Faculty of Electronics & Computer Technology and Engineering

DESIGN AND DEVELOPMENT OF IOT BASED FLOOD MONITORING AND ALERTING SYSTEM USING ESP8266

NAZEERA BINTI RADUAN

Bachelor of Electronics Engineering Technology with Honours

2024

DESIGN AND DEVELOPMENT OF IOT BASED FLOOD MONITORING AND ALERTING SYSTEM USING ESP8266

NAZEERA BINTI RADUAN

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology (Telecommunication) with Honours

Faculty of Electronics & Computer Technology and Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2024

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI DAN KEJURUTERAAN ELEKTRONIK DAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Design and Development of IoT Based Flood Monitoring and Alerting System using ESP8266

Sesi Pengajian : 2023/2024

Saya NAZEERA BINTI RADUAN mengaku membenarkan laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (✓):

✓	SULIT*	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
✓	TERHAD*	(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.
✓	TIDAK TERHAD	

Disahkan oleh:

DR. AKM ZAKIR HOSSAIN
Pensyarah Kanan
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
Universiti Teknikal Malaysia Melaka

(TANDATANGAN PENULIS) (COP DAN TANDATANGAN PENYELIA)

Alamat Tetap: JA1688, TAMAN PANGLIMA PAK 2 SEMPANG PANTAI, 77300 MERLIMAU, MELAKA.

Tarikh : 13 Januari 2024

Tarikh : 13 Januari 2024

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare that this project report entitled "Design and Development of IoT Based Flood Monitoring and Alerting System using ESP8266" 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 :

Student Name : NAZEERA BINTI RADUAN

Date : 13/1/ 2024

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 (Telecommunications) with Honours.

Signature :

DR. AKM ZAKIR HOSSAIN
Pensyarah Kanan
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
Universiti Teknikal Malaysia Melaka

Supervisor Name : DR. AKM ZAKIR HOSSAIN

Date : 13/1/ 2024

DEDICATION

I want to sincerely thank everyone who has made a significant contribution to my academic and personal development. This dedication is to my mother, Jalilah binti Sidek, who has always inspired me with her unwavering love and support. I also like to thank Dr. AKM Zakir Hossain, my supervisor, for all of his guidance, advice, and cooperation. His guidance has been important to my achievement academically. Lastly, I would want to thank all of my friends for their unwavering support and encouragement, which has given me a great deal of happiness. I sincerely acknowledge the profound impact these individuals have had.

ABSTRACT

An excessive flow of water in a water system for example a lake or river is frequently the cause of flooding. Flooding because of sewage overflow and chemical spills can cause a number of health problems besides leading to the lack of essentials and damage to homes, offices, and other facilities. The risk of electrocution when electrical equipment comes into touch with floodwater should not be ignored. The NodeMCU ESP8266 microcontroller, water level sensor, a relay and an instant alarm will all be used in this system in nearby villages to warn the appropriate authorities and rapidly send information about potential floods. The process for the output starts when there is no flood detected and the Green LED will turns on. When the water level sensor detect flood at the maximum level, the sensors transmit data to the Blynk application through ESP8266. The sensors receives a signal, the buzzer and red LED will functioning while the relay will cut off main power supply and the bulb will turn off. When the maximum water level not triggered, the relay can manually turn on by using Blynk application to power on the bulb. The system also predicts how long it would take for a flood to reach them, giving people an opportunity of time to escape.

ABSTRAK

Banjir sering disebabkan oleh jumlah air yang berlebihan yang mengalir dalam sistem air seperti tasik atau sungai. Banjir akibat limpahan kumbahan dan tumpahan bahan kimia boleh menyebabkan beberapa masalah kesihatan selain membawa kepada kekurangan barang keperluan dan kerosakan kepada rumah, pejabat dan kemudahan lain. Risiko renjatan elektrik apabila peralatan elektrik bersentuhan dengan air banjir tidak boleh diabaikan. Pengawal mikro NodeMCU ESP8266, penderia paras air dan penggera segera semuanya akan digunakan dalam sistem ini pada tempat terjejas untuk memberi amaran kepada pihak berkuasa yang berkenaan dan menghantar maklumat dengan pantas tentang kemungkinan banjir melalui IT. Proses untuk output bermula apabila tiada banjir dikesan dan LED Hijau akan dihidupkan. Apabila Sensor Lembapan Tanah mengesan banjir pada tahap maksimum, sensor menghantar data ke aplikasi Blynk melalui ESP8266. Penderia menerima isyarat, buzzer dan LED merah akan berfungsi manakala geganti akan memotong bekalan kuasa utama dan mentol akan dimatikan. Apabila paras air maksimum tidak dicetuskan, geganti boleh dihidupkan secara manual dengan menggunakan aplikasi Blynk untuk menghidupkan mentol. Sistem ini juga meramalkan berapa lama masa yang diambil untuk banjir sampai kepada mereka, memberikan orang ramai peluang masa untuk melarikan diri.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Dr. AKM Zakir Hossain, for his advice that has been important in shaping my educational journey. His precious guidance, feedback and richness of information have all greatly aided in my development as a student overall.

I am grateful to Universiti Teknikal Malaysia Melaka (UTeM) for the financial support that has enabled the completion of this project. Additionally, I would like to express my appreciation to all my fellow colleagues.

Finally, my highest appreciation goes to my parents and I want to express my sincere gratitude to my mother Jalilah binti Sidek, for her constant moral support from home. Her confidence in my abilities has inspired me and I am appreciative of the power she gives me. To my siblings, Muhammad Ehsan Bin Raduan, Najiha Binti Raduan and Muhammad Artif Bin Raduan, I would like to express my gratitude for their priceless contributions. Their help and guidance have been invaluable and their constant encouragement has had a big impact on my studies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

V	-	Voltage
mm	-	Millimetre
mW	-	Milliwatt
mA	-	Milliampere
VCC	-	Voltage Common Collector
GND	-	Ground
DO	-	Digital Output
AO	-	Analog Output

LIST OF ABBREVIATIONS

IoT	-	Internet Of Things
NodeMCU	-	Node Micro Controller Unit
LED	-	Light Emitting Diode
SMS	-	Short Message Service
GSM	-	Global System For Mobile Communications
IDE	-	Integrated Development Environment
LCD)	-	Liquid Crystal Display
Wi-Fi	-	Wireless Fidelity
LAN	-	Local Area Network
GPS	-	Global Positioning System
SoC	-	System On Chip
iOS	-	iphone Operating System
GPRS	-	General Packet Radio Service
API	-	Application Program Interface
SPIFFS	-	Serial Peripheral Interface Flash File System
GPIO	-	General-Purpose Input/Output
DC	-	Direct Current
AC	-	Alternating Current
PCB	-	Printed Circuit Board

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

In December 2021, Malaysia was hit by terrible floods that resulted in the loss of around 400 000 people, approximately 50 fatalities and an estimated RM6.1 billion in finances. Unexpected rainfall levels turned highways into watercourses and drowned sections of Peninsular Malaysia's west coast under nearly four metres of water. Selangor state's districts of Klang, Petaling and Hulu Langat sustained the most losses, most likely because of their heavily populated metropolitan environments and lack of past experience with flooding this serious [1]. Floods are extremely harmful disasters that can seriously harm people, property and buildings. There remains concern about the requirement for efficient monitoring and warning systems as floods increase in frequency and severity across the entire world. User can take proactive steps to protect lives and property by using early-warning devices that offer real-time updates on water levels and flow. The development of IoT technology presents an exciting potential to create these systems at a low cost with excellent precision [2].

The microcontroller NodeMCU ESP8266 are small, affordable computers that are widely utilized in IoT applications because of their adaptability, versatility and ability to connect to other devices. IoT devices have three ways to connect to the internet which is directly, through another IoT device or via both. They use network connections to communicate with users and share information. Software applications are used by the IoT to establish interconnections and connections between physical objects [3]. NodeMCUs are small, low-cost computers that are commonly used in IoT applications because of their versatility, connectivity and affordable price [4]. These technological gadgets are a component of the warning and monitoring system for flooding. The system has an LED, a buzzer and water level sensor. The NodeMCU receives this information from the water level sensors once they have calculated the distance between the sensor and the water's surface.

To summarize, the incorporation of NodeMCU into an IoT flood monitoring and alert system provides a budget-friendly approach to continuous monitoring and flood warning transmission. The system can be expanded and altered to meet the particular requirements of different settings and situations. The increasing availability and affordability of IoT sensors and devices can reduce the impact of floods and preserve lives and property.

1.2 Problem Statement

Societies across the world are susceptible to floods as a result of several reasons such as shifting weather patterns and climate change. However, many user cannot afford to use traditional flood monitoring systems due to their complexity and high cost. As a result, having a flood monitoring system that can offer exact and current data regarding water levels and is easily accessible and affordable is essential. Traditional flood monitoring systems involve manual data collection and analysis methods. Employees or volunteers in such projects visit rivers, streams or other flood-prone waterbodies and use a range of instruments to physically assess the water levels. As an example, a stream site that is installed and run to continuously monitor the water level and flow is known as a gauging station [5]. After that, the data is analysed to assess the probability of floods and the implications for the user in the area.

The current flood monitoring systems' limited usability and accessibility present a serious problem because setting up and maintaining these devices frequently calls for specialised technical knowledge. Its application is limited to user and organizations with limited resources and technological competence due to its complexity [6]. Easy installation should be given top priority in the creation of an Internet of Things-based flood monitoring and alerting system that utilizes NodeMCU to get over this problem. Developing a user-friendly interface can help simplify the installation and maintenance processes. A greater number of people, including those with little knowledge of technology, will be able to access and benefit from the flood monitoring system if it is made more user-friendly. This will increase accessibility in general and motivate more user to efficiently monitor and respond to flood incidents.

Finally, it can be difficult for authorities and citizens to take precautionary actions because floods can happen unexpectedly and without warnings. Flooding causes many serious issues for user to deal with, so they could not notice the risks of electrical hazards. When there is flooding, user's immediate safety concerns like evacuating, safeguarding their property and maintaining their personal safety. Because of this, people may overlook or underestimate the electrical hazards that flooding can cause,such as shock from electrical currents, fires or damage to electrical systems. Therefore, design and development of IoT based flood monitoring and alerting system using ESP8266 has an operating system that can shut off the power supply in case of an electrical accident in order to keep people safe. This preventative strategy is designed to ensure the lives of individuals and protect them from harm. A system that can give real-time data and send warnings and notifications in the event of abrupt changes in water levels or flow is required for flood monitoring and alerting. Floods can have a severe negative impact on vital infrastructure, including bridges, highways and electricity lines which can have long-term negative effects on the economy and society [7].

1.3 Project Objective

This project's main objective is to use IoT devices including sensors and wireless connectivity to deliver accurate and current information regarding water levels. Additionally, it attempts to alert users with notification and alarms whenever water levels significantly rise. The following are the specific objectives:

a) To design and simulate a sensor by using ESP8266 to monitor water levels for flood monitoring and alerting system.

b) To fabricate the prototype interface for accessing and visualizing flood data.

c) To develop an operating system that automatically cuts off power during electrical accidents in order to ensure user safety and prevent harm.

1.4 Scope of Project

The scope of this project are as follows:

a) The purpose of this project is to create a sensor network with a NodeMCU ESP8266 microcontroller, water level sensors and other components ensuring continuous monitoring water levels.

b) Focus on generate warnings and information concerning the possibility of maximum water levels.

c) User can access and examine real-time flood data through the project's distribution of notifications gathered via the Blynk application.

d) Implement automatically turn off the main power supply to enhancing user safety during floods.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The potential of IoT-based systems to improve response and preparedness for disasters have contributed to a significant increase in applications for flood monitoring and alerting in recent years. This chapter mostly discusses the background, data and theories, previous research and connections between the researcher's approaches. The related research papers, journals, publications and other sources will also be included in this area. Ultrasonic sensors, pressure sensors and image processing methods are some few examples of the different sensors and technologies that have been investigated for use in flood monitoring investigations. Arduino based flood monitoring and alerting systems using NodeMCU that use sensors and communication technologies to produce in-the-moment alerts and notifications have been suggested in a number of research studies. More research and testing are necessary, therefore to determine how well these devices help disaster response and increase user flood resilience. Before completing the assessment task, the literature study comprises reading other people's writings to gather important information and knowledge, as well as other people's similar projects finished by others. The prior dissertation, research papers, journals, publications and the Internet are some of the sources. All relevant topics are compiled and discussed in this chapter.

2.2 Flood History in Malaysia

Southeast Asian nation of Malaysia has a year-round climate that is characterized by constant temperatures, high levels of humidity and lots of rainfall. The nation is advantageous to be immune to natural disasters including earthquakes, volcanoes, typhoons, hurricanes and tornadoes. However, two crucial water-related issues that needs to solve are floods and water shortages. The length, regularity and economical destruction that floods do to the country lead to the most dangerous of floods. There are 189 drainage area in Malaysia and around 85 of them are often flooded. 4.82 million people or around 22% of the population are affected by this, which occupies about 9% of the nation's total land. The fact that roughly 3.5 million people still live in flood-prone locations raises concerns, even though historically Malaysians resided along river banks. The primary causes of flood risks in Malaysia have been determined to be three main variables brought on by human activities that have changed the hydrological system's physical characteristics. These elements include continued development in areas at risk of flooding, forest destruction and the development of slopes in mountainous places [8].

