Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF FLOOD MONITORING SYSTEM WITH IOT

NUR AINA INSYIRAH BINTI ABD LATIFF

Bachelor of Electronics Engineering Technology with Honours

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DEVELOPMENT OF FLOOD MONITORING SYSTEM WITH IOT

NUR AINA INSYIRAH BINTI ABD LATIFF

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

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2022

DECLARATION

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

Signature	:	
Student Name	:	NUR AINA INSYIRAH BINTI ABD LATIFF
Date	:	13 JANUARY 2023

APPROVAL

I approve that this Bachelor Degree Project 1 (PSM1) report entitled "Development of Flood Monitoring System with IoT" is sufficient for submission.

Signature :

Supervisor Name : TENGKU MOHD FAISAL BIN TENGKU WOOK

Date : 13 JANUARY 2023

Ts. TG MOHD FAISAL BIN TENGKU WOOK
Jurutera Pengajar Kanan
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

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 Electronics Engineering Technology (Industrial Electronics) with Honours.

Signature :

Ts. TG MOHD FAISAL BIN TENGKU WOOK
Jurutera Pengajar Kanan
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Supervisor Name : TENGKU MOHD FAISAL BIN TENGKU WOOK

Date : 13 JANUARY 2023

Signature :

Co-Supervisor Name (if any) :

Date :

DEDICATION

This thesis is dedicated to everyone that have support me support in terms of physical assistance, mental assistance and financial assistance from beginning until the end of this project development. These special thanks I dedicates to my lovely parents, my whole family, my supervisor, my lecturers, my housemates, my classmates and to all my dearest friend. Thank you so much for all the guidance, support and encouragement until the end of this project.

ABSTRACT

In recent times, many areas have been hit by unpredictable floods but residents have not received any warnings before it occurs. The majority of flood monitoring approaches are based on telemetry systems, which necessitate the use of transmitters and repeaters in order to communicate the information to a central terminal. It is expensive and unreliable when there is equipment malfunction in a section of the sensed area, as is the case in this case. This flood monitoring system using ultrasonic sensor and NodeMCU ESP8266 will help people to monitor and predict the floods before it occurs at an affordable price. The main objective of developing a Flood Monitoring System with Iot is, to detect water levels of the river when it rains before a flood occurs. Besides, the project is to notify residents earlier to save their life and lower the risk of death. The goal of this project is to use ultrasonic sensor to monitor the water level of the river. The siren, tower lamp and the Blynk app will be used to alert residents in the surrounding region. Fire fighter, residents or APM will be notified by Telegram Bot and will take their further actions and be ready before flood occur. Therefore, it is predicted that this system will give many advantages to prevent substantial property damage and loss of life.

ABSTRAK

Sejak kebelakangan ini, banyak kawasan dilanda banjir yang tidak menentu namun penduduk tidak menerima sebarang amaran sebelum kejadian berlaku. Majoriti pendekatan pemantauan banjir adalah berdasarkan sistem telemetri, yang memerlukan penggunaan pemancar dan pengulang untuk menyampaikan maklumat kepada terminal pusat. Ia mahal dan tidak boleh dipercayai apabila terdapat kerosakan peralatan di bahagian kawasan deria, seperti yang berlaku dalam kes ini. Sistem pemantauan banjir menggunakan sensor ultrasonik dan NodeMCU ESP8266 ini akan membantu orang ramai memantau dan meramal banjir sebelum ia berlaku dengan harga yang berpatutan. Objektif utama membangunkan Sistem Pemantauan Banjir dengan Iot adalah, untuk mengesan paras air sungai apabila hujan sebelum banjir berlaku. Selain itu, projek ini adalah untuk memaklumkan penduduk lebih awal untuk menyelamatkan nyawa mereka dan mengurangkan risiko kematian. Matlamat projek ini adalah untuk menggunakan sensor ultrasonik untuk memantau paras air sungai. Siren, lampu menara dan aplikasi Blynk akan digunakan untuk memberi amaran kepada penduduk di kawasan sekitar. Anggota bomba, penduduk atau APM akan dimaklumkan oleh Telegram Bot dan akan mengambil tindakan selanjutnya dan bersedia sebelum banjir berlaku. Oleh itu, sistem ini diramalkan akan memberi banyak kelebihan untuk mengelakkan kerosakan harta yang besar dan kehilangan nyawa.

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LIST OF SYMBOLS

V	-	Voltage
cm	-	Centimeter
m	-	meter
sec/s	-	second

LIST OF ABBREVIATIONS

GSM	-	Global System for Mobile Communication
FMWS	-	Flood Monitoring Warning System
IoT	-	Internet of Things

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

Floods caused by heavy rains were reported across Peninsular Malaysia's central-western region on March 6-7 on 2021. More than 1,290 individuals have been moved to 14 evacuation centers across the states of Kuala Lumpur, Melaka, Negeri Sembilan, and Selangor, according to the ASEAN Disaster Information Network (ADINet). Floods in the districts of Gombak, Hulu Langat, Kuala Langat, Petaling, and Sepang have displaced 1,020 residents, mostly in Selangor.

Although, river flooding occurs during the local tropical wet season, which normally occurs between the months of October and March. Flooding happens when heavy rain or when heavy rain falls over a long period of time causes the flood levels of a river or stream to rise to the point where they submerge land. Normally, this type of flood happens along the east coast of Malaysia, in places like Kelantan, Pahang, and Terengganu. River flooding results in the death of people and the destruction of property.

It is one of the technologies that may be utilized to reduce loss of life in floods, and it is particularly useful in east coast states such as Kelantan, Terengganu, and Pahang. In order to prevent loss of life due to flooding, it is possible to integrate an alarm system into the system to inform the public and authorities. When the water level in the river exceeds a certain threshold, the system will send an alert to the user, indicating that the system has detected an abnormal situation. It is specifically built for rescue teams such as PDRM, BOMBA, and the Joint Pararescue Mission (JPAM). With the use of this technology, the rescue team will be able to obtain information about the water level and distribute that information to the general public, particularly flood victims, in order to facilitate evacuationProblem Statement

1.2 Problem Statement

In recent times, many areas have been hit by unpredictable floods but residents have not received any warnings before it occurs. The majority of flood monitoring approaches are based on telemetry systems, which necessitate the use of transmitters and repeaters in order to communicate the information to a central terminal. It is expensive and unreliable when there is equipment malfunction in a section of the sensed area, as is the case in this case. This flood monitoring system using ultrasonic sensor and NodeMCU ESP8266 will help people to monitor and predict the floods before it occurs at an affordable price.

1.3 Project Objective

The main aim of this project is to be developing a Flood Monitoring System with Iot. Specifically, the objectives of this project are as follows:

a) To develop a system that will be able to analyze water levels of the river when it rains before a flood occurs.

b) To develop a system that will able to notify residents earlier to save their life and lower the risk of death.

c) To develop a flood early warning and notifications system to minimize damage property and lives.

1.4 Scope of Project

The scope of this project is focused on areas that are found to be areas prone to flooding. This is to make it easier for them to be prepared for flooding. This will also make it easier for many parties such as firefighters to act more quickly when floods occur. It will also be able to save important items from being destroyed by floods. Firstly, to operate this system, the hardware should be placed near the river to let the ultrasonic read the water level. There are 3 stage of water level in the river. For the first stage is low level, which is water still in safe position. Second level of water is moderate level. When water level reach moderate level, residents must be alert with the condition of water and prepare for the flood by rescuing valuables things. Lastly in danger condition is the last level. Resident, firefighter or JPAM shall immediately take safety actions of the residents. Protect from death, missing and drown cases. Users will be notified or monitor this system through the blynk app and they also can monitor manually at the river. The attention of this system is monitoring the water level of the river and measuring the rate of rainwater drop.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In order to complete this Flood Monitoring System, conduct a literature review to gather the necessary information and skills. The bulk of this section comes from previous projects and thesis that are related to this one. From books, journals, and articles on the internet, this source can provide information. Researcher study of the project provides a way for project developers to learn about what features are missing from their work. Improve and construct a successful project is quite important.

2.2 Past Related Research

2.2.1 Smart IoT Flood Monitoring System

The purpose of this research is applicable to both urban and rural areas. The system that has been proposed has a design that is both simple and inexpensive to maintain. This project will automatically update the water level on the web server, and the system will send out a warning signal to the people in the area, urging them to evacuate as quickly as possible. Previous research that are relevant to this topic suggest that the system was developed using a variety of different approaches. According to the findings of this study report, the Arm Mbed IoT device platform provides both an operating system and a large number of cloud services. In the Smart IoT Flood Monitoring System, the microcontroller used a Mbed LPC1768 with an application board. These components were chosen since they are Internet of Things (IoT) solution based. This particular family of microcontrollers is known as the

LPC176x. It also has a drag-and-drop programming interface, with the board being displayed as a USB drive, and it has online resources that are simple to use [1].

