ELECTRONIC ENGINEERING

COMMUNICATION DEPARTMENT

ALARM FLOOD SENSOR WITH GSM OUTPUT

FINAL YEAR PROJECT REPORT

NAME	MATRIX NUMBER
MUHAMMAD FAIZ DANIAL BIN FUAD	*08DEP20F1056*

SUPERVISOR NAME: DR MARLINA BINTI RAMLI

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ABSTRACT

In Malaysia, floods are the natural disasters that happen every year during the monsoon season from November until January. These floods caused serious damage to houses, roads, businesses, public facilities and even killed people. Though many steps have been taken by the government in order to prevent these incidents, but it seems went unsolved. Here, the Alarm System Heat Flood Detection and Warning System is proposed in helping to monitor and manage this critical situation by providing crucial information to the public and the local authorities at the affected area. The system is able to measure the water level and alert the public and the local authorities by sending a notification (i.e. SMS and MMS) regarding the flood conditions. Furthermore, the system enables the public and the local authorities to see the live graph data of the water level using the Android application on the mobile phone .

CHAPTER 1

1.0 INTRODUCTION

There are 2 types of flood: normal flood and flash flood. Flood is an event where a large amount of water covering an area that is usually dry. Meanwhile, flash flood is a sudden flood of water caused by heavy rain. Flash flood occurs due to slow-moving thunderstorm that repeatedly moving over the same area or heavy rain from hurricane and tropical storms. It takes about several minutes to hours to develop. Normally, flash flood occurs 6 to 7 hours after heavy rainfall, meanwhile river flood occurs longer and lasted a week or more. Flash flood is not seasonal, but it can happen anytime and it has certain limitations compared to the river flooding. Normally floodwater moves with fast speed and flash flooding occurs when a barrier holding back water fails or when water falls too quickly on saturated soil or dry soil that has poor absorption ability. Flash floods often occur in a dry place and do not have a good drainage system.

Flooding occurs when heavy rain lasting for several days or when heavy rain in a short period causes a river or stream water levels submerge to land. Normally, this flood occurs at east coast countries such as Kelantan, Pahang and Terengganu. A river flood is common natural disaster. This flood caused serious damage to houses, roads, businesses, public facilities and even killed people. Many steps have been taken by the government to prevent these incidents, but it seems went unsolved. The alarm system can be integrated into the system to alert public and authorities on flood to avoid loss of life. Such system is called a flood monitoring system with GSM. The system requires the need of telecommunication services from companies like Maxis, Celcom, and Telekom Malaysia. The function of this system is to measure the water level of river and when the water level is beyond the threshold level, it will send a notification to the user.

1.2 PROBLEM STATEMENT

The absence of technology or the availability of pertinent information is not the issue with disaster management. It is frequently a problem with information accessibility. The core spirit of research and drive to identify disaster recovery solutions is the ability to effectively use information technology to discover and manage information, the capacity to critically assess, and the ability to appropriately apply such information to solve a problem. The ability to identify, locate, access, and determine is therefore essential for carrying out an effective response to the issue.

1.3 OBJECTIVE

- To develop a sensor network device for sensing water level.
- To develop processing and transmission units using GSM.
- To ready for the monsoon season.

1.4 SCOPE OF PROJECT

To keep track of changes in the water level, data on the level of the water was periodically gathered and updated. The concept uses the GSM mobile network to alert users to flood disasters. This research is being done to find solutions for the issues caused by floods. The following characteristics must be present in the device: It has an ultrasonic sensor to determine how far away a flood on the road is.

The technology included a camera that will show a livestreamable, real-time image of the flood. It has serial communication capabilities for text message alerts that contain information about the date, time, water level, and road conditions.

CHAPTER 2

2.1 LITERATURE REVIEW

2.1.1. Flood warning and monitoring system utilizing internet of things technology

One of the greatest calamities that can occur everywhere in the world, including Malaysia, is flooding. Flood warning and monitoring are required to provide victims at specific locations with high flood risk with an early notice and help lessen the impact of the disaster. Internet of Things integration into the system could enable the victim to receive accurate flood status updates in real-time. This study develops a wireless sensor node-based real-time flood monitoring and early warning system for a flood-prone area. The Node MCU-based technology used in this system is incorporated utilizing the Blynk application.

When a flood or heavy rain happens, the wireless sensor node can assist the victims by monitoring the water levels and rain intensity and issuing an early warning. The sensor node, which is located at the designated flood region, consists primarily of an ultrasonic sensor and a rain sensor that are both controlled by NodeMCU, the system's microcontroller. When the flood reached a particular threshold of danger, buzzer and LED began to activate and inform the sufferer. Through a wireless connection, the Blynk application receives data collected by the sensors. By examining the interface and receiving push notifications that are provided in the Blynk programme via IOS or Android smartphones, the victim will learn the current condition of flood and rain. The information on the flood level delivered by email may be useful to numerous organizations for flood forecasts and system development.