There are many different kinds of floods that can occur, such as surface water floods, river floods, flash floods, urban floods, monsoon floodsnand coastal floods. Monsoon and flash floods are especially common in Malaysia [9]. While Malaysia experiences monsoon every year, flooding is not unstoppable anymore. One of the affected parts of Malaysia is Kelantan where excessive rainfall during the Northeast Monsoon from October to March can result in flooding. The themes of the Kelantan flood study can be divided into three categories based on the thematic review: flood factor, flood impact and flood resilience or mitigation. Future research on the floods in Kelantan could still be improved [10]. One of the most frequent and dangerous natural disasters is flooding. There is an urgent need for an enhanced response to flood dangers given the rising number of fatalities and financial losses caused by floods each year throughout the world. The IoT has created an interesting opportunity for scientific research to investigate how camera images and data from wireless sensors in IoT networks could improve flood management.

Flood risks have a major impact on society and the economy, resulting in fatalities, property destruction and severe effects [11]. Flood dangers have a variety of negative effects, including as damage and structural damage, property loss, food and water contamination, disruption of socioeconomic operations like transportation and communications and damage to agricultural land. Natural disasters are classified into two categories which is physical effects and user effects. The two instances of the physical effects include casualties (deaths and injuries) and property damage. This section discusses how flooding affects infrastructure, the economy and society.

Since there is electricity and water present when flooding happens, there is a serious risk of electric shock. When individuals place portable power outlets or fans on the ground, this risk increases. In this case, when water comes into touch with these gadgets or their cords, it creates a conduit for the electrical current to pass through the water, which could cause people to receive electric shocks. People need to take precaution and keep electrical items away from standing water during flooding in order to prioritize safety. Taking measures such as elevating or safeguarding power outlets and equipment can effectively prevent inadvertent contact with water, thus reducing the risk of electric shocks and creating a safer environment.

If effective monitoring and efficient prevention methods are not applied, these natural hazards frequently have disastrous results that cause large economic losses, social upheavals and harm to urban settings. Flooding has been the most common natural hazard, accounting for 41% of all global disasters in the last ten years, according to historical data shown in Figure 2.1. There were about 1,566 flood incidents from 2009 to 2019 alone, affecting almost 0.754 billion people, leaving 51,002 dead and causing an estimated $371.8 billion in damages. When seen in context, these figures only take into consideration "reported" instances of extensive flooding, which are often regarded as flood disasters [12].

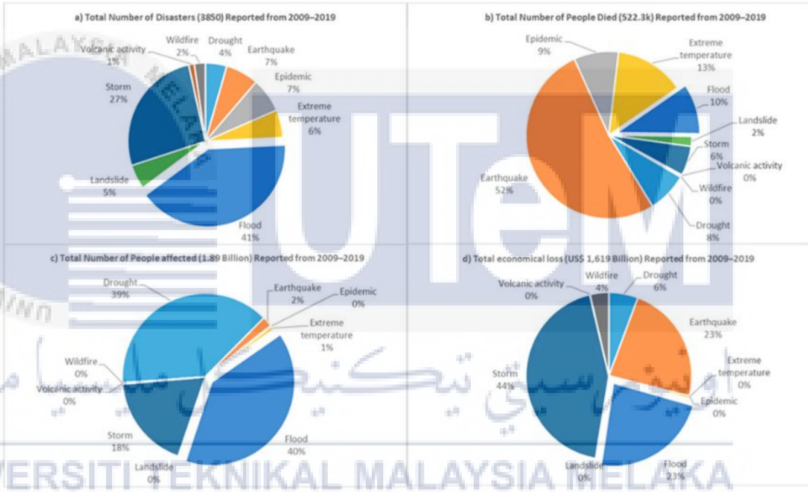

Figure 2.1 Comparison Of Different Disaster Types Reported From 2009 to 2019 [12]

The worldwide impact of floods would be much more concerning if the data took seriously the numerous smaller-scale floods, where less than ten people may have drowned but still had an impact on hundreds or more people, or circumstances where there was no state of emergency or call for international relief. However, the current circumstance suggests the creation of improved methods for flood monitoring and response. It is crucial to improve flood monitoring given the increased uncertainty brought on by climate change and the rising population living in areas at risk of floods.

2.3 Related Previous Project

2.3.1 An Arduino Uno microcontroller board with an ATmega328 chip for the flood disaster indicator.

The authors point out that the improvements in technology have sped up the development of early warning and alerting systems for flood management. These systems, which make use of the Short Message Service (SMS) provided by the Global System for Mobile Communications (GSM) are essential for rapidly warning people about imminent floods. This study presents an easy-to-use, transportable and reasonably priced early warning system that uses GSM shields for data transmission and an Arduino board to manage the complete system. The system is composed mostly of two elements: hardware and software. While the hardware component of the system makes use of float switch sensors to detect the water level, the software component of the system evaluates the data collected to assess the level of danger. An alarm message is created and delivered to the user after the risk level has been established. All of the system's components are connected through the GSM network, enabling SMS communication [13].

In order to help local authorities manage floods more systematically, this research paper concentrates on the development of a system for monitoring flood disasters. The system's goal is to continuously alert users and give information while also detecting floods. The system can acquire information on water levels by using sensors. Its major goal is to warn neighbors so that they may take the appropriate safety measures to safeguard their lives and property. Data from the sensors is transmitted to users via the system using GSM and SMS technologies, allowing the data to be supplied straight to their mobile phones. The GSM network seems to be more dependable and responsible during flood seasons. An Arduino UNO board was used as the system's controller. Because of its input-output ports, this microcontroller is affordable, needs minimal programming and is simple to connect with other devices.

The following parts are used in the creation of the flood monitoring device: Float switch sensors (RSF50 Series), a GSM modem, an ATmega328-based Arduino Uno microcontroller board and a liquid crystal display (M1632 LCD) screen are all included. In Figure 2.2, the hardware design circuit is illustrated.

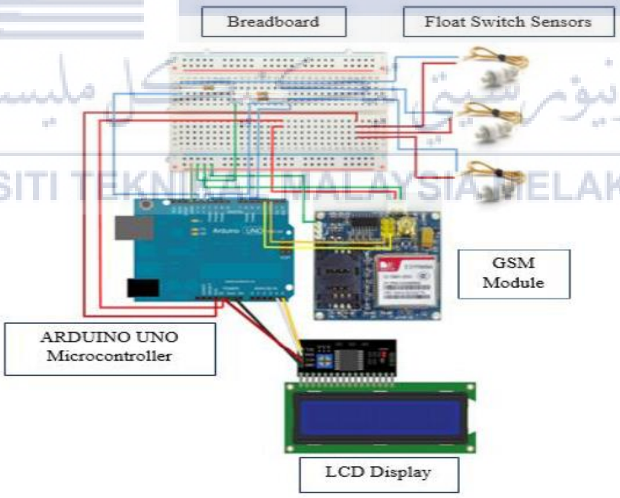

Figure 2.2 The Hardware Design Circuit [13]

To keep monitor of water levels, the authors carefully installed three float switch sensors in the right places. Depending on the particular needs, these sensors can be used in both low-risk and high-risk environments. The system is built to identify five distinct scenarios and when it detects water, it sends out an electric pulse. The following activities are started by the information acquired by the float switch sensors which are then transmitted to the Arduino Uno microcontroller. The microcontroller analyses the data by comparing it to an initial threshold value. The system outputs information via an LCD display and SMS alerts. A Java-based Integrated Development Environment (IDE) built on the wiring project, an open-source programming platform, is used to programme the microcontrollers.

2.3.2 The flood monitoring and alert system incorporates an Arduino Uno, an Ethernet shield and the ARP33A3 device to record voice.

In several regions of this nation, the number of deaths caused by flooding is increasing. This study was conducted by the authors that focused in Tamil Nadu's capital, Chennai, a flood disaster two years ago that caused a considerable loss of life and property. The places near the riverbank and downstream are more severely impacted than other areas whenever flooding occurs. To provide residents in these locations enough time to quickly escape, it is important to warn them well in advance. That is the reason why this system need a designated warning mechanism to avoid such occurrences. In order to assist individuals avoid incorrect information, our technology delivers factual information. The system also makes use of voice communications, which is advantageous for people who might not be able to read text messages.

According to the authors, three key technological foundations support the Internet of Things: hardware (electronics and sensors), communication (primarily wireless networks) and software (data storage, analytics and front-end apps). The IoT is a system that combines both wireless and cable connections to link physical things with the Internet and any embedded or attached sensors. There will be one or more sensors on the linked physical items. Each sensor will keep an eye on a certain factor, such as temperature, vibration, position and motion. In the IoT, these sensors will link to one another and to platforms that can interpret or display data from the flows of sensor data. The systems and people of a corporation will both get new data from these sensors [14].

This article explained by phone calls, the Flood Monitoring and Alerting System is designed to alert consumers near river regions. An Arduino Uno microcontroller, which connects with a GSM modem, an ultrasonic sensor and an Ethernet shield will controls the system. By measuring the distance between the ultrasonic sensor and the water, the device is capable of determining the level of water height. After that, a web page is updated with the computed height value. The system compares the computed water level with the specified threshold value to determine if the level of water exceeds a certain threshold. The microcontroller triggers a voice call to notify residents via the GSM module if the current level exceeds the threshold.

Figure 2.3 show the flowchart for this project explain that a call has to be made to the residence once the water level reaches the threshold level. When a call is placed using the GSM module, the AT+ATD command is used and when the call is answered, the recorded voice message should be played. The APR33A3 has a GSM module interface. The APR33A3 has two modes of operation. The first mode is record mode, in which any one of the seven channels may be used to capture sounds. When the call is answered, the second option (playback mod) allows the recorded audio to be played from the channel.

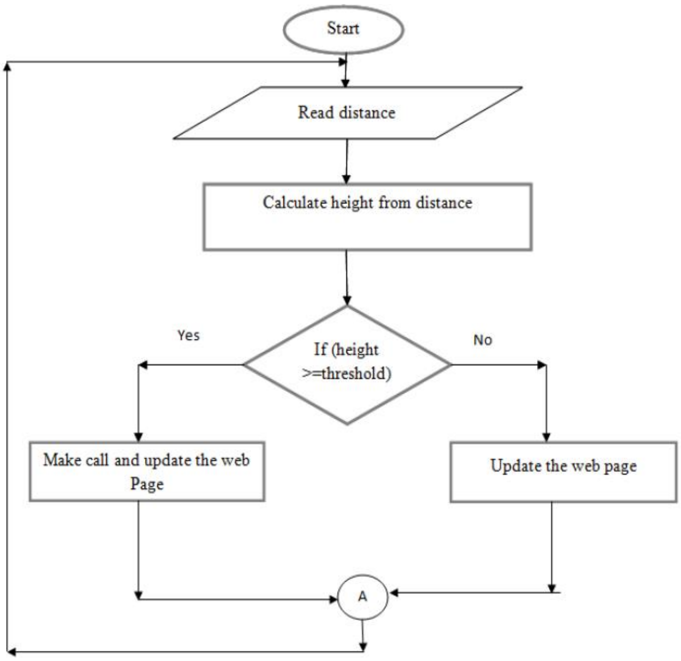

Figure 2.3 Flowchart [14]

2.3.3 The Internet of Things (IoT)-based flood monitoring and alarm system uses an Arduino Uno board.

Each year, the amount of property damage and fatalities has increased due to the unpredictable climate conditions that cause extreme floods. During the yearly monsoon season, flooding is a frequent natural occurrence in Malaysia. In 2010, Sabah, Johore, Malacca, Negeri Sembilan, and Pahang, located in the eastern regions of Malaysia, experienced floods as a result of extended rain brought on by northeast monsoon winds. With more than 30,000 evacuees, Johore is the most severely hit of the five countries. In order to prevent electric shock during the flood, electricity was turned off in several regions, and there were allegedly food and water shortages in some shelters [15]. Although the disaster is expected with fast action and reaction from local authorities, the damage can be reduced. As a result, this flood monitoring system was created to assist the local government in offering more methodical solutions.

The authors identify a sensor can set up in the desired location, such as a riverbank or low-lying areas and it measures the difference in water level. A signal will be produced by this sensor and sent to the 24-hour control center. The sensor's raw data will be assembled and evaluated in this facility. Every variation will be seen and recorded in the database. When an alert circumstance arises, the monitoring server promptly notifies the person responsible so that they may take appropriate action. Flooding is often caused by a rise in water levels in a water system, such as a river or lake or by spilling. An enormous amount of water can occasionally be released suddenly when a barrier breach. The result is that a lot of the water absorbs into the soil, "flooding" the area. In a station, rivers are involving the riverbanks. In addition to a shortage of goods and houses, offices and other property, street infrastructure flood water contains bacteria from waste sites, sewage flow and chemical spills which lead to in many kinds of diseases.

Since Arduino is a controller, additional components like the worldwide system for mobile communications (GSM), Bluetooth, Wi-fi and LAN connection are needed in order for it to communicate with the cloud. Numerous studies, such as one on flood catastrophe and its management in Malaysia focused on the importance of finding the best ways to inform in the event of a disaster. The author also proposed four other action states, including rebuilding, reduction, reaction, and preparedness. In this approach, the majority of academics recently attempted to identify flood control mitigation strategies that would reduce risks. Later, IoT-based systems inspire researchers to construct an intelligent flood control system due to their simplicity and greater variety of applications in numerous fields.

Figure 2.4 shows the block diagram in this project that used water sensors to measure the water level. To estimate the amount of rainfall in a certain location, rain sensors are used.