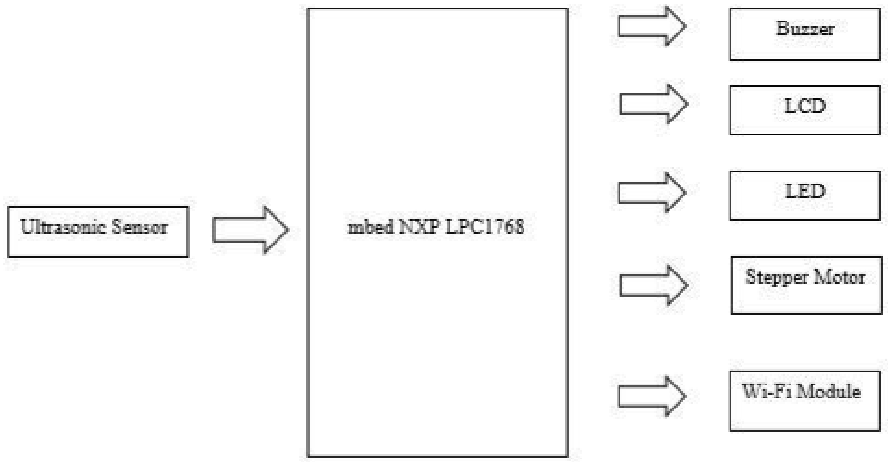

Figure 2.1 Block diagram Smart IoT Flood Monitoring System

2.2.2 The Development of Smart flood Monitoring System Using Ultrasonic Sensor with Blynk Applications

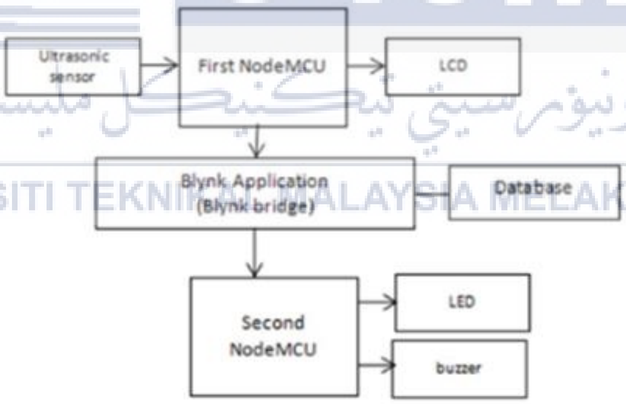

Figure 2.2 Block diagram Smart IoT Flood Monitoring System with Blynk Application

This article shows, the overall block diagram of this system is shown in Figure 2.2. The first NodeMCU, which is equipped with an ultrasonic sensor, will detect the flood level. The data will then be displayed on the LCD panel. The information will be sent to the Blynk app through a wireless connection. The statistics will also be displayed on the Blynk app. Simultaneously, the data is kept in a CSV database, which may be transformed into Excel format via email and then sent to the second NodeMCU using Blynk Bridge. Once the level reaches warning and critical levels, the buzzer and LED will activate, alerting the local authority to take further action. This previous project system is using 2 NodeMCU compared to this project which only 1 NodeMCU for microcontroller [2].

2.2.3 A Real Time Solution to Flood Monitoring System using IoT and Wireless Sensor Networks

This paper shows an Android application for the project's software application. The Android app and online application for this project were both accomplished in this module. Login, Registration, the number of users registered to the app, the state of the sensor, and safe zones near the flood-affected area where people can move will all be displayed on the admin web page. individuals who have created an account will be able to use the Android app. The user is given a unique username and password to use when signing in to the site. The user can then access all of the app's functions. The program receives data such as the current water level and temperature. This application features a map that displays the user's current position as well as neighboring safe areas [3].

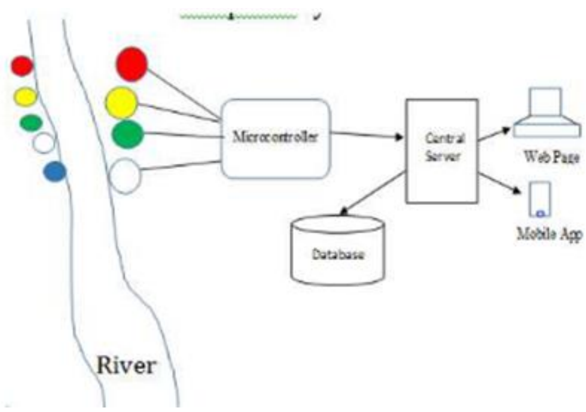

Figure 2.3 Block Diagram Sketching

2.2.4 Flood Monitoring and Warning Systems: A Brief Review

In this paper, state The AVHRR is one of the satellite characteristics that can be used to monitor floods from a remote location. The degree of severity of a flood in China was determined by measuring the water surface friction, which was obtained from a variety of satellite data sources. It is able to track the movement of floodwaters in India using satellite data and a Geographic Information System (GIS). The FMWS of both systems made use of satellite radar. The FMWS device is a stand-alone gadget that focuses primarily on flood monitoring. The manual FMWS devices necessitate constant human intervention to monitor and control the system. With the use of floodgates, flooding can be managed and controlled effectively. River and carnal supplies also be protected and managed by using it.

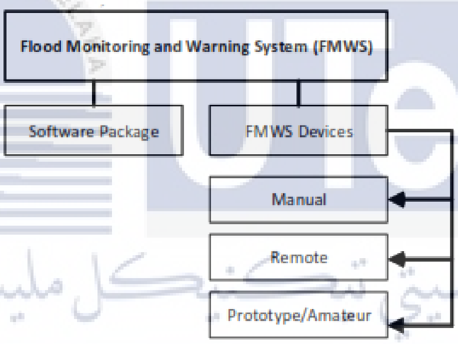

Figure 2.4 Classification of FMWS

On the other hand of this project articles, Remote FMWS devices are automated devices that are installed in a specific region to monitor it. All of the information about the flooding incidents is updated on a regular basis. Rather, they inform residents and rescue teams before the situation escalates. Some gadgets employ the GSM module as a means of communication between the device and the SMS receiver. On the other side, ZigBee/IEEE 802.15.4 allows data to be uploaded and monitored online. Other gadgets use Wi-Fi as their communication medium, which means that their range is constrained to the area where Wi-Fi is available [4].

2.2.5 Flood Monitoring System Using Thingspeak Web Server and IFTTT

This project is using IFTTT application for software application. If This Then That is what "IFTTT" stands for. It indicates that the action must be carried out in the event that any of the triggers are triggered. It is a web-based application that runs on open-source software that can generate sequences of straightforward if/then expressions known as applets. There are seven distinct processes involved in the process of generating an applet, but all we need is one mobile device that is operational and has a sim card. After successfully completing the first seven stages, we are presented with a URL that may be utilized for initiating the SMS applet. An applet including two separate applications was developed as part of this project. One of these applications is designed to store data collected by sensors, while the other is an SMS application. Not only can this IFTTT be used to send SMSs, but it can also push notifications to Gmail and Facebook, among other services [5].

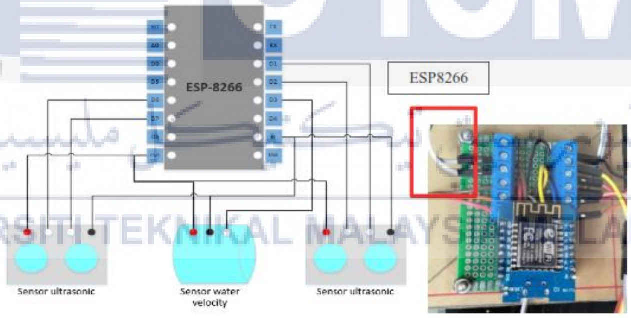

Figure 2.5 Circuit of ESP8266 to the sensors

2.2.6 Flood Monitoring and Alerting System based on IOT

This research is being carried out in order to identify answers to the issues posed by floods, as shown in this article. The device must have the following features: an ultrasonic sensor that detects the floodwater level on the road from a distance. A camera was put in the system, which will webcast a real-time image of the deluge. The sensor-containing gadget should be positioned in front of Our system. Ultrasonic waves will be imperfectly reflected if the sensor is not positioned perpendicular to the flood water; otherwise, measurement mistakes would arise. It is suggested that the sensor be put on a 3- to 3.5-metre-tall pole. A Solar Power Bank of 80, 000 Ampere Ampere-Hour (mAh) will be used to power the flood sensors and microcontrollers for continuous operation of water flood height sensing and network data transfer [6].

2.2.7 The Implementation of an IoT-Based Flood Alert System

The researchers propose a flood warning system that be able to detect water levels and assess how quickly they are rising. The result of measurement is communicated as an alarm to a mobile phone via Short Message Service, providing society a heads-up to leave before the water level rises to dangerous levels (SMS). The data from the sensor is collected at the mini-processor in this project, which is built on an IoT platform, and an alarm is generated and sent as an SMS to a smartphone. To establish its utility, the suggested technology is put to the test in two different environments in an experimental setting. The Raspberry Pi-based SMS-based flood early warning system is tested in this step to check that it is capable of broadcasting the message. The GSM Module should be checked to see if it can send an alarm SMS to the phone [7].

2.2.8 Development of Advanced Flood Detection System with IoT

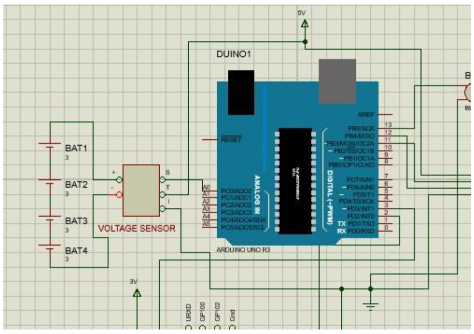

Figure 2.6 Cicuit Diagram of the Project

The article is about Arduino IDE and Proteus were the applications used. The hardware assembly phase of the process has begun. Figure 1 depicted the pin assignments for the Arduino UNO. Because voltage is the only analogue input, the output of the voltage sensor is connected to the analogue input of the Arduino. A 12V battery provided power for the entire circuit. The Arduino 5V output provides power straight to the electronic components that require 5V. The battery will then be linked directly to the micro-hydro generator. Pins analogue (0) and analogue (1) will be used to connect the ultrasonic sensor (1). The Wi-Fi module's transmitter and receiver pins are wired to Arduino second and third pins. Due to the lack of a library for certain components, the simulation is unable to replicate esp8266 and voltage sensors [8].

2.2.9 Flood Monitoring And Alerting System

Voice notifications are given to users who are located in close proximity to rivers via the FLOOD MONITORING AND ALERTING SYSTEM. The entire system is controlled by a microcontroller based on the Arduino Uno board. The GSM modem, the ultrasonic sensor, and the Ethernet shield are all interfaced with it. A measurement is taken of the distance that between the ultrasonic sensor and the water, and this information is measured then used to determine the height level of the water. The value that was calculated for the height is updated on the website. The water level that was computed would then be compared with the threshold that had been set, and if the current level is higher than the value that had been set for the threshold, the microcontroller would enable a voice call to be issued to residences via the GSM module in order to inform them. We are recording voices with an ARP33A3 device, which is interfaced with a GSM modem so that the recorded voice can be played back when the phone is answered [9].

