Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF AUTOMATIC PET FEEDER AND WATER FOUNTAIN USING MICROPROCESSOR

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Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours

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

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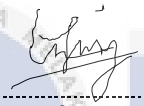
2021

DECLARATION

I declare that this project report entitled “Development of Automatic Pet Feeder and Water Fountain using Microprocessor” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

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APPROVAL

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

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Date : 11 JANUARY 2022

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

Thankful to Allah for His grace, for giving me healthy life and strength. Thank you to my family and friends especially my beloved parents Che Ghani bin Che Lah and Che Yam binti Hamat who encourage me to finish this Final Year Project and always stay by side. And also to my siblings, friends, and of course to Dr. Farid Arafat bin Azidin, as my supervisor for shared their opinion, guidance and idea to encourage the completion of this study. Finally, a big thank you to all those involved who helped me up to scar the final report.

ABSTRACT

An automated pet feeder and water fountain system was created for the use of pets. This machine was created because every individual who keeps these animals such as cats, dogs and so on must have problems with the care of the diet of pets. Problems faced by pet care such as being busy with daily affairs until pet feeding time is neglected and unmanaged. In addition, the high cost of sending a pet to a pet shop or pet nursery. Automatic pet feeder and water fountain is specially designed to solve the problems faced by pet owners where in small or large scope conditions. It is also designed to be easily used by pet owners to feed or drink when not at home. The project is to innovate the existing food dispenser product and water fountain for pets to be of better quality and operate automatically and add to the Arduino program. This machine system uses a servo motor to open the food lid, ultrasonic sensors are also used to detect the food level in the container. While water fountain uses motor pump, ultrasonic sensor and relay.

ABSTRAK

Sistem pengumpan haiwan peliharaan dan air pancut automatik dibuat untuk penggunaan haiwan peliharaan. Mesin ini dicipta kerana setiap individu yang memelihara haiwan ini seperti kucing, anjing dan sebagainya mesti menghadapi masalah dalam menjaga diet haiwan peliharaan. Masalah yang dihadapi oleh penjagaan haiwan kesayangan seperti sibuk dengan urusan seharian sehingga waktu makan haiwan peliharaan diabaikan dan tidak teratur. Di samping itu, kos penghantaran haiwan peliharaan yang tinggi ke kedai haiwan peliharaan atau taman asuhan haiwan peliharaan. Pengumpan haiwan peliharaan automatik dan air pancut dirancang khusus untuk menyelesaikan masalah yang dihadapi oleh pemilik haiwan peliharaan di mana dalam keadaan kecil atau besar. Ia juga dirancang agar mudah digunakan oleh pemilik haiwan peliharaan untuk memberi makan atau minum ketika tidak berada di rumah. Projek ini adalah untuk menginovasi produk dispenser makanan dan air pancut yang ada agar haiwan peliharaan lebih berkualiti dan beroperasi secara automatik dan menambah program Arduino. Sistem mesin ini menggunakan motor servo untuk membuka penutup makanan, sensor ultrasonik juga digunakan untuk mengesan tahap makanan di dalam bekas. Sementara air pancut menggunakan motor pam, ultrasonik dan relay.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Dr Farid Arafat Bin Azidin for their precious guidance, words of wisdom and patient throughout this project.

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My highest appreciation goes to my parents and family members for their love and prayer during the period of my study. An honourable mention also goes to myself for all the motivation and understanding.

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CHAPTER 1

INTRODUCTION

1.1 Background

For this project, pet feeder is designed which is suitable to use by either cats or dogs. The system will work automatically and will be controlled by the pet owner. With the existence of this project, pet owners can also take care of their pet's diet because the nutrition is very important so that it does not suffer from any health problems. Nowadays, the community out there is too busy with their careers which is the cause of their pets not being well taken care of. One of the factors for pet care is to feed and drink adequately. In particular, its main purpose is to design a system that can provide food and water automatically by controlling them using the Blynk app and can control it remotely, indirectly able to maintain a pet's nutritional diet.

This project is to Development of Automatic Pet Feeder and Water Fountain using Microprocessor. As we know that the Internet of Thing (IoT) can connect over the world in one place. All the physically devices that can be connected and obtain the data for analyzing for some applications. IoT provides a wide variety of connectivity with difference application qualities. In development of IoT, the technology of WiFi provides a platform for remarkable amount of IoT solutions. The WiFi in this project are using in microcontroller nodemcu ESP8266. ESP8266 are contain crucial element of a computer including networking WiFi, so it is suitable for doing IoT projects. Then, this project are using Blynk application to control it remotely where it can setting the time for the feeding pets. Therefore,

ESP8266 is required in this project because it is built-in with WiFi that can be connected to the Blynk app.

1.2 Problem Statement

As we all know, the majority of people out there necessarily have pets that are made friends at home. These pets need to be taken care of by their owners where they need to feed and drink adequately. Some pets are unable to control their diet where they will continue to eat as long as the food is served. Then, problems will also arise and feel burdened if the owner has to leave their pet for a certain amount of time and no one there is watching over it. Therefore, with this system that pet owners can feed their pets automatically is the best way to solve this problem. The system can also help the owner to keep a close eye on his pet's nutrition properly. Animal nutrition and health should be taken care of so that they will not be a problem in the future. The best part is pet owners can feed and drink their pets anywhere without setting foot into their home by simply setting feeding times on a smartphone application only and no need to ask for help from neighbors or friends to feed their pets.

1.3 Project Objective

The main aim of this project is to develop of automatic pet feeder and water fountain using microprocessor for the convenience of pets. Specifically, the objectives are as follows:

1. Feed the pet automatically without being physically present according to the time the owner wants.
2. To control the pet's nutritional diet in the right way.
3. Find out if pet's food and water are inadequate or running out.

1.4 Scope of Project

The scope of this project are as follows:

a) This project will develop a prototype to Development of Automatic Pet Feeder and Water Fountain using Microprocessor which using Nodemcu ESP8266 and Blynk application.

b) This project was made to prioritize the use of IoT by using Blynk apps downloaded on smartphones.

c) This project is specially designed to facilitate users in taking care of pet nutrition in an orderly manner which is set the time 3 times per day to feed the pet.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Nowadays, pet feeder and water fountains have many types that used around the world that have the same main function which is to make it easier for consumers to feed and drink on pets. Each type is different based on the components that used. In this chapter, I will review previous articles to know every different process.

2.2 Pet

Pets are animals that are kept at home to be kept as companions [1]. There are some of them who make the animal part of their own family. We already know, that many people out there who have pets at home for example, cats, rabbits, dogs, hamsters and so on and it can be said that everyone will have a pet that they love and even take care of it so well and grow up healthy.

There are many benefits or advantages if we have a pet at home. One of them, it can relieve stress or pressure because animals have their own aura that can give peace to anyone who approaches them. Pets also teach us what responsibility is and the existence of a caring attitude. This is because they need daily care and attention. They also depend on humans for entertainment or happiness and most importantly the care of their food. Then, pets also taught humans about commitment. This is because taking care of pets is a big commitment that should not be underestimated. They are not like toys or dolls that we can keep and put on the shelf when we are tired of playing with them. They need to be given adequate attention by playing, being cleaned, given enough food and so on. Pet food requires regular care.

However, there are a handful of owners who are so worried if they are not at home and no one can feed and drink their pets. So, with this project, it can help owners who do not have enough time to manage their pet's feeding time because the system will work by controlling through an application uploaded on the smartphone. It make it easier for the owner even when not at home. As we know that excellent pet nutrition care can bring joy and happiness in the family.

2.3 Type of Pet Feeding

In this era of technology, many entrepreneurs out there have built various types of systems which can help pet lovers to take good care of their pet's nutrition. Some common pet nutritional care foods used by pet lovers are automated pet food containers that use simple technology with minimal features.

2.3.1 The Petsafe 5 Meal Pet Feeder

Figure 2.1: The petsafe 5 meal pet feeder

Based on the figure above which is 2.1, this pet feeder has just six buttons underneath the hood, along with a digital display that has the quality of a cheap calculator.

The directions that come with the feeder are very clear, so programming the pet feeder is simple once you get the hang of it. After setting the clock using the labeled up and down buttons, you can then program the times at which you'd like your feeder to spin, offering your pet a new batch of food or whatever you put inside the 5-part 1-cup tray [2].

2.3.2 Pet Food Autofeeder by using Arduino

For this article, [3] the project use an Arduino as a microcontroller where it can adjust the meal time and the number of portions. This project uses a rotational motion mechanism. The rotation of this mechanism is placed linearly under the container where it moves the pet food using a rotational motion [7]. To make this project work successfully, it must be use the components that are appropriate to its function. It consists of a Real Time Clock, DC motor, limit switch, buzzer, 4x3 keypad and liquid crystal display.

