the gas concentration level.

Carbon monoxide concentration level	The sign or symptom
0 ppm (0%)	Fresh air and nothing happen. Nothing happens despite the fresh air.
35 ppm (0.0035%)	Within six to eight hours of continuous exposure, headache and dizziness develop.
100 ppm (0.01 %)	In 2–3 hours, it will get a little headache.
200 ppm (0.02%)	Within 2–3 hours, you may have a mild headache and a lack of judgement.
400 ppm (0.04%)	Frontal headache within 1 – 2 hours
800 ppm (0.08%)	Within 45 minutes, you'll have dizziness, nausea, and convulsions, and you'll be unconscious within two hours.
1600 ppm (0.16%)	Within 20 minutes, a headache, elevated heart rate, dizziness, and nausea appeared, followed by death in less than two hours..

Table 2.3 Symptoms of CO poisoning

Figure 2.8 MQ2 Gas Sensor

2.8 Flame Sensor

The infrared (IR) fire sensor is a device that detects fire or fire in the area where it is placed. After a zone has been engulfed in flames, the temperature of the surrounding area will rise to critical levels, with carbon dioxide and carbon monoxide levels in the atmosphere clustering together. This option is superior to the others for detecting fire. The wavelength of flame sensor to operate is in the range of 760 nm to 1100 nm. The detection range is up to 100 cm.

Figure 2.9 Flame Sensor

2.9 Summary of literature review

Author	Title	Remarks
Nagib Mahfuz, Shawan Karmokar, Md. Ismail Hossain Rana	A Smart Approach of LPG Monitoring and Detection System Using IoT	1.Develop a multilayer alarming method with an appropriate gas sensing mechanism. 2.The proposed electronic device has the facility to monitor real-time gas leakage conditions and SMS inquiry and alarming functionality.
Afsana Mim Anika	Gas Leakage with Auto Ventilation and Smart Management System Using IoT	1. Gas spillage location, fire detection and auto ventilation, disrupting System (SMS, Notification through adaptable application) and water syphoning framework are the five major concerns managed.
Brij Bhushan Sharma, Pankaj Vaidya, Nagesh Kumar	Arduino based LPG Leakage Detection and Prevention System	1. To minimize the effect of the LPG leakage, many systems have been proposed. A gas leakage detection system is a process of identifying potentially hazardous gas leakage by using sensors and creating a suitable electronic gadget.
Shawkat Jahan, Md. Minhajul Azmir, Md. Mahafuzul Islam	Development of Smart Cooking Stove: Harvesting Energy from the Heat, Gas Leakage Detection and IoT Based Notification System	1. This study shows how an IoT-based gas leakage monitoring system was utilised in the design and deployment of a smart cooker. As a result, even if the user is not at home, he or she will be warned and will be able to take the required precautions to avoid an accident.

Table 2.4 Literature Review I

Author	Title	Remarks
Prasanta Pratim Bairagi, Prof. (Dr.) L. P. Saikia	Development of a LPG Monitoring and Automatic Cylinder Booking System Based on Wireless Sensor Network	1. To detect gas leaks with the use of a gas sensor and to keep track of the cylinder's weight with the help of a load sensor. 2. Calculates the weight of the remaining gas in the cylinder and, when it reaches a critical level, sends an SMS to the registered mobile number and shows it on the LCD display to alert users.
Priyanka Sankpal, Sourabh Jamadagni, Nikita Chougule, Shailesh Gurav	Gas Leakage and Fire Detection using Raspberry Pi	1.Gas leakage and Fire detection is the process of identifying potentially hazardous gas leaks and fire by sensors. 2.These sensors alert people by sending and SMS through the GSM. 3. This detection can be achieved by using the gas sensor (MQ-2) and Fire Sensor which are interfaced to the Raspberry pi. 4. Whenever the sensor detects gas and fire, a voltage is generated in it and is given as input to raspberry pi. The SMS is sent by the GSM when Gas and Fire is detected.
Sourav Debnath, Samin Ahmed, Suprio Das, Abdullah-Al Nahid	IoT based Low-Cost Gas Leakage	1. The fundamental goal of this study is to identify the presence of LPG gas, which is the cause of the fire, as well as to detect smoke that is emitted by the light. 2. A real-life helpful and cost-efficient sensible project 3. The circuit is less complicated, and there is no environmental or physical damage.

Author	Title	Remarks
Sony Shrestha, V. P. Krishna Anne, R. Chaitanya	IoT Based smart gas management system	1. This system uses a gas sensor, a fire sensor, and a load cell to detect gas leaks, fires, and to continually monitor the amount of gas in the cylinder. 2. Buzzer starts beeping on detection of gas leakage and fire. 3. A notification will also appear informing the user that the gas in the cylinder is close to run out. The user will be notified by SMS or phone call if a gas leak or fire is detected.
S. Z. Yahaya, M. N. Mohd Zailani, Z. H. Che Soh, K. A. Ahmad	IoT Based System for Monitoring and Control of Gas Leaking.	1. This project intends to create an IoT-based gas leak detection and monitoring system that uses the Node MCU as the control device and the Blynk application as the IoT platform to detect and monitor gas leaks at home and alert the user's smartphone.
Md. Tarikul Islam Juel, Md. Sajid Ahmed, Tabassum Islam	Design of IoT Based Multiple Hazards Detection and Alarming System	1. Using this IoT-based gadget, to monitor the fire risk elements from the server in specific locations.

Table 2.5 Literature Review II

2.10 Summary

Because humans are ineffectual, the Internet of Things (IoT), which is extensively used, has an impact on the project. In addition, the IoT communication protocol offers a simple way to communicate with intelligent objects. Then there's the possibility of an unintended gas release. The goal of a gas leakage detector is to identify gas leaks early enough for people to take precautionary measures.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter will go through the methodology and description that will be used to complete the project effectively. A block diagram and flow chart will be used to depict every technical aspect, including the construction and operation of software and hardware. Each component or piece of software has a certain function to fulfil.

3.2 Methodology

The project flow is the path the project should take in order to run properly. Because the procedure is followed step by step, the flowchart below is essential. Following that, knowledge and comprehension about the project are gathered through conducting some research by searching, reading, and learning about prior relevant projects. Figure below show the flowchart of the project.