These sensors afterwards transmit data to Arduino Uno via IoT regarding measures of water and rainfall. Now, at the controlling end, the system calculates the time it would take for flooding to occur in a region and inform the villagers once it surpasses the threshold limit value. The sensors placed close to water bodies are connected to the cloud, which senses the amount of water and rain fall. The data is saved in the cloud and when the threshold value is crossed, a notice is sent to the responsible party, who then broadcasts it to others.

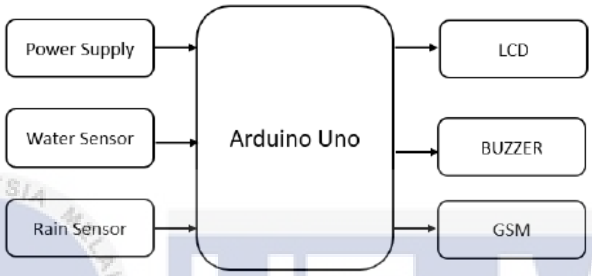

Figure 2.4 Block Diagram of Proposed System [15]

2.3.4 IoT Flood Monitoring System: Google Maps Integration with an Arduino and GSM Module

The intense weather variations nowadays have a huge impact on disasters. One of the calamities brought on by harsh weather is flooding. Weather is simply one factor that affects floods; another is human activity that harms the forest. Preparing for the impending flood is necessary to reduce the number of casualties. A flood early warning system is a useful tool for predicting approaching floods. As a result, the government has pushed businesses and organizations to create monitoring tools that can transfer data for disaster early warning systems.

The writers of this article described how a Google Maps-based prototype for a flood monitoring system had been created. It transmits data about the water level and its location to a station that monitors floods using ultrasonic sensors as a height detector, an Arduino Uno as a CPU, a U-Box Neo 6m GPS module, and a GSM module. Based on the Google Maps user interface, the prototype's architecture generates flood altitude data together with its location. When an Arduino Uno and a GSM module are combined, the output results include data on flood height and leads to an alarm on a flood information system station. In general, the study caused the development of an effective method for communicating an early warning message, allowing for the notification of an impending landslip without the need for human involvement [16],

The integrated module developing stage and programming are the two stages of the prototype system's design process. An ultrasonic sensor is used to activate the system, and the GPS module sends information about the water level and the position of the flood to the Arduino Uno, which processes the data. A block diagram technique is frequently used to demonstrate how different components or modules are integrated, illustrated in Figure 2.5. A computer and processor at the information system station then use the data to create a water level information system using Google Maps after the information is supplied through SMS to the station.

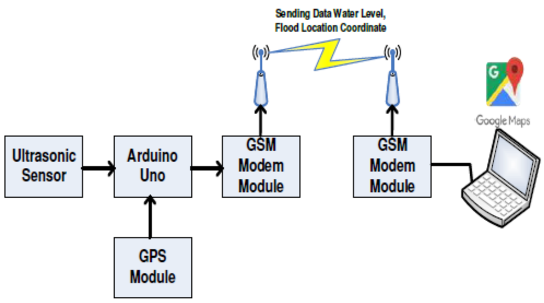

Figure 2.5 Block Diagram of Prototype System [16]

The results shown that the Google Maps-based flooding information system has been completed as expected. As illustrated in Figure 2.6, a prototype system circuit has been constructed successfully. By using ultrasonic sensors, Arduino Uno, the U-box neo 6m GPS module and the SIM900 GSM module, the information about the water level and the position of the flood is sent to the information system station. The flood information system station uses Google Maps' marker label feature to highlight flood areas and provide information about water levels after receiving the data through the data processor's GSM modem. The objective of this prototype is to provide useful information regarding the location of the flood and related water levels.

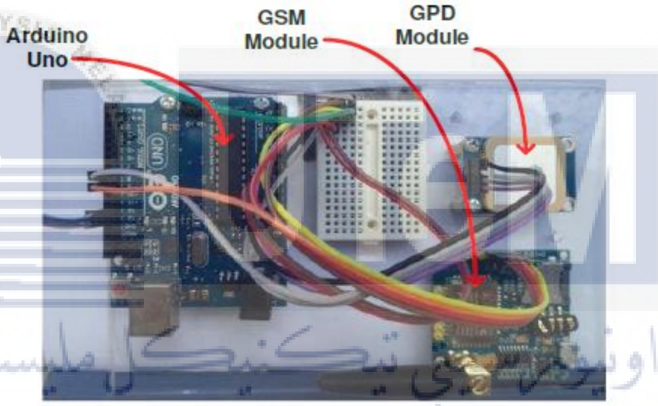

Figure 2.6 Prototype System Circuit [16]

2.3.5 Designing a water characteristics-based solution using NodeMCU and ESP8266 for an IoT flood warning system.

This article concentrates on Indonesia, a tropical nation noted for enduring excessive rainfall that frequently causes disastrous flood disasters that result in significant property damage and human casualties. Many developing countries still use outdated techniques to deal with flood disasters. However, a rapid flood warning system that can cover large areas, such as using the internet, is urgently needed to lessen the severity of serious disasters. IoT is smart technology that can link to smart phones, sensors, online services and relay data in real time. An early warning system may be managed and controlled with the use of this skill. The author mention that the accuracy in flooding detection and speed in information handling are the two most crucial elements of a flooding detection system. The accuracy of flooding detection is crucial because it verifies the reliability of flooding information and serves as a guide for anyone who want to follow up on it in order to take proactive measures [17].

As a result of ESP8266 strong internet connectivity, this microcontroller has emerged as a new and intriguing IoT tool. The ESP-8266 also has an inexpensive inbuilt wifi module and a SoC, making it possible to programmed it without a separate microprocessor. Both the water level sensor and the water velocity sensor were connected to the ESP8266 directly in this study. All gadgets can be linked to the internet through the IoT technology. IoT has several applications and is currently quite popular all around the world. IoT is a system that connects all living things to the internet to create a bigger network [17]. Assuring that the circuit between the ESP8266 and the sensors is right is important for monitoring water characteristics. Each sensor in this study draws power from the ESP8266's 3.3 V DC integrated circuit. For input and output, the first ultrasonic sensor is linked to ESP8266 pins D6 and D7, while the second ultrasonic sensor is attached to pins D1 and D2 (GPIOs 5 and 4, respectively). While pin D3 (GPIO0) was connected to the water velocity sensor. This entire circuit is shown in Figure 2.7.

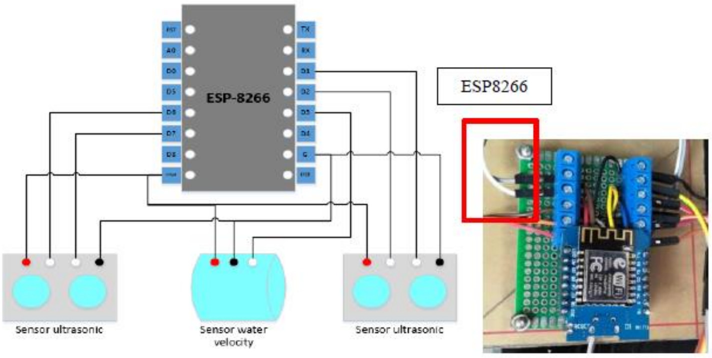

Figure 2.7 Circuit of ESP8266 [17]

This research project creates experiment scenarios using a dam prototype, and the scenarios are designed to indicate water characteristics that are exactly the same as those observed in real dam conditions. The acrylic dam prototype has sensors added, as seen in Figure 2.8. Two ultrasonic sensors and one sensor measuring water velocity are utilised in the dam to collect information about water characteristics. The first ultrasonic sensor is located on a downstream river prototype and is 8 cm above the riverbed. The second ultrasonic sensor is located on a dam and is 10 cm above the dam.

Figure 2.8 Dam prototype [17]

This study also included a map or location of the dam so that the system could monitor a lot dams. The dam monitoring system will be essential for ensuring that flooding maps in the city are accurate. The fastest and most accurate way to alert the public about floods is by using the internet for real-time monitoring and checking for any dams. Web-based water condition monitoring, as seen in Figure 2.9.

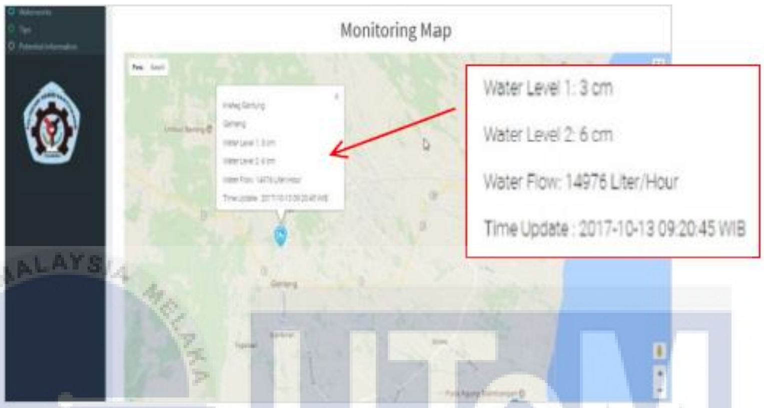

Figure 2.9 Web Monitoring of Water Condition [17]

2.3.6 Flood Monitoring and Warning System for the Internet of Things: NodeMCU ESP8266 Integration with CSV Database

This research project aims to create a wireless sensor node-based real-time flood monitoring and early warning system for an area at risk for flooding. The Blynk application is integrated with NodeMCU-based technology in the system. The wireless sensor nodes are essential in helping the victims of floods and severe rains since they continuously monitor water levels and rain intensity and provide early warning signals. The NodeMCU microcontroller controls the rain and ultrasonic sensors that make up these sensor nodes, which are effectively positioned in the chosen at risk of flooding area. The technology alerts those in danger by turning on the buzzer and LED when the flood reaches the specified danger threshold. The wirelessly connected Blynk application receives and processes the data gathered by these sensors [18]. The author's primary objective is to make sure that the flood victims are aware of the current flood and rain circumstances. This is accomplished using the Blynk application's user-friendly interface and push notifications that are sent to their iOS or Android cellphones. The information on the flood level delivered by email may be useful to numerous organisations for forecasting and system development. As an outcome of test results, it was discovered that this prototype can monitor, identify and alert the victim sooner than the occurrence of floods.

This paper shows the development of a flood monitoring system in Malaysia's Selangor state using a wireless sensor node. Based on Figure 2.10, to determine water levels and rain intensity, the system uses an ultrasonic distance sensor and a rain sensor. The gadget creates an alarm with differently coloured LEDs when unsafe levels are reached to warn individuals in flood-prone locations. The HC-SR04 is chosen in the study's comparison of other ultrasonic sensors because of its potential for monitoring flood levels. The NodeMCU technology serves as the microcontroller and joins the sensors to create a wireless sensor node that sends information to the Blynk app on customers' cellphones. The information is simultaneously stored in a CSV database and is exportable to Excel for further analysis by local authorities [18].

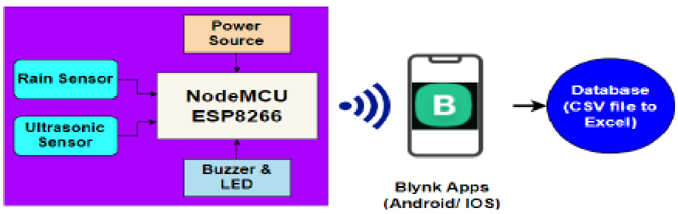

Figure 2.10 Schematic Diagram of the Proposed Flood Warning [18]

In this research paper the author uses Blynk application as a hardware that can be remotely controlled and used to display, save, and monitor data. The Blynk cloud, Blynk applications and Blynk database are the three primary parts of the Blynk platform. In this work, Blynk was used to construct an application for a flood monitoring system that used data from a NodeMCU connected to rain and ultrasonic sensors over the internet through a smartphone. A specific area of the Blynk interface contains an LCD panel that shows level indications, such as safety, warning and critical levels. The real flood level as determined by the ultrasonic sensors is displayed by the value display widget. Additionally, a group of LEDs illuminate according with the present flood level to visibly depict the flood's status. The notifications regarding the water level reaching a critical level that were delivered to the victim's email address. As a result, victims will know the specific situation of the water level.

2.3.7 Raspberry Pi-based Flood Monitoring and Alerting System

Any economic growth and development are dependent on agriculture and accurate forecasting enables farmers to protect their crops against flooding. The technique has several benefits for preserving both human and animal lives. The suggested model is extensively used to monitor river flow variations and water levels. It can also be used to measure water levels at dams and on river crossings. The measured value is updated on the web server on a frequent basis which is highly helpful for sending flood notifications to the appropriate authorities and citizens to enable quicker response. The project consists mostly of a wireless sensor to track water quality. Raspberry Pi processes the measured parameters. Reduce the impact or harm that a natural phenomena may cause with an Android application installed on your device. Therefore, developing a mobile application designed for monitoring flood conditions might be extremely helpful for people who are travelling or otherwise on the go.

As opposed to attempting to find a non-flooded route blindly, informing them in advance on the state of the roads will greatly save their travel time and inconvenience [19].

According to the authors, the suggested model is frequently utilized to monitor river flow variations and water levels. It may also be used to measure water levels at dams and on river crossings. The measured value is updated on the web server on a frequent basis, which is highly helpful for sending flood notifications to the appropriate authorities and citizens to enable quicker response. The project consists mostly of a wireless sensor to track water quality. Raspberry Pi processes the measured parameters. The GPRS alert management system received the processed information given from the associated node. Data is logged using the Google Spreadsheet API. The alert management system is mapped from the Google Spreadsheet to free analytical tools. Before an emergency occurs, the alert management system may be used to watch, record, and inform people about it. Based on Figure 2.11 shown the flowchart of this project.