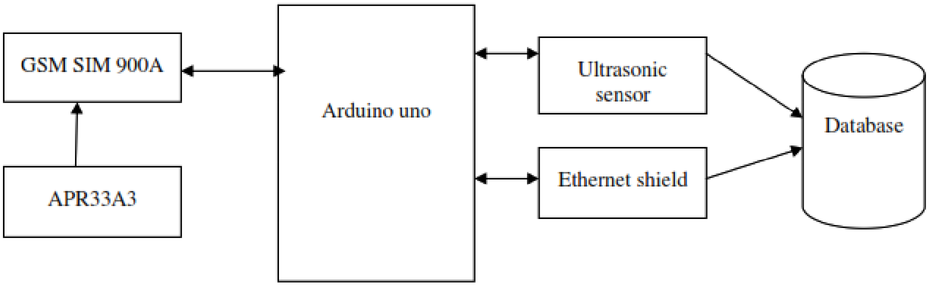

Figure 2.7 Block Diagram of the Project

2.2.10 Flood Monitoring and Alert System Using Wireless Sensor Network

The goal of this project is to raise awareness of the impending flood disaster in the neighborhood. In this project, SIM900 has been chosen as the mechanism to be employed. In real time, the system will notify the user. When the measured values of parameters surpass the threshold values established, the GSM module will send an alarm through SMS.

Figure 2.8 GSM Module

This system uses a ZigBee module to transport data from one node to another. Simple communication between the microcontroller and the PC is used in these modules. The system can be configured to work with either point-to-point or multi-point networks. This module uses about 0.15 Watt of power and transfers data at a rate of 250 kbps from one node to another. The maximum distance between two modules is 120 meters, and if the distance is greater than 120 meters, the connection will be disrupted or data will not be transferred [10].

Figure 2.9 ZigBee Module

2.3 Comparison Literature Review

Table 2.1 Comparison Literature Review

No	Title	Author	Abstract	Project Scope
1	Smart IoT Flood Monitoring System	Shahirah Binti Zahir ,	The Smart IoT Flood Monitoring System will address all of the current system's flaws. If the general public has access to the internet, they can monitor events and predict whether or not a flood will occur at the web server. The water level will be updated on the web server, and the system will send out an alert to citizens so that they can take immediate action.	1. Every second, the embed NXP LPC1768 will collect data from an ultrasonic sensor. It measured three different water level distances 2. On the Smart IoT Flood Monitoring Web Server and LCD, all of the collected data will be shown.

2	The development of smart flood monitoring system using ultrasonic sensor with blynk applications	1. Nor Anum Zuraimi Md Noar 2. Mahanijah Md Kamal	This research presents the development of a smart flood monitoring system using the Blynk platform as a data transmission medium. This system consists of two NodeMCU development boards that have been coupled using the Blynk programming language (IOS or android).	1. During floods, first NodeMCU-based transmitter with an ultrasonic sensor will display the water level on an LCD. Ultrasonic sensor data is supplied wirelessly to the Blynk app. 2. Instantly collected data is recorded in a database. Data will be sent to a second NodeMCU via Blynk bridge to trigger the buzzer and LED to inform the controller.

3	A Real Time Solution to Flood Monitoring System using IoT and Wireless Sensor Networks	1. Sonali Patil 2. Jija Pisal 3. Aishwarya Patil 4. Siddhi Ingavale 5. Prajakta Ayarekar 6. Prof. Mrs. Shagupta Mulla	This project has designed this system to send out notifications and alert messages to tell people about the impending flood. It will use some sensors for this purpose, which will be useful in providing flood information. It will also provide all safe locations around the user's location where they can migrate. They always use a map to locate a safe area.	1. This node is a self-contained flood monitoring system with all of the required sensors and networking modules. 2. It consists of three key stages: sensors, controller, and a Wi-Fi interface for uploading data to the server. 3. The ESP collects data from various sensors, computes it, and uploads it to the server.

4	Flood Monitoring and Warning Systems: A Brief Review	1. Muhammad Izzat Zakaria 2. Waheb A. Jabbar	One of the shortcomings of existing flood monitoring and warning systems is the lack of reliable data analysis in the system that can be accessible (FMWS). This project also categorized and contrasted their benefits and drawbacks, and then recommended new solutions and enhancements based on emerging Internet of Things technologies.	1. Remote FMWS devices are automated devices that are installed in a specific area to monitor it. The rather serve to inform residents before the situation escalates. 2. Sensors to detect the flood level, a controller to collect data from multiple sensors, and actuators to activate warnings and notifications are all common components of FMWS.

5	Flood Monitoring System Using Thingspeak Web Server and IFTTT	1. Sajid Baig 2. T. Navya Sri 3. Y. Praneeth 4. V. Naga Lakshmi	This system uses two NodeMCU boards as a transmitter and receiver, and the ThingSpeak app as a server. Two NodeMCUs are installed in rainfall areas, one acts as a transmitting unit with a water level sensor that sends data to the ThingSpeak server.	1. If This Then That is an acronym for IFTTT. It means that if a trigger occurs, the action must be carried out. It is an open-source web-based application that creates applets, which are chains of basic conditioned statements.
6	Flood Monitoring and Alerting System based on IOT	1. Harshali S. Mali 2. Ashwini R. Marathe 3. Priyanka K. Patil	The sensor network, processing/transmission unit, and database/application server are the three primary components of the created system. These real-time water status data can be monitored	1. It has an ultrasonic sensor that detects the distance of the floodwater level on the road. The setup included a camera that will broadcast a real-time image of the flood through livestream.

			remotely using a wireless sensor network that feeds measured data to an application server through mobile GPRS.	2. Serial Communication is used to deliver a text message with the date, time, water level, and road accessibility information. Users, Logs, and Contact Numbers are the three (3) modules that make up the system.
7	The Implementation of an IoT-Based Flood Alert System	1. Wahidah Md. Shah 2. F. Arif 3. A.A. Shahrin 4. Aslinda Hassan	The data from the sensor is collected at the mini-processor in this project, which is built on an IoT platform, and an alarm is generated and sent as an SMS. To establish its utility, the suggested technology is put to the test in two	1. The sensor will then be connected to a Raspberry Pi that will be connected to a Huawei mobile broadband in order to send an alarm message to the user.

			different environments in an experimental setting.	2. The GSM Module should be tested to see if it can send an SMS to the mobile phone.
8	Development of Advanced Flood Detection System with IoT	1. Elmeen Daud 2. Mohd Izhar A. Bakar	A sensor module, microcontroller, and output module make up an advanced flood detector. It includes an ultrasonic sensor for detecting water level, as well as I0T and data transmission to the microcontroller. The data will be collected, processed, and	1. The output, which is the Wi-Fi module and the buzzer, will receive a command from Arduino. The Blynk app will display the river's water level as well as the battery capacity. 2. When the water level rises too high, Arduino generates

			selected output will be transmitted to the output module by the CPU.	an alert message, which is communicated through Wi-Fi. If the battery level is low, the Blynk app will receive a notification.
9	Flood Monitoring and Alerting System	1. S. Jana Priya, 2. S. Akshaya 3. E. Aruna, 4. J. Arokiya Mary Julie	The water's height is determined in the first section using an ultrasonic distance measuring sensor. In the second section, the Ethernet shield is utilized to send height data to the web page. The last step is to contact residents and leave a voice message informing them of the incident. The call is	1. The entire system is controlled by an Arduino Uno microcontroller. It is interfaced with a GSM modem, an ultrasonic sensor, and an Ethernet shield. 2. The computed water level would then be compared to

			made using GSM, the most frequently used mobile standard, and the recorded audio message is played using ARP33A3.	the set threshold, and if the current level is higher than the set threshold, the microcontroller would send a phone call to inhabitants via the GSM module to alert them.
10	Flood Monitoring and Alert System Using Wireless Sensor Network	Muhammad Fakhruddin Bin Samuji	To monitor and predict the flood, the project will design a system that uses a wireless sensor network, which comprises of a sensor, a transceiver to send data, and a computational device. In order to predict the flood disaster, data on water level, temperature,	1. WSN-based flood monitoring and warning system is created and built for flood disaster monitoring, prediction, and alerting.

			and water velocity are essential. The working idea of this method begins with sensors collecting flood characteristics at a specific location, then transmitting that information from nodes to the base station.	2. Through the ZigBee module, the data will be sent to sensor node 2. 3. A transceiver, a microprocessor, and a temperature sensor count as node 2. The information provided by the transceiver in sensor node 1 will be retrieved by the receiver.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The development of developing flood monitoring system using IoT is being done in two stages which is, the first is hardware stage, and the second is the software stage. The hardware that is needed for the implementation of the project is going to be covered in this part. NodeMCU ESP8266 and the Blynk Application are the software applications that are being utilized in the construction of this project. The procedures and materials that were employed will be explained below.

3.2 Flow Chart

The process that was engaged in this project was represented by a flow chart, which was a form of diagram. A flow chart is utilized throughout the process of analyzing, creating, and controlling this project's processes. Before moving forward with this project, a timeline detailing how the various steps of this project will be carried out was planned. The existing flood monitoring system will be classified in this part depending on the technique of sensing and monitoring flood levels. Sensors to detect the flood level, a controller to collect data from various sensors, and actuators to activate alarms and notifications are typical components of a flood monitoring system. Based on prior studies, this brief review will concentrate on the sensors used in existing systems.