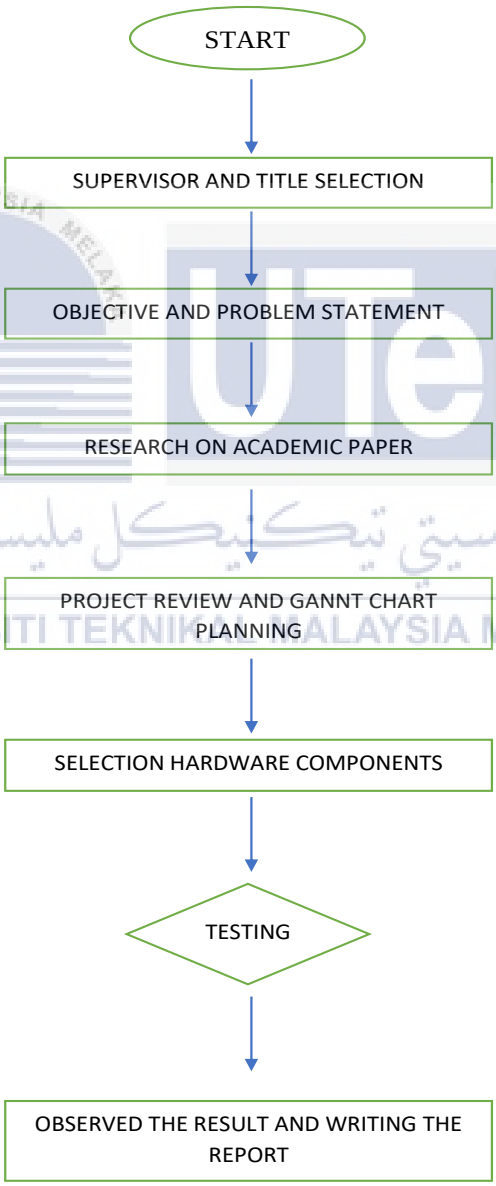


Figure 3.1 Project methodology flowchart

To begin, the chosen project title was examined in order to develop ideas and identify the project's objectives and solution based on the observed issues.

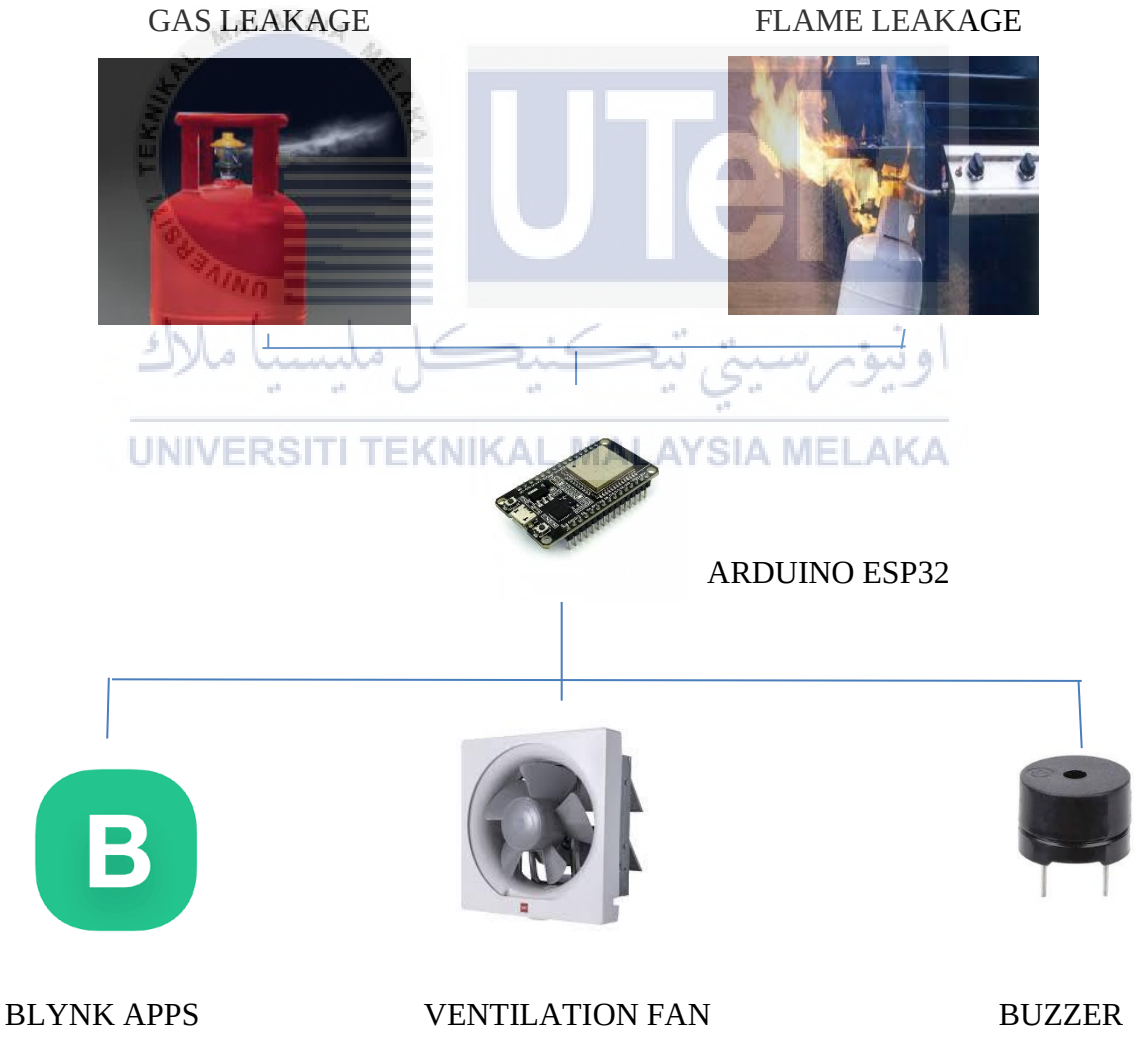
Next, a literature study of an existing project was conducted to gather further knowledge and insight from credible sources such as journals, conference papers, and publications that are relevant to this project. It aids in the development of project knowledge, theories, and concepts.

In addition, a Gantt chart is useful for organising a project timetable because the procedure took some time to complete on time. The project is then separated into two stages, each of which focuses on circuit and hardware design. Before moving on to the hardware components, Proteus 8 Professional Software is used to design, build, and simulate the electrical circuit. The Arduino Integrated Development (IDE) is used to mimic the coding programme.

This project is separated into two sections, one for circuit design and the other for hardware design. Before moving on to the hardware pieces, Proteus 8 Professional Software is used to design, build, and simulate the electrical circuit. The Arduino Integrated Development (IDE) is used to code the simulation software.

3.3 Project Characteristic

This gas leakage detector will detect gas leaks or anything else potentially harmful, and it will notify the user via smartphone or any other device that supports Blynk Apps. The goal of this project is to eliminate gas leaks in the home. This project uses an Arduino Uno microcontroller with a gas sensor and a flame sensor to detect and quantify the environment. The ESP8266 is used to link the hardware to the Blynk Apps so that when something happens, the user is notified.