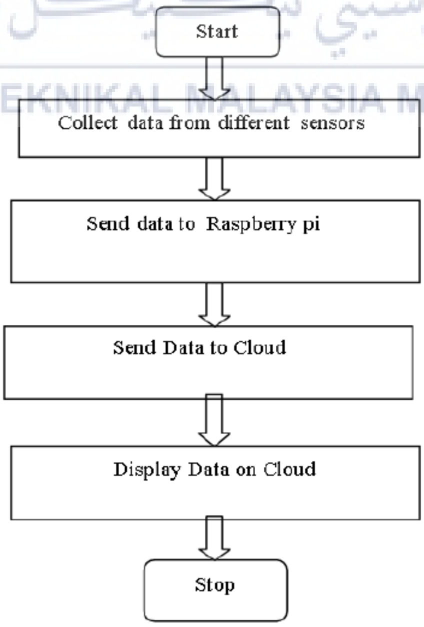

Figure 2.11 Flow Diagram of System [19]

The Raspberry Pi collects data from linked input devices, analyses it, and triggers it in accordance with pre-set settings. The sensor-measured values are sent via Raspberry Pi. The authors of the research used a variety of sensors, including mercury, level, and ultrasonic sensors [19]. Additionally, once the data is in the cloud, software analyses it and may choose to execute an action, like delivering a notification or automatically altering the sensors without the need for the user to be involved. Cloud computing, commonly referred to as "the cloud" is the delivery of data, software, files, and more to data centers through the Internet. The authors also highlight some point which is developing a mobile application designed for monitoring flood conditions might be extremely helpful for people who are travelling or otherwise on the go. As opposed to attempting to find a non-flooded route blindly, informing them in advance on the state of the roads will greatly save their travel time and inconvenience.

2.3.8 Flood Monitoring and Alerting System by using Zero W

The most frequent natural calamity that has a considerable negative impact on lives, property, and the economy is flooding. According to scientists, a 4-inch sea level rise by 2030 has the potential to trigger major flooding in many parts of the world. This proposal suggests a flood warning system that can detect the rate of rise in water level and detect changes in water level. The measured result is delivered as a warning through short message service to a mobile device and giving the local population time to evacuate before the water rises to a dangerously high level (SMS). The purpose of this suggested building is to continuously measure the water level, rainfall reading, current temperature, and humidity values in order to remotely monitor and notify the general public about the current flood conditions. Many technologies are employed to complete this work, including messaging, live data flow via a remote online platform called Thing Talk, video streaming, audio alerts, etc [20].

The authors identify that the information's collected by the sensor is stored at the mini-processor in this prototype's IoT platform where it is also used to generate and send SMS alerts to smartphones. To evaluate the effectiveness of this prototype system, it is put into use in two different situations. Also, we may keep an eye on the temperature and humidity to record the climate. The system operates in three steps: monitoring water levels in dams and rivers, keeping an eye on rain and weather patterns for informational purposes and displaying the measured data and camera live feed on platforms like ThingSpeak and YouTube. If the water level rises above a predetermined value, SMS and vocal alerts are sent through speaker.

Figure 2.12 below shown the block diagram of proposed system that consists of a central component known as the Raspberry Pi (Zero W), which serves as the system's brain and is the point at which all sensors and other components are connected. The water level sensor, dht11 temperature and humidity sensor, and raindrop sensor are the sensors used in this system. Sensors begin operating properly as soon as the system is turned on. Water level sensor begins monitoring the water level using its preset measurement parameters, for instance. This system continuously gives notifications to the user about how the water level will fluctuate with all sensor readings delivered via SMS, internet, and audio alarms. Additionally, for optional purpose DHT11 is used for monitoring climate parameter like temperature & humidity. Aside from individuals who live close to the river, who will be alerted by buzzer when the water level reaches a critical level, those who are farther away will also be kept updated on the situation via SMS and live feed.

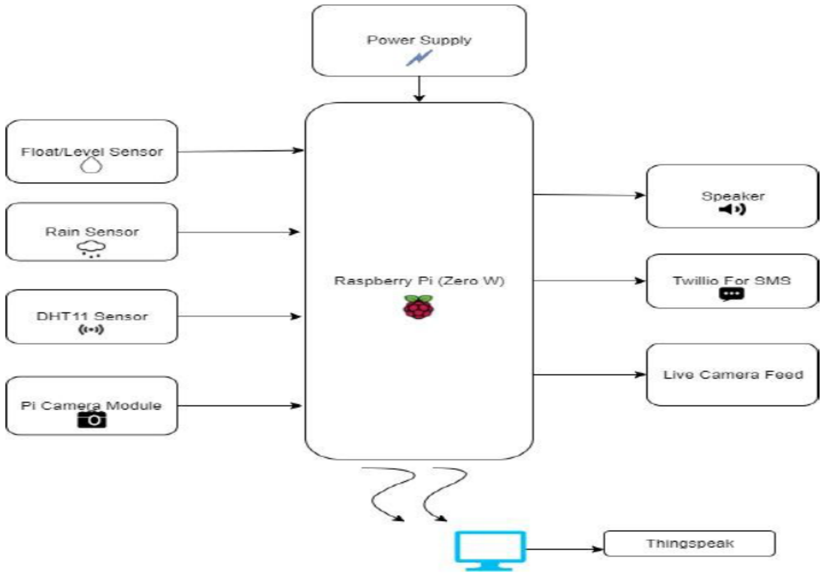

Figure 2.12 Block Diagram Of Proposed System [20]

Python is the official programming language of the Raspberry Pi includes both Python and IDLE3, a Python complete development environment. The Raspberry Pi 0 W's GPIO pins are linked to sensors including temperature, level, and rain sensors. The CPU and API built with the Raspberry Pi 0 W are used to read sensor data. Data will be processed before being sent to associated web platforms including YouTube, Twilio, and thing speak. Python IDLE, a programming environment from which the suggested system may be managed via codes, is included in this stage of development. IDLE3 and Python Script are the technologies necessary for developing this level. After successful testing and interface, the system's findings are able to be seen and it complies with all criteria and regulations. All of the sensors function well and provide accurate results. Successful sensor readings and data transmission to users and subscribers via a variety of media.

2.4 Comparison of Previous Research Paper

In this subtopic, research regarding their components, advantages and disadvantages will be discuss.

Table 2.1 Advantages and disadvantages of previous project

No.	Reference	Components	Advantages	Disadvantages
1.	[13]	• Arduino Uno board based on the ATmega328. • GSM modem • Float switch sensors (RSF50 Series)	• The system uses float switch sensors to enable early detection of rising water levels. Different liquids such as water, oil or chemicals can be worked with float switches. Without requiring any adjustments, this sensor can handle various liquids.	• The GSM network's accessibility and SMS communication are essential to the system's efficiency. The system may have trouble getting notifications to the intended receivers especially in rural or affected areas with inadequate or insufficient network coverage.

		• Liquid crystal display (M1632 LCD) screen		
2.	[14]	• Arduino Uno • GSM SIM 900A • ultrasonic sensor • Ethernet shield • ARP33A3 device to record voice	• The system uses an ultrasonic sensor to measure the distance between the sensor and the water in order to determine the height of the water level. From a few centimeters to several meters, ultrasonic sensors can measure a wide range of distances.	• The system uses the ARP33A3 in order to capture voice and play it back during phone conversations. This restricts the system's capacity to give residents accurate or personal voice notifications. The voice calls could only be capable of playing pre-recorded messages. • Only devices linked to the same LAN as the Ethernet shield will be able to access the web page and the dynamic water level data. Without

				extra network modifications, users outside of the LAN could not have direct access to the system's web page and real-time data.
3.	[15]	• Arduino Uno • GSM • LCD • Water Sensor • Rain Sensor • Buzzer	• The IoT and Arduino Uno technologies are used in the flood monitoring and warning system that has been put into place. This system depended on ARM7 processors and this method offers a more affordable option. This increases its accessibility and affordability for use in many settings. • The system uses water and rain sensors linked to an Arduino Uno to	• Due to the system's dependence on IoT and cloud connections, a reliable internet connection is required for optimal performance. The system's capacity to monitor and issue alerts may be impacted by any interruptions or failures in the internet connection.

			track rainfall and water levels in real-time. The technology immediately warns the authorities and neighboring settlements when the threshold values are surpassed, allowing for fast response and evacuation.	
4.	[16]	• Arduino Uno • GSM SIM900 Module • GPS U-Box Neo 6M Module • Ultrasonic Sensor HC-SR04	• After processing the data from the sensors and GPS module, the system delivers it to the information system station as SMS data. This enables effective data processing and communication, ensuring that the necessary data is acquired and properly displayed.	• The prototype system uses SMS communication to send data, but there may be restrictions on the quantity of data that can be communicated as well as the possibility of delays or congestion in the SMS network. This could

			• In order to create flood height information and display flood areas on a map, the prototype system integrates Google Maps API. The capacity for users to observe and understand the flood situation is improved by this connection, making it simpler to pinpoint the impacted locations.	have an impact on how current and accurate the information is.
5.	[17]	• NodeMCU ESP8266 • Ultrasonic sensor • Water sensor	• The project includes the creation of three software applications, including ESP8266 programming, a web server and an Android application. This improves the system's efficiency and usability by	• Real-time monitoring, data transfer and notification delivery all depend largely on internet access. The functionality and dependability of the system may be affected by any technical

			enabling data processing, transmission, and visualization. • Two ultrasonic sensors and one water velocity sensor are installed in the prototype dam to collect data on the water's properties. These sensors make it possible to gather and analyze data for monitoring and detection.	difficulties or interruptions in internet access.
6.	[18]	• NodeMCU ESP8266 • Rain Sensor • Ultrasonic Sensor • Buzzer	• The Blynk application integration offers a user-friendly and interactive platform for victims to observe current flood conditions. Through the application, users may see graphs and measurements, obtain data on	• This system performance might drop as the CSV database becomes bigger. Large CSV files can slow down and use more resources during reading and writing, which

		• LED	floodwater level and rainfall intensity and get alerts and messages.	affects the system's scalability and responsiveness.
7.	[19]	• Raspberry pi • Ultrasonic Sensor • Mercury Sensor	• A mercury sensor is a component of the system that helps to control and reduce mercury emission. The system can help with the implementation of suitable measures to limit the negative impacts on human health and the environment by correctly monitoring and identifying mercury levels in the atmosphere, lithosphere, and surface water. • This system is able to launch rescue and relief activities, priorities	• The security and privacy of the data may be a concern if it is stored on websites like Google Spreadsheet for the purpose of monitoring important floods. Strong security measures must be put in place to protect the data from theft, unauthorized access, breaches, or unintentional releases

			locations at higher risk, and effectively coordinate efforts, resulting in more accurate and quick reaction measures.	
8.	[20]	• Raspberry Pi (ZeroW) • Water level sensor • DHT11 Sensor • Rain Drop Sensor	• The method is more dependable and affordable because Twilio Messaging Platform is used instead of a GSM module. This lowers the overall cost of the system and enables dependable message delivery.	• There is a possibility that privacy issues will surface when the live feed is aired on a widely used platform like YouTube, especially if the visual feed records private or sensitive data. To protect people's privacy and prevent sensitive areas from being disclosed, it's crucial to develop and keep by privacy standards and guidelines.

2.5 Summary

In conclusion, a deeper understanding of the flood monitoring and alerting system and its potential has been gained as a result of the various pieces of literature mentioned above. The concept and design had been worked on by numerous authors from various places and each contributing a certain form of energy-saving thinking and approach. A project using relevant and cutting-edge technology might be developed as a consequence of the extensive literature reviews that have been considered to successfully achieve the goals. The project will require less hardware and be simpler and easier to operate for residential properties. It has been suggested that the system be constructed for my project using both hardware and software.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The four stages of the project's development are thoroughly explained and described in this chapter. The initial stage is concerned with creating and designing the project's flowchart. The presentation of a proper block diagram explaining the project's elements and connections comes next. Additionally, an illustration of the project's operational flow is provided. A thorough overview of the project's hardware and materials is also included in this chapter, showing their importance and relevance to its entire implementation. As a result, the design of flowcharts will demonstrate a higher degree of understanding. The task's resources and the process for creating the circuit association will also be covered. Similarly, the use of programming will be analyzed to development of and Arduino based flood monitoring and alerting system using ESP8266.

3.2 Project Workflow

A flowchart is a diagram that shows a different stages in their correct sequence. It is crucial to have an effective flowchart for the next project in order to have a successful conclusion. A great project's workflow may be improved with the help of a variety of strategies and data. An excellent high-efficiency project could improve successive project flow data, such as multiple journal, research and book publishing studies. The process of evaluation is then carried out while considering the pros and negatives as well as the necessary criteria and perspective. After the previous development has been successfully implemented, the final step will be carried out. An efficient procedure for project management is shown in Figure 3.1

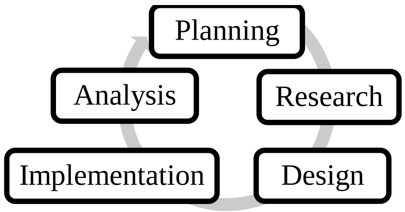

Figure 3.1 The Project Work Process

3.3 Flowchart of Overall PSM

Figure 3.2 shown the process of flood monitoring and alerting system for overall steps and decisions needed to perform this project. This flowchart is divided for two types and the first one is general process for this project. After that, we focused on with software and hardware.