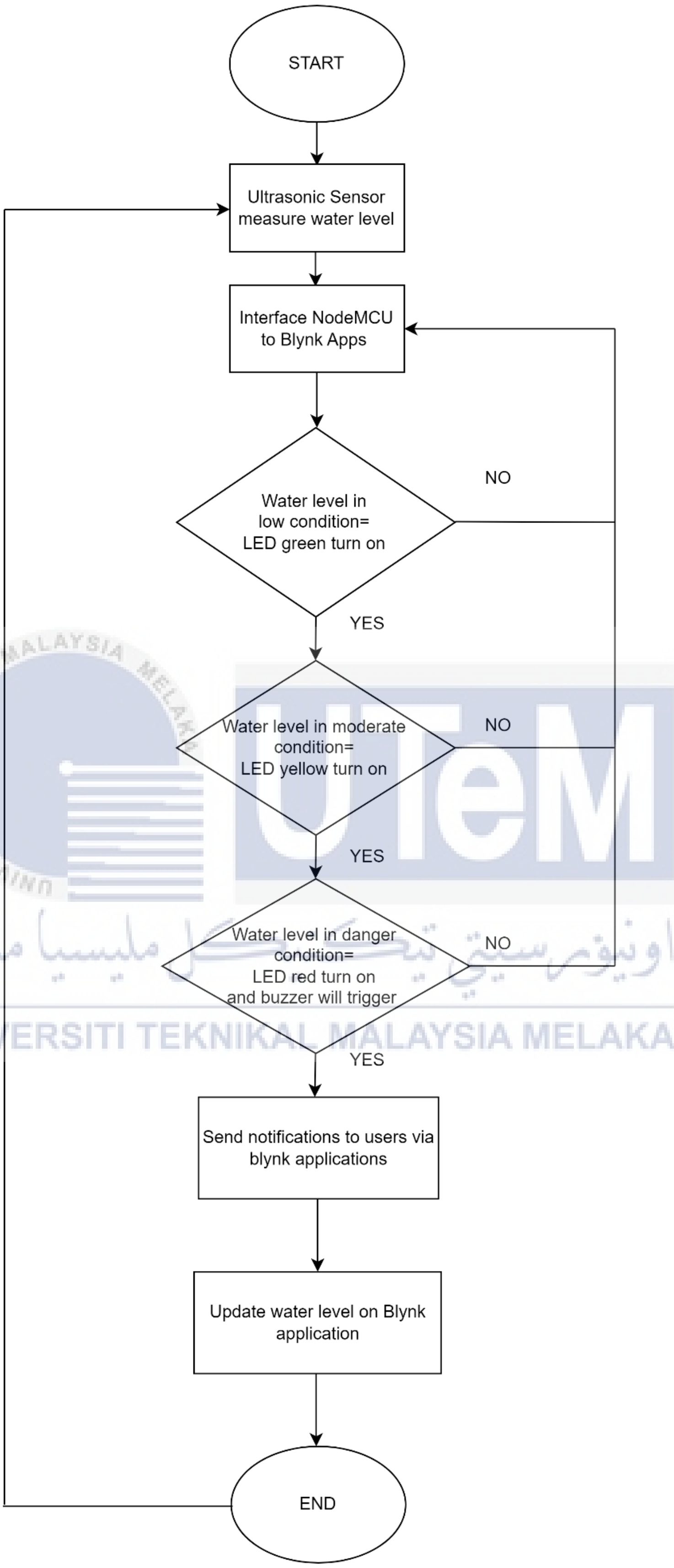

Figure 3.1 Flowchart of The Project

3.3 Block Diagram

The overall block diagram of the system is shown in **Figure 3.2**. The first NodeMCU, which is connected with an ultrasonic sensor, will detect the flood level. The ultrasonic sensor will function as the device's inputs. It will do this by converting the physical signal into an electrical signal that will then be transmitted to the NodeMCU. The data will then be displayed on the user's phone which is on Blynk application. The information will be sent to the Blynk app through a wireless connection. The statistics will also be displayed on the Blynk app. Once the level reaches warning and critical levels, the buzzer and LED will activate, alerting the local authority to take further action.

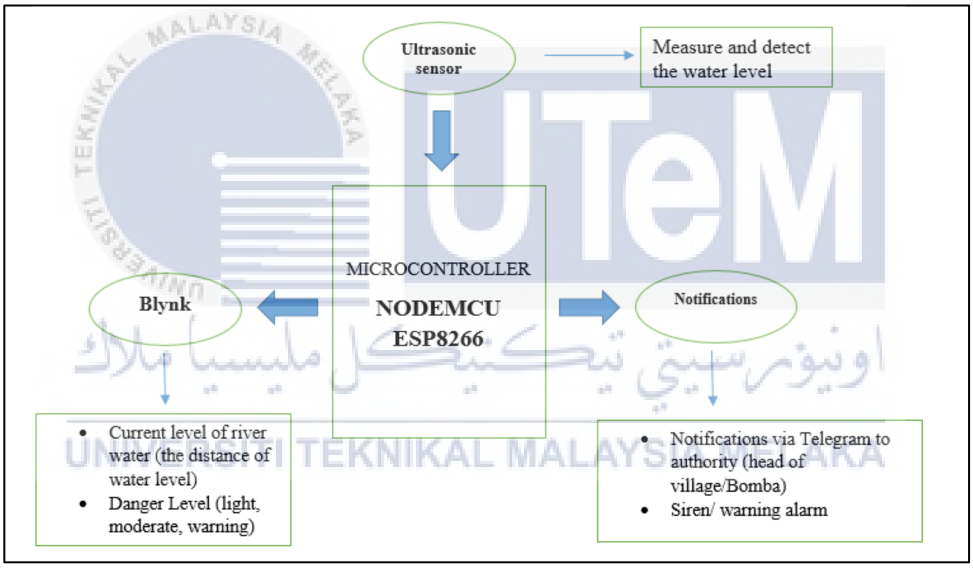

Figure 3.2 Block Diagram of The Project

3.4 Hardware

Some hardware is used in this project, such as a microcontroller, sensors, and power supply components. To identify flood levels, the hardware collects the water level measurement. The item of hardware includes a NodeMCU ESP8266 enabled controller that connects to the server and allows data to be shared over the internet.

3.4.1 Ultrasonic Sensor

A flood monitoring system that makes use of wireless sensor nodes has been developed to observe the status of floods. There is a wide variety of ultrasonic sensors available, which is works at a different frequency and requires a distinct amount of power. In order for this project to be successful, the ultrasonic sensors will need to be able to identify barriers or objects measuring between 2 cm and 50 cm. After extensive investigation between the HC-SR04 and other ultrasonic sensors, it was determined that the HC-SR04 satisfies the requirements of this project for determining the level of flood water.

As illustrated in **Figure 3.3**, the sensor used to measure water level in this project is an Ultrasonic sensor. This sensor measures the distance between the sensor and the item. With both a transmitter and a receiver, it works similarly to a simple communication system. This sensor operates by sending out ultrasonic waves and then receiving the signal reflected back. The ultrasonic sensor's working voltage is 3–5 volts. This ultrasonic detector has a short to long detection range and uses only 75 milliwatts of electricity. It produces ultrasonic sound at 14000/4 Hz that travels through the air. We can calculate the distance of an object from sonar using the receiving time and speed of sound.

$$\boldsymbol{Speed\ of\ sound = 340\frac{m}{s} = 0.034\frac{cm}{micro}sec.\, or\ 29\ micro\frac{sec}{cm}}$$

$$\boldsymbol{Time = Distance/speed}$$

Due the fact that sound waves travel through the air and bounce back from objects, the time received is twice as long as the real time. As a result, the height of water is computed depending on distance.

$$\boldsymbol{Distance\ in\ cm = time \times \frac{0.034}{2}\ or\ Distance\ in\ cm = \frac{\frac{time}{29}}{2}}$$

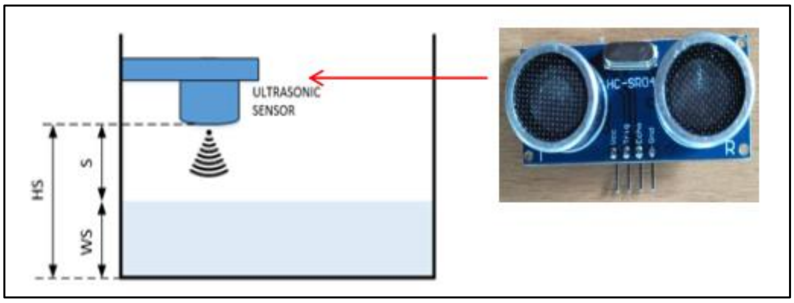

Figure 3.3 Reading Water Level Diagram

3.4.2 NodeMCU ESP8266

NodeMCU is a free and open-source firmware for the ESP8266 WI-FI device. The NodeMCU firmware that comes with an ESP8266 Development board or kit can be downloaded by analyzing the capabilities of an ESP8266 chip. In addition to its WI-FI functionality, the NodeMCU Development Board includes analogue pin, digital pin, and serial communication protocols. The Arduino programming environment can also be used to create NodeMCU applications. This makes learning a new programming language and integrated development environment (IDE) for NodeMCU straightforward for Arduino developers.

NodeMCU is an Internet of Things (IoT)-focused open-source Lua-based firmware and development board. It includes software for the ESP8266 Wi-Fi SoC from Espressif Systems, as well as hardware for the ESP-12 module. On the NodeMCU ESP8266 development board, the ESP-12E module has an ESP8266 chip with a Tensilica Xtensa 32-bit LX106 RISC microprocessor. The NodeMCU has 128 KB of RAM and 4MB of Flash memory to store data and programmes. Its high processing power, built-in Wi-Fi / Bluetooth, and Deep Sleep Operating characteristics make it ideal for IoT projects.