3.3.1 System Hardware Chart

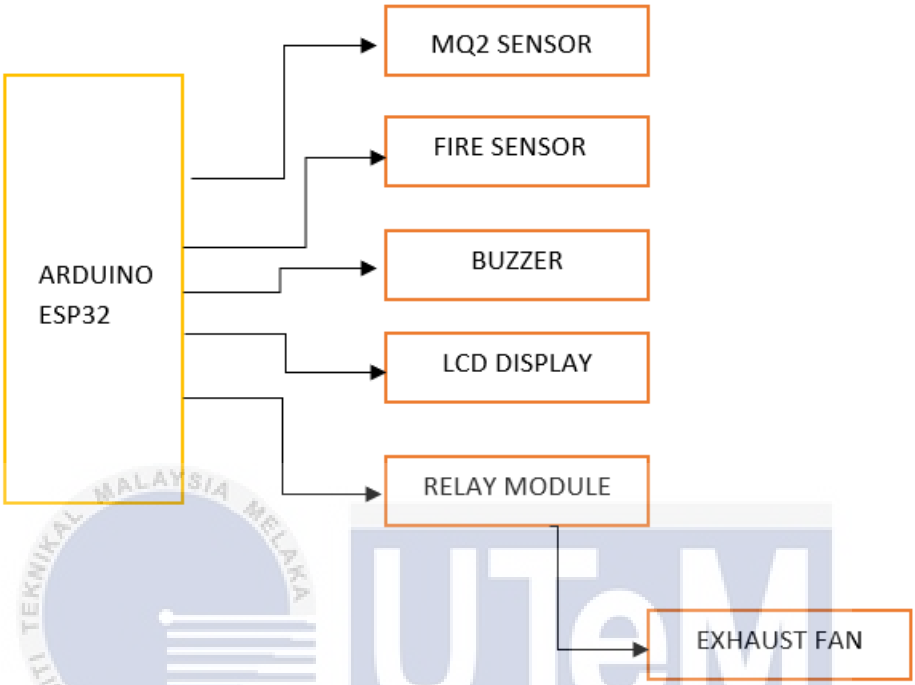


Figure 3.2 System Hardware Chart

Gas and fire sensors are interfaced to the Arduino microcontroller in the proposed framework. These sensors serve as a supplement to the framework. When transmitting SMS, the ESP32 uses for the orders. This item is a fantastic development board for IoT applications (Blynk). The suggested system additionally includes an auto air ventilation system.

3.4 Summary

In this system, the parameter observed are the presence of gas leaks, and flame of the LPG gas that installed at our house.

3.4.1 IR Sensor Module

This sensor detects the presence of flame and sends a signal to the ESP32, Wi-Fi module, and Blynk app, alerting the user if a fire occurs. This sensor's operation is shown in the flowchart below.

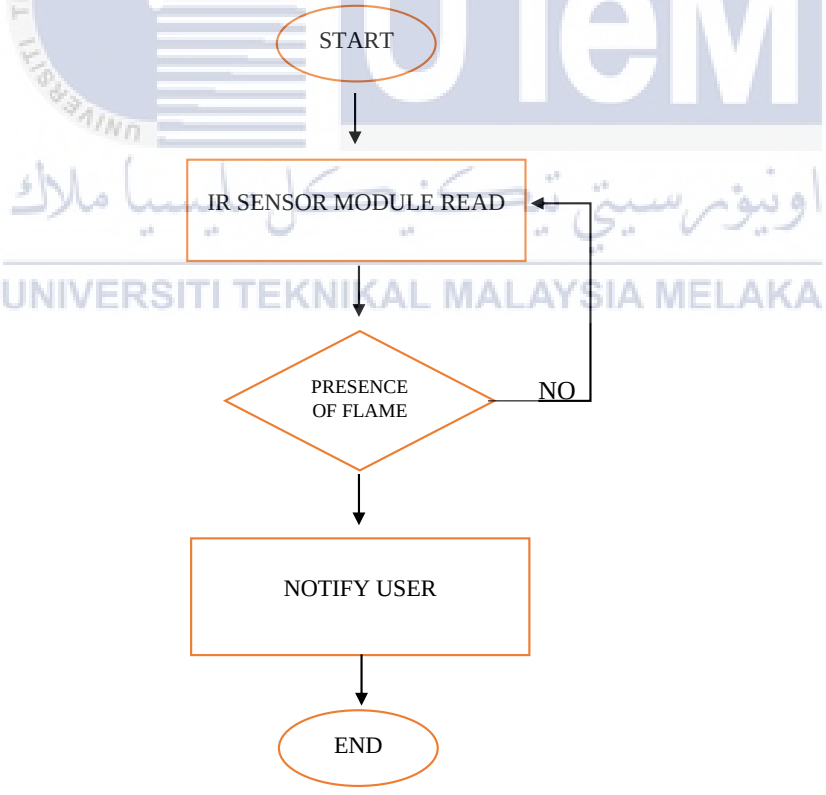


Figure 3.3 Flowchart of Fire sensor

3.4.2 Gas Sensor

This equipment can detect both gas and smoke, however as we've seen, a separate gas sensor was used to detect gas. A gas leak's goal is to detect gas in our home.