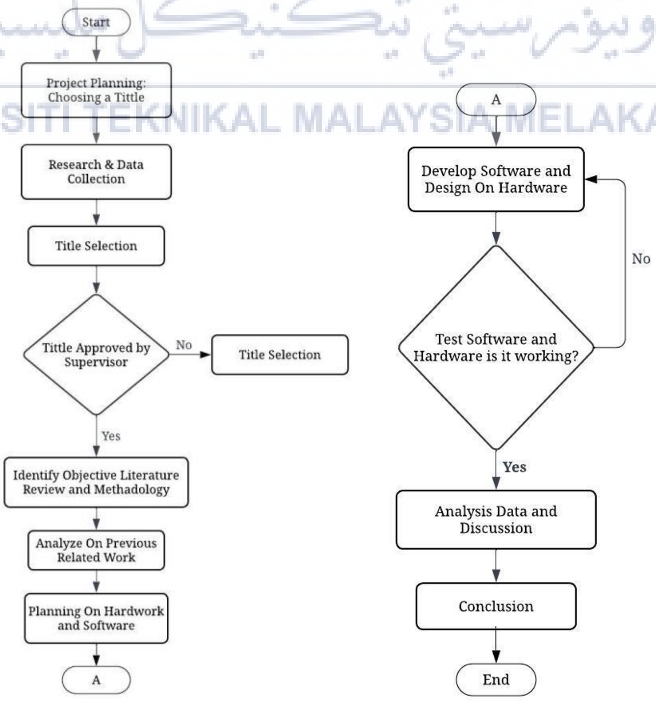

Figure 3.2 Flowchart of Overall PSM

3.4 Proposed System

Basic structure of flood monitoring system is illustrated in Figure 3.3. The block diagram shows the system consist of water level sensors, NodeMCU, Blynk Application and the output which is buzzer, two LED and Relay 3V. Our proposed method is to predict flood warning signs and notify those in need by using ESP8266. Additionally, it sends out a warning to close user, telling people to get away since there is a danger of flood. A water level sensor is used in this project to measure the water level. These sensors then provide water level values to NodeMCU via IoT, which is Blynk Application. The red LED and buzzer will turn on instantly as an alert. In the end, the Blynk app will send out a notification to the public with data information and the relay will cut off main power supply.

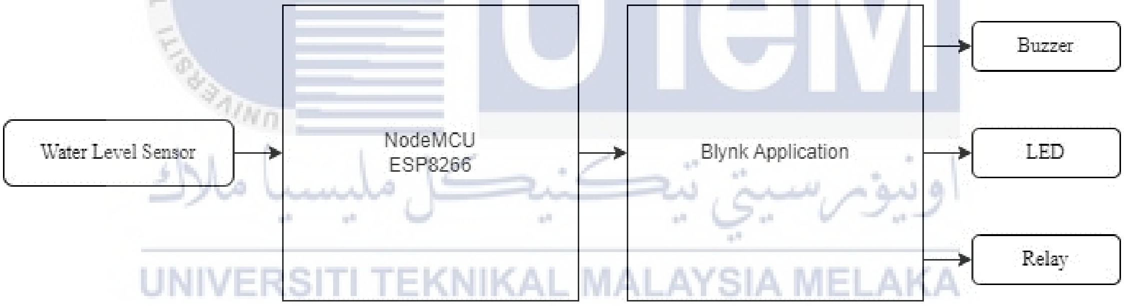

Figure 3.3 Project System Block Diagram

3.5 Hardware Specifications

To get the intended result, this project made use of several hardware components. Without the hardware implementation, the project cannot be finished successfully. The pin arrangement, functionality and interfaces with NodeMCU make up the hardware implementation. The hardware implementation is required for the device to function as intended.

3.5.1 NodeMCU ESP8266

Since NodeMCU is an open-source platform, users are free to access and alter its hardware architecture for personalization and development needs. The Espressif Systems-produced ESP8266 Wi-Fi chip is integrated into the NodeMCU Dev Kit/Board. The ESP8266 chip is known for being reasonably priced and for supporting the TCP/IP wireless communication protocol. The SPIFFS file system is used by NodeMCU to store data. The Espressif NON-OS SDK (Software Development Kit) provides the foundation for the C-based NodeMCU implementation. The firmware, which was initially intended as an add-on project for NodeMCU development modules based on the ESP8266, is currently supported by the community and may be used with any ESP module. Based on Figure 3.4, a NodeMCU device is similar to an Arduino. ESP8266 is its key component. The pins are programmable. It has Wi-Fi built-in. Micro-USB ports allow it to receive electricity. It has a modest price and multiple programming environments can be used to programmed it [21]. NodeMCU comes with a number of GPIO Pins. Following figure 3.5 shows the Pinout of the board.

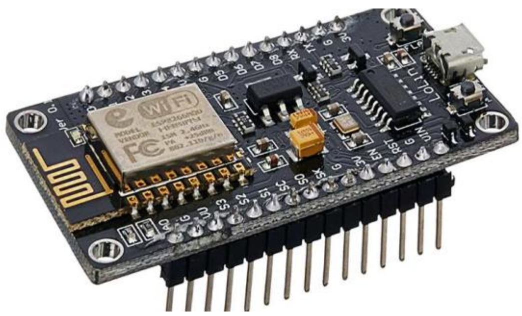

Figure 3.4 NodeMCU ESP8266 [21]

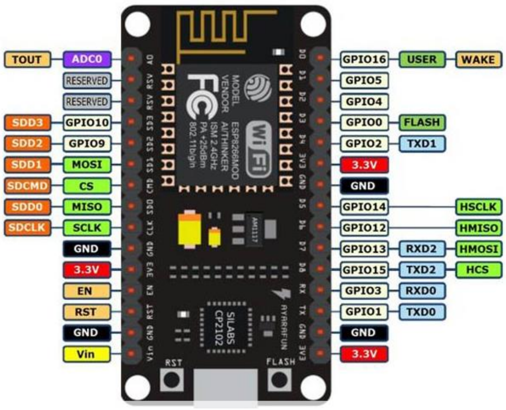

Figure 3.5 NodeMCU ESP8266 Pinout [21]

3.5.2 Water level sensor

For identifying the existence of water or other conductive liquids, the water level sensor offers an easy-to-use and reasonably priced option. The sensor is made up of parallel conducting strips that produce a voltage proportional to the water level when they are submerged in water or another conductive liquid. A microcontroller board's analogue input pins then read this voltage directly. The working voltage and current for the sensor are DC 3-5V and less than 20mA, respectively. It is an analogue type sensor with a 40 mm x 16 mm detection area that runs in the operational temperature range of 10 to 30 degrees Celsius. The sensor is appropriate for usage in non-condensing humidity settings ranging from 10% to 90%. Its dimensions are 65 mm x 20 mm x 8 mm based on Figure 3.6.

Figure 3.6 Water level sensor Module [22]

Table 3.1 Water level sensor Module Pinout Configuration

Pin Name	Description
VCC	The Vcc pin powers the module, typically with +5V
GND	Power Supply Ground
DO	Digital Out Pin for Digital Output.
AO	Analog Out Pin for Analog Output

3.5.3 2 Channel 3V Relay Module

This is a board designed for a relay, operating at a low 3V level and requiring a driver current of 15-20mA as shown in Figure 3.7. Its purpose is to control various appliances and equipment that draw significant current. The relays on this board are capable of handling AC250V 10A or DC30V 10A. It comes with a standard interface, allowing direct control by a microcontroller. For safety reasons, the module is optically isolated from the high voltage side and also prevents ground loops when interfacing with a microcontroller. It comes with an Optocoupler LOW Level Trigger extension board and making it compatible with Arduino. A common terminal, a usually open terminal and a normally closed terminal with optocoupler isolation make up the SPDT configuration of high-quality loose music relays, assuring strong anti-jamming capabilities.

Figure 3.7 2 Channel 3V Relay

3.5.4 Light Emitting Diode (LED)

An LED, a semiconductor light source with two leads is shown in Figure 3.8. The LED produces light when it is turned on. When the LED terminal is provided with the appropriate voltage, this is accomplished by allowing electrons to recombine with electron holes inside the device, releasing energy in the form of photons. The term "electroluminescence" refers to this phenomena. The energy band gap of the semiconductor material employed affects the LED's colour. The following are the LED colours and their corresponding forward voltages: Green LED's forward voltage range is 1.9–4.0V, whereas the forward voltage range for Red LED is 1.63–2.03V.

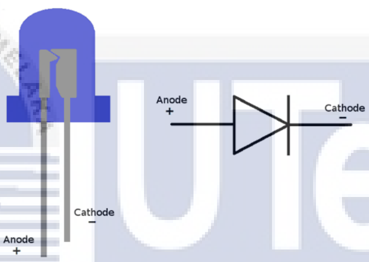

Figure 3.8 LED

3.5.5 Buzzer

Using a buzzer will allow sound elements to be added to this project affordably. A buzzer with a small 2-pin configuration is shown in Figure 3.9, making it simple to utilise on breadboards, perf boards and PCBs, among other platforms. This part is used for many electrical projects. A DC power supply between the voltages of 4V and 9V is adequate to power the buzzer. Using a regulated +5V or +6V DC source is advised over using a simple 9V battery. The buzzer is typically wired to a switching circuit that enables it to be turned ON or OFF at predetermined times and intervals.

Figure 3.9 Active Passive Buzzer Pinout

3.6 Implementation

3.6.1 Project Implementation

The data send by the sensors are handled by the NodeMCU controller. The pinout D1 untill D8 can be input or output that will be connected to the water level sensor and get the input from the sensor. The working principle of the system is based on the water level sensor. The process begins with the Green LED turning on when no flood is detected. When the water level sensor connected to NodeMCU detects the flood reaching the maximum level, it will wirelessly transmit the data to the Blynk application. Simultaneously, the buzzer will sound and the red LED will immediately as an alert. Lastly, the notification will received from Blynk application to send information to publics. The relay will cut off main power supply and the bulb will turn off. When the maximum water level not triggered, the relay can manually turn on by using Blynk application to power on the bulb.

3.6.2 Flowchart of the System

Figure 3.10 display the process of flood monitoring and alerting with the overall system and the user-interface flows.

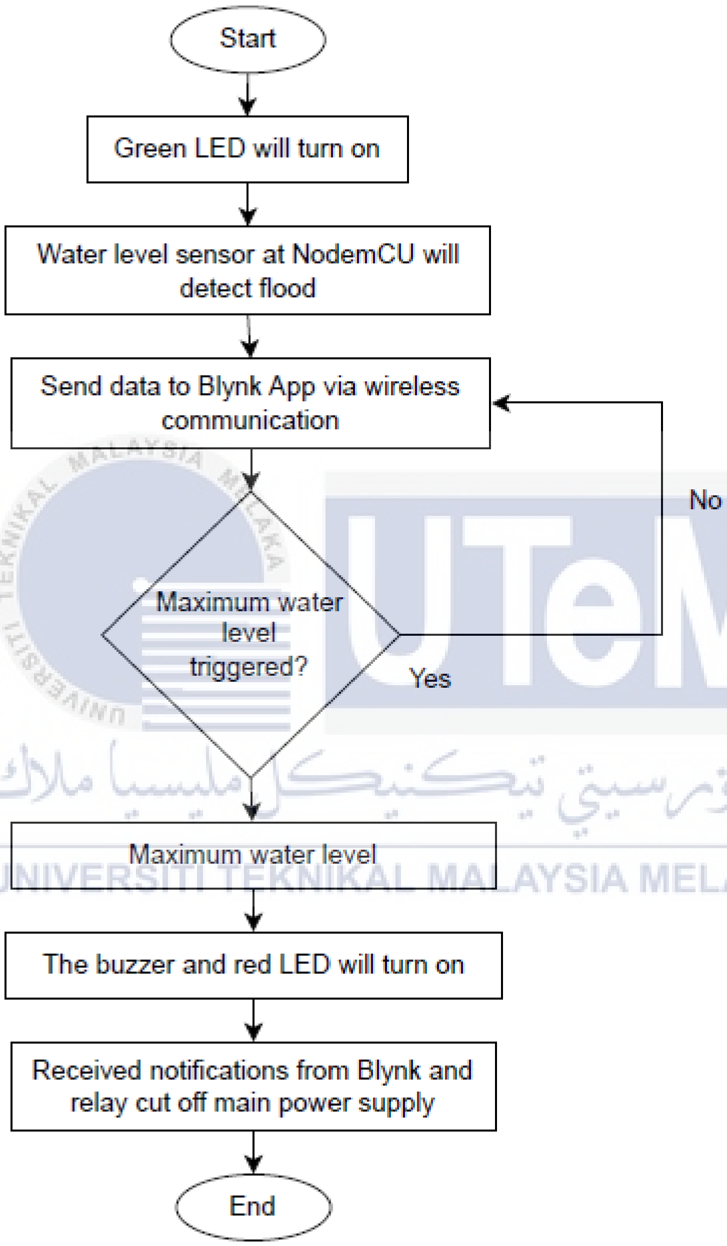

Figure 3.10 The Flowchart of the Project Process

3.7 Software Configuration

3.7.1 Arduino IDE

A cross-platform programme that works on Windows and other operating systems is the Arduino integrated development environment (IDE). The Arduino creates the programme by loading C code that has been processed by the IDE. The uploading and adding of programmes to Arduino boards is done using this Java-based software. The term "programming language" refers to a computer language that provides a set of instructions that may be used to carry out any task. Computer code that defines a collection of commands that may be used to do any operation is known as programming language. The programming language may be used to create programmes that carry out certain algorithms. A programming language's syntax and semantics can be divided into two sections. The Arduino IDE, which is a programme of software for creating and writing C code, is shown in Figure 3.11 .

