PROJECT PROPOSAL

MOBILE AUTOMATIC WATERING MACHINE

APHINAN APHIWONG

STUDENT ID 6231501076

BACHELOR OF ENGINEERING

COMPUTER ENGINEERING

SCHOOL OF INFORMATION TECHNOLOGY

MAE FAH LUANG UNIVERSITY

MOBILE AUTOMATIC WATERING MACHINE

APHINAN APHIWONG

THIS COMPUTER ENGINEERING PROJECT HAS BEEN APPROVED

TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF BACHELOR OF ENGINEERING

MAJOR OF COMPUTER ENGINEERING

EXAMINING COMMITTEE

…….. ADVISOR

(Assistant Professor Dr. Suppakarn Chansareewittaya)

…….. COMMITTEE

(Dr. Mahamah Sebakor)

…….. COMMITTEE

(Ronnachai Sretawat Na Ayutaya)

ACKNOWLEDGEMENT

This project will not be successful without the kind support of the advisor, committees and all supporters. We would like to thank everyone for their advice and help. We are also grateful to everyone for their continuous encouragement throughout this project. This accomplishment would not have been possible without them. Thank you.

Aphinan Aphiwong

Title	Mobile Automatic Watering Machine	
Author	Aphinan Aphaiwong	
Degree	Bachelor of Engineering	
	(Computer Engineering)	
Supervisory Committee	Assistant Professor Dr. Suppakarn Chansareewittaya	Advisor
	Aj. Dr. Mahamah Sebakor	Committee
	Aj. Ronnachai Sretawat Na Ayutaya	Committee

ABSTRACT

This project is a part of the Computer Engineering Pre-Project course. Mobile automatic watering machine. The project organizers have a desire to bring the knowledge that has been studied and developed to be useful and can be used in practice according to the intended purpose. It is a collaboration of both sides, namely Hardware, through a watering machine and web applications through a mobile order.

Keyword : watering, web app

LIST OF CONTENTS

CHAPTER 1
INTRODUCTION

1.1 Background and Rationale

In the past, watering plants required manual labor. If there is a large area, a lot of people or machines are needed. Or in the case of watering plants that we planted by ourselves in a house or dormitory with a small planting area and sometimes we forgot to water it.

Successful farming is influenced by a number of factors. Physical factors, socioeconomic factors including biological factors. One of them is the amount of watering. If that area has the right light, temperature, humidity and amount of watering, plants can grow too.

The Mobile Automatic Watering Machine was built for measuring soil moisture and calculating the amount of watering and recording it in real time. Therefore, farmers or general households can view current and past statistics and can track crop growth.

1.2 Objective

1.2.1 To make the watering is easier and more convenient

1.2.2 To develop an IoT system for measuring soil moisture from sensors and storing data to make statistics

1.2.3 Use the collected data to calculate and tracking the growth of plants

1.3 Scope

1.3.1 The system can measuring soil moisture from sensors

1.3.2 The system can store data and make statistics of soil moisture and amount of watering

1.3.3 Users can view statistics of soil moisture, amount of water and tracking growth of plants from the application in present and for 1 month