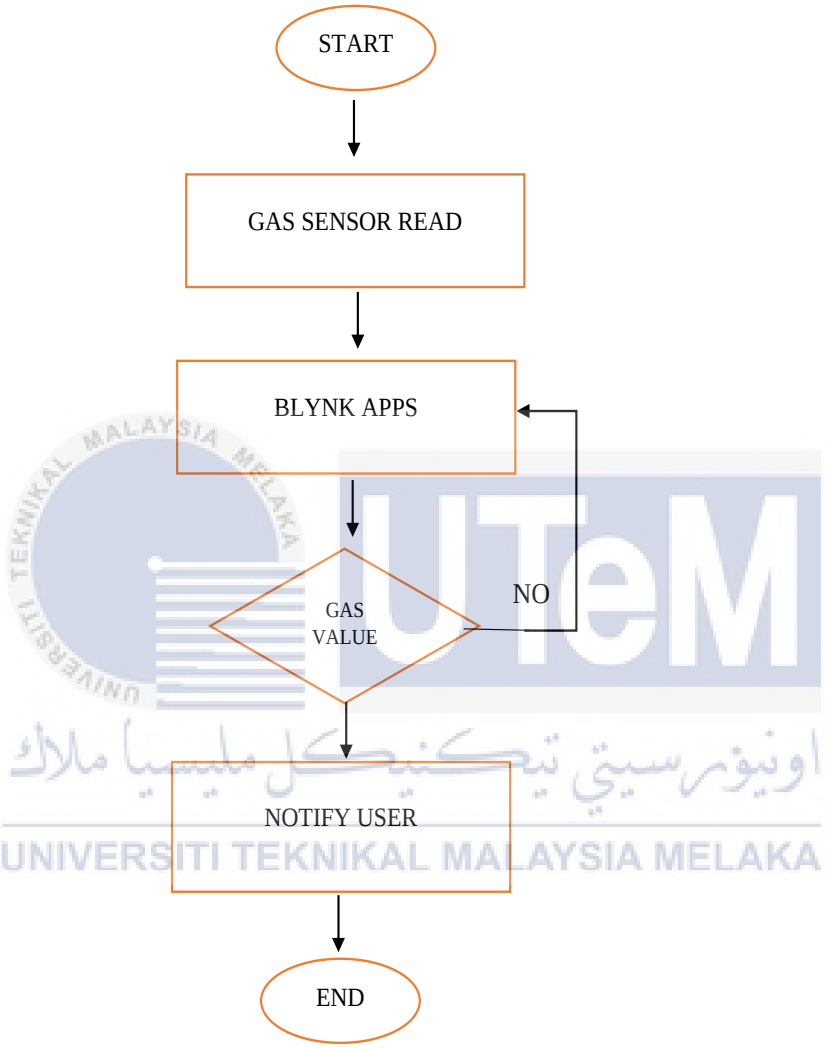


Figure 3.4 Flowchart of gas sensor

3.4.3 Microcontroller and Driver

The ESP32 will be configured for internet access by importing the libraries and code into the Arduino IDE. To connect the ESP32 to Blynk Apps, Blynk Apps code was introduced to the hardware programme coding.

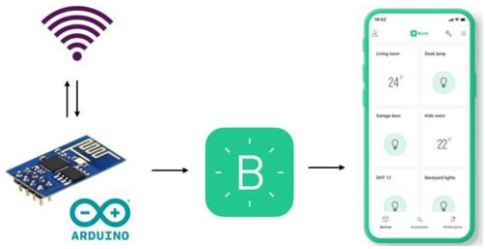


Figure 3.5 Diagram of Blynk Cloud Flow

3.5 Software and Component

3.5.1 Software

3.5.1.1 Proteus

Proteus is a collection of software tools for automating electrical schematic creation and circuit board printing. This application works with a variety of microcontrollers that are often found in educational settings. As a consequence, even beginners learning to create electronic circuits could benefit from it.

Figure 3.6 Proteus Logo

3.5.1.2 Arduino IDE

The Arduino IDE is a multiplatform programme containing code editing text, a communication area, computational text, and a ribbon with buttons for common functions and string menus. It can also upload and communicate with Arduino and Genuino devices. Additionally, because proteus is a simulation-based application, Arduino may be simulated. The Arduino IDE is a multiplatform programming environment containing code editing text, a communication region, computational text, and a ribbon with buttons for common functions and string menus. It can also upload and communicate with Arduino and Genuino devices. Furthermore, because proteus is a simulation foundation software, it can simulate Arduino.

Figure 3.7 Arduino IDE logo

3.5.1.3 Blynk Application

Blynk is a platform that allows IOS and Android apps to control a range of microcontrollers, including Arduinos, Raspberry Pis, and other internet-connected devices. It's a digital control panel that allows you to design a graphical interface for any project simply by hovering over the widgets. It uses a Java server to manage communication between the Blynk mobile app and the microcontrollers. Blynk is a web application that

connects hardware to the cloud and analyses data from devices in real time. As a consequence, it may be managed and notified from anywhere.

For this project, Blynk apps are installed in cellphones, and SMS and alerts are sent through GSM Module and Blynk application when a gas leak or fire is detected. A device must have a configuration produced by Blynk Apps after adding a new device in order for the hardware to be synced with Blynk Apps.

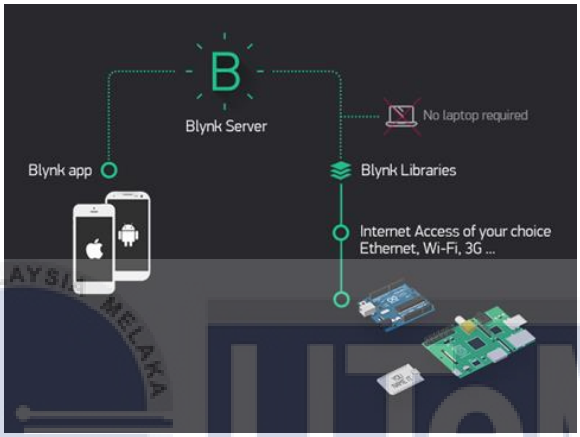


Figure 3.8 Blynk Application

3.5.2 Component Use

3.5.2.1 Arduino ESP32

Arduino ESP32 is the microcontroller utilised in this project. As a result, a platform that functions as an open-source microcontroller board with low power consumption and low cost. Less cost can save more money from an economic standpoint.

Figure 3.9 Arduino ESP32

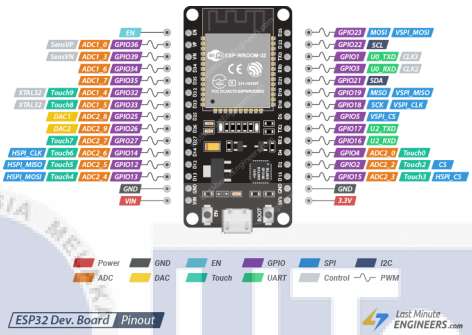


Figure 3.10 ESP32 Pin Diagram

3.5.2.2 Gas Sensor

Gas sensors are electronic devices that can detect and identify a wide range of gases. They're usually used to detect and monitor harmful or explosive gas levels.

Figure 3.11 Gas Sensor MQ2

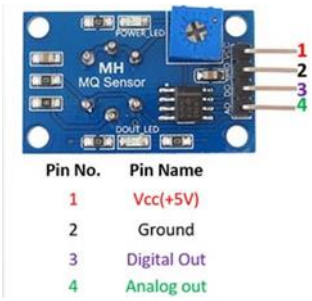


Figure 3.12 Gas Sensor Pin Diagram

3.5.2.3 Flame Sensor

The flame sensor module uses a photodiode to detect light and an op-amp to regulate sensitivity. When it senses a fire, it emits a HIGH signal.