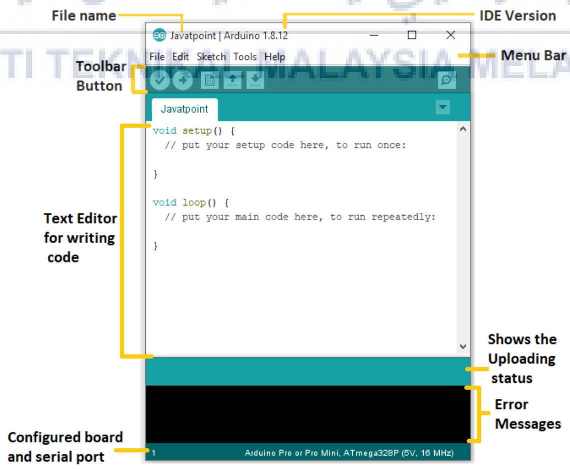

Figure 3.11 Arduino IDE Program

3.7.2 Blynk Application

Microcontrollers like the Arduino, Raspberry Pi and NodeMCU can be remotely controlled by using the Blynk application platform in combination with iOS and Android apps, as shown in Figure 3.12. This platform provides a cutting-edge dashboard that enables users to design a customised user experience suited to their individual requirements. Users can quickly construct the ideal interface by simply swapping out the necessary devices. The benefit of using Blynk is that it is not restricted to any particular boards or shields and is compatible with a wide range of hardware possibilities. Blynk may operate online and integrate with the IoT whether the Arduino is linked to the internet by Wi-Fi, Ethernet or an ESP8266 Wi-Fi module chip.

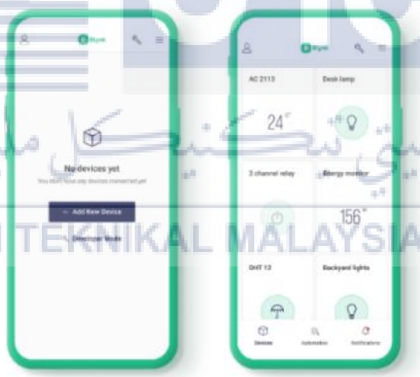

Figure 3.12 Blynk Application

3.8 Limitation of proposed methodology

There are several limitations to the study that limit the extent to which the results may be applied to real-world situations. This project focuses on creating a prototype in order to apply IoT concepts to showcase the system's potential on a smaller scope. The recommended components might not be suitable for use in practical situations. The following is a summary of the limitations:

a) Water level sensor: Numerous environmental conditions such as trash, sedimentation and water turbulence, can lead to incorrect readings from water level sensors in real life situation. Choosing high-quality sensors made to withstand these interferences is crucial to increasing precision and ensuring the accuracy of the data gathered for flood monitoring.
b) Buzzer: The buzzer's audibility and range determine how well it can warn of impending flooding. Large or noisy environments increase the probability that not everyone will hear the sound immediately, which could cause flood notifications to be missed or delayed.
c) 3V Relay: A 3V relay is not ideal for directly switching off the main power supply in real-life flood situations since it is designed for low-power applications and may not handle the voltages usual in electrical systems. It is essential to use relays intended for higher voltages, such as 110V or 220V AC to ensure correct operation and safety compliance.

3.9 Summary

In conclusion, when all hardware and software are correctly connected and fulfil the requirements, the flood monitoring and warning system may be developed. This chapter explains the project's development, including the hardware, software and system interface. The hardware and software block diagrams used in this project have already been discussed. This will make it easier for the reader to comprehend how this project evolved. The project's errors will be fixed in order to achieve the objectives. The methods for collecting and analyzing data are described thoroughly in Chapter 4.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

The development of an IoT-based flood monitoring and alerting system applying the ESP8266 is the main emphasis of this project's overview and discussion of its findings and outcomes. The planning and implementation of the model are discussed, with a focus on how the software configuration integrates the Blynk and microcontroller programmes. This study evaluated the early warning system's effectiveness by analysing the immediate warnings it issued in addition to measuring water levels. The study of the collected data allowed for the identification of patterns and trends in the changes in water level, which improved our understanding of flood cases. The project's results show that the system was effectively put into place and that it is dependable in providing timely notifications and staying up to date with floods.

4.2 Design Schematic Diagram Flood Monitoring and Alerting System

The overview and analysis of this project's findings and outcomes focus on the creation of IoT-based flood monitoring and related. This technology has considerable potential for enhancing early warning systems and facilitating proactive measures that reduce the impact of floods on infrastructure and people. The collaborative open-source Fritzing software is designed to be a user-friendly computer-aided design (CAD) tool for designing electrical devices. The objective is to facilitate developers' move from prototyping to improved circuit design [23]. This schematic diagram uses an ESP8266 microcontroller to demonstrate how to build a basic circuit. With the aids of Fritzing application as shown in Figure 4.1, schematic diagram is obtained with the use of several components such as water level sensor, two LED, a buzzer and relay to cut off main power supply. The process for the output starts when there is no flood detected and the Green LED will turns on. However, when the water level sensor detect flood at the maximum level, it will send data to Blynk application via wireless communication. When the sensors receives a signal, the buzzer and red LED will functioning. The relay will cut off main power supply and the bulb will turn off. When the maximum water level not triggered, the relay can manually turn on by using Blynk application to power on the bulb.

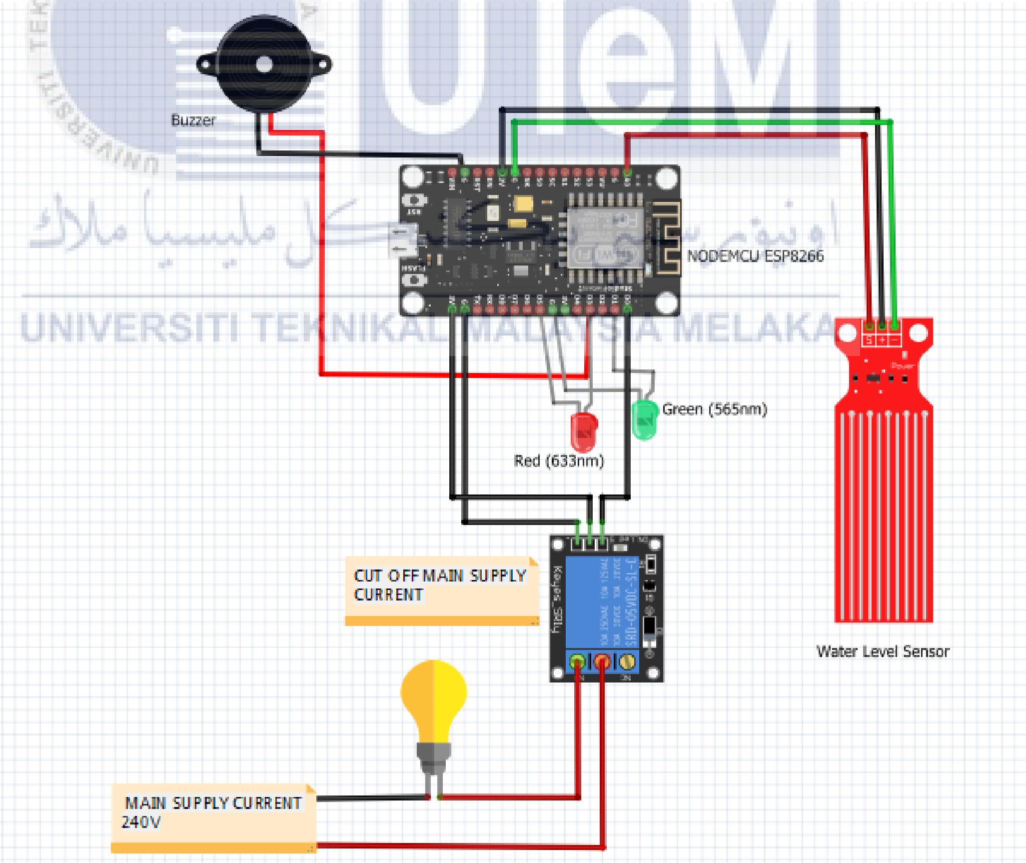

Figure 4.1 Schematic Diagram Flood Monitoring and Alerting System using Fritzing Software

To improve the simulation, Tinkercad software was used to create a detailed schematic diagram for the flood monitoring system. Since the software provided an accurate picture, it was essential to the system's successful development. The flood monitoring system could be thoroughly simulated by utilising Tinkercad's features, which enhanced understanding and improved the system's design. This part describes how the simulation circuit was modified to change the NodeMCU and replace it with an Arduino board to run the simulation circuit. The ESP8266 and Arduino boards have the same pinout, which means that the pin configuration and arrangement are the same. Figure 4.2 display the connection between Arduino as ESP8266 microcontroller and others component. In this simulation circuit, the original 240V AC power supply has been replaced with a 9V battery to turn on the bulb and the switch as relay.

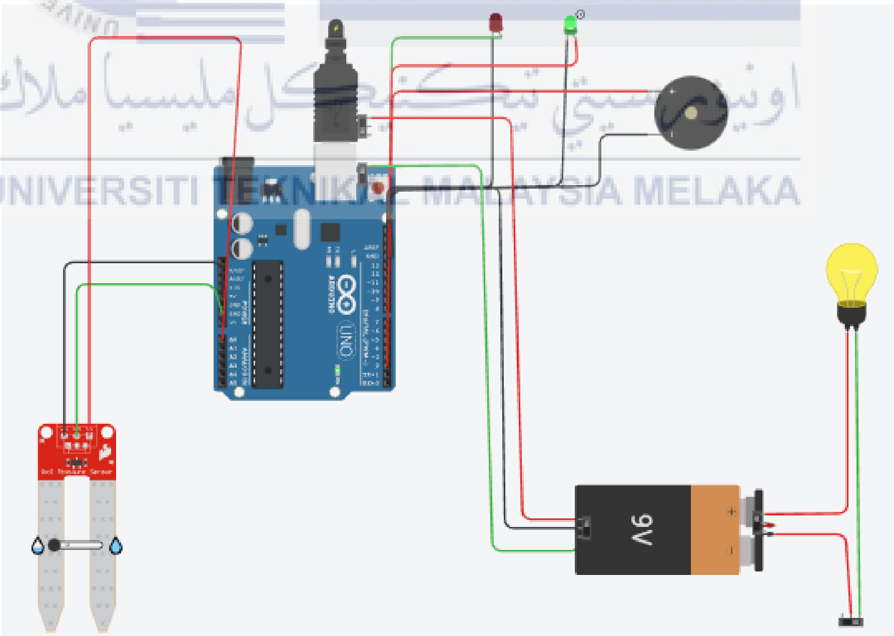

Figure 4.2 Modified Schematic Diagram for Flood Monitoring and Alerting System using Tinkercad Software

Based on figure 4.3, when there is no flood detected at the maximum level, the process starts by turning on the Green LED. However, once the water level sensor detects a flood at the maximum level, it wirelessly transmits the data to the Blynk application. The buzzer and red LED are both turned on when a signal indicating that the water level is above the maximum threshold is received as shown in Figure 4.4. The relay will cut off main power supply and the bulb will turn off.

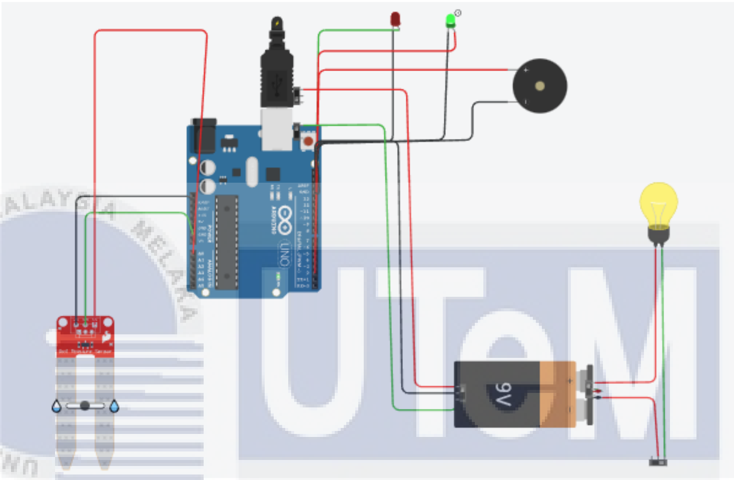

Figure 4.3 Green LED Function

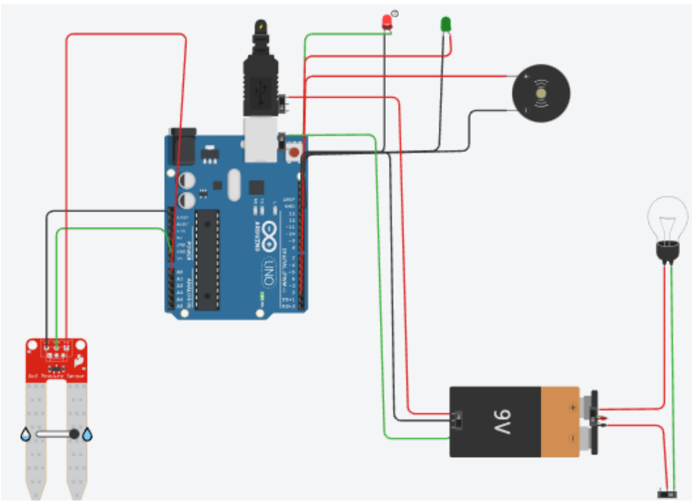

Figure 4.4 The Buzzer and Red LED Turned On

4.3 Hardware Development

The ESP8266 module plays a vital role in enabling microcontrollers to establish connections with 2.4 GHz Wi-Fi networks. With Wi-Fi connectivity, this characteristic enables the microcontroller to communicate with other devices, cloud services and internet-based platforms, providing a wide range possibilities for IoT applications. The pinout D1 untill D8 can be input or output that will be connected to the water level sensor and get the input from the sensor. There are certain pins on the ESP8266 board that are implemented to connect the water level sensor to the device. Pinout A0 will connected with A0, pinout GND with ground and pinout VCC at the sensor will connected with pinout VU at the controller. These pins were selected and connected to ensure that the ESP8266 and water level sensor function together effectively. For the output, two LED and a buzzer will connect with ESP8266. Positive anode for Green LED and Red LED will connected to the GND while negative anode Green LED at D1 and negative anode Red LED at D2. The Buzzer also will connected at pinout D3 for positive and pinout GND for negative. Lastly, the notification will received from Blynk application to send information to publics. Figure 4.5 shown the preliminary hardware for design flood monitoring and alerting system.