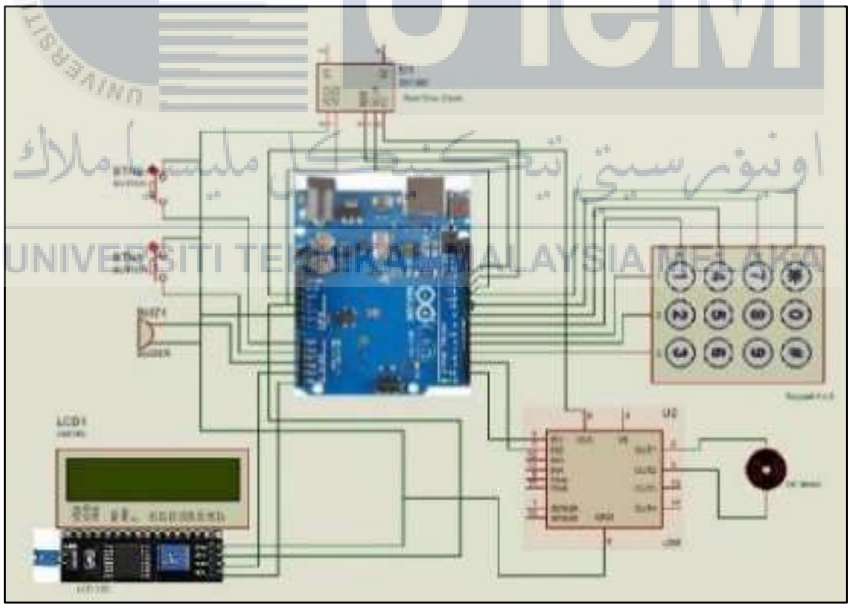

Figure 2.2: Schematic diagram of project

For the schematic diagram that has been shown on figure 2.2 above, there are three main criteria in this project where when '*' is pressed, users can adjust the actual time based on the time they first used it. Second, when '1' and '2' are pressed, the user can set the first

meal time and the second meal time, respectively. Finally, when ‘3’ is pressed, within 9 periods the user can adjust the feed size.

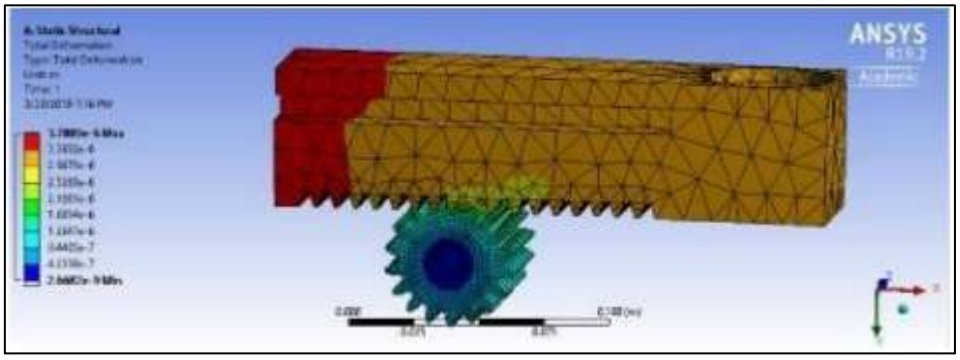

Figure 2.3: Result of mechanism analysis. [12]

ANSYS is used to analyze the maximum pressure that it can withstand at a critical point. Then, the analysis used is a static structure and a rectangular shelf is a moving object. And the spur gears is fixed on the base of the pet feeder. Nozzle diameter and layer thickness 0.1mm. The lowest (level8) has an orientation angle of 60 degrees which is 0.3mm of nozzle diameter and 0.1mm of layer thickness.

2.3.3 Arduino MEGA based PET Feeding Automation

In this article, [4] I found out that this project uses the Arduino Ethernet Shield to connect the Arduino to the internet easily for all consumers. This project also makes it easy for the owner to set the quantity of food to be given to the pet on the smartphone app. Then, all the predefined information will be transferred to the PCB via Ethernet then the signal will be sent to the food production gate. The most important component is the DS3231 RTC (Real Clock) Module. This component will be used to set each date and time for the pet to be fed. Therefore, by setting the pet’s meal time according to the schedule, the device will fill the food bowl automatically.

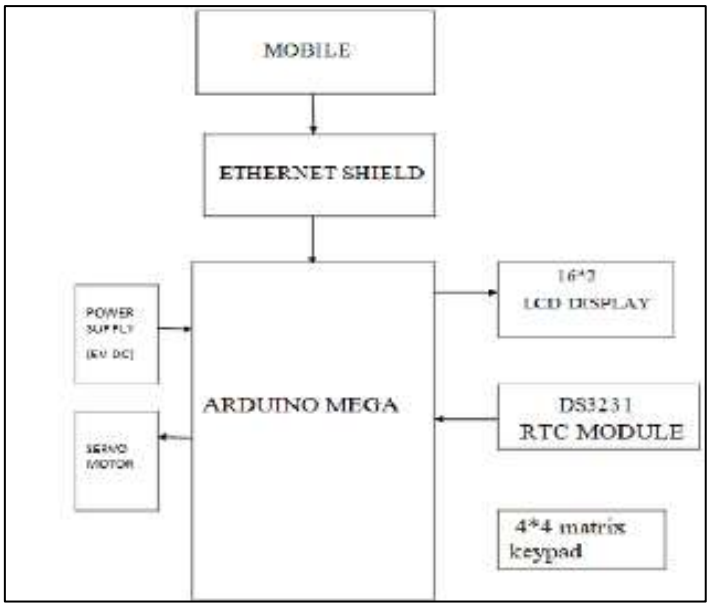

Figure 2.4: Block diagram of project [12]

Based on figure 2.4, 16 * 2 LCD is intended to display the time using the DS3231 RTC Module. The RTC DS3231 module works to set the date and time for the pet to be fed and then the bowl will be filled with food automatically. Then, food preparation by rotating the container using a servo motor. The rotation angle and opening period of the container can also be set according to the amount you want to give to the pet. To arrange the time to feed the pet manually by using 4 * 4 matrix keyboard.

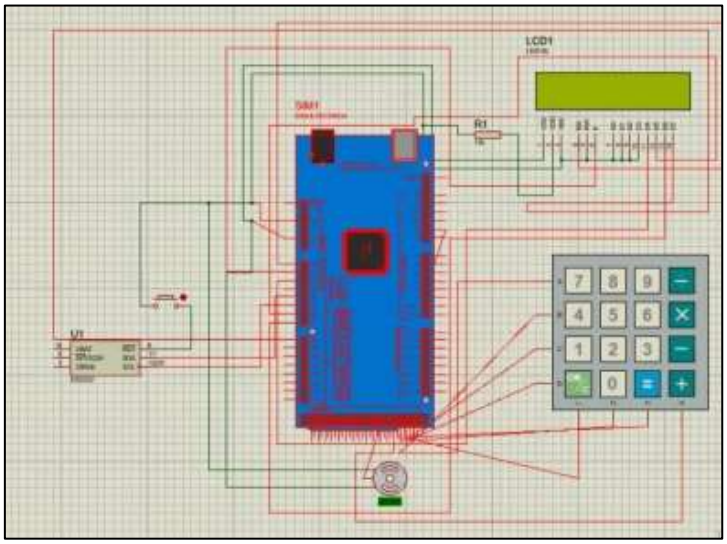

Figure 2.5: Circuit diagram of the proposed system

2.3.4 Certain Investigations on Automatic Feeding of Domestic Pets

In this article, [5] it is intended to enable the user which is the pet owner to automate simple things. This is meant to monitor and also control pet's food where it is controlled by a microcontroller. Next, the project was also built to makes pet's food an automatic machine. It means an automatic machine that can supply food at a set table. This pet's food will be timed when it will be released. To make this project work successfully, it must be use the components that are appropriate to its function. The main components are microcontroller, motor, GSM and also sensors.

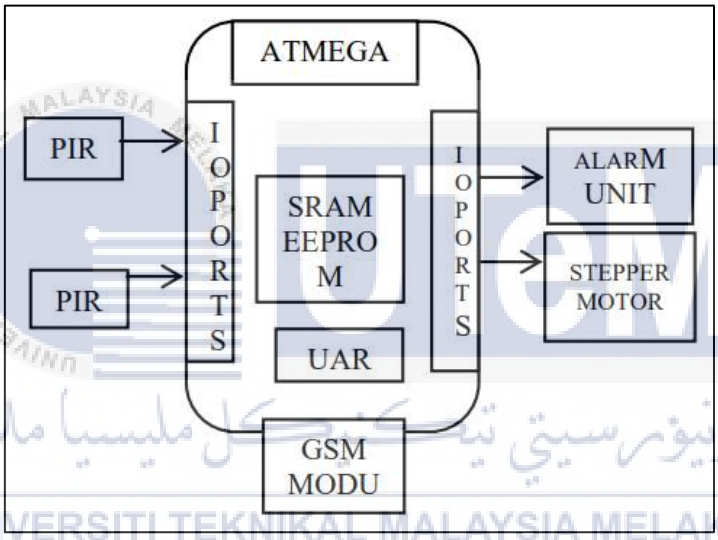

Figure 2.6: Block diagram

Sensor and stepper motors by using microcontrollers. IR sensor will monitor the level of food on the exhale, when the food crosses the pre-set limit then the IR sensor sends a signal to the microcontroller immediately. The microcontroller turns on the steeper motor at certain times. And this process will continue until the IR level is over.