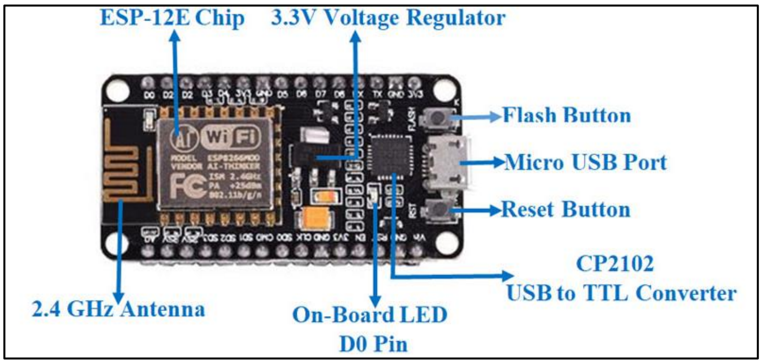

Figure 3.4 Nodemcu ESP8266 Diagram

3.4.3 LEDs

In its most basic form, a light-emitting diode (LED) is a semiconductor device that generates light when an electric current is sent through it. Light is formed when current-carrying particles (also known as electrons and holes) interact within a semiconductor material. Because light is formed within the solid semiconductor material, LEDs are solid-state devices. Organic LEDs (OLEDs) are classified as "solid-state lighting," as opposed to other types of illumination that use heated filaments (incandescent and tungsten halogen lamps) or gas discharge (fluorescent lamps).

The function of these LEDs in this system is to alert and notify people from water level of the river. The color of LEDs is a straightforward notification that can notify people direct from the river. LEDs color also can tell people the water level of the river. When LED color turns yellow, people will be ready to save their things before the floods hit. If the red LED turn on, people will know that the water level of the river is on danger position. LEDs is also one of the biggest initiatives for locals who don’t have a gadget to refer to the current situation using the Blynk app.

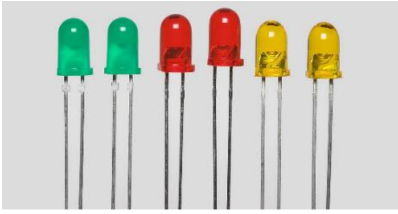

Figure 3.5 LEDs

3.4.4 Buzzer

A buzzer is a device that converts audio signals into sound signals. DC voltage is frequently used to power it. The buzzer can produce a variety of sounds, including music, sirens, buzzers, alarms, and electric bells, depending on its design and intended application. The usage of buzzer for this system is to tell people that the water level has reached dangerous levels. Besides LEDs, buzzer also is a big initiative component that can triggered people from danger. Some people are too busy to look at phone or they just stay at home and sleep. So, they do not alert with surroundings. So, when the buzzer sound is heard around their area, they will be quicker to act and protect themselves.

Figure 3.6 Buzzer

3.4.5 DHT11

A cheap digital sensor for detecting humidity and temperature is the DHT11. To instantly detect humidity and temperature, this sensor may be simply interfaced with any micro-controller, including Arduino, Raspberry Pi, and others. The DHT11 humidity and temperature sensor comes in sensor and module varieties. The pull-up resistor and a power-on LED make this sensor and module distinct from others. Relative humidity sensor DHT11 is used. This sensor employs a thermistor and a capacitive humidity sensor to measure the flow of air. The humidity detecting capacitor consists of two electrodes separated by a substrate that can hold moisture as a dielectric. The capacitance value changes as the humidity levels fluctuate. The IC calculates, interprets, and converts the modified resistance values into digital form. This sensor uses a negative temperature coefficient thermistor to measure temperature, which results in a drop in resistance value as temperature rises. This sensor is typically built of semiconductor ceramics or polymers in order to obtain higher resistance values even for the smallest change in temperature.

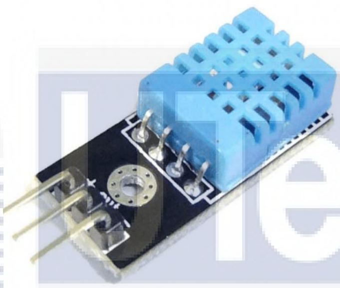

Figure 3.7 DHT11 Sensor

3.5 Software

Software is a set of data or computer instructions that tells the machine how to perform certain tasks. Physical hardware, on the other hand, is what the system is comprised of and what does the work. Computer software, in computer science and software engineering, refers to all of the information, programs, and data that computer systems handle. Computer software includes programmes, libraries, and non-executable data such as online documentation or digital media.

3.5.1 Arduino IDE

Figure 3.8 Arduino IDE

Sketches are the programmed created with the Arduino IDE (Integrated Development Environment). These rough sketches are created in a text editor and saved on disc with the extension. Cutting and pasting text, as well as searching and replacing existing text, are all available in the editor. The message box displays the error messages and feedback obtained during the saving and exporting processes. The text output of the Arduino Software (IDE) is displayed on the console, along with any other pertinent information and detailed error messages. The configured board and serial port are displayed in the bottom right-hand corner of the window.

It's built on the Java Platform, and it comes with built-in commands and functions for debugging, changing, and compiling code in the environment. Operating systems such as MAC, Windows, and Linux can easily access it. The Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro, and NodeMCU ESP8266 are all members of the Arduino family. On the board of each of them is a microcontroller that can be programmed and accepts information in the form of code.

3.5.2 Blynk IoT Platform

Blynk was created to control devices from afar, allowing data to be presented, stored, and monitored. As illustrated in Figure 3.8, the Blynk platform is divided into three stages: Blynk cloud, Blynk apps, and Blynk database.

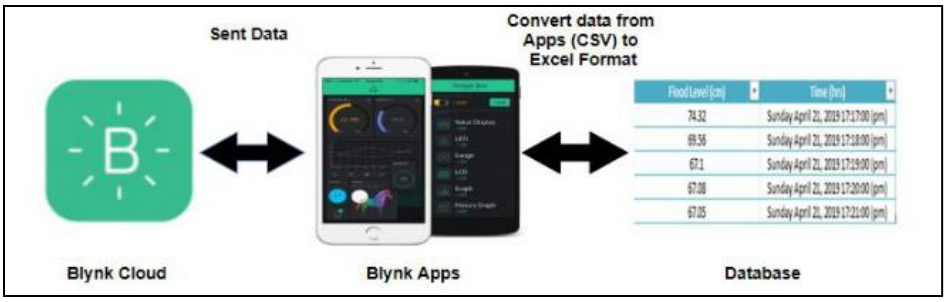

Figure 3.9 Blynk Platform

Blynk was used to construct a flood monitoring system application that used a smartphone to monitor data from a NodeMCU that was connected to ultrasonic and rain sensors over the internet. Inside the Blynk's interface, there will be an LEDs that will display the level indicator (safety, warning, and critical levels). The value display widget will then show the level of the flood as determined by ultrasonic sensors. Aside from that, different LEDs light up based on the current flood level to display the current flood condition. Finally, the flood level may be tracked and saved in the database using the history graph widget. Blynk's layout design was adopted in this project.

3.6 Preliminary Result

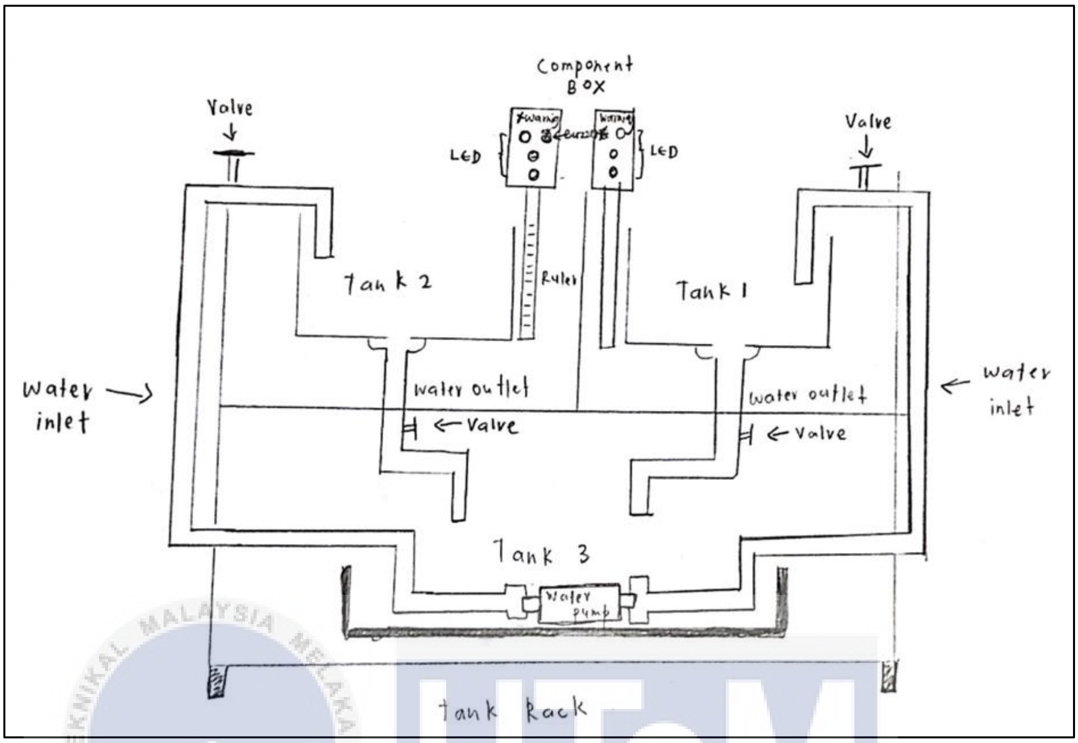

Figure 3.10 Preliminary Result

For the expected result, Ultrasonic sensor HC-SR04 are used as inputs to the NodeMCU and power supply of 5V to power up the system. The ultrasonic sensor is used to detect the water level of the flood level at a high prone area of flood. The water level is divided to 3 level. For the first classifications is safe, followed by warning and danger. When the water level inside the tank changes, the sensor will notice it, and the graphs will capture the data and adjust the values accordingly. As a result, when the measurement changes rapidly and the water starting to reach dangerous level, the buzzer and LEDs will activate, serving as alerting devices. When the flood water level rises to a dangerous level, Blynk sends out a notification to the victims. Wi-Fi enabled NodeMCU to connect to the internet. Ultrasonic sensors serve as the system's input after the Blynk connection is established.