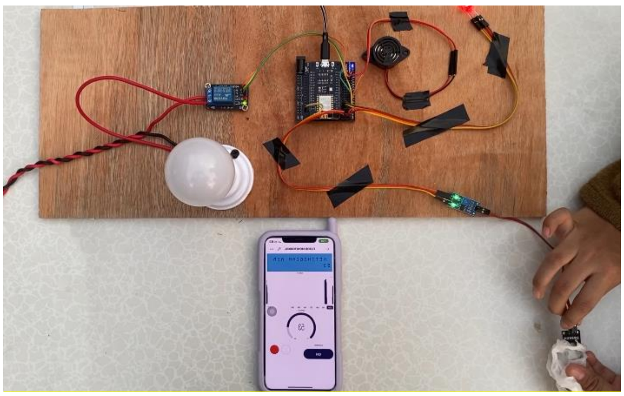

Figure 4.5 Comple Cicuit Development

4.4 Blynk Application Development

Developing Blynk applications allows users to make customized mobile programmers that can manage and control IoT devices. Users can simply create their own applications with Blynk without having extensive programming experience. Users can drag and drop widgets and other components to customize the look and feel of the application on the platform's user-friendly interface. These widgets can be connected to particular hardware platforms like NodeMCU, enabling users to manage their IoT devices and acquire real-time sensor data. Overall, Blynk makes it easier for users of all skill levels to construct IoT apps. Additionally, a Google account is needed to register the Blynk application. The Google account will then give a token so that the Blynk application can be activated. The Wi-Fi Module code that uses the token to link Blynk applications to the Flood Monitoring and Alerting System as shown in Figure 4.6.

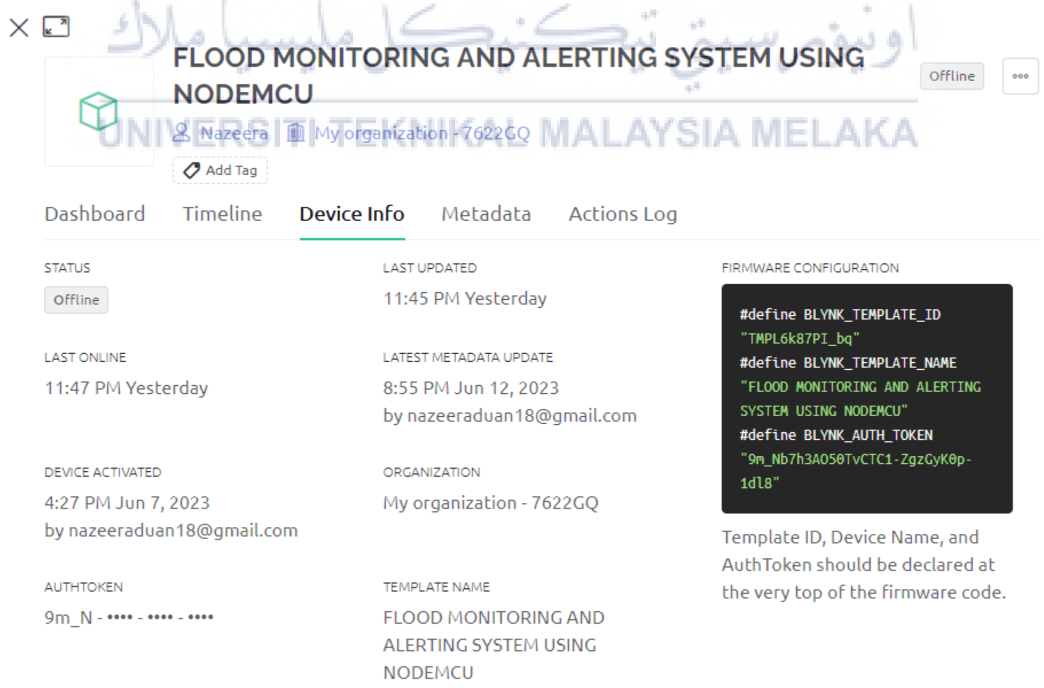

Figure 4.6 Blynk Interface

4.5 Prototype Development

Project development refers to the comprehensive process of organising and carrying out a certain function or work. The first step in creating an ESP8266 by using IoT flood monitoring and alerting system was to carefully define the requirements of the project. The key aspects were explained in detail, including data transmission methods, flood sensor capabilities and smooth integration with the ESP8266 platform. Then, a high-level design was developed to show how various parts, including the ESP8266, Blynk Application and the output which is buzzer, two LED, relay and water level sensors, work together. The next step in the integration process was to connect water level sensors to the ESP8266 so that real-time water level monitoring to cut off power supply could be performed. A lot of testing was done to confirm the accuracy and dependability of the sensor under a range of environmental circumstances.

In order to assess the prototype's general functionality, dependability and responsiveness, it performed extensive evaluation following connection. The prototype received incremental modifications to optimise efficiency, taking into account valuable feedback from the testing process. Throughout this process, an extensive record of the design decision-making, challenges faced and solutions implemented was maintained. A specific home appliance was considered in the design of the IoT-based Flood Monitoring and Alerting System utilising ESP8266 prototype, which is seen in Figure 4.7. To make this model, playwood and additional electrical hardware components were used. In order to improve portability and compactness, the 5V relay and ESP8266 were neatly put together into one box. A buzzer, red LED, green LED and an 8W LED lightbulb were all included in the playwood.

Figure 4.7 Prototype of Flood Monitoring System

4.6 Experimental Result

To ensure efficient flood detection and early notification, the system operates in a step-by-step manner. The Green LED turns on when no flood is detected, as depicted in Figure 4.8. Conversely, the water level sensor wirelessly notifies the Blynk application whenever it detects a flood at its highest level. Figure 4.9 illustrates that when the flood reaches the maximum water level, it triggers the activation of a red LED and a buzzer, providing a clear signal of a flood emergency. Simultaneously, a relay operates by switching off the primary power source, subsequently turning off a connected lightbulb.

Figure 4.8 The Input Result

Figure 4.9 The Output Result

The water level sensor wirelessly transmits data to the Blynk application if there is a noticeable change in the water level. The development of a flood monitoring system that is easy to use with the Blynk application is shown in Figure 4.10. This configuration not only detects changes in the water level but also alerts users when the level reaches a certain maximum level. Such notifications are shown graphically in the accompanying picture. Due to its ability to enable fast sharing of data through the Blynk application, this notification feature is needed for effective flood monitoring. This method helps users take quick action and improves overall response to possible flood emergencies by quickly informing users when the water level reaches a critical threshold.

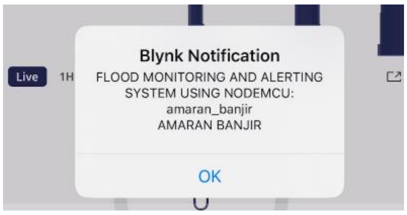

Figure 4.10 Blynk Notification

The Blynk application is necessary for gathering data, which users or local authorities may then manually evaluate to better understand the situation based on readings from the water level sensor. As an illustration, Figure 4.11 presents the timeline information obtained using the Blynk application. The definition of timeline data is given in the arrangement of events, along with an explanation of how it is used to arrange events chronologically according to their dates of occurrence. The timeline can be further enhanced by considering both time limitation periods and event types. The information that follows describes the specifics of how timeline data can be sorted on the Blynk application. A variety of time period options are available to users, such as "Latest" "Last Hour" "6 Hours" "1 Day" "1 Week" "1 Month" and "3 Months". This timeline makes sure that everything is easily collected for easy interpretation on a single page, including the many circumstances that the sensor detects

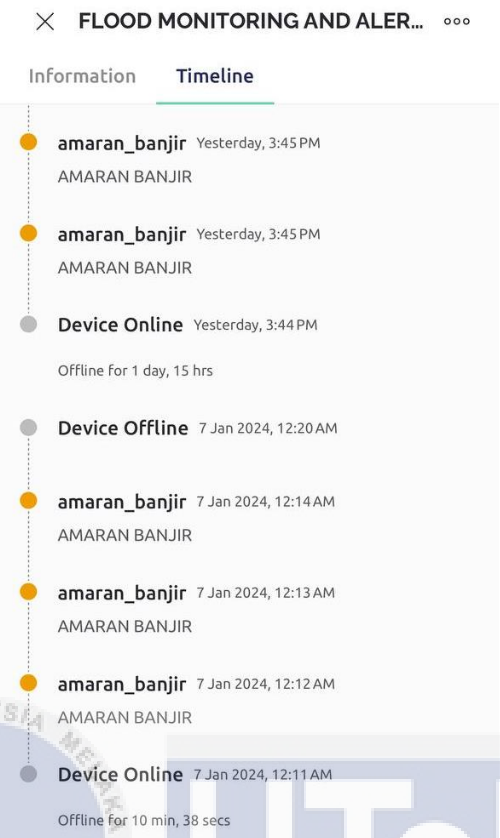

Figure 4.11 Timeline Data

The gathered data is not only shown within the programme but also shown graphically as shown in Figure 4.12. With the help of these settings, users can examine and evaluate timeline data in a manner consistent with their chosen time periods. This feature fits the needs and preferences of individual users by enabling a more targeted and customised analysis of events within the Blynk application. Visualize data seamlessly on a chart, incorporating both real-time and historical information through a single datastream. When it comes to the values axis (vertical), each Datastream added to the chart widget is equipped with its own scale on both the right and left sides. This scale can be fine-tuned manually or set to auto-scale during the Template dashboard setup. Additionally, the timeline axis (horizontal) plays a crucial role in pinpointing values relevant to the exact time of a conducted search. In essence, this functionality provides a comprehensive and user-friendly way to interpret and analyze data within the visual context of a chart.

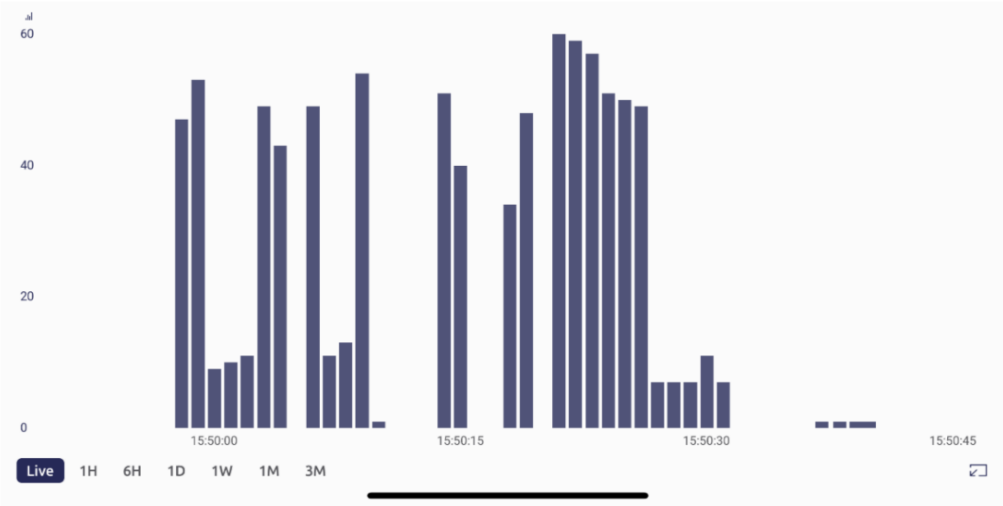

Figure 4.12 Graphical Data

4.7 Discussion

The main goal of this project was to use the ESP8266 to develop an IoT flood monitoring and alert system. The system was designed to monitor water levels and alert users when floods are approaching using the Blynk application. As discussed in both Chapter 1 and Chapter 2, floods have recently grown to be significant cause for concern. Malaysians must act proactively to minimize the devastation these floods will cause by taking precautionary steps. This project was carried out after an idea was developed successfully but with a few minor errors. Using the chosen components, the initial result was obtained. Although projects like this have existed before, this prototype stands out because it takes an innovative way by using simple and user-friendly components, such as the ESP8266, water level sensor, a buzzer, LEDs and 3V relay module. While it was being developed, the project faced into a number of difficulties, most of which were caused by numerous mistakes and problems. One significant obstacle that caused delays and disruptions was locating the required code. Debugging also became an important part of the process, requiring a lot of effort to locate and correct code errors. Another major hurdle occurred when it was found that a number of the pieces in the original schematic diagram were incompatible due to limitations in their capabilities. This realization made it necessary to replace a few elements, which introduced complexity that was not anticipated and necessitated an examination of the overall design. The project aims to overcome obstacles during development by showcasing endurance and problem-solving skills and turning failures into instructive learning opportunities.