Numerous types of ultrasonic sensors with significant differences in frequency and power consumption are available. The high-frequency ultrasonic sensors will have a sharper beam width and may detect obstacles in a longer range. Some of the new sensors also have the same detection range as previous models but less power consumption. The ultrasonic sensors must be able to detect obstacles or objects between 2cm and 50cm in this project. Since the entire system supply is taken out of the supply, less current consumption is crucial and must be capable of operating at low voltage. HC-SR04 meets this project's criteria for detecting the level of flood water after long research between the HC-SR04 and other ultrasonic sensors.

2.1.2 Flood disaster indicator of water level monitoring system .

With the development of technology, early warning systems for flood management have advanced quickly. These systems employ the Global System for Mobile Communications' Short Message Service (SMS) to inform individuals in advance (GSM). In this work, an early warning system that uses an Arduino board to manage the entire system and GSM shields to transmit data is shown. The hardware and software components that make up the system were the basis for its design and implementation. Float switch sensors are used by the model to assess the water level. After collecting the data, it analyses it to identify the type of risk that is there. An alarm message is translated from the detected level and provided to the user.

To assist local authorities in offering more organized solutions, this article focuses on flood disaster monitoring systems. The technology can detect floods and providing ongoing alerts or information. The sensors can find out the information about the water level. The system's purpose is to warn the neighborhood so that safety measures can be done to safeguard people's lives and property. The created system makes use of GSM and SMS to send data from sensors to the appropriate users' mobile phones. Since the GSM network is considerably more reliable during the flood season, it can be used by using the GSM module. Three float switch sensors are used to differentiate the escalation level. The data send by the sensors are handled by the Arduino Uno controller. The Arduino Uno controller has been program for different input and send different output through transmission pin. Commands are send using C compiler program with relevant (Attention) AT commands. The transmitted output from the Arduino Uno controller is conveyed through to GSM module. Then, SMS alarm send to the respective user. User receives different SMS depending on the level of sensors detection. GSM network is being exploited to convey data to the user via SMS alarm. SMS via GSM network has been proven to be reliable due to its works on a different band and can be sent or received although the phone lines are congested. It also has the advantage of sending data to multiple users

2.1.3 Flood Monitoring and Warning system

Unavoidable occurrences such as floods and heavy rains can result in significant human casualties and infrastructure damage. Flash floods cause property damage by rising quickly in flood-prone locations, but because monitoring systems are there, the impact on human lives is largely avoidable. Although there are numerous technologies used by disaster management organisations to monitor flood levels, most of these systems have a restricted range and require advanced maintenance. As a result of manual operation and poor real-time

water level monitoring, conventional flood gates in water canals commonly seen in underdeveloped nations overflow and experience flash floods.

On top of that, the lacking accurate data analysis in the system that can be accessed is one of the limitations of the conventional flood monitoring and warning systems (FMWS). Therefore, in this paper, we have explored and reviewed the existing methods of flood monitoring and emphasizing their structure and sensing techniques. We have also classified and compared their advantages and limitations and accordingly suggested new solutions and improvements by utilizing new technologies based on the Internet of Things. This paper introduces a detailed mini-review of sensing methods in the existing flood systems as reported in previous studies to serve as a quick guide to researchers who are engaging in this field.

The GSM is also responsible for sending warning message, flood levels that has been measured from the sensor and image to the tar-gated mobile phone. Here, data from the server is sent to the Flows Android Application and the live data graph. PHP programming is used to create live data graph that will display water distance, temperature and humidity. Flood Detection and Warning System uses an Android Application to aid its Warning System. After the development phase, the prototype will be tested ina similar situation to real situation and event. The sensor will be placed in a small container and water will be poured slowly into the container. Next the system will start its operation. If the water level reach at certain level, the SMS and the MMS will be sent to the specific recipient. The time will be recorded and the data will be collected by the system. Finally, the data will be analysed and live data graph/chart will be displayed. The system will be tested several times under different circumstances and different water levels.

2.1.4 Solar-Powered Flood Detection System Using Arduino

Arduino Uno is one of the microcontroller board technologies and an open source platform to create interactive computerized device. It builds with microcontroller that can interface to various types of circuits and expansion boards. This type of board was widely used by community as a brain of thousands of interesting projects. There are many other microcontroller platforms available for computing physical device . Same with Arduino Uno, it most simple platform and it comes in complete package. Besides it ready to use, Arduino also flexible and inexpensive. In this project, Arduino board based on AT Mega 328P microcontroller is used. Building with 14 digital input/output pins (6 can be used as PWM outputs), 6 analog inputs and several power pins, it used to write and uploads computer code to the physical board.

A flood detector with monitoring system is built. The flood detector system built to sense the water level at different type of level. This system will be located at a strategic place with a suitable unit like a pole. The system also built with monitoring system that tells us the water level at the area. This gives the early measurement of water to public without need to

go to the near areas that have a high probability affected by flood. Besides monitoring and detector system, a warning system will be built together that able to inform citizens around the area.