3.7 Summary

This chapter explains the proposed process for developing a new, effective, and integrated flash flood prediction strategy that incorporates both hardware and software setup. The purpose of this project is to make existing approaches more interconnected in order to improve them. The best systems can be developed quickly and easily if you have a clear picture of what you're doing, which you can get from a block diagram or system architecture.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

The analysis will be done in this chapter's Results and Discussion section in accordance with the data that have been gathered and by observing the Develeopment of Flood Monitoring System with IoT. The designed hardware and the implemented software were explained. This system's functionality was examined in prototype form and described. In this chapter, certain project limitations were also explained.

4.2 Schematic Diagram and Wiring Diagram

This schematic diagram and wiring diagram of the project is constructed using Microsoft Powerpoint to visualize the connection between NodeMCU ESP8266, Ultrasonic Sensor, DHT11 Sensor, LED and Buzzer. The connection between all the components is connected by using male-to-male jumper wire as shown in the figure 4.1. First component is NodeMCU ESP8266 that used 5V DC as power supply and using micro USB port at VIN port to power up. The output voltage of NodeMCU ESP8266 is 3.3V, therefore the incoming voltage supply is 5V. Ultrasonic sensor has four pins, which two are used to provide power and another two is for the data. VCC pin of the Ultrasonic sensor is connected to VU pin of the NodeMCU. Ground pin of the sensor should be join with the ground pin of NodeMCU. Trig and Echo pins of Ultrasonic sensor are connected with D6 and D5 pin of NodeMCU as shown in figure 4.1. DHT11 pin have two pins for power and one pin for data. Data transmission pin of DHT11 is connected to D7 pin of NodeMCU. While VCC pin of DHT11 sensor is connected to VU pin and ground pin is connected to ground pin of NodeMCU.

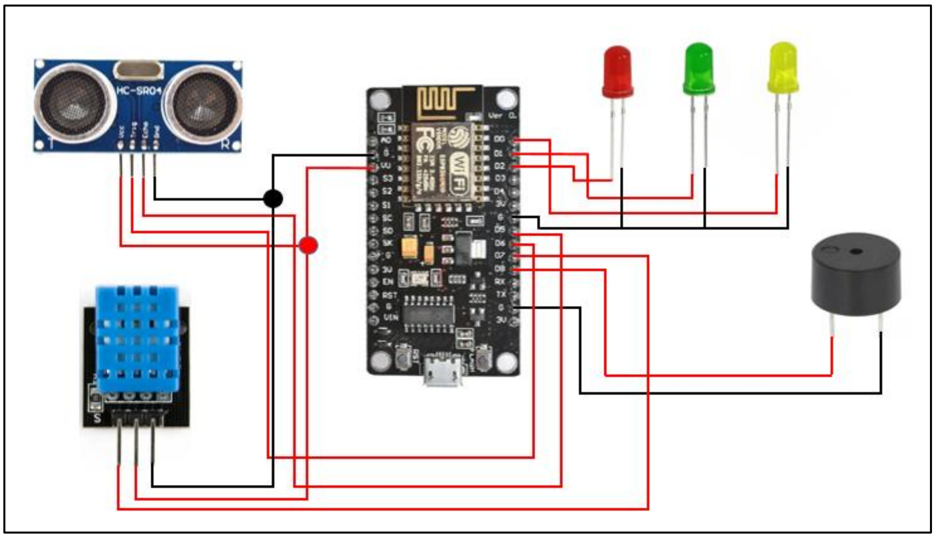

Figure 4.1 Circuit Diagram

There are several output components are connected to NodeMCU ESP8266 such as Green LED, Yellow LED, Red LED and Buzzer. All the output components needs 5V input voltage to power up and to trigger the output. Green LED is connected to D0 pin, Yellow LED is connected to D1 pin and Red LED is connected to D2 pin of NodeMCU ESP8266. Another output component is Buzzer that is connected to D8 pin of NodeMCU to power up.

4.3 Hardware Implementation

In this project, the NodeMCU, Ultrasonic Sensor, DHT11, LED and Buzzer will be used to in order to assemble the prototype as shown in the figure below. All the components have their own vital and it plays well to collecting and receiving data from the IoT platform which is Blynk that are transmit from NodeMCU ESP8266 module. Ultrasonic will act as a sensor to detect the presence of water or to detect the rate of water rise. Other than that, DHT11 also act like a sensor to detect the humidity and temperature at the surrounding. The higher the temperature of surrounding, the lower the humidity. The led functions as an indicator to the water level according to the water level that has been set in the program.

The program in the NodeMCU has ordered that the ultrasonic reads the rise of water according to the level. The water level has been divided into 3 levels according to the height (cm) of the water in the tank. There are 3 classifications of water level such as safe condition which is in the range of water is 0cm until 6cm. Second condition is warning condition in the range between 6cm until 12cm. Last classification is around 12cm and above which is in danger condition. Besides, before accessing the internet, the NodeMCU's Wi-Fi connection needs to be configured by specifying the SSID and Password. The NodeMCU 5V DC is powered via a USB cable since it requires a minimum of 3.3V and a maximum of 5V to power up all the input and output components.

4.4 Software Implementation

4.4.1 Arduino IDE Program


```
#define BLYNK_TEMPLATE_ID "TMPLdBd8PvSG"
#define BLYNK_DEVICE_NAME "test"
#define BLYNK_AUTH_TOKEN "L01NViTZVfpU_8s_CrwCw2aOIXoa8Fqo"  //Enter your blynk auth token
#define BLYNK_PRINT Serial

//Include the library files
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include "DHT.h"
DHT dht(13,DHT11);
```

Figure 4.2 Funtion Library Used in the Coding

As seen in figure 4.2, the code was programed during this section using the Arduino IDE software. The templete id #define BLYNK_TEMPLATE_ID can be named by any name because it will auto generated when the templete is created. AuthToken is declared as #define BLYNK_AUTH_TOKEN is a distinguishing number produced by Blynk.Cloud. It should be present on every device. Blynk will automatically generated a new device for the QuickStart procedure. It was given a brand-new AuthToken when it was created. Blynk merely placed this AuthToken into user sketch. User should always look in the Device Info section of the chosen device for the AuthToken for the Device. Then, The #define BLYNK_PRINT Serial is used to create the status print that will be displayed on the serial monitor at the Arduino IDE, including the time stamp, serial_print function, connection status, error, and more. Furthermore, The ESP8266 is connected to the WiFi network that will be used to transmit and receive the data signal using the #includeESP8266WiFi.h> command. The setup configuration for the SSID and password required to connect to the WiFi will be handled by the library. <BlynkSimpleEsp8266.h> library is intended for the interface between Esp8266 and Blynk.

```
const int trigPin = D6;
const int echoPin = D5;
int dht11 = D7;
int LEDGreen = D0;
int LEDYellow = D1;
int LEDRed = D2;
int buzzer = D8;
BlynkTimer timer;

long duration;
float distanceCm;
float waterLevel;
float temp, hum;
```


Figure 4.3 Initial Function Condition and Pin Configuration

The coding used to define the following function that is used inside the coding is shown in the above figure. The turn is expressed as an integer, and this will be used to provide the turn for any executing coding that is called. Next, the ultrasonic sensor's trig and echo pin numbers are configured using the const int trigPin = D6 and const int echoPin = D5 variables. The signal pin of DHT11 is configured using int dht11 = D7 and followed by three indicator that configured using int LEDGreen = D0, int LEDYellow = D1 and int LEDRed = D2. Continued with buzzer, the pin confiuration for buzzer is int buzzer = D8.

```
//   print the temperature and humidity
   temp = dht.readTemperature();
   hum = dht.readHumidity();
  Serial.println("Temperature in Celcius:");
  Serial.println((dht.readTemperature( )));
  Serial.println("Humidity %:");
  Serial.println((dht.readHumidity()));

  Blynk.virtualWrite(V7, temp);
  Blynk.virtualWrite(V8, hum);
  delay(1000);
```

Figure 4.4 Humidity and Temperature Display

Surrounding humidity and temperature that be detected from DHT11 should be display as output either in serial monitor or Blynk application. In figure 4.4 shows, the code temp = dht.readTemperature() and hum = dht.readHumidity();that is to read the reading of humidity and temperature from DHT11 since the sensor do not have the formula. Then, after the sensor has been read, the value of humidity and temperature should be display on serial monitor. The code Serial.println("Temperature in Celcius:") and Serial.println("Humidity %:") are the command to display the output value of the DHT11 sensor on the serial monitor.


```
  // Calculate the distance
 distanceCm = duration * SOUND_VELOCITY/2;
 waterLevel = 18-distanceCm;

 //Prints the distance on the Serial Monitor
//Serial.print("Distance (cm): ");
Serial.println("waterLevel");
Serial.println(waterLevel);
Blynk.virtualWrite(V3, waterLevel);
```

Figure 4.5 Ultrasonic Formula and Water Level Display

Using NodeMCU, user need to trigger the ultrasonic sensor module to broadcast a signal before waiting for the ECHO to arrive. The interval between triggering and Received ECHO is measured by NodeMCU. Since that sound travels at around 340 m/s, the formula that can be used is shown in figure 4.5. While, the code Serial.println("waterLevel") is to display the value of water level from Ultrasonic Sensor in serial monitor.

4.4.2 Blynk Application

Id	Name	Alias	Color	Pin	Data Type	Units	Is Raw	Min	Max	Decimals	Default Value
1	ULTRASONIC	ULTRASONIC		V3	Double		false	0	300	#.00	
2	DANGER	DANGER		V4	Integer		false	0	1	--	0
3	MODERATE	MODERATE		V5	Integer		false	0	1	--	0
4	SAFE	SAFE		V6	Integer		false	0	1	--	0
5	Temperature	Temperature		V7	Double		false	0	100	#.##	
6	Humidity	Humidity		V8	Double		false	0	100	#.##	

Figure 4.6 List of Virtual Pin Configuration

The Blynk pin configuration is shown in table 4.6 above and has been put up in accordance with the justification in the coding section. This will ensure that the NodeMCU and Blynk connection will function properly and the data will be appropriately visualised. The configuration is fairly simple, and each widget information tab in the Blynk software provides an example and an explanation. Virtual pins are employed because they enable the interface of any sensor, LED, microcontroller, and buzzer. In addition, users can enter any value in the virtual pin, enabling other users to submit and receive the data.