4.8 Summary

The goal of developing an ESP8266-based IoT flood monitoring and alerting system is to assist flood-affected user by providing timely notifications and support. Through the Blynk app, users will receive notifications containing important data, and the relay will have a critical role in cutting off the main power supply as necessary. People who are dealing with the effects of floods can gather important data about the water levels using this method. Early defect detection and prevention of disruptive scenarios are achievable through analysis. Chapter 5 provides a detailed analysis of the challenges encountered and suggests potential avenues for further development.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter explains how the ESP8266 and Arduino were implemented to develop the Internet of Things-Based Flood Monitoring and Alerting System. It also highlights the successes that were achieved in accordance with the set goals and discusses the difficulties that were encountered. The discussion extends to proposals for future work on the project, outlining potential enhancements and extensions. This chapter contributes to the continuous improvement of the Flood Monitoring and Alerting System by providing an insightful examination of its development, difficulties encountered, and opportunities for future improvement.

5.2 Conclusion

The development of an IoT flood monitoring and alerting system is beneficial for providing prone areas with early warnings. The system manages to simulate a sensor by using ESP8266 to monitor water levels for flood monitoring and alerting system. This enables the user to take preventive action and minimize the possible effects of the worst-case situation. Electrical accidents during or after a flood are common underestimate. It seems reasonable that persons who have been impacted by flooding must deal with many kinds of urgent issues, which can cause them to ignore the dangers posed by electrical hazards. Therefore, the system provides a precaution for user in danger of electrical accidents by including a power supply cut-off capability, ensuring their safety.

Among the pressing issues surrounding flooding is the equally important difficulty of informing consumers about the possible hazards of electrical accidents. It becomes necessary to create an interface that is easy for users to use in order to properly communicate these risks and make sure that those affected by flooding put their safety first among the many other pressing concerns they must deal with. Financially speaking, cost management entails navigating through expenses related to obtaining hardware components like relays, water level sensors, NodeMCU ESP8266 microcontrollers and other necessary pieces. The total project budget also includes platforms for testing and simulation, and development tools. Managing time well is essential for reaching different project milestones.

In conclusion, the major problem of flooding in water systems is successfully solved by the proposed flood monitoring system, which includes the NodeMCU ESP8266 microcontroller, water level sensor, relay, and buzzer. The important risk of electrocution during flooding incidents is considered by the system, in addition to other health hazards and property damage. The system not only successfully implements safety measures, such as cutting off the main power supply and delivering real-time information on flood forecast, but it also quickly warns users via the Blynk application.

5.3 Future Works

For future enhancements, improvements to the Design and Development of the IoT-Based Flood Monitoring and Alerting System using ESP8266 could be implemented in the following ways:

i. Installing an automated power cutoff system for the entire house will enhance the system's safety characteristics. This can be accomplished by integrating a NodeMCU ESP8266 microcontroller-managed smart electrical switch. If flooding is detected, the microcontroller can send out a signal to turn off the main power supply to the house.

ii. Improve system performance by incorporating more sensors to monitor water quality. These sensors measure a range of characteristics such as temperature, pH and pollutant levels to give a more comprehensive picture of the environmental conditions during flooding.

iii. Enhance the system's flood data display capabilities by adding higher-level graphs, charts and mapping functions. This improvement aims to make the information more approachable and user-friendly by providing users with a clearer and more understanding picture of the flood conditions.

REFERENCES

[1] S. Rahman, "Malaysia's Floods of December 2021: Can Future Disasters be Avoided?," *Iseas Perspect.*, vol. 26, no. 2022, pp. 1–15, 2022.

[2] Messner Frank and V. Meyer, "'Flood Damage , Vulnerability and Risk Perception – Challenges for Flood Damage,'" *Environ. Res.*, pp. 149–167, 2006.

[3] K. Rose, S. Eldridge, and L. Chapin, "The Internet of Things (IoT): An Overview," *Int. J. Eng. Res. Appl.*, vol. 5, no. 12, pp. 71–82, 2015, [Online]. Available: https://crsreports.congress.gov

[4] K. Swathi, T. U. Sandeep, and A. R. Ramani, "Performance Analysis of Microcontrollers Used In Iot Technology," *Int. J. Sci. Res. Sci. Eng. Technol.*, vol. 4, no. 4, pp. 1268–1273, 2018.

[5] R. R. Mason and B. A. Weiger, "Stream Gaging and Flood Forecasting," *Fact Sheet*, p. 4, 1995.

[6] T. H. Assumpção, I. Popescu, A. Jonoski, and D. P. Solomatine, "Citizen observations contributing to flood modelling: Opportunities and challenges," *Hydrol. Earth Syst. Sci.*, vol. 22, no. 2, pp. 1473–1489, 2018, doi: 10.5194/hess-22-1473-2018.

[7] M. Pregnolato, A. Ford, S. M. Wilkinson, and R. J. Dawson, "The impact of flooding on road transport: A depth-disruption function," *Transp. Res. Part D Transp. Environ.*, vol. 55, pp. 67–81, 2017, doi: 10.1016/j.trd.2017.06.020.

[8] S. Muzzamil, H. Shah, Z. Mustaffa, and K. W. Yusof, "Disasters Worldwide and Floods in the Malaysian Region : A Brief Review," no. January, 2017, doi: 10.17485/ijst/2017/v10i2/110385.

[9] N. A. Ibrahim, S. R. W. Alwi, Z. A. Manan, A. A. Mustaffa, and K. Kidam, "Flood Impact on Renewable Energy System in Malaysia," *Chem. Eng. Trans.*, vol. 89, no.

May, pp. 193–198, 2021, doi: 10.3303/CET2189033.

[10] N. A. Zulkepli, N. Diana, and M. Idris, "Identifying the research of flooding in Kelantan, Malaysia: A review," *Int. J. Mech. Eng.*, vol. 7, no. 4, pp. 974–5823, 2022.

[11] Z. Mohd Taib and N. Siah Jaharuddin, "Disaster Management: the Impact of Flood Disaster on Small Medium Enterprises in Malaysia," no. December 2015, 2015, [Online]. Available: https://www.researchgate.net/publication/336510227

[12] B. Arshad, R. Ogie, J. Barthelemy, B. Pradhan, N. Verstaevel, and P. Perez, "Computer vision and iot-based sensors in flood monitoring and mapping: A systematic review," *Sensors (Switzerland)*, vol. 19, no. 22, pp. 1–28, 2019, doi: 10.3390/s19225012.

[13] W. H. Wan Hassan, A. Z. Jidin, S. A. C. Aziz, and N. Rahim, "Flood disaster indicator of water level monitoring system," *Int. J. Electr. Comput. Eng.*, vol. 9, no. 3, pp. 1694–1699, 2019, doi: 10.11591/ijece.v9i3.pp1694-1699.

[14] L. H. Azman and P. D. N. M. Nawi, "Flood monitoring and alerting system," *Appl. Inf. Technol. Comput. Sci.*, vol. 3, no. 1, pp. 822–836, 2022, [Online]. Available: https://publisher.uthm.edu.my/periodicals/index.php/aitcs/article/view/2512

[15] S. Behera and S. Kishore Parida, "IoT-based Flood Monitoring and Alerting System using Arduino Uno," *Turkish J. Comput. Math. Educ.*, vol. 09, no. 03, pp. 702–706, 2018.

[16] D. Satria, S. Yana, R. Munadi, and S. Syahreza, "Prototype of Google Maps-Based Flood Monitoring System Using Arduino and GSM Module," *Int. Res. J. Eng. Technol.*, vol. 4, no. 10, pp. 1044–1047, 2017, [Online]. Available: www.irjet.net

[17] H. Yuliandoko, Subono, V. A. Wardhany, S. H. Pramono, and P. Siwindarto, "Design of flood warning system based IoT and water characteristics," *Telkomnika (Telecommunication Comput. Electron. Control.*, vol. 16, no. 5, pp. 2101–2110, 2018,

doi: 10.12928/TELKOMNIKA.v16i5.7636.

[18] M. S. Mohd Sabre, S. S. Abdullah, and A. Faruq, "Flood Warning and Monitoring System Utilizing Internet of Things Technology," *Kinet. Game Technol. Inf. Syst. Comput. Network, Comput. Electron. Control*, vol. 4, pp. 287–296, 2019, doi: 10.22219/kinetik.v4i4.898.

[19] M. K. Joshi, "Flood Monitoring and Alerting System using IOT," *Int. J. Res. Appl. Sci. Eng. Technol.*, vol. 8, no. 5, pp. 673–676, 2020, doi: 10.22214/ijraset.2020.5105.

[20] A. Jadhav, H. Jadhav, S. Jalkote, and V. Deokamble, "Flood Detection and Alert System Based on Iot," *Int. Res. J. Mod. Eng. Technol. Sci. @International Res. J. Mod. Eng.*, no. 09, pp. 2582–5208, 1084, [Online]. Available: www.irjmets.com

[21] Y. Parihar, Sing, "Internet of Things and Nodemcu: A review of use of Nodemcu ESP8266 in IoT products," *J. Emerg. Technol. Innov. Res.*, vol. 6, no. 6, pp. 1085–1086, 2019, [Online]. Available: https://www.researchgate.net/profile/Yogendra-Singh-Parihar/publication/337656615_Internet_of_Things_and_Nodemcu_A_review_of_use_of_Nodemcu_ESP8266_in_IoT_products/links/5e29767b4585150ee77b868a/Internet-of-Things-and-Nodemcu-A-review-of-use-of-Nodemcu-ES

[22] Davis Instruments, "Soil Moisture Sensor 6440," *Thames Val.*, vol. 6440, p. 1, 2007.

[23] A. Knörig, R. Wettach, and J. Cohen, "Fritzing - A tool for advancing electronic prototyping for designers," *Proc. 3rd Int. Conf. Tangible Embed. Interact. TEI'09*, pp. 351–358, 2009, doi: 10.1145/1517664.1517735.

APPENDICES

Appendix A Code For Flood Monitoring and Alerting System

```
#define BLYNK_TEMPLATE_ID "TMPL6k87PI_bq"
#define BLYNK_TEMPLATE_NAME "FLOOD MONITORING AND ALERTING SYSTEM USING
NODEMCU"
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>


char auth[] = "9m_Nb7h3AO50TvCTC1-ZgzGyK0p-1dl8";//Enter your Auth token
char ssid[] = "Zeera";//Enter your WIFI name
char pass[] = "Zeera_99";//Enter your WIFI password

#define sensor A0
#define relay  D0
#define ledgreen D1
#define ledred D2
#define buzzer D3

BlynkTimer timer;
bool pirbutton = 0;

void setup() {
Serial.begin(9600);
pinMode(sensor, INPUT);
pinMode(relay, OUTPUT);
pinMode(ledgreen, OUTPUT);
digitalWrite(ledgreen, HIGH);
pinMode(ledred, OUTPUT);
digitalWrite(ledred, LOW);
pinMode(buzzer, OUTPUT);
digitalWrite(buzzer, LOW);

  Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);
  for (int a = 0; a <= 15; a++) {
    delay(500);
  }
  //Call the function
  //timer.setInterval(100L, soilMoistureSensor);
}

//Get buttons values
```

```
BLYNK_WRITE(V5) {
 bool RelayOne = param.asInt();
  if (RelayOne == 1) {
    digitalWrite(relay, LOW);
  } else {
    digitalWrite(relay, HIGH);
  }
}

void loop() {
int val = analogRead(sensor);
float sensor = (val * (100.0 / 1023.0));
if (sensor>=50)
{
digitalWrite(relay,HIGH);
Blynk.virtualWrite(V5, 1);
digitalWrite(ledred, HIGH);
Blynk.virtualWrite(V3, 1);
digitalWrite(ledgreen, LOW);
Blynk.virtualWrite(V2, 0);
digitalWrite(buzzer, HIGH);
Blynk.logEvent("amaran_banjir","AMARAN BANJIR");
//lcd.print(4,1,"AMARAN BANJIR");
}
else{
//digitalWrite(relay,LOW);
digitalWrite(ledred, LOW);
Blynk.virtualWrite(V3, 0);
digitalWrite(ledgreen, HIGH);
Blynk.virtualWrite(V2, 1);
digitalWrite(buzzer, LOW);
}
Serial.println(sensor);
Blynk.virtualWrite(V0, sensor);
delay(500);
Blynk.run();
}
```

Appendix B Gantt Chart for Final Year Project 1

PROJECT ACTIVITY /TASK	**WEEK**													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Project Briefing	X													
Research project	X													
Background, Problem statement & Objective		X	X											
Identify component			X	X										
Make project proposal				X	X									
Project flow chart					X	X								
Methodology						X	X							
Review report								X		X				
Submit 1st draft report											X			
Submit report												X	X	
Presentation														X

Appendix C Gantt Chart for Final Year Project 2

PROJECT ACTIVITY /TASK	**WEEK**													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Meeting with Supervisor	X					X						X		
Planning Prototype	X													
Submission of Logbook						X						X		
Testing Prototype			X	X	X	X	X	X		X	X	X	X	X
Data Analysis				X	X	X	X	X						
Writing Chapter 4					X	X								
Writing Chapter 5						X	X							
Review report								X		X				
Submit 1st draft report													X	
Submit report														X
Presentation													X	