2.2 What is flood ?

Flooding is a situation in which water from a river or from rain covers large areas of land. It is also defined as a temporary rise of the water level, as in a river or lake or along a seacoast, resulting in its spilling over and out of its natural or artificial confines onto land that is normally dry. Flooding in Malaysia is a normal phenomenon occuring every year. It usually occurs in low surface area and exposed to the river. It can occur at the city or metropolitan area like Kuala Lumpur, Johor Bharu and Pulau Pinang due to the limited drainage systems which fail to bear the excessive rain water. According to [2], flooding commonly happens at the dry area, but suddenly gets submerged under water. Flooding can happen all of a sudden and retreated rapidly. It also takes a long time for the water to recede. Flood can also occur at irregular intervals and vary in size, duration and area affected. During flood, water flows from high area to low lying area. This means low-laying areas might be flooded quickly before it starts to get to higher ground. This can be illustrated by Figure 2.

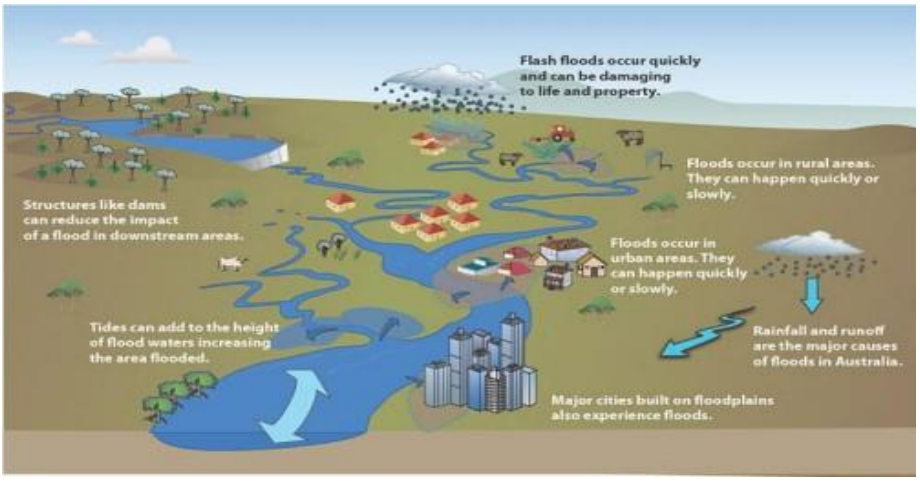


Figure 2 .

2.3 Flood Stage

There are various stages in this flood that can be used as a point of reference for the authority. The authorities must be aware of the flood stage to estimate the flood. Shows the different types of flood stages that all authorities consider when conducting flood control systems, according to [14]. Table 1 lists the five stage levels for floods.

STAGES	***DESCRIPTION***
Action Stage	Water surface in the river is typically near or just above top of banks at this level. No man-made structures are flooded in this level. Typically, only a small portion of parkland is affected by these water overflows.
Minor Flood Stage	At this level, there may be a minor flood in the river, and the road may be under water. The water may also overflow onto the grass or field.
Moderate Flood Stage	This stage of the river's development may start at the road, which is likely to be blocked off and closed. This stage typically occurs during monsoon flooding. Additionally, this stage primarily occurs in East Coast States (Malaysia)
Major Flood Stage	This phase of the project is crucial because flooding is a disaster that is present at this time. Significant flooding is actually possible in a number of low-lying zones. Perhaps the structures are completely submerged. Relocation on a large scale might be required.
Record Flood Stage	At this stage, the river is at its highest it has been since records began for the area in which the flow gauge is located. This does not imply a major flood. Some areas may have never experienced a major flood, and with it the record level is in the medium category.

CHAPTER 3

3.1 Methology Introduction

Methodology is the method or procedure used to carry out a project more specifically. These methods are very important to ensure the completion of the project. The methods used include project planning flowcharts and collecting data components.

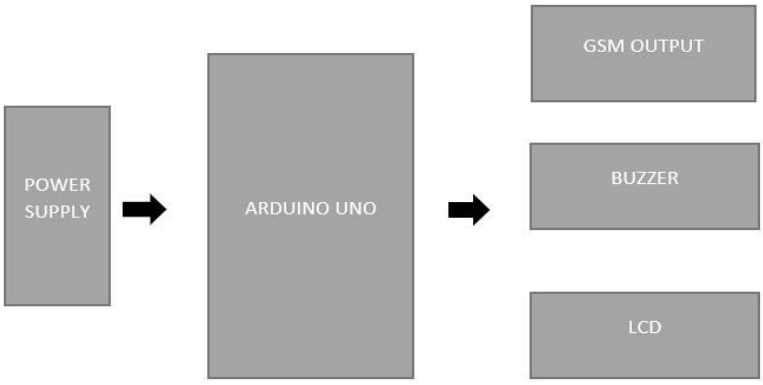
3.2 Project Planning

This project uses GSM technology and ultrasonic sensor to detect the water level and sends data to a rescue team to serve as a warning. Rescue team can get data processing based on the results of point prediction model to trigger timely warnings (Short Message System) and give the information to the stakeholder that are exposed to floods. For the warning system using ultrasonic sensor to be used as a marker or detector water level in the river and this system will send SMS alert via GSM system. GSM also serves as a modem for transmission to the satellite so that the rescuer can know information about the water level in a river vulnerable to flooding .