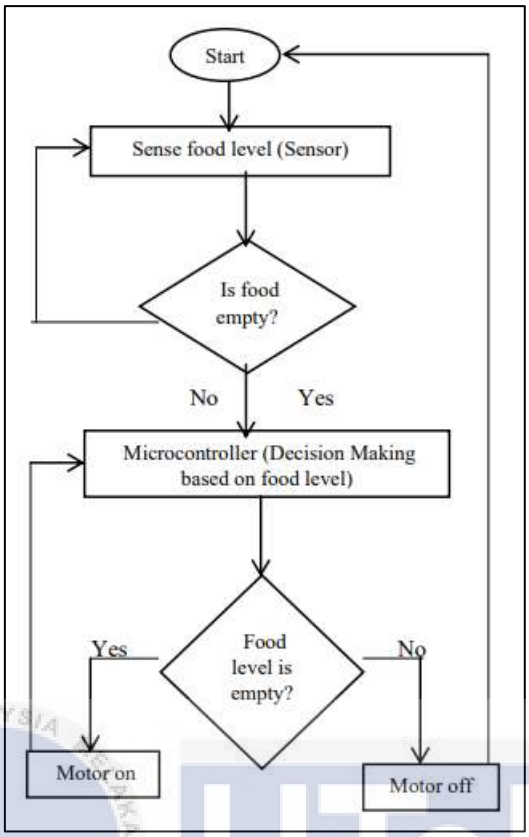

Figure 2.7: Hardware Setup

This flow chart shows how sensors and stepper motors work using microcontrollers. The IR sensor works by continuously monitoring the level of food in the shot where the IR sensor will send a signal to the microcontroller when the food has exceeded a predetermined limit. The microcontroller turns on the steeper motor at a certain time, it runs clockwise and counterclockwise in a 5 -second delay operation.

2.3.5 Automatic Pet Food Dispenser using Digital Image Processing

In this paper, [6] this project is to build an automated design that can detect specific pets based on Digital Image Processing. It is also able to nourish such pets that are detected with modern pet profiles. Then, it can also be healthy for pets detected with modern stored pet profiles. Food boxes and plates are separated to make it easier for consumers to place special ingredients especially for special pets. This project uses the Twilio API application

downloaded on a smartphone. It works when the required pet is successfully fed, then there will be a message sent to the smartphone via the Twilio API app.

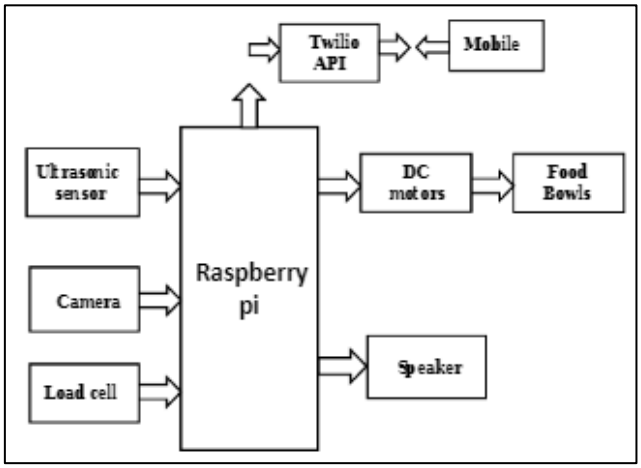

Figure 2.8: Block diagram

Based on the block diagram above, raspberry pi is used in this system as a controller. The ultrasonic sensor is to detect the pets that are in front of the system. The camera is used to take pictures of pets after the detection process is done. DC Motors are used to produce food for pets. And then the loadcell is used to detect the presence of food in the bowl. Also, when the food starts to decrease from the set point value, the charge cell will detect and a message will be sent when the pet is fed. Then, the loadcell will detect the food in the bowl. When the food is further reduced from the set point value, it will detect and a message will be sent when the pet is fed.

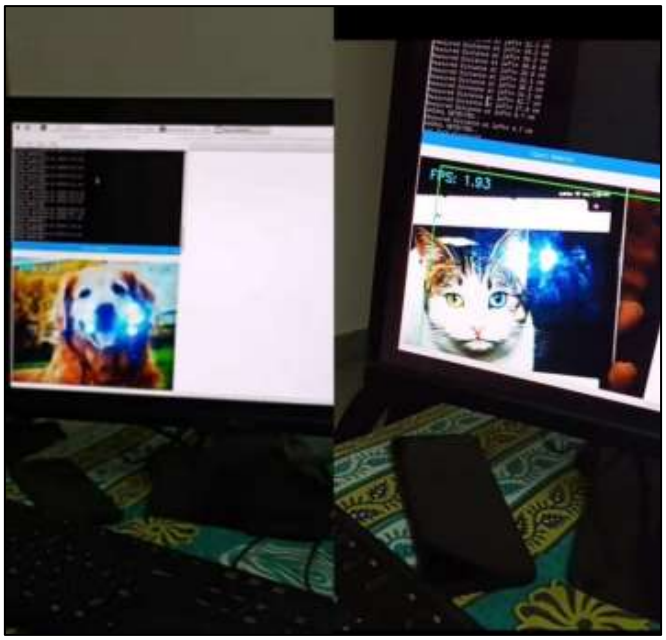

Figure 2.9: Recognition of pets

Figure 2.7 shows that when the pet can be detected and recognized as a required pets, DC Motor will released the right food to the pet.

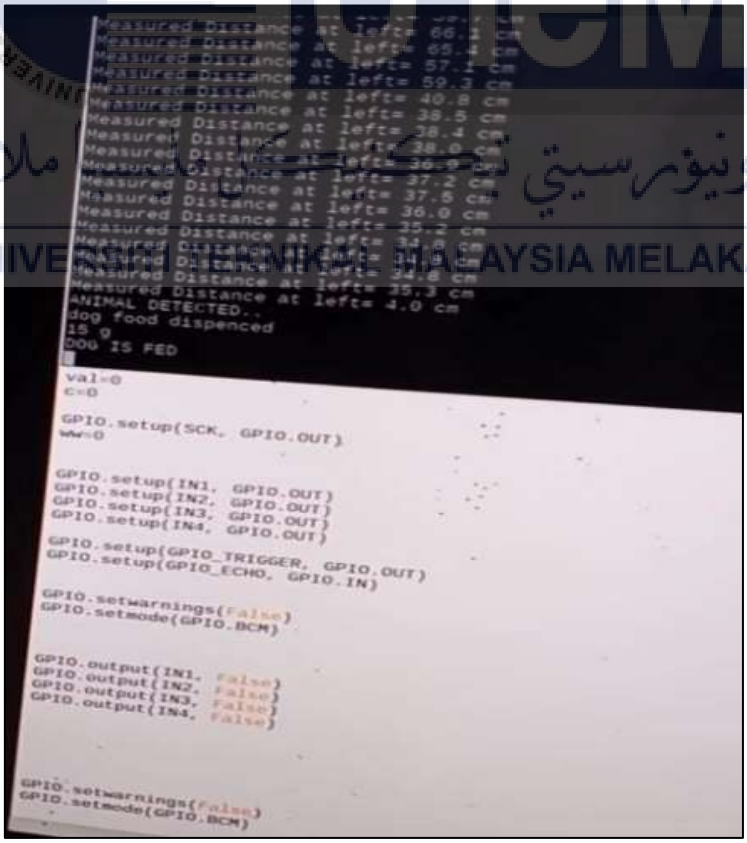

Figure 2.10: Load Check for dog food

The predefined amount of food dispensed is 40g. Once food amount becomes half the amount of predefined, the message is sent to the mobile using a Twilio API. For cat food the amount dispensed is based on the rotation of DC motor and the message is sent once the food is dispensed.

Figure 2.11: Message using the Twilio API

Based on the figure 2.9 above, for pets that are successfully fed, a message will be sent via the Twilio API.

Figure 2.12: Product after food dispense

The project is to feed two pets of different species. However, This Design is implemented to feed one or more than one pet of either same or different species. The product and design can be altered depending on the necessity for one or more pets. This design of pet feeder provides few other features which will be more convenient for both owner and pet like The Feed time, Time gap between consecutive feeds, call for pet at feed time and to have control over the quantity of food served.

2.4 Comparison

This comparison is to analyze the difference and functionality. The aspect that will be considered included method, operation and scope. The table below shows the comparison with details.

Title	Scope	Operation	Method
The Petsafe 5 Meals Pet Feeder	Use the digital clock to schedule each meal.	Easy	Using only four D batteries.
Pet Food Autofeeder using Arduino	Arduino is used as the microcontroller to control the mechanism and there are rotational to linear motion to feeding the pets.	Complex	Using rotational motion Mechanism to feed the pets.
Arduino MEGA based PET Feeding Automation	Set the quantity of food to be given to the pets on the smartphone application then, the signal will be sent to the food production gate.	Complex	Feed the pets according to the time and date that has been determined using module ds3231 RTC (real time clock).
Certain Investigations on Automatic Feeding of Domestic Pets	The microcontrollers will immediately turn ON when pet's food comes under IR sensor and this process will continue until the IR level is over.	Complex	IR sensor continuously monitors the food level in the blow, when the food cross pre-set limit then IR sensor sends the signal to the microcontroller immediately.

Automatic Pet Food Dispenser using Digital Image Processing	It controlled by tracking the animal using a camera and Raspberry Pi	Complex	Uses Convolution Neural Network techniques to perform pet detection and identification before feeding the pet.