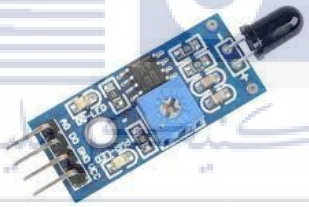


Figure 3.13 Flame Sensor

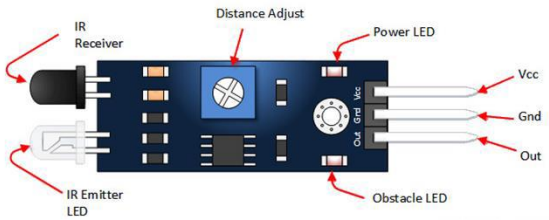


Figure 3.14 Flame Sensor Pin Diagram

3.5.2.4 Relay Module

A relay is a type of electronic switch. The relay module is utilised to control an exhaust fan in this project. When LPG gas leaks, the microcontroller sends a signal to the exhaust fan through a relay, which immediately turns the exhaust fan on. As a result, the gas will be dissipated outside the home using this mechanism.

Figure 3.15 Relay Module

3.5.2.5 DC 12V Fan

To remove smoke and spilled gas with an auto ventilation fan.

Figure 3.16 12v DC Fan

3.5.2.6 LCD 16x2 display

LCD stands for Liquid Crystal Display, and it is a type of electronic display that is utilised as a module screen. The most popular module is a 16x2 display screen. The house's condition will be displayed via an LCD display

.

Figure 3.17 LCD 16x2 display

3.5.2.7 Buzzer

A buzzer or beeper is an audio signaling device which will make a sound when the gas leakage happen. The price for this equipment also affordable and easy to handle.

Figure 3.18 Buzzer

3.6 Summary

This chapter elucidate the methodology of development gas leakage detector with IoT where it is the most salient in developing this project to ensure that it accomplished successfully.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

The project's preliminary results are discussed in this chapter. In addition, the analysis will be based on the approach and preliminary results obtained. The analysis must adhere to the project's aim and scope, which were described in Chapter 1. As a consequence of this, the project's capacity was developed to ensure that the project is running as anticipated.

4.2 Result and Analysis

The outcomes were obtained and recorded using the Arduino IDE and Blynk Applications to demonstrate that the hardware can be connected to the applications and that the parameter readings were reliable.

4.2.1 Flowchart Coding for Hardware

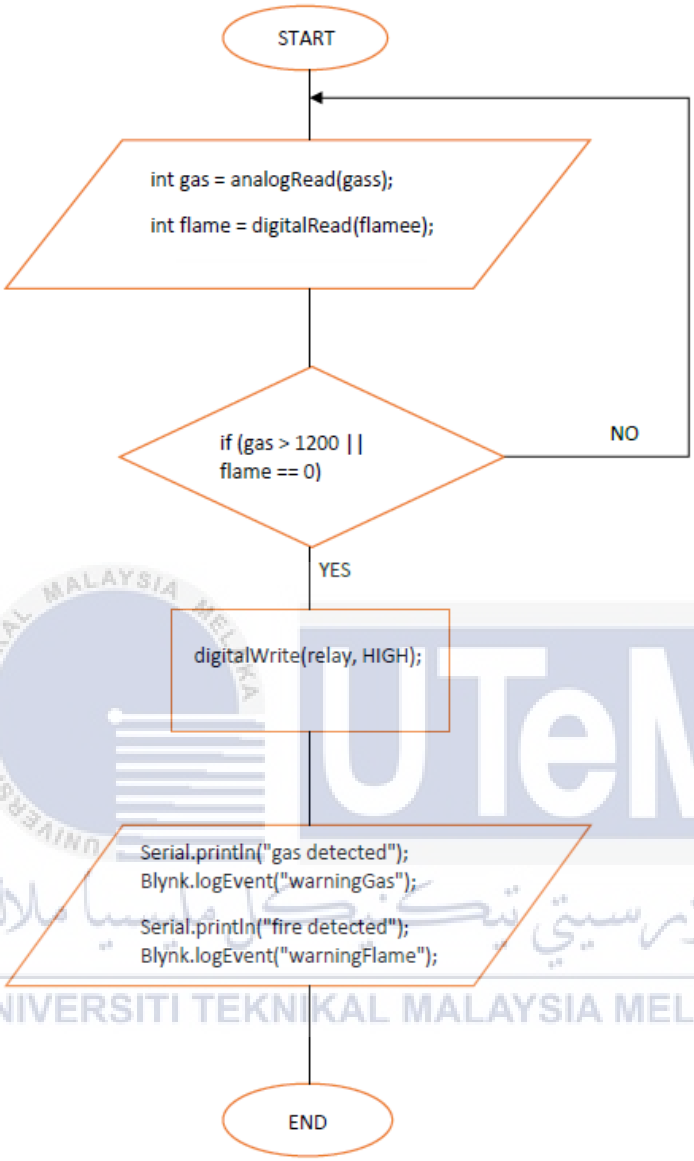


Figure 4.1 Flowchart coding for hardware

4.2.2 Flowchart Coding for Software

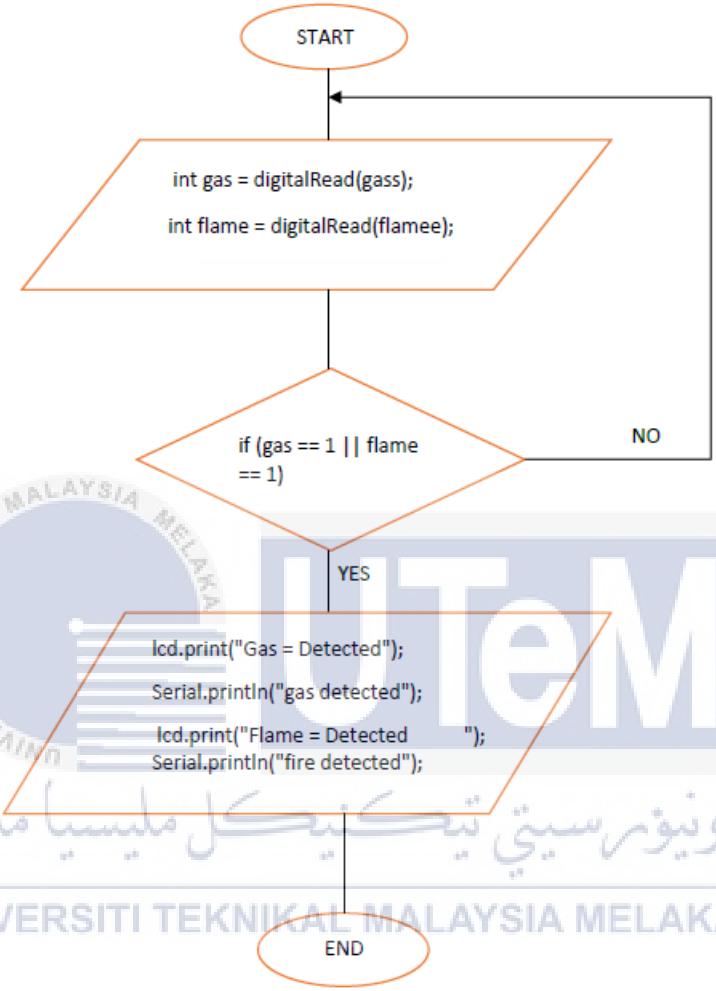


Figure 4.2 Flowchart coding for software

4.3 Circuit Design

The circuit is design using Proteus software which it shows the connection of the component with Arduino.