In this project, the system is turned on by the solar panel system. The technology is GSM shield. The GSM shield will receive a signal from the ultrasonic sensor and process the information to send a brief message to the relevant authorities or communities. If ultrasonic sensors provide input. In this system, a microcontroller houses both ultrasonic sensors and a GSM shield.

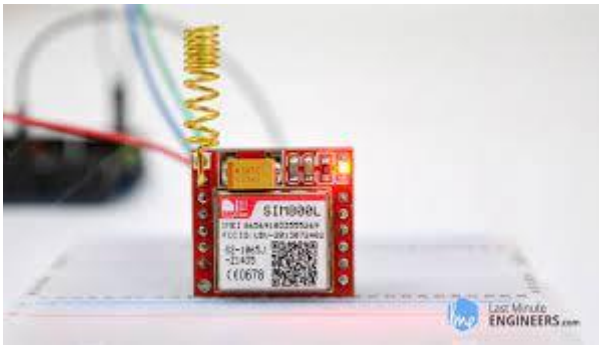
The normal level, middle level, and danger level are the three divisions of the ultrasonic measurement. Normal level is typically designated as a safe level. For the middle level, however, it denotes an impending flood or river overflow, and the government or residents should be alert to the possibility of flooding. Residents should be ready to evacuate to higher ground or a safe location, such as a hill or a school, if the danger level increases. Additionally, the authorities need to help or rescue flood victims more quickly.

3.3 Block Diagram



Power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. It could be AC to DC or DC to DC. Consequently, power supplies are sometimes regarded as electric power converters.

The **Arduino Uno** is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.



A **GSM** module or a GPRS module is a chip or circuit that use to establish communication between a mobile device or a computing machine and a GSM or GPRS system.

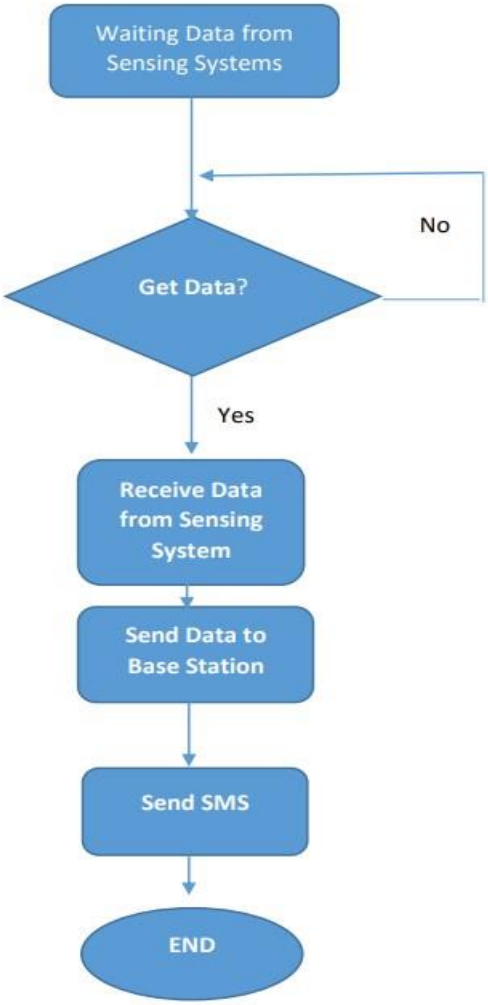
A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers.

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric.

3.4 Flowchart

The planning flow chart is an important element in the developed Flood Detector system. It may include the sequence of actions, materials or services entering or leaving the process (inputs and outputs), decisions that must be made, people involved, time involved in each step and/or process measurements.

The processes described can be manufacturing processes, administrative or service processes, and project plans. This is a generic tool that can be adapted for many purposes. This flowchart consists of the flow for the entire Alarm Flood System .



3.4.1 First Step

The project selection process with group members is carried out, research has been carried out and project ideas have been planned. Various aspects need to be considered from the advantages of the project, the cost of the project, the materials to be used so that the project that will be produced can achieve the set objectives. After that, the project idea was introduced to the supervisor. After the Supervisor received the project idea, research was carried out and information related to the project was collected from books, the internet and other reference sources. A proposal has also been prepared together with a statement of the problem, objective and scope of the study of the product that will be produced to the supervisor. Finally, the title of the project 'Alarm Flood System was set .