Table 2.1: Comparison from Related Project

2.5 Summary

In this chapter are about for the past research paper that related to this project. Every scope, method and operation are discussed and summarize. Some are using IoT but the technique not suitable to use. Every type of pet feeder and water fountain have its own method. In this chapter also discuss a pet feeding using a different material.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, all progress, techniques and methodology that carried out during the development of this project will be explain by me. This chapter also will overview the operation of work, followed by explanation for hardware and software. Lastly, this chapter also will list the part of component that used in this project.

.

3.2 Methodology

The general flowchart of this project is shown in figure 3.2. First of all, a literature review of the article was made where the previous articles related to pet food feeders and water fountains as well as the methods used. Based on the studies that have been done, most of the pet feeders are not very systematic and the components used are also complicated to plan. According to past survey articles, the project uses the Internet of Things (IoT) to ensure it is easy to plan for users. Therefore, this project system uses the Nodemcu ESP8266 microcontroller as it is built with WiFi and Bluetooth. In the design of this system there are two parts namely software and hardware development. In software development, this consists of food and water level detection programming and ESP8266 connected to the blynk application. To complete the project, hardware development should be done by installing all the components and planning the project properly where both hardware and software should be run simultaneously. If there are errors in the project, a process of testing and

troubleshooting will be done immediately to ensure all systems are working again. And lastly, the data will be analyzed from the data collected after everything is completed and successful.

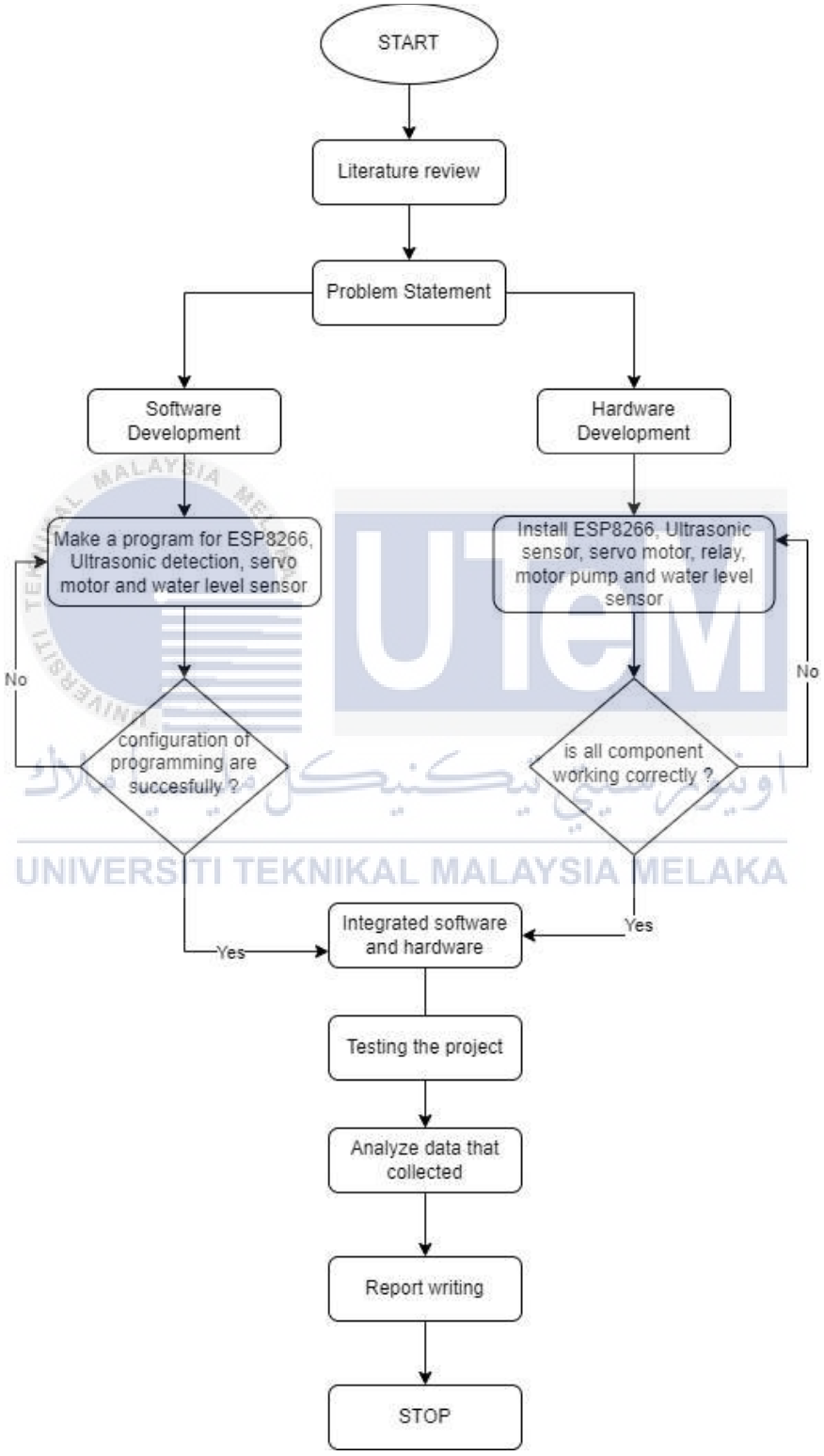

Figure 3.1: General flowchart

3.3 Process Flow of Automatic Pet Feeder

Based on the flowchart in figure 3.3 below, first of all, [8] ultrasonic sensor connected to the ESP8266. Function of ultrasonic sensor is to detect the level of food if food tank is empty and give the data to the ESP8266. And ESP8266 will check either the food in the tank was low or not. If not, it will continue the rotation of the process. If yes which is the food level is low (ultrasonic sensor detect the distance is more than 15cm), the ESP8266 will provide output to Wi-Fi that already connected to the Blynk and the Blynk will receive the warning notification which is “Hey, Please Refill My Food”. Then, the food needs to be filled immediately[9]. And the servo motor will release the food for 2 seconds according to the time that have been set which is 6am, 1pm and 6pm.

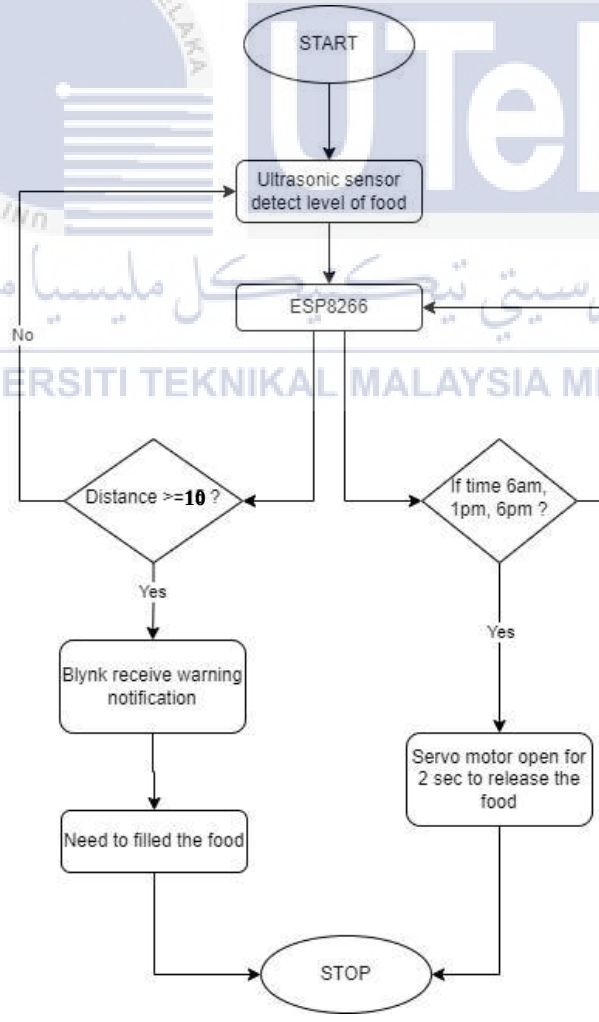

Figure 3.2: Flowchart of automatic pet feeder

3.4 Process Flow of Water Fountain

For the process flow of the water fountain in figure 3.4 below, [10] the ultrasonic sensor as an input is connected to the ESP8266. The function of the ultrasonic sensor is to detect the water level in main storage tank whether low or high and provide the data to the ESP8266 and also can monitor it through blynk. Then, the water level sensor will detect the water on the container if sufficient or not. If sufficient, it will continue the process rotation. If the water level is insufficient which is <=300, the ESP8266 will provide output to the Wi-Fi that already connected to the Blynk and the motor pump will automatically fill up the water to the height that already set. Lastly, the relay will cut off the motor after the water reaches the correct level.