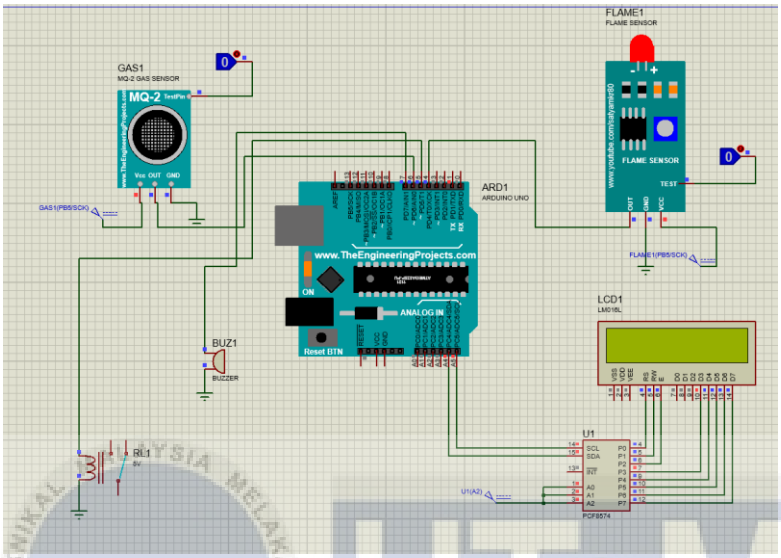


Figure 4.3 Software design

4.4 Project Design

Figure 4.4 Project Design

This design consists of polypropylene. The 12V fan will be activated as the sensor inside the box sense any gas or smoke. The flame sensor will detect if there is present of flame.

4.5 Hardware Analysis

The hardware of this project consists of, Arduino ESP32, 12V DC Fan, MQ2 Gas/Smoke sensor, buzzer, Relay Module, and LCD Display.

4.6 Result of Arduino ESP32

This project Arduino ESP32 is used to send and receive notification through Blynk Application. The capability of this component is it able to receive notification when the sensor detects the present of gas/smoke or fire in that area. Arduino ESP32 will send notification to the connected mobile phone.

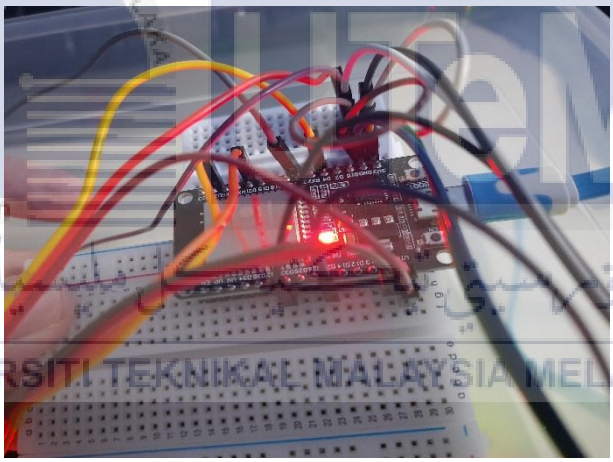


Figure 4.5 Arduino ESP32 connection

Port 3V3 on the Arduino ESP32 is linked to power the device. The status when it is turn on the buzzer will ring and the LCD display will switch on simultaneously. It is shows that circuit run correctly. At the same time, the gas senser also will starts to detect. This is because gas sensor needs to be warm up for couple minutes due to its characteristics before we can make the true test of gas sensor.

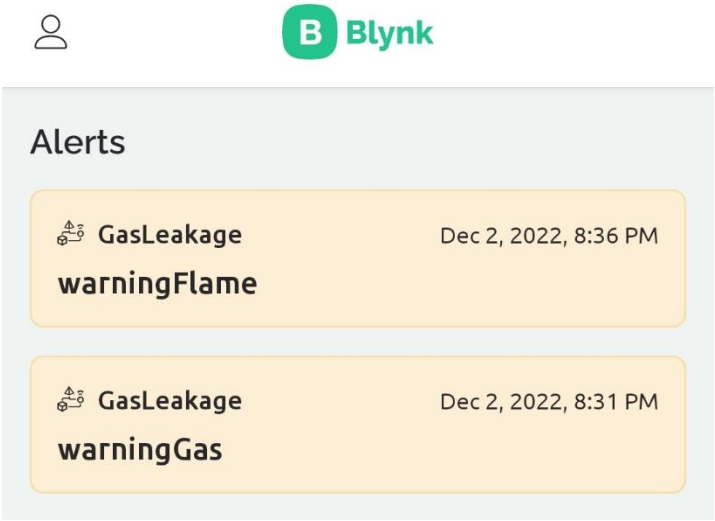


Figure 4.6 Notificcation from Blynk Application

Blynk Application is used in this project to gice notification to the authorized person if there is any gas or smike leakage and the presence of flame.

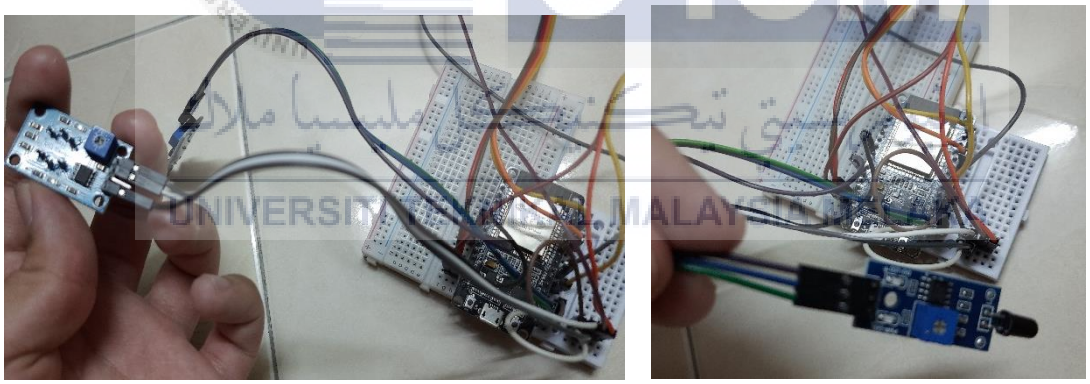


Figure 4.7 Gas sensor and flame sensor connection

This project consist of gas/smoke sensor and flame sensor. Both sensors will react if there is gas/smoke leakage or presence of flame.