1.4 Methodology

1.4.1 Preparation and project design

1.4.2 Literature review and requirement gathering

1.4.3 Building hardware devices and application

1.4.4 Testing the devices

1.4.5 System analysis

1.4.6 Pre-Project document presentation

1.4.7 System development

1.4.8 Testing the devices and system analysis

1.4.9 Project presentation

The concept of Mobile Automatic Watering Machine is shown in Figure 1.1

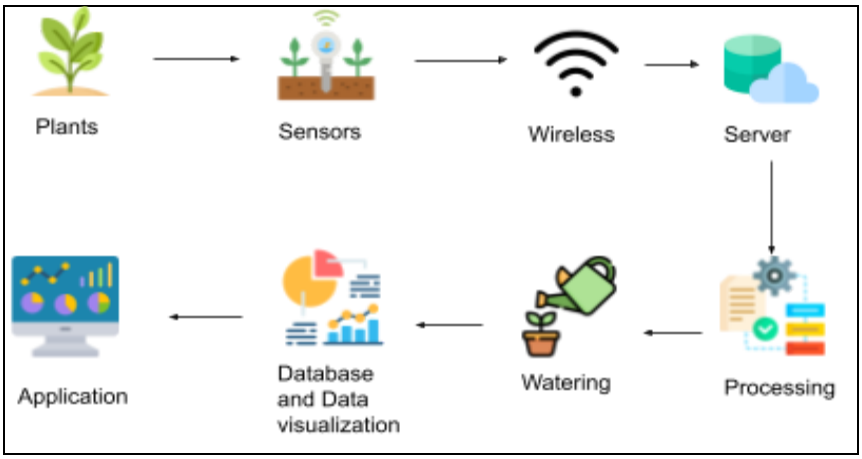


Figure 1.1 Concept diagram of Mobile Automatic Watering Machine

1.5 Plan

Table 1.1 Working plan

	Pre-Project					Project				
Plan / Month	Jan	Feb	Mar	Apr	May	Aug	Sep	Oct	Nov	Dec
Preparation and project design										
Literature review and requirement gathering										
Building hardware devices and application										
Testing the devices										
System analysis										

Pre-Project document presentation										
System development										
Check and solve problem										
Documentation / Report										
Final Project presentation										

1.6 Expected Result

1.6.1 The system is work done, practical and efficient

1.6.2 The system can accurately measuring soil moisture

1.6.3 The system can show statistics of soil moisture, amount of watering in both current and historical for 1 month

1.6.4 The system can facilitate the farmers or general households to be guide the care of plants

1.7 Resources

1.7.1 Equipments

1.7.1.1 Hardware

- Soil moisture sensor
- ESP 32
- LED

- Springer
- Pump
- Pipe
- Jump wire
- Camera
- Mini solar cell

1.7.1.2 Software

- Arduino IDE
- Blynk
- TinkerCad

1.7.2 Place

- Garden
- Farm
- Greenhouse

1.7.3 Budget

- Motor 220V (1,250 THB)
- Pump 370W (1,250 THB)

1.7.4 Equipments for trial size

- ESP32 dev kit v1
- OptoCoupler Relay Module 1CH 5V
- Micro submersible water pump DC 3V-5V
- Durable Silicone tube 8*10mm (1 meter)
- 4xAA battery holder
- Panasonic alkaline battery AA
- Jumper wires

CHAPTER 2
LITERATURE REVIEW AND RESEARCH
INFORMATION ON THE EQUIPMENT USED IN THE PROJECT

2.1 Related Theory

The concepts and theories for conducting this research are derived from the economic area in Chiang Rai province, which is the agricultural area where a large number of plantations are grown. Plant cultivation requires the use of watering with a traditional watering can because there is no electricity in the vegetable plot area, it causes difficulties.

In plantations cultivation, The producer has foreseen the problem and has studied, analyzed and designed and invented a watering control system. from the theory and related research.

2.2 Related Research

(Eakalak Sumonphan and Somkiat Boonroddit, 2011) in the design of watering control. found that if the ground The wetness value is lower than the specified humidity sensor. The humidity sensor is activated by transmitting the detected soil moisture value from the sensor tip. to the control circuit, then the control circuit activates the water pump. by supplying electricity to the pump The suction water is sent to the sprinkler head to spray the water out as a mist. water the plants we want When there is a volume of water that flows into the ground causing the ground to have sufficient humidity to reach the specified value. Sensor will send the humidity value to the control circuit and the control circuit will order the water pump to stop working.

(Suparerk Chaowalittrakul, 2017) with research on system design Automatic watering of vegetable plots through a soil moisture sensor And send the data signal back to the receiver

wirelessly by using a microcontroller to control the work by installing the sensor in the mock-up area for measurement. Soil moisture, Then send the measurement value through the module. Wireless communication in the 2.4 GHz frequency to the main microcontroller to process whether water Should water be supplied or not and control the water supply system.