3.4.2 Second Step

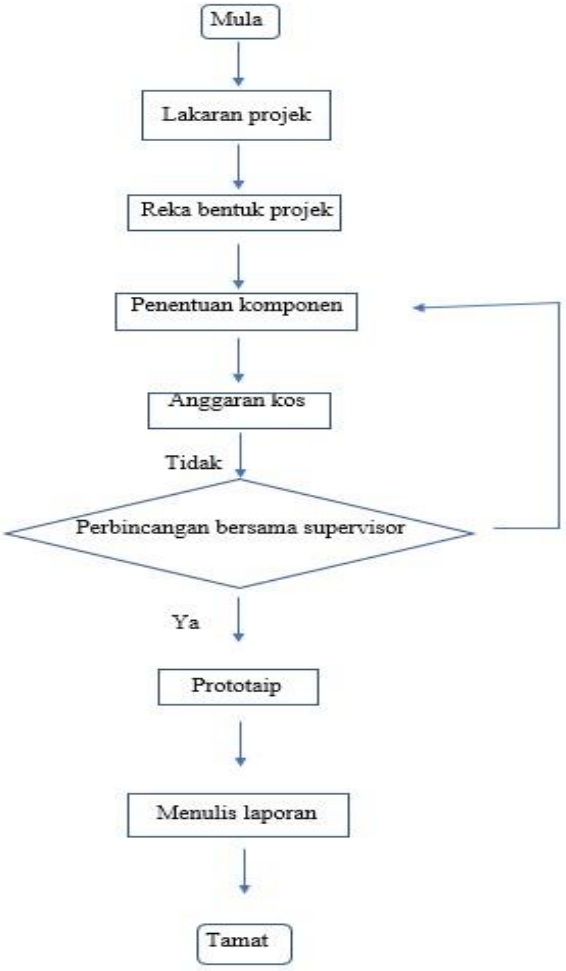
At this stage, the Project Sketch has been sketched using Autocad so that the description of the product's criteria can be clearly explained as well as a reference when in the product creation phase.

Next, the study of the design also plays an important role before the determination of the components and the creation takes place. Several aspects that need to be emphasized in

determining the design include, the production of products compatible with the environment. So that when in the testing phase, the results do not have a bad effect or cause any difficulties because this matter is not studied.

In addition, the cost of the project components was researched through observations in electrical shops and online. The cost calculation is not only based on the components but the cost for testing and the cost of the study site is also calculated as an estimate of the total amount to produce the product. The purpose is for students to be able to analyse every product they want to suit their taste and budget.

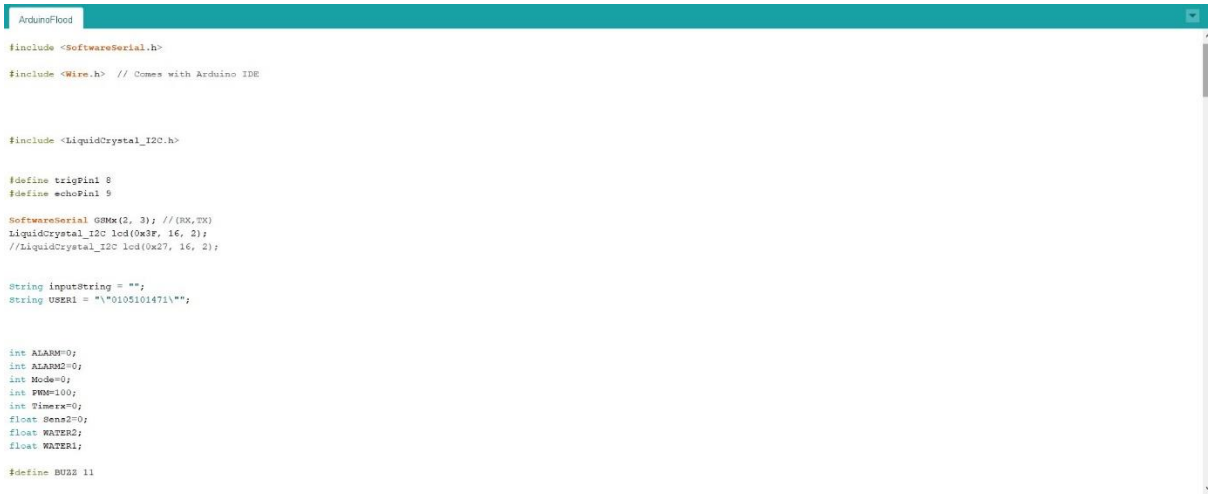
After all aspects have been studied, the prototype production continues as a framework for a product before the creation phase begins. The purpose is to further explain the structure of this project to the supervisor so that the acceptance and understanding of our product meets the objectives that have been set.