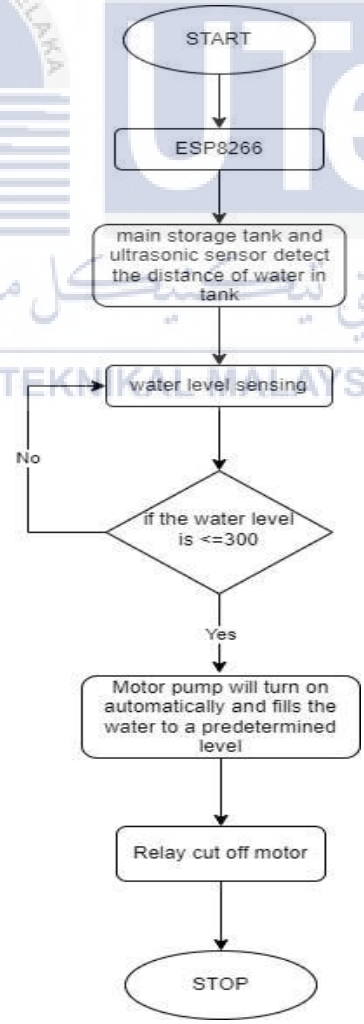

Figure 3.3: Flowchart of water fountain

3.5 Gantt Chart

Gantt chart is a very important management. This is because it shows the overview process of project. It useful to keep task on track based on timeline and deadlines.

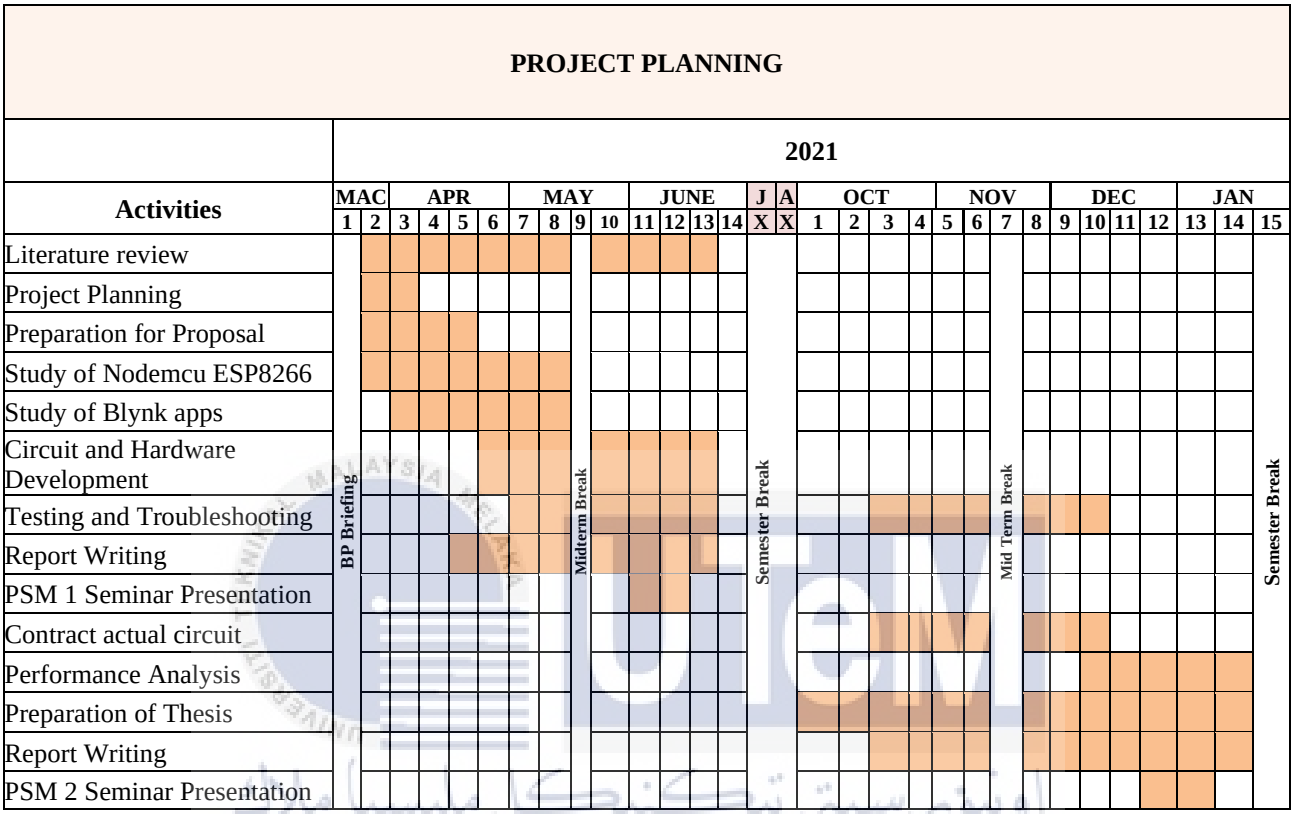

Figure 3.4: Gantt Chart BDP 1 & 2

Figure 3.5, for the BDP 1 that shows the flow progress of this project. In week 1-2, I need to prepare about the proposal. Then, study of NodeMCU ESP8266 and Blynk apps that have to understand because this project using this two main equipment. After that, circuit and hardware development where I need to show the design circuit diagram and flow connection of this project and testing or troubleshooting if any error occurred. Then, complete the report that needs to be submitted to the supervisor according to the date that has been notified. Lastly, I need to make a presentation to the panel.

For the BDP 2, this is the Gantt chart for this semester. Basically, for this semester, I need to make some additional information and testing or troubleshooting if any error occurred. Then, I have to contract actual circuit and the data will be collected and analyze in better performance, once the project is successfully.

3.6 System Requirement

Automatic pet feeder and water fountain require both software and hardware usage. Both requirements are listed as shown in the tables below:

3.6.1 Software Requirement

In this project, that is software implementation is a explanation of the software that was used to develop this project system successfully. Arduino IDE software are chosen since the microcontroller in this project is nodemcu ESP8266 and Blynk application as an IoT criteria. Arduino IDE software acts as a medium communication between the ESP8266 module and serial monitor. This software can be used with any board. Then, proteus and tinkercad software is to design the circuit of this project and run the simulation.

3.6.1.1 Arduino IDE

In this project, nodemcu ESP8266 will use Arduino IDE software which is easy to write the code of the project and upload to the board. Then, in this project, it run the program of ultrasonic sensor where need to detect the food and water level in the container and make a signal when food and water tank are empty where it can see the distance that already set in Blynk application. This figure below show the coding of arduino for this project.

Figure 3.5: Coding

Table 3.1: Software Requirement

No.	Software	Description
1.	Microsoft Office Word 2016	Platform for writing project reports and drawing each diagram.
2.	Microsoft Office Power Point 2016	Platform for BDP presentation.
3.	Google Chrome	Make a research about project using Google Chrome browser.
4.	Arduino IDE	Platform to code the IoT components connection.
6.	Proteus and Tinkercad	To design a PCB design, circuit design and simulation.

Table 3.2: Hardware Requirements

No.	Hardware	Description
1.	Smartphone	Platform to monitors the feeding via the Blynk application.
2.	Food dispenser	Store food for feeding pet.
3.	Nodemcu ESP8266	Microcontroller which it can connect to the Blynk apps using WIFI.
4.	DC Servo motor	To open the lid of food and will be dropped the pet's food into the bowl.
5.	Ultrasonic sensor	Sensors used to detect the distance food and water level in main storage tank.
6.	Motor pump	Pumping water into the tank reach to upper level.
7.	Small Submersible Water Pump	It is used to make a small water fountain.
8.	Relay	To cut off the motor pump when the water level reach to upper level.
9.	Water level sensor	To detect the water level in container is sufficient or not.

3.7 Main Component

3.7.1 Nodemcu ESP8266

Figure 3.6: Nodemcu ESP8266 [13]

For this project, nodemcu ESP8266 is chosen to been used because it was open source microcontroller and specially it targeted for IoT based application shown in figure 3.10. Nodemcu has 128kb RAM and 4Mb of flash memory, to store the data and programs.

Parameter	Specification
Microcontroller	Tensilica 32-bit RISC CPU Xtensa LX106
Operating voltage	3.3v
Input voltage	7-12v
Digital I/O pins	16
Analog input pins	1
UARTs	1
SPls	1
12Cs	1
Flash memory	4 MB
SRAM	64 KB
Clock speed	80 MHz

Table 3.4: Nodemcu ESP8266 specification

3.7.2 Relay

Figure 3.7: Relay [14]

Relay is an automatic switch that connects to the motor pump. It is work by adjusting the rotation of the magnet to connect or disconnect the electric current automatically. In this project, relay will cut off motor when the water level filled until it reaches the set height.

3.7.3 DC Servo Motor

Figure 3.8: DC servo motor

DC servo motor is used to open the feed cover where the servo motor is running, the motor rotates a propeller located on the cutlery, which drops the pet's food into the feeding bowl. Majority this motor acts as an output for IoT project.

3.7.4 Ultrasonic Sensor

Figure 3.9: Ultrasonic sensor [15]

Ultrasonic sensors work to detect the food and water level in tanks if empty. It uses ultrasonic sound waves to calculate the distance to the target object and then the reflected sound converts it into an electrical signal. The distance for the sensor to detect the food and water level if it exceeds 15cm and 4cm.

3.7.5 Water Level Sensor

Figure 3.10: Water level sensor [17]

The water level sensor is a device that measures the water level in a fixed container that is too high or too low. For this project, water level sensor will detect the water on the container wheather sufficient or not. If insufficient which is the water level is <=300, motor pump will automatically On.