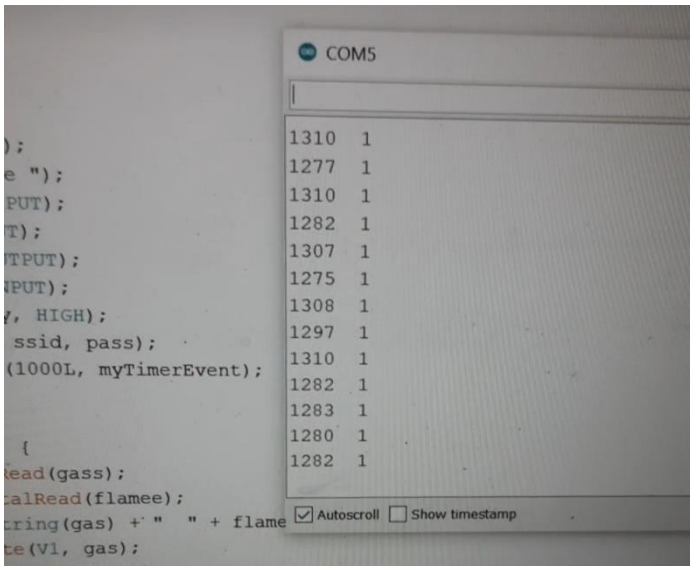


Figure 4.8 Reading when there is gas leakage

For gas/smoke sensor, the reading that already to be key in at the coding is 1200 ppm. When the reading above 1200 ppm, the gas sensor wll automatically react. At the same time, the 12V fan will switch on instantly to remove the gas/smoke leakage.

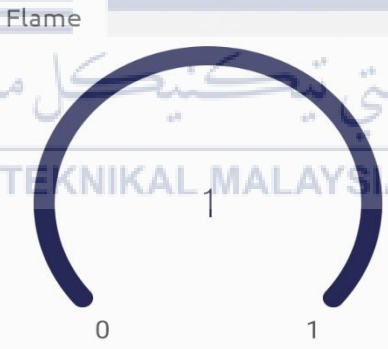


Figure 4.9 Reading when there is presence of flame

For flame sensor, the reading in the coding already set when 0 there is no present of gas.Meanwhile, when the reading is 1 it is shows that there is the presence of flame.

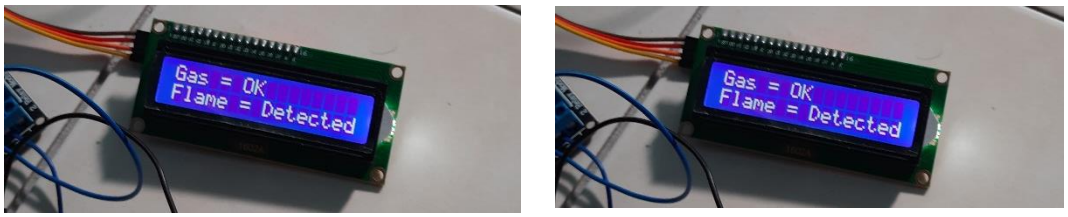


Figure 4.10 LCD display for gas and fire detection

For LCD display, is used to show when there is a presence of gas leakage or flame. When the MQ2 gas sensor or the flame sensor detect it will automatically display at the LCD display like shown on Figure 4.10.

4.7 Cost of the hardware project

The cost of the project is reasonable and below the budget expectation.

Payment Method	Check No.	Job		
CASH				

Qty	Item #	Description	Unit Price	Discount	Line Total
1		Mini Breadboard	2.90		2.90
1		Buzzer	1.50		1.50
1		DC 5V Fan	5.90		5.90
1		12V Power Supply	8.40		8.40
1		Female Terminal Block	1.90		1.90
1		IR Flame Detector	4.30		4.30
1		Female To Male Jumper	3.70		3.70
1		5V Relay 1 Way	3.90		3.90
1		MQ-135 Gas Detector	6.90		6.90
1		ESP32 Board	32.90		32.90

Total Discount		
	Subtotal	MYR 72.30
	Sales Tax	
	Total	MYR 72.30

Figure 4.11 Cost of the project

4.8 Discussion

For Arduino, at first it was planned for this project to use Arduino ESP8266, but it switches to Arduino ESP32 because this Arduino the Wi-Fi module already build in together inside. If use Arduino ESP8266 need to be extra NODE MCU because if use on that Arduino the circuit connect with IoT and there will be also some cost cut if use ESP32. For Arduino ESP32 has even more reliable performance and excellent quality.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter will provide the conclusion and future work suggestions for improving the system's development. This section includes discusses the project's limitations as well as some ideas or suggestions for how to enhance it. There are also suggestions for future work that should be updated in terms of the system's development. It also emphasises the importance of the study findings and any future implementation.

5.2 Summary of the project

As the conclusion, this project focused on to design a program that can alert authorized person by sending a notification using Arduino ESP32 to Blynk Application. Next, there a lot of steps need to be highlight to create a good output of the project. By learning the output of the project will be able to understand the basic operation of gas/smoke sensor and fire sensor. Besides, this project helps people to know the condition of their house through mobile phone. This is because, it is important for people to know if there is anything happen and they can take early precaution.

Furthermore, there is important for people to know the about the harmful of concentration of gas/smoke that can harm to people. This kind of gases cannot be seen by bare eyes, the gas sensor will use to detect the gas leakage and it will send alert notification to authorized person. The excess of gas will be eliminated using the exhaust fan. The fan will be automatically on when there is the present of gas occur in the house.

Lastly, this project should be taken to any consideration and can be improved through ideas from any other people.

5.3 Project objective achievement

1. To eradicate harmful that can cause any mishaps of gas leakage and presence of flame by the exists of gas sensor and flame sensor.
2. To make sure the fan reacts as the ventilation if there is leakage of gas or smoke due to the dangerous of concentration of gas if human smell it.

5.4 Project Potential Commercial

1. It is usable in daily life especially for household which use LPG gas as daily usage for cooking.
2. The price is quite reasonable for all people who want to use it.
3. It has a system that can help to trace leakage on the early stage.