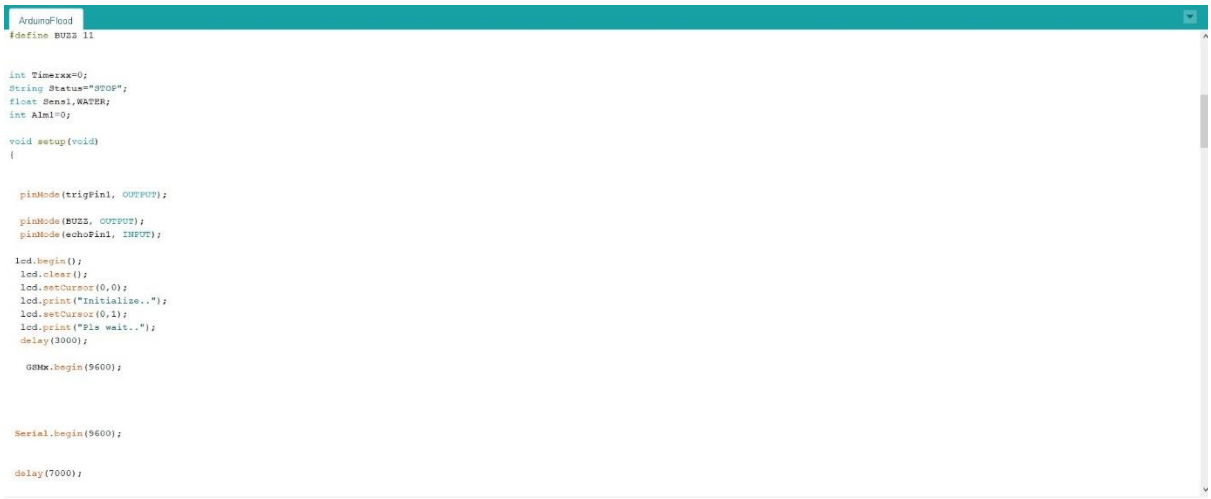
3.5 Software Method

The Arduino development environment is accessed after the Arduino board has been connected to a computer via USB (IDE). The user writes Arduino code in the IDE, uploads it to the microcontroller, which executes it and communicates with the piezo buzzer and sensors. With a few extra methods and functions that we'll go over later, the Arduino code is written in C++. The computer language C++ is simple to comprehend. When we create an Arduino "sketch," as the code files are known, it is processed and converted to machine language. The preferred method is to encode using Arduino code. After attaching the Arduino to the PC with a USB cable, we open the Arduino IDE and select the proper board and port.

Once the code has been uploaded to the Arduino, copy it and then open it in the Arduino IDE. Using this technique, it is possible to show how the Social Distancing Detector automatically processes a buzzer when it detects the maximum distance between communities.



```
ArduinoFlood
#include <SoftwareSerial.h>

#include <Wire.h>  // Comes with Arduino IDE



#include <LiquidCrystal_I2C.h>


#define trigPin1 8
#define echoPin1 9

SoftwareSerial GSMx(2, 3); //(RX,TX)
LiquidCrystal_I2C lcd(0x3F, 16, 2);
//LiquidCrystal_I2C lcd(0x27, 16, 2);


String inputString = "";
String USER1 = "\"0105101471\"";


int ALARM=0;
int ALARM2=0;
int Mode=0;
int PWM=100;
int Timerx=0;
float Sens2=0;
float WATER2;
float WATER1;

#define BUZZ 11
```



```
ArduinoFlood
#define BUZZ 11


int Timerxx=0;
String Status="STOP";
float Sens1,WATER;
int Alm1=0;

void setup(void)
{


  pinMode(trigPin1, OUTPUT);

  pinMode(BUZZ, OUTPUT);
  pinMode(echoPin1, INPUT);

 lcd.begin();
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Initialize..");
  lcd.setCursor(0,1);
  lcd.print("Pls wait..");
  delay(3000);

   GSMx.begin(9600);



 Serial.begin(9600);


 delay(7000);
```

```
ArduinoFlood
delay(8000);

  Serial.println("AT");
  GSMx.println("AT");
  delay(2000);
  Serial.println("AT+CMGF=1");
  GSMx.println("AT+CMGF=1");
  delay(2000);
  Serial.println("AT+CMGD=1");
  GSMx.println("AT+CMGD=1");
  delay(2000);
  Serial.println("AT&W");
  GSMx.println("AT&W");
  delay(2000);

  Serial.print("AT+CMGS=");
  delay(300);
  Serial.println(USER1);
  GSMx.print("AT+CMGS=");
  delay(300);
  GSMx.println(USER1);
  delay(1000);

  GSMx.print("Flood Detector ready..");
  delay(200);
  Serial.println(char(26));
  GSMx.println(char(26));
  delay(4000);


  digitalWrite(BUZZ,HIGH);
  delay(10);
  digitalWrite(BUZZ,LOW);
  delay(10);
    digitalWrite(BUZZ,HIGH);
```

```
ArduinoFlood
    WATER=0;
  }
Serial.print(distance1);
Serial.print("\t");
Serial.println(WATER);

  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("WATER LEVEL:");
  lcd.setCursor(0,1);
   lcd.print(WATER);



if (ALARM==1){

    lcd.clear();
    lcd.print(" FLOOD WARNING!");
    digitalWrite(BUZZ,HIGH);
  delay(20);
  digitalWrite(BUZZ,LOW);
  delay(20);
  digitalWrite(BUZZ,HIGH);
  delay(20);
  digitalWrite(BUZZ,LOW);
  delay(20);
  digitalWrite(BUZZ,HIGH);
  delay(20);
  digitalWrite(BUZZ,LOW);
  delay(200);
      digitalWrite(BUZZ,HIGH);
  delay(20);
  digitalWrite(BUZZ,LOW);
```

```
ArduinoFlood
  delay(500);
}

if (WATER<50){
  ALARM=0;
}
  //-------------------------------------------------------------

   if (WATER>50 && ALARM==0){
       GSMx.print("AT+CMGS=");
                Serial.println(USER1);
                GSMx.println(USER1);
                delay(1000);

                GSMx.print("FLOOD DETECTED!");
              //  GSMx.print("FLOOD DETECTED!");



                delay(200);
                Serial.println(char(26));
                GSMx.println(char(26));
                delay(4000);
       Serial.println("FLOOD DETECTED!");

    digitalWrite(BUZZ,HIGH);
  delay(10);
  digitalWrite(BUZZ,LOW);
  delay(10);
        ALARM=1;

     }
```