3.7.6 Power Supply Module

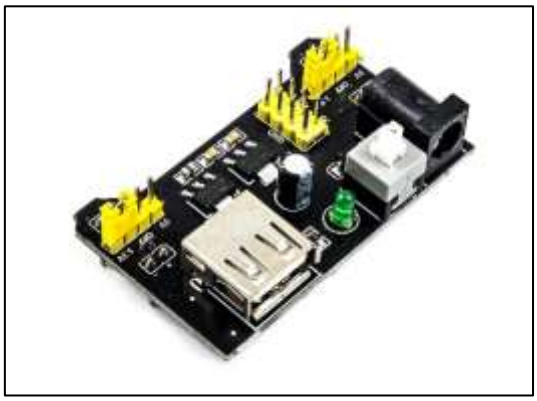

Figure 3.11: Power Supply Module [16]

The power supply module is the power house that energizes the PLC to carry out its function. The power supply module converts the input source power into signal level voltage used by the PLC processor and other modules.

3.7.7 Small Submersible Water Pump

Figure 3.12: Small Submersible Water Pump [18]

A mini submersible pump is a smaller version of the submersible water pumps which is lightweight and small size. A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy. This is done by the water being pulled into the pump. It is used to make a small water fountain for this project.

3.7.8 Pump Motor

Figure 3.12: Pump Motor [19]

In this project, pump motors are used to take the water from low pressure to high pressure levels. It works where the sensor detects a lack of water, the pump motor will turn on and remove water from the tank by itself and then the water is filled until it reaches the set height.

3.8 Blynk Application

Figure 3.13: Blynk application [20]

Blynk is a platform which design for IoT and alcon can control hardware remotely. In this application, a digital dashboard where may create a graphic interface based on the project. It also can display sensor data, store data,vizualize it and others. Three major component in this platform that very important which is Blynk App, Blynk Server and Blynk

Libraries. Since this project about IoT, blynk server is responsible to communicated between hardware and mobile phone.

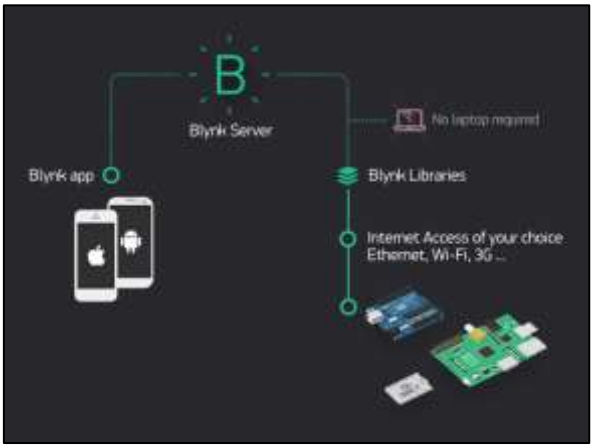

Figure 3.14: The connection from hardware to mobile phone

The connection to the cloud can using the Wi-Fi, Bluetooth and (BLE) Bluetooth Low Energy, Ethernet, USB (serial), GSM and so on.

3.9 Tinkercad

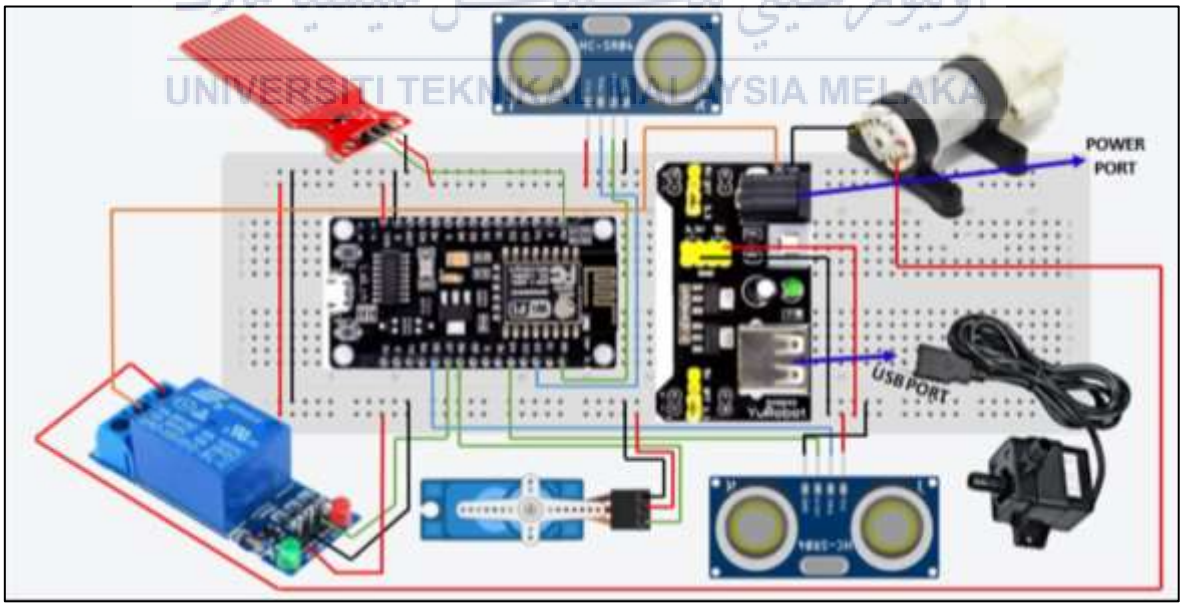

Figure 3.15: Circuit diagram [21]

Based on the diagram above, this is the relationship between the IoT components that will be used in this system. The IoT components used in this system are NodeMCU ESP8266, DC servo motor, Ultrasonic sensor, relay, water level sensor, small submersible water pump and motor pump. First of all, there are three part which is input, output and controller. For the input part, it consists of an ultrasonic sensor water level sensor. Ultrasonic sensor is connected to the NodeMCU ESP8266. Ultrasonic sensor will detect if the food and water level on main storage tank does not reach the predetermined height, in other words the food and water tank is empty. Water level sensor is to detect the water level on container is sufficient or not. For the output part, the connections are DC servo motor, motor pump, and relay. When the food level is insufficient which is the food tank is empty. Then, the servo motor will open the food lid to release the food into the bowl. If the water level sensor detects <=300, motor pump will automatically fill up the water to the level that already set. Then, once the filled water reaches a sufficient level, the relay will be cut off the motor when the water level reach to the upper level.

3.10 Summary

In this chapter, the system of this project are already being discussed. The flowchart shows all the process of automatic pet feeder and water fountain is clearly and of course easy to undersatand. Then, part of hardware is important to ensure that this is project are working succesfully. Next, the part of software also importatnt for this project. It is because this platform need to use it correctly to prevent some error occured.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and analysis on the development of automatic pet feeder and water fountain using microprocessor. Then, all the performance and result for this project will be explained in this chapter. The data collected is taken as evidence that shows the objectives for this project have already been achieved.

4.2 Analysis

All the analysis was taken based on the project implementation. The reading based on some requirement which is the timeliness that has been set for the servo motor to function and the pressure of length tube.

4.3 Software Result

4.3.1 Development of Blynk Application

In this project, the Blynk application also plays an important role where it can be used by simply downloading in any smartphone. Blynk is an application used as an interface to display the output of a project. In the blynk interface it has RTC, value display, V level and notification. This project uses RTC to display time and date according to current time. It also uses a 24 -hour system. Then, the Blynk app can also find out the quantity of food and water is sufficient or not by displaying the set distance. In addition, the Blynk apps will receive the warning notification when the food is empty and need to be refilled

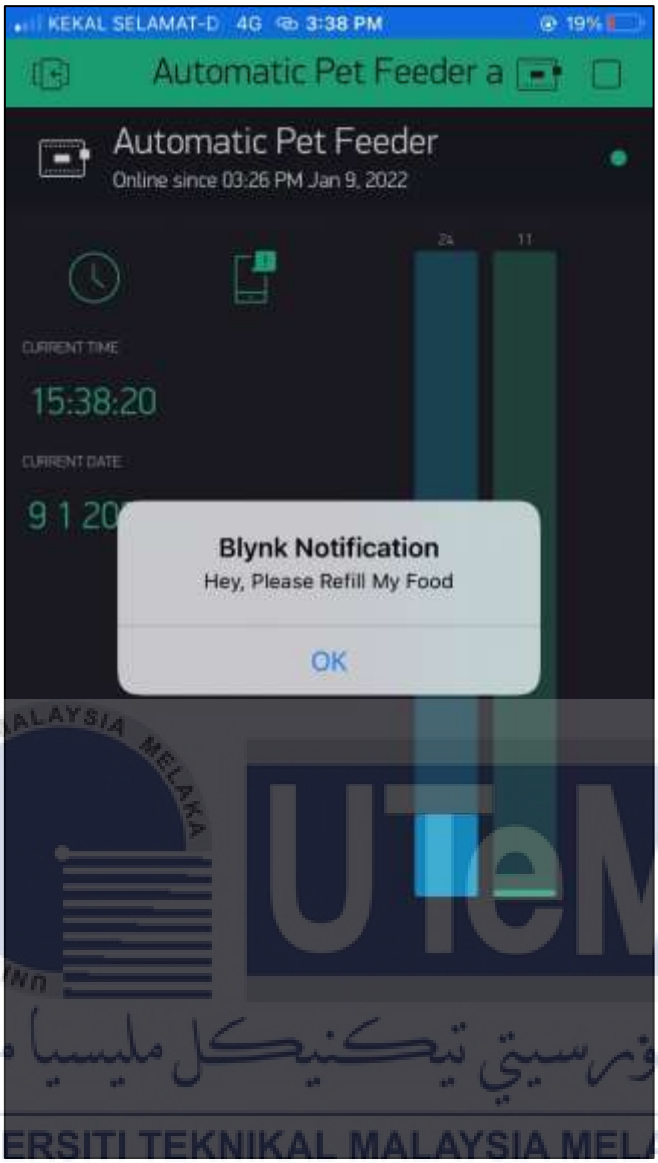

Figure 4.1 Blynk application

Based on figure above, the blynk apps shows the time and date according to the current time which is 15:38:20 and 9/1/2022. And it shows ultrasonic sensor detecting the level of food in main storage tank is 11cm and 24cm for level of water. Then, its also shows the warning notification which is “Hey, Please Refill My Food” where the food is empty and need to be refill where the food level has been set should not exceed 10cm because it indicates that the food is only a little left.