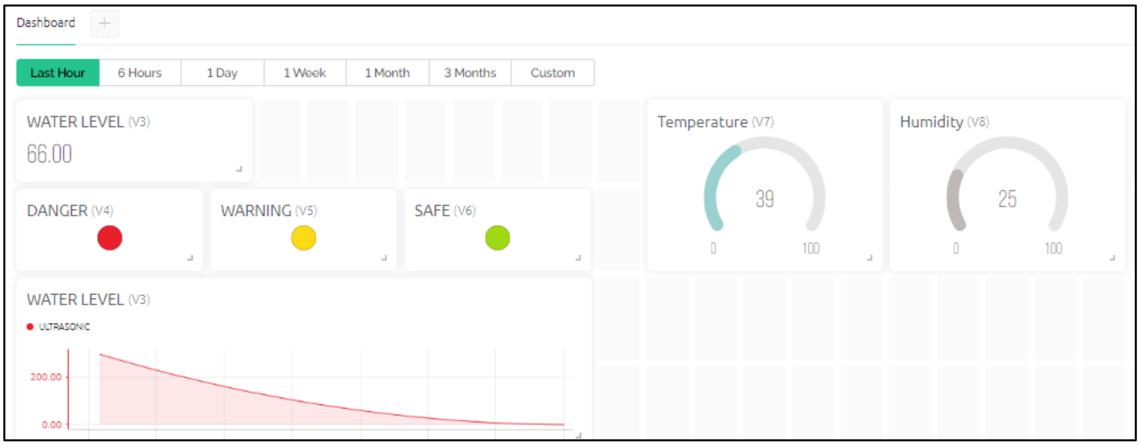

Figure 4.7 Blynk Dashboard Setup

Figure 4.7 shows that the display configuration and the graph of the data at dashboard of blynk software. In this dashboard, user can choose any widget on the left side of dashboard to display the output data. The display can be customize according to user taste but should be appropriate referring to the type of output that want to be displayed on the Blynk application. To show the output of indicator, the suitable widget can be use is LED. Meanwhile, to display the output value of Ultrasonic and DHT11 sensor, label and gauge widget is suitable to display the value of each output. The output data of water level can also be monitored through a graph shown by a widget chart. This method can also be used to setup the output display in the blynk application which is used on mobile phones as shown at figure 4.8. The output data that be displayed on the Blynk application via Mobile phone should be same with the data on Blynk web dashboard.

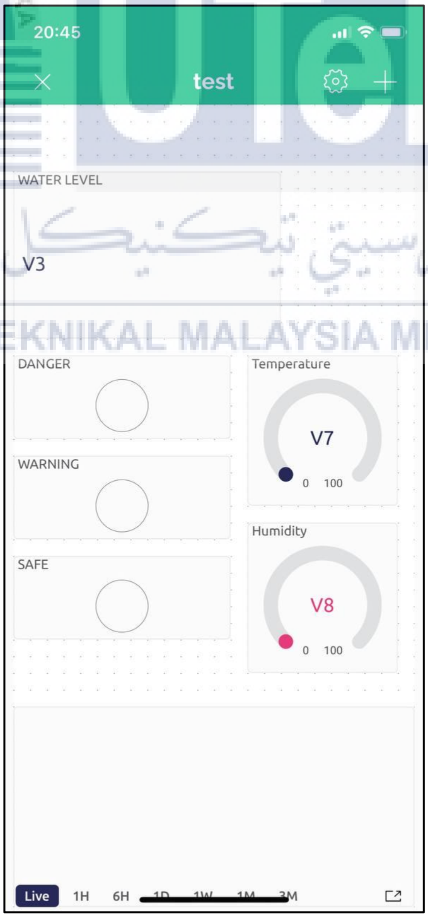

Figure 4.8 Blynk Dashboard Setup on Mobile Phone

4.5 Result and Analysis

4.5.1 Project Prototype

Figure 4.9 Flood Monitoring System with Iot Prototype

This section's subsection will demonstrate the outcome of the project prototype. A project prototype has been created to make sure it can simulate how the project will operate based on the stated goal. The prototype are using glass water tank as a river. Figure below show that a large water tank is used as a source of water supply as a prototype, but in actual conditions water supply is rain falls. Water pump has been used to divert water that acts as rain from the water tank to the river container. Then, another water tank that have been used as river with a height 18cm as shown on figure 4.9. There is a ruler that has been attached to the side of the aquarium which is used as an indicator of the water level that will increaseThe actual circuit that has been constructed on the breadboard as shown in figure 4.10 has been attached to the side of the aquarium as an indicator for the user. An ultrasonic sensor has been placed at the top of the aquarium to measure the height of the river water that increases from rain. DHT11 sensor used as a temperature and humidity measurement of the surrounding area has been placed on the side of the aquarium.

Figure 4.10 Actual Circuit for Flood Monitoring System with IoT

As a result, the level of water was measure by using the ultrasonic distance sensor and calculated the distance in centimeter scale. The system's primary purpose is to detect the water's level, which can be expressed in one of three ways: safe, warning, or danger. The appropriate LED colour was used to determine the various levels of water. The indicators indicating the state of the water were as follows: green meant it was safe, yellow meant it was a warning, and red meant it was in danger. Other than that, if the water level in the river is between 0cm and 6cm, it means that the river is still at a safe level and the green indicator will light up as shown in figure 4.11. Then, if the river situation is in a warning state, it means that the water level in the river is within 6cm to 12cm and the yellow indicator will light up illustrate in figure 4.12. Last condition is the most dangerous condition where the water level of river is in danger condition. The water level that is in a state of danger condition is 12cm and above and this shows that the river has been flooded and red indicator will light up as shown in figure 4.13.

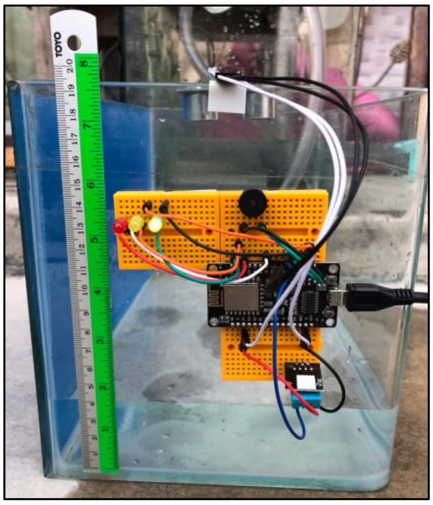

Figure 4.11 Green Indicator in Safe Condition

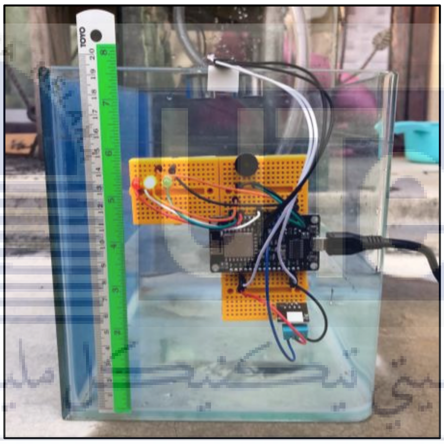

Figure 4.12 Yellow Indicator in Warning Condition

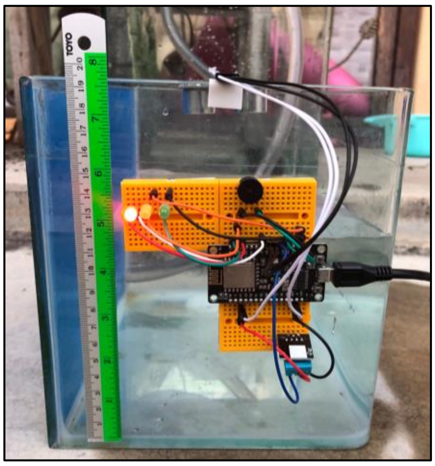

Figure 4.13 Red Indicator in Danger Condition

4.5.2 Project Analysis

The analysis was being repeated 3 times in 18cm of maximum water level in a tank. The data is recorded in table 4.1. The data was state in Blynk platform for user to monitor the water level of the river. Measured value is recorded using ultrasonic sensor where the actual value is measured using ruler right on the water tank surface.

Table 4.1 Water Level Testing Data

Water Surface	Safe Condition	Warning Condition	Danger Condition
Test 1	0.37cm	6.10cm	12.02cm
Test 2	0.13cm	6.02cm	12.15cm
Test 3	0.25cm	6.08cm	12.35cm

Based on the data, there are small error for value in each of condition. The actual value for safe condition is 0cm but in test 1, 0.37cm error was state. Follow with test 2 and test 3 with the small amount of error. Same goes with warning condition, the amount of error is not too much different in every test. The actual level of danger condition is 12cm to 18cm but the error of initial danger condition is more huge compared with safe and warning condition. The occurrence of an error is due to percentage error of ultrasonic sensor is below than 10%. The figure below shows the output of each condition in Blynk platform.

Figure 4.14 Result for Safe Condition

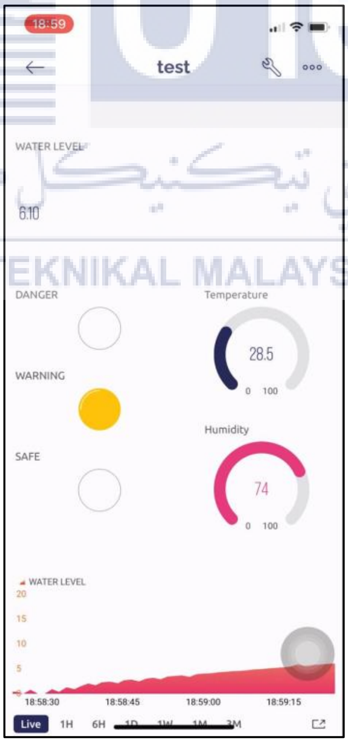

Figure 4.15 Result for Warning Condition

Figure 4.16 Result for Danger Condition

4.5.3 Temperature and Humidity

The temperature and humidty data from sensor and online source were compared. Other than that, the relation between temperature and humidity also has been compared by a google. From the reseach, the relation between temperature and humidity can be conclude that the lower the temperature, the higher the humidity of surrounding like figure 4.17. Then, the table below shows that the different between sensor temperature and online temperature.