3.6 Summary of Methodology

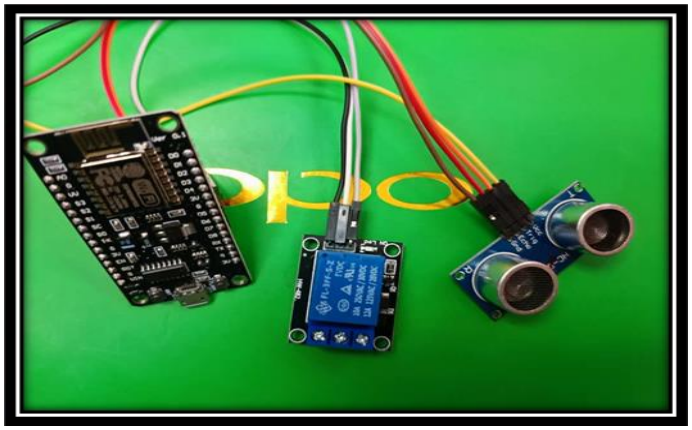
The project methodology, materials purchased, budget calculation, product design, and timeline are all described in this chapter's research. I've provided a thorough explanation to help you better comprehend the project's title. In the sections that follow in this chapter, I also make material purchases and cost estimates. I have also expanded on the details of the supplies required for flood early warning systems. I carefully calculated the material purchase budget, taking into account the actual purchase price, to make sure that the project's budget is reasonable. Following that, I go into greater detail about method selection in this chapter. It focuses on the approaches that will be taken to address and develop the problematic project.

CHAPTER 4

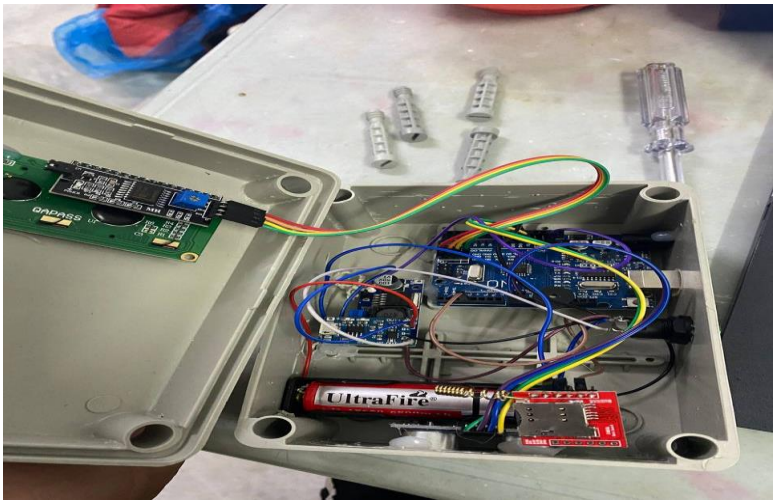
4.1 RESULT AND ANALYSIS

In this chapter, its had present data and analysis derived from the testing of doorbell for the deaf products. This is to ensure that all research objectives and scope are met. To ensure the project's success, every piece of data had been analyzed .