Figure 4.2 Blynk application

Based on figure above, the blynk apps shows the time and date according to the current time which is 4:9:51am and 11/1/2022. Then, both Level V shows the distance of the ultrasonic sensor detecting the level of food and water in the main storage tank where 15cm represents the distance of the sensor detecting the level of food while 9cm is the distance of the sensor detecting the level of water. The last one is warning notification which is “Hey, Please Refill My Food” where the food is empty and need to be refill.

4.3.2 Development of Arduino IDE

In this project, the Arduino IDE will be used as an open source software implementation. To get an output, it is necessary to write coding using C and C ++ programming languages. As mentioned in chapter 3, this project uses Nodemcu ESP8266 as a microcontroller where it works as WIFI. So with the right coding, continue to upload to the Nodemcu ESP8266 to get the output as planned at the beginning of the project was made.

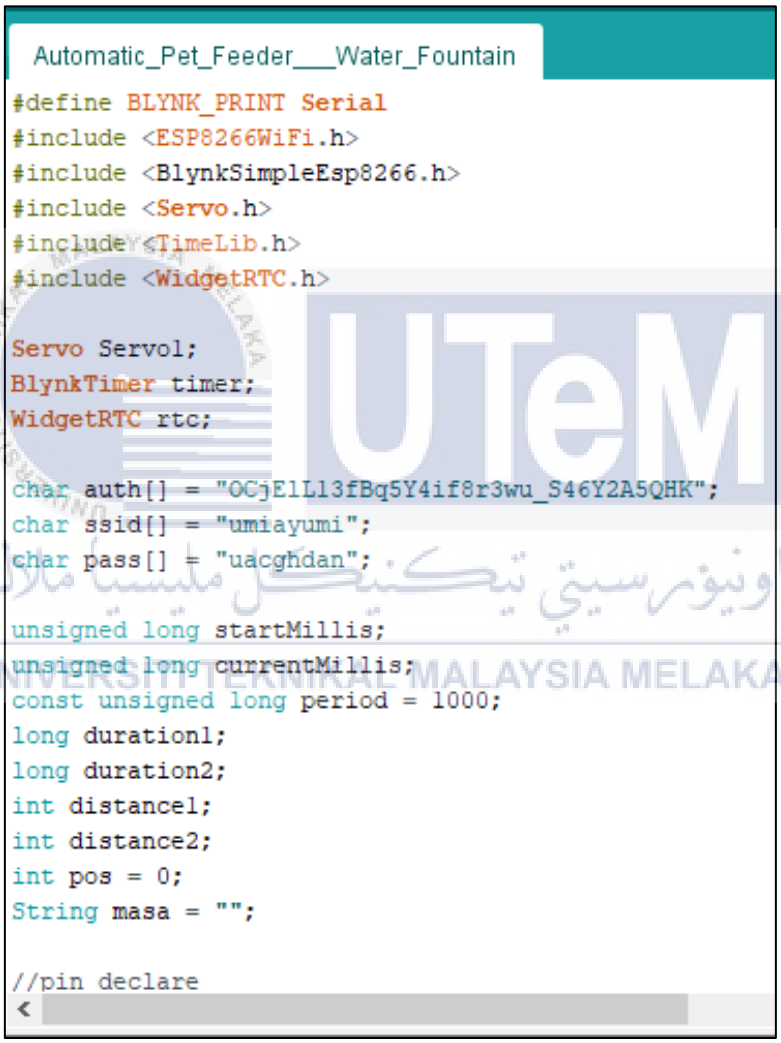

Figure 4.3 Coding of the project

4.4 Analysis Result Data

4.4.1 The time taken for the food to be filled

Testing for the time taken for food to be filled into containers is set at 3 times in a day. The food will come out based on the set time which is at 6 am, 1 pm and 6 pm. Then, the servo motor will release the feed where the motor rotates a fan located on the cutlery, which drops the pets's food into the feed bowl. The table showing the time taken for food to be filled in 3 times a day.

Time (24h)	Servo Motor
0600	Accurate
1300	Accurate
1800	Accurate
0200	Accurate
0330	Accurate

The table shows measured to identify the servo motor. Analysis of this data to determine the accuracy of servo motor functioning according to a predetermined time. Based on the schedule, the time taken is 3 times a day. The time taken is at 6am, 1pm and 6pm and the food is served on time. With such time, it will help the pet to keep his diet more balanced and controlled.

4.4.2 Pressure of Length Tube

Testing at 3000ml water level which is the maximum level for a bottle filled with water. The time taken to measure the water level in minutes is taken based on the modified

suction length of the tube. The graph below shows the time taken to measure the level of water sucked. For the purpose of this test, the total capacity of the bottle is 3000ml.

Sample Number	Length of Tube (mm)	Time taken to Measure Water Level (min)
1	500	3.08
2	1000	5.11
3	1500	7.18

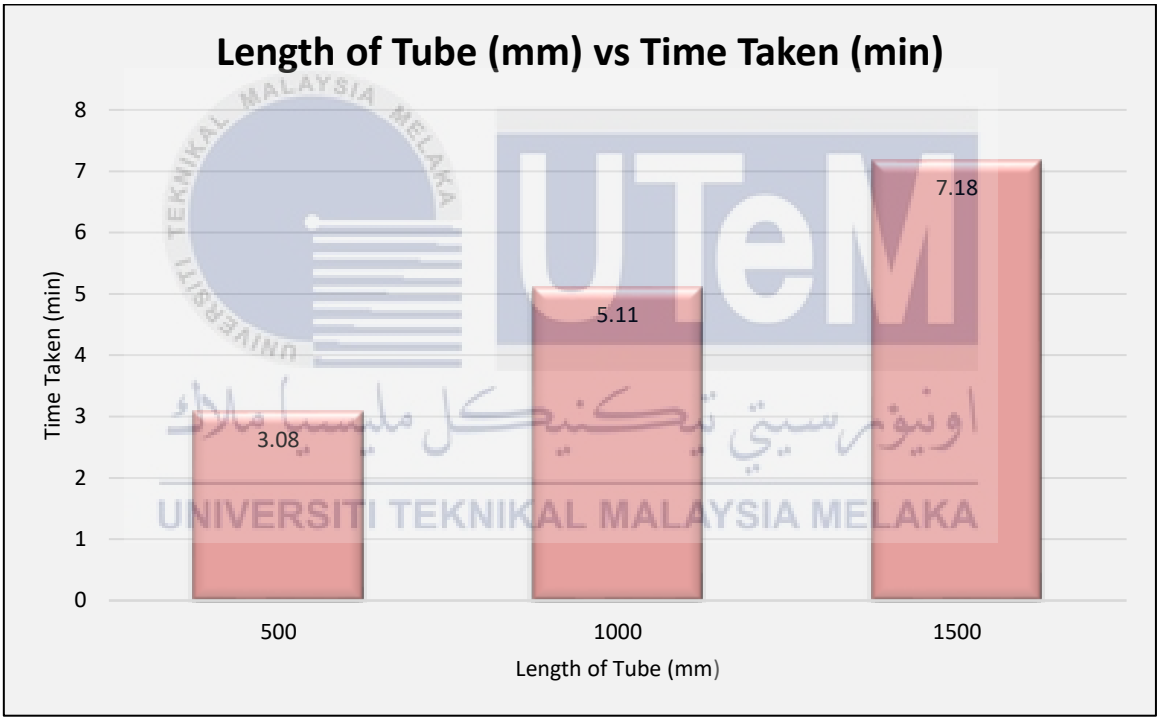

Figure 4.4 Graph of Time taken to Measure Water Level

Based on the graph above, it shows that if the length of the tube increases, then the time taken for the water level to reach its maximum level will also increase. To ensure the accuracy of the time taken to measure the water level reaches the maximum level is where the data taken for each sample is 2 to 3 times. For sample 1, the time recorded to fill the water container with a maximum value of 3000ml is 3.08 min for a tube length of 500mm

which is the fastest time. As a result, the pressure for a tube length of 1500 mm is decrease. So, to compress the container to start pumping it needs more load. Therefore, using a tube of appropriate size and high pressure will produce a better suction.