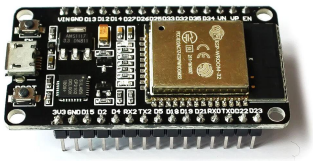
2.3 Related Work

Automatic watering system Controlled by the application is provided by the Arduino program. which is a program intended for programming to enter data into the circuit board, and temperature sensors are also introduced ,Measure the temperature for watering when the temperature is higher than the set temperature.Value Control light intensity which creates water system, then take the data that transmits data through the cloud and can display information on smartphones via the Internet to help To control the temperature and humidity values of Various environments within the house control system Cultivated to increase yields where the temperature and humidity inside the system control of the greenhouse will be at an appropriate interval to provide smart farm administration The simulation is automated and efficient.Filter the water to reuse the used water again and to Save water in water circulation It is better to reuse the old.

2.4 Related Technology for trial size

2.4.1. Hardware

2.4.1.1 ESP32 dev kit v1



Specifications - ESP32 DEVKIT V1 DOIT	
Number of cores	2 (Dual core)
Wi-Fi	2.4 GHz up to 150 Mbit/s
Bluetooth	BLE (Bluetooth Low Energy) and legacy Bluetooth
Architecture	32 bits
Clock frequency	Up to 240 MHz
RAM	512 KB
Pins	30
Peripherals	Capacitive touch, ADCs (analog-to-digital converter), DACs (digital-to-analog converter), I²C (Inter-Integrated Circuit), UART (universal asynchronous receiver/transmitter), CAN 2.0 (Controller Area Network), SPI (Serial Peripheral Interface), I²S (Integrated Inter-IC Sound), RMII (Reduced Media-Independent Interface), PWM (pulse width modulation), and more.

2.4.1.2 OptoCoupler Relay Module 1CH 5V

Relays are always good to have especially for electronics projects. Relay itself offers two main benefits:

- Isolation of low voltage system against high voltage system, example 5VDC and 240VAC
- Allow electronics with low voltage to control high power load, for example from Arduino to AC light bulb.

This is not an ordinary Relay breakout. It comes with 1(single) channel 5V activation relay, ready to control 250VAC at 10A. Extra isolation with opto-coupler at the front end of control, and the activation logic for relay is configurable via a mini jumper. In simple words, the relay can be configured as 5V(High) activation or 0V(Low) activation.

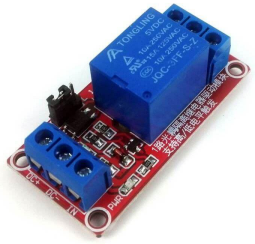
This is a ready breakout board with one (single) 5V activated relay, with 3 screw terminals for the relay (NO, NC, COM) and screw terminals for control signals from microcontrollers such as Arduino. The control signal is opto-isolated, protected. It even comes with an activation LED indicator for the relay.

Easy to use and suitable for beginners, and of course students too. If you need to control AC or high current, high voltage load, this will be the perfect board.

Features:

- 5V 1 channel relay module
- Configurable Activation Logic, High or Low, via mini jumper
- Maximum Current Rating: 10A
- Maximum Voltage Rating: AC 250V
- Can control various appliances with large current and high voltage
- Can be controlled directly by microcontroller such as Arduino, 8051, AVR, PIC, DSP and ARM

- Build in an Opto-Isolator for extra isolation and protection to the controller.
- A power indicator LED, Green
- Comes with an indicator LED

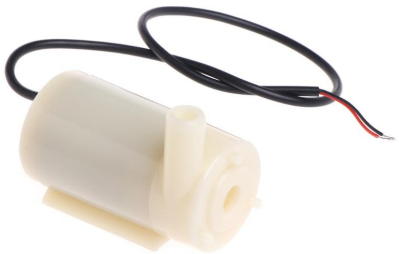


2.4.1.3. Micro submersible water pump DC 3V-5V

This Micro Submersible Water Pump DC 3V-5V, can be easily integrated into your water system project. The water pump works using a water suction method which drains the water through its inlet and releases it through the outlet. You can use the water pump as an exhaust system for your aquarium and a controlled water flow fountain.