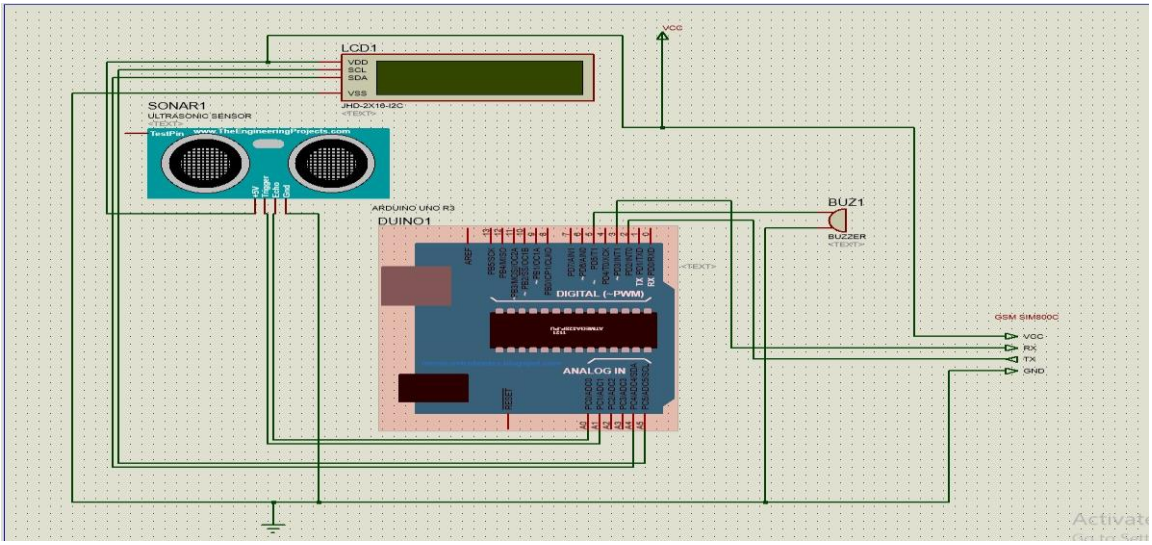
4.1.1 BEFORE



4.1.2 AFTER



4.2. Schematic Diagram



4.3 Result

4.4 Discussion

I've learned that this project is a good accomplishment for both myself and others, as was already mentioned. I can see that this project will benefit me greatly while also achieving the goal. This project, in my opinion, is a good place to start if you want to learn more about engineering and the internet of things so that, as electrical engineering students, you can eventually help more people. I created this early flood warning system project so that the neighbourhood could get ready and be cautious.

4.5 Summary

The results of the project have a high success rate, as this chapter has explained, because they thrive in the local environment. I gained so much knowledge from the outcomes and gradually applied it to this new norm. Despite the numerous challenges I faced, I kept improving until the solution came off brilliantly. I've had a lot of electrical practises thanks to the method I employ, specifically learning how to instal and other things.

4.6 Conclusion

There are benefits and drawbacks to this project, as I had concluded in my conclusion, which I had previously discussed. I sincerely hope that the benefits I receive from this product can also benefit and benefit the neighbourhood. Along with the shortage, I'll also work to get better and have been looking for more research on this project to make it as effective as possible. As a result, this project will be useful down the road. In order to make the product more responsible in the future, more testing and analysis should be conducted.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

An efficient early flood warning system can be helpful to the neighbourhood and serve as a preventative measure for the victims, reducing casualties, disaster-related trauma, and property damage. A specific area's flood victims can receive information via SMS, an efficient alert communication mechanism. It would be optimal for this system to incorporate data mining and artificial intelligence components that could help with data analysis of water level information and result in detailed graphs for better analysis. This result will aid in the prediction of water level behaviour in the future. According to the findings, the project's goals were successfully met because the circuit fully operated. The data is finally been sent via GSM mobile, where it act as a modem for the system. All three float switch sensors are detecting all the water level that consist of alert level, moderate risk level and high risk level. Finally, data from input sensor and Arduino Uno microcontroller reached at the control center.

5.2 RECOMMENDATION

In order to reduce the number of fatalities and property losses brought on by flood disasters, alarm flood systems have been developed. When the flood water level reaches warning and danger levels, the system has the ability to phone the user and the Rescue Department and send warning SMS. Two-way communication is offered by this system. The user can turn on or off the system and send an SMS request to check the flood water level. When the flood water level exceeds the warning and danger levels, a buzzer included in the device will sound. It is strongly advised that future researchers include a feature for finding the flood-plain area and notifying the Rescue Department when the flood water level reaches a dangerous level in their future studies.

Future researchers can also create a straightforward smartphone application that allows users to quickly check the floodwater level in real-time. When the flood water level rises, the mobile application can record the date and time of the incident as well as a graph of the ultrasonic sensor data.

1. Suggest replacing the battery with a solar panel, here can save energy and do not need to constantly charge the battery.
2. Suggest replacing the float switch with an ultrasonic sensor, here to ensure that the sensor used is stronger and more modern.
3. Suggesting replacing the buzzer with a remote control alarm, here can ensure that the user can always know if the water level in the drain of his house is at a warning or warning level.

5.3 SUMMARY

This chapter has provided explanation of the project's outstanding success. Numerous inferences and suggestions can be made to make this project even better or perhaps the greatest project ever in the future.

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