4.5 Result

Figure 4.5 Pet Feeder and Water Fountain Prototype

Figure 4.6 Pet Feeder and Water Fountain Prototype

Figure 4.7 Pet Feeder and Water Fountain Prototype

As a result, the automatic pet feeder and water fountain were successfully completed as planned. The project managed to collect all the data predicted at the beginning of the project started. The project was successful when ultrasonic sensors were able to detect

distances when food and water were running low and needed to be filled. Then, the food is also served to the set time according to control the pet's nutritional diet in the right way.

4.6 Summary

This chapter presented to demonstrate applicability of the proposed system automatic pet feeder and water fountain using microprocessor. Based on data analysis and results, it was successfully where everything works well by using the right program. And for the hardware, the components worked well and the prototype was also designed as planned at the beginning of the project.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, there are four chapters in this report. First of all is Chapter 1 which details the introduction of pet feeders and water fountain and a statement of the problems that will be encountered in this project are also stated. In addition, the objective of this project where it can overcome the problem statement and then the project scope is also specified in this chapter. Then, chapter 2 introduces a review of the literature. This literature review aims to review and make improvements to my project. It consists of journals, articles, and books which are related to my project of pet feeders and water fountains. Next, chapter 3 shows the overall methodology of the project which includes the process flow chart, the components that will be used on this project. Then the project schedule is also made for the process to complete this project. Finally, analysis data and results have been shown in Chapter 4 which is the result for the software and hardware. All the data been taken need to analysis to make sure the project achieve the objective of the project that is to design automatic pet feeder and water fountain using microprocessor. Then, establish to develop the automatic pet feeder and water fountain that are able to automate process and remotely monitor. Last but not least, this project is to develop of automatic pet feeder and water fountain that able to feed the pets automatically using microprocessor. Then, this project is to innovate the existing food dispenser product and water fountain for pets to be of better quality and operate automatically. Blynk application is a platform that use in this project to display the data and monitor the feeding times of pets. With this project, it helps consumers out there who keep pets to monitor their feeding time more regularly. In addition, using the

Blynk app can also help users to know the quantity of food and water. This project is specially designed for anyone who has a pet that needs their pet's nutrition to be monitored well without any problems and makes it easy for users to monitor remotely. Furthermore, the presence of ultrasonic sensors makes it easier for consumers to know the quantity of food and water through smartphones only.

5.2 Future Works

The future direction of taking care of pets is not that easy and it takes a lot of commitment. Where it consists of taking care of them by showing concern for them and feeding on time in the right way on a daily basic. As we all know, not everyone knows how to manage pet nutrition properly. So, with this project, it can help consumers out there and everything will be easy. Then, if we are going to pursue our project in the future, better physical design should be the first thing for use to consider and we need to improve our physical design in a more aesthetic way to attract customers.

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APPENDICES

Appendix 1: The Coding of the project

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>                    /* Enable the use of wifi module. Make sure you downloaded and installed the ESP8266 library*/
#include <BlynkSimpleEsp8266.h>             /* Code for talking with Blynk*/
#include <Servo.h>
#include <TimeLib.h>                        /* Program code related to Real Time Clock (RTC). */
#include <WidgetRTC.h>                      /* Communication code with Blynk Real Time Clock Widget */

Servo Servo1;
BlynkTimer timer;                           /* Define parameter for Blynk Timer */
WidgetRTC rtc;                              /* Define parameter for RTC Widget */

char auth[] = "OCjElL13fBq5Y4if8r3wu_S46Y2A5QHK";      // Put in the Auth Token for the project from Blynk. You should receive it in your email.
char ssid[] = "umiayumi";                   // Key in your wifi name. You can check with your smart phone for your wifi name
char pass[] = "uacghdan";                   // Key in your wifi password.

unsigned long startMillis;                  /* start counting time for display refresh*/
unsigned long currentMillis;                /* current counting time for display refresh */
const unsigned long period = 500;           // refresh every X seconds (in seconds) Default 60000 = 1 minute
long duration1;                             // variable for the duration of sound wave travel
long duration2;
int distance1;                              // variable for the distance measurement
int distance2;
int pos = 0;
String masa = "";
int status_pos = 1;
int status_refill = 1;

//pin declare
uint8_t echo1 = 16;  //D0
uint8_t echo2 = 14;  //D4
uint8_t trig1 = 4;  //D2
uint8_t trig2 = 15;  //D8
uint8_t waterlvl = A0;
uint8_t servoPin = 12;  //D6                // Declare the Servo pin
uint8_t relay_pump = 13; // GPIO13 D7

int waterval = 0;
```

```
BLYNK_CONNECTED() {                              /* When Blynk server is connected,
initiate Real Time Clock function */
  rtc.begin();
}

void setup() {
  Serial.begin(9600);                          // Serial Communication is starting with 9600 of
baudrate speed
  Servo1.attach(servoPin);                     // We need to attach the servo to the used pin
number
  Servo1.write(180);
  //ervo1.writeMicroseconds(0);  // set servo to mid-point
  //Servo1.write(0);
  pinMode(relay_pump, OUTPUT);
  //pinMode(led, OUTPUT);
  //pinMode(buzzer, OUTPUT);
  pinMode(trig1, OUTPUT);
  pinMode(trig2, OUTPUT);                      // Sets the trigPin as an OUTPUT
  pinMode(echo1, INPUT);
  pinMode(echo2, INPUT);                       // Sets the echoPin as an INPUT
  pinMode(waterlvl, INPUT);
  //Serial.println("Ultrasonic Sensor HC-SR04 Test");      // print some text in Serial Monitor
  //Serial.println("with Arduino UNO R3");                 /* Initiate the Serial Monitor
function */
  /* Declare the Output Pin D4 (GPIO 2) as an output pin for LED Light*/
  setSyncInterval(1);                          /* Synchronise or read time from the Blynk
Server every 1 second */
  Blynk.begin(auth, ssid, pass);               /* Initiate the Blynk server login for the
specific project*/
  while (Blynk.connect() == false ) {}         /* If the Blynk Server not yet
connected to nodeMCU, keep waiting here */
  setSyncInterval(10 * 60);                    /* After successful login, change
Synchornise Time reading for every 10 minute (Do not need to always check for the time)*/
  startMillis = millis();                      /* Start record initial time for display refresh
*/

}

void loop() {
  Blynk.run();                                 /* allow the communication between
Blynk server and Node MCU*/
  timer.run();                                 /* allow the Blynk timer to keep
counting */

  currentMillis = millis();                    /* Keep counting time for display
refresh */
  if (currentMillis - startMillis > period) {  /* For every 1 second, run
the set of code*/
```

```
    String currentTime = String(hour()) + ":" + minute() + ":" + second();        /* Define
"currentTime" by combining hour, minute and second */
    String currentDate = String(day()) + " " + month() + " " + year();           /* Define
"currentDate" by combining day, month, and year */
    masa = String(hour()) + "" + minute() + "" + second();
    Serial.print("Current time: ");                                    /* Display values on Serial
Monitor */
    Serial.print(currentTime);
    Serial.print(" ");
    Serial.print(currentDate);
    Serial.print(" ");
    Serial.print(masa);
    Serial.println();

    Blynk.virtualWrite(V1, currentTime);                              /* Send Time parameters
to Virtual Pin V1 on Blynk App */
    Blynk.virtualWrite(V2, currentDate);                              /* Send Date parameters to
Virtual Pin V2 on Blynk App */

    startMillis = millis();                                           /* Reset time for the next counting
cycle */
  }

  waterval = analogRead(waterlvl);
  Serial.print("Waterlvl = ");
  Serial.println(waterval);
  if (masa == "41013" || masa == "41213" || masa == "41513" ) { //food
    Servo1.write(0); //tell servo to go to position in variable 'pos'
    delay(1000);
    Servo1.write(180); // tell servo to go to position in variable 'pos'
    delay(1000);
  }
  measure();

  if (waterval <= 300 ) { //waterlvl
    digitalWrite(relay_pump, HIGH);
  }
  else {
    digitalWrite(relay_pump, LOW);
  }

  if (distance2 >= 10 ) {
    //digitalWrite(led, HIGH);
    if (status_refill == 1) {
      status_refill = 0;
      Blynk.notify("Hey, Please Refill My Food");
    }
    else {
      status_refill = 1;
    }
```

```
  }
  else {
    //digitalWrite(led, LOW);
  }
}
void measure() {
  digitalWrite(trig1, LOW);
  delayMicroseconds(2);
  digitalWrite(trig1, HIGH);
  delayMicroseconds(10);
  digitalWrite(trig1, LOW);
  duration1 = pulseIn(echo1, HIGH);
  distance1 = duration1 * 0.034 / 2;

  digitalWrite(trig2, LOW);
  delayMicroseconds(2);
  digitalWrite(trig2, HIGH);
  delayMicroseconds(10);
  digitalWrite(trig2, LOW);
  duration2 = pulseIn(echo2, HIGH);
  distance2 = duration2 * 0.034 / 2; // Speed of sound wave divided by 2 (go and back)

  Serial.print("Distance_1: ");
  Serial.print(distance1);
  Serial.println(" cm");
  Serial.print("Distance_2: ");
  Serial.print(distance2);
  Serial.println(" cm");

  Blynk.virtualWrite(V3, distance1);
  Blynk.virtualWrite(V4, distance2);
  return;
}
```