Table 4.2 Temperature Testing

Temperature	Measured (Celcius)	Actual (Celcius)
Test 1	27.5	27
Test 2	29	29
Test 3	32.3	32

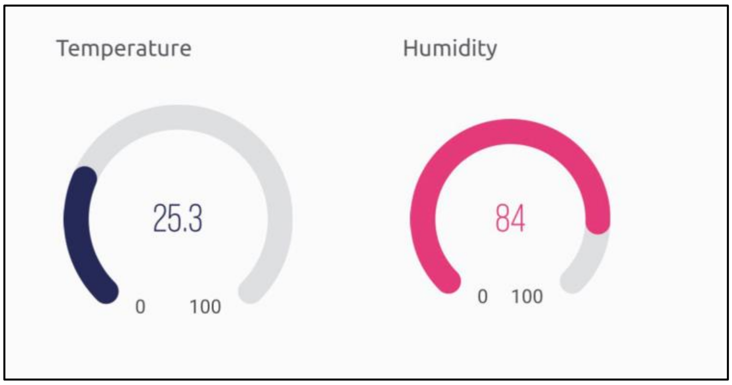

Figure 4.17 Output for Temperature and Humidity

4.5.4 Notifications

Water level in Danger condition will reach the maximum value of water. Other than indicator, Blynk user also can be notified the warning alert by the notifications on mobile phone and can be notified by email. In the actual condition, residents can received the warning alert by buzzer or siren. When the water level reached 12cm±, the notification will be sent to user mobile phone and email illustrate in figure below.

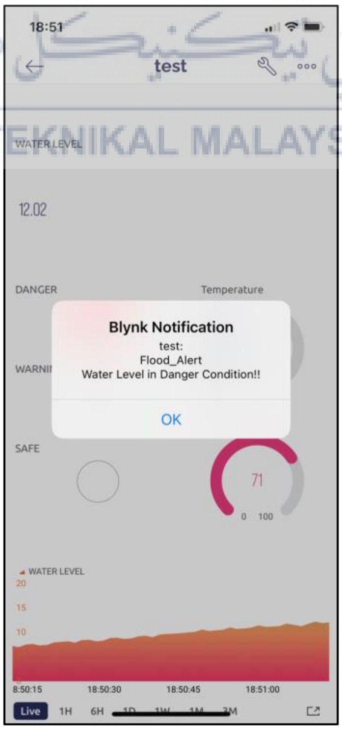

Figure 4.18 Notifications on Blynk platform

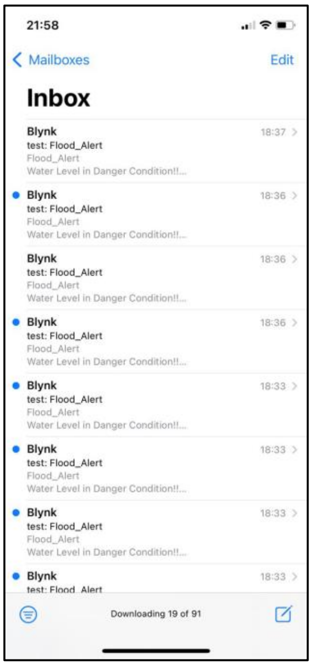

Figure 4.19 Notifications on Email

4.6 Summary

In this chapter shows that, all the outputs produced by the sensor have been successfully exhibited through the Blynk platform. From results, it can be concluded when the water was supplied, the rate of water level is increasing. The condition of the river still in a safe condition when the water level still in range of 0cm to 6cm and the green indicator still bright up. Then, if water level increased to 6.1cm to 12cm, the condition will change to warning condition which the indicator has changed from green to yellow. The last condition is a danger condition which the water level increased into 12.1cm to 18cm and automatically the indicator changed from yellow to red indicator and buzzer will sound as alerting system. The goal of making this project a monitoring project has been successfully proven with all the results that have been discussed.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Flood monitoring system with IoT are important because they handle the annual flood disaster that occurs in Malaysia, particularly in Melaka. The residents' ability to be informed of the coming disaster is greatly improved by the flood monitoring and alerting system. Since the flood information would be available instantly, early decisions might be made, such as moving residents and their belongings. However, all section of the project plan and project result has been discussed in detailed. There are several parts are not accurate between actual and result data because of sensor error, but the process flow of the project plan and the outcomes has been achieved successfully. All sensor plays a vital role to measure the level of water and a surrounding of humidity and temperature. Then, the concept of monitoring system achieved successfully by receiving notifications when river in danger condition and the water level can be monitored using Blynk platform and monitored via indicator on actual circuit. Lastly, this project should be carried out and finished by final-year students with the assistance of a supervisor because it is important. The time allocation is sufficient and practical to complete the project.

5.2 Future Works

For future improvements, there are some suggestions to be made for a better project completion in the future as this one is being completed. Future research is necessary to complete this project successfully. This project can be improved by adding more types of sensors. A rain sensor can be added to this project to notify residents of the presence of rain.

Besides, The flow rate sensor can also be used in this project to detect the water velocity in the river during rain. Then, to monitor the rate of water increase in every minute, a suggestion that can be used for this project is to use a rain gauge. with this method, the rate of water increase can be calculated in a short time. Lastly, To improve the accuracy and sensitivity of the current flood monitoring system, other flood parameters, such as barometric pressure, wind direction, wind speed, and others, can be included.

REFERENCES

[1] S. Binti Zahir *et al.*, "Smart IoT Flood Monitoring System," in *Journal of Physics: Conference Series*, 2019, vol. 1339, no. 1. doi: 10.1088/1742-6596/1339/1/012043.

[2] N. A. Z. M. Noar and M. M. Kamal, "The development of smart flood monitoring system using ultrasonic sensor with blynk applications," in *2017 IEEE International Conference on Smart Instrumentation, Measurement and Applications, ICSIMA 2017,* Mar. 2018, vol. 2017-November, pp. 1–6. doi: 10.1109/ICSIMA.2017.8312009.

[3] S. Patil, J. Pisal, A. Patil, S. Ingavale, P. Ayarekar, and S. Mulla, "IRJET-A Real Time Solution to Flood Monitoring System using IoT and Wireless Sensor Networks A Real Time Solution to Flood Monitoring System using IoT and Wireless Sensor Networks," *International Research Journal of Engineering and Technology*, p. 1807, 2008, [Online]. Available: www.irjet.net

[4] M. I. Zakaria and W. A. Jabbar, "Flood Monitoring and Warning Systems: A Brief Review," *Journal of Southwest Jiaotong University*, vol. 56, no. 3, pp. 140–156, Jun. 2021, doi: 10.35741/issn.0258-2724.56.3.12.

[5] K. Sundar *et al.*, "FLOOD MONITORING SYSTEM USING THINGSPEAK WEB SERVER AND IFTTT," 2020. [Online]. Available: http://www.ijeast.com

[6] G. H. Raisoni, "Flood Monitoring and Alerting System based on IOT Harshali S. Mali (IT Third Year), Ashwini R. Marathe (IT Third Year), Priyanka K. Patil (IT Third Year) Guide name: Mr. Harshad Patil." [Online]. Available: www.ijariie.com

[7] W. Md Shah *et al.*, "The Implementation of an IoT-Based Flood Alert System," 2018. [Online]. Available: www.ijacsa.thesai.org

[8] E. Daud, & Mohd, and I. A. Bakar, "Development of Advanced Flood Detection System with IoT," 2021.

[9] S. J. Priya, S. Akshaya, E. Aruna, J. Arokiya, and M. Julie, "Flood Monitoring and Alerting System," *International Journal of Computer Engineering & Technology (IJCET)*, vol. 8, no. 2, pp. 1–05, [Online]. Available: http://www.iaeme.com/IJCET/index.asp1http://www.iaeme.com/IJCET/issues.asp?JType=IJCET&VType=8&IType=2JournalImpactFactor

[10] M. Fakhruddin and B. Samuji, "Flood Monitoring and Alert System Using Wireless Sensor Network."

APPENDICES

Appendix A - Gantt Chart PSM 1

PSM1 2022 - DEVELOPMENT OF FLOOD MONITORING SYSTEM WITH IOT															
Task to be completed:	**Status**	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**	**W11**	**W12**	**W13**	**W14**
1. Research the detail about project	plan														
	actual														
2. Proposal writing	plan														
	actual														
3. Proposal Submission	plan														
	actual														
4. List all the literature review	plan														
	actual														
5. Obtain components	plan														
	actual														
6. Generate block diagram and flowchart	plan														
	actual														
7. Preparing circuit diagram	plan														
	actual														
8. Preparing abstract	plan														
	actual														
9. Progress report writing	plan														
	actual														
9. Report Subission	plan														
	actual														

Appendix B - Gantt Chart PSM 2

PSM2 2022/2023 - DEVELOPMENT OF FLOOD MONITORING SYSTEM WITH IOT															
Task to be completed:	**Status**	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**	**W11**	**W12**	**W13**	**W14**
A) Hardware Development															
1. Buy all components	plan														
	actual														
2. Ensuring that microcontrollers ESP8266 works	plan														
	actual														
3. Ensuring that ultrasonic sensors works	plan														
	actual														
4. Ensuring that DHT11 sensors works	plan														
	actual														
5. Construct the circuit on breadboard	plan														
	actual														
6. Develop coding using Arduino IDE	plan														
	actual														
7. Develop Blynk interface	plan														
	actual														
8. Interfacing Blynk with ESP8266	plan														
	actual														
9. Testing hardware	plan														
	actual														
B) Final preparation															
1. Preparing final report	plan														
	actual														
2. Poster making for presentation & demo	plan														
	actual														
3. Presentation & Demo	plan														
	actual														