5.5 Future Works

A control system can be offered using GSM networks since the GSM range is broader and can monitor and manage household appliances. A PIR sensor, which can be placed anywhere in the house to detect human movement, can be used to detect gas leaks. Aside from that, a PIR sensor can detect the amount of infrared radiation. As a result, everything that generates low-level radiation emits more radiation as it gets hotter. After then, if the device senses human movement, the alert will go off instantly.

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APPENDICES

Appendix 1 Coding for Hardware

```
#define BLYNK_TEMPLATE_ID "TMPL17pUuCSJ"
#define BLYNK_DEVICE_NAME "GasLeakage"
#define BLYNK_AUTH_TOKEN "qPgWcScIigTqjnoqFIK7aMC53P-MDV4_"

#define BLYNK_PRINT Serial
#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "Haroro Pororo";
char pass[] = "haidir77";

LiquidCrystal_I2C lcd(0x27, 16, 2);
BlynkTimer timer;

int relay = 4;
int buzzer = 17;
int gass = 33;
int flamee = 27;
int msgG = 0;
int msgF = 0;
boolean con = false;

BLYNK_WRITE(V0)
{
  int pinValue = param.asInt();
  Serial.println(pinValue);
  if (pinValue == 1) {
    con = true;
  }
  else {
    con = false;
  }
}


void setup() {
  Serial.begin(9600);
  lcd.begin();
  lcd.backlight();
```

```
  lcd.clear();
  lcd.setCursor(0, 1);
  lcd.print(" welcome ");
  pinMode(relay, OUTPUT);
  pinMode(gass, INPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(flamee, INPUT);
  digitalWrite(relay, HIGH);
  Blynk.begin(auth, ssid, pass);
  timer.setInterval(1000L, myTimerEvent);
}

void myTimerEvent() {
  int gas = analogRead(gass);
  int flame = digitalRead(flamee);
  Serial.println(String(gas) + "  " + flame);
  Blynk.virtualWrite(V1, gas);
  Blynk.virtualWrite(V2, flame);

  if (gas > 1200 || flame == 0) {
    digitalWrite(buzzer, HIGH);
  }
  else {
    digitalWrite(buzzer, LOW);
  }

  if (con == false) {
    if (gas > 1200) {
      digitalWrite(relay, LOW);
      lcd.setCursor(0, 0);
      lcd.print("Gas = Detected      ");
      if (msgG == 0) {
        Serial.println("gas detected");
        Blynk.logEvent("warningGas");
        msgG = 1;
      }
    }
    else {
      lcd.setCursor(0, 0);
      lcd.print("Gas = OK            ");
      digitalWrite(relay, HIGH);
      msgG = 0;
    }

    if (flame == 0) {
      if (msgF == 0) {
        lcd.setCursor(0, 1);
        lcd.print("Flame = Detected      ");
        Serial.println("fire detected");
        Blynk.logEvent("warningFlame");
```

```
      msgF = 1;
     }
    }
    else {
     lcd.setCursor(0, 1);
     lcd.print("Flame = OK              ");
     msgF = 0;
    }
  }
  else {
   digitalWrite(relay, LOW);
  }
}

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

Appendix 2 Coding for software

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2);

int relay = 5;
int buzzer = 7;
int gass = 6;
int flamee = 4;
int msgG = 0;
int msgF = 0;

void setup() {
  Serial.begin(9600);
  lcd.begin();
  lcd.backlight();
  lcd.clear();
  lcd.setCursor(0, 1);
  lcd.print(" welcome ");
  pinMode(relay, OUTPUT);
  pinMode(gass, INPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(flamee, INPUT);
  digitalWrite(relay, LOW);
}

void loop() {
  int gas = digitalRead(gass);
  int flame = digitalRead(flamee);
  Serial.println(String(gas) + "  " + flame);
  if (gas == 1 || flame == 1) {
    digitalWrite(buzzer, HIGH);
  }
  else {
    digitalWrite(buzzer, LOW);
  }

  if (gas == 1) {
    digitalWrite(relay, HIGH);
    lcd.setCursor(0, 0);
    lcd.print("Gas = Detected        ");
    if (msgG == 0) {
      Serial.println("gas detected");
      //bot.sendMessage(CHAT_ID, "gas detected");
      msgG = 1;
    }
```

```
  }
  else {
    lcd.setCursor(0, 0);
    lcd.print("Gas = OK                ");
    digitalWrite(relay, LOW);
    msgG = 0;
  }

  if (flame == 1) {
    if (msgF == 0) {
      lcd.setCursor(0, 1);
      lcd.print("Flame = Detected          ");
      Serial.println("fire detected");
     // bot.sendMessage(CHAT_ID, "fire detected");
      msgF = 1;
    }
  }
  else {
    lcd.setCursor(0, 1);
    lcd.print("Flame = OK              ");
    msgF = 0;
  }
  delay(500);
}
```

Appendix 3 PSM 1 Gantt Chart

No.	Project Activity	Expected / Actual	Week													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Briefing about PSM 1	Plan														
		Actual														
2.	Research on academic paper	Plan														
		Actual														
3.	Meeting with Supervisor	Plan														
		Actual														
4.	Study background project	Plan														
		Actual														
5.	Prepare chapter 1: Introduction	Plan														
		Actual														
6.	Weekly update: Logbook & Report	Plan														
		Actual														
7.	Update to Supervisor: Progress 1	Plan														
		Actual														
8.	Prepare chapter 2: Literature review	Plan														
		Actual														
9.	Prepare chapter 3: Methodology	Plan														
		Actual														
10.	Draft report submission	Plan														
		Actual														
11.	Update to supervisor: Progress 2	Plan														
		Actual														
12.	Report submission to SV	Plan														
		Actual														
13.	PSM presentation evaluation	Plan														
		Actual														

Table 5.1 Gantt Chart PSM 1

Appendix 4 PSM 2 Gantt Chart

No.	Project Activity	Expected / Actual	Week												
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Briefing about PSM 2	Plan														
		Actual														
2.	Research for information	Plan														
		Actual														
3.	Meeting with Supervisor	Plan														
		Actual														
4.	Analysis Data	Plan														
		Actual														
5.	Prepare for chapter 4	Plan														
		Actual														
6.	Weekly update: Logbook & Report	Plan														
		Actual														
7.	Prepare for chapter 5	Plan														
		Actual														
8.	Compile and drafting report	Plan														
		Actual														
9.	Progress work 2	Plan														
		Actual														
10.	Final Report	Plan														
		Actual														
11.	Report submission (Panels)	Plan														
		Actual														
12.	Presentation PSM 2	Plan														
		Actual														
13.	Report submission (Final Format)	Plan														
		Actual														

Table 5.2 Gantt Chart PSM 2