Specification:

- Input Voltage: DC 3V-5V
- Flow Rate: 1.2-1.6 L/min
- Operation Temperature: 80 Deg.C
- Operating Current: 0.1-0.2A
- Suction Distance: 0.8 meter (Max)
- Outside diameter of water outlet: 7.5mm
- Inside diameter of water outlet: 5.0 mm
- Diameter of water Inlet : 5.0 mm
- Wire Length: 200 mm
- Size: 45 x 30 x 25 mm
- Weight: 30g



2.4.1.4.Durable Silicone tube 8*10mm (1 meter)

This Durable Silicone Tube 8*10mm (1 Meter) is made of a rubber-like thermoset material, is extremely pliable and elastic and not altered by the effects of weather.

It's also very good at withstanding pressure. It is widely used in pneumatic and water pump applications. This tube is also good to use with the Micro Submersible Water Pump DC 3V-5V and any application that requires an air pump motor.

Features:

- Material: Silicone Tube
- Length: 1 meter
- Color : Transparent
- Size: 8mm x 10mm
- Diameter (inner): 8mm
- Diameter (outer): 10mm
- Thickness: 1.5mm

2.4.1.5.4xAA battery holder

It holds 4 x AA size battery nicely. Here are the batteries that are compatible with it:

- PKCELL Heavy Duty AA Battery (4pcs)
- GP 4 x AA Supercell Battery
- PKCELL Ultra Alkaline AA Battery (4pcs)
- PKCELL NiMH Rechargeable AA 2000mAh Battery (4 Pcs)

Features and specifications:

- Brand new and good quality
- Material: Plastic and metal
- Weight: 15g
- Color: black
- The case can hold 4 x AA batteries (battery is NOT INCLUDED)
- Connection: Series, so the output voltage will be 4 x battery voltage
- Output Voltage = 6.0VDC typical if you are using normal AA
- Output Voltage = 4.8VDC typical if you are using rechargeable NiMH
- Size: 5.7cm x 6.2cm x 1.5cm

2.4.1.6 Panasonic alkaline battery AA

Panasonic alkaline dry battery is the technological development responding to compatibility with currently used digital devices and getting your devices 30% more power compared to the former model of alkaline dry cell.

* Ideal for high power electronic devices such as digital camera, tape/CD/VCD portable player, and etc...

* Certified by industrial standard

* No mercury added

* Voltage : 1.5 v.

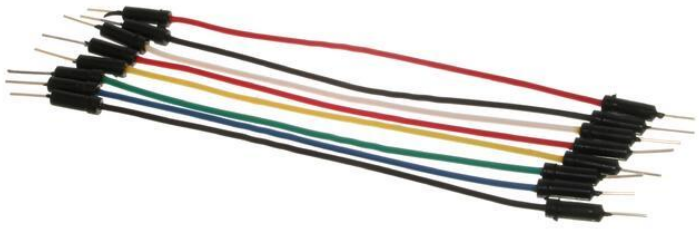
* Size : AA

* Contains : 4 batteries/pack

2.4.1.7 Jumper wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.

Types of Jumper Wires: Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.



2.4.2 Software

2.4.2.1.Arduino IDE 1.8.19

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Writing Sketches

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

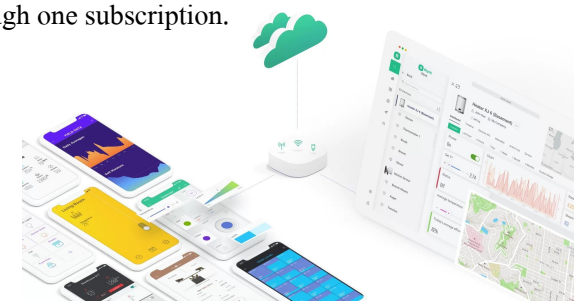
Serial Monitor

This displays serial sent from the Arduino board over USB or serial connector. To send data to the board, enter text and click on the "send" button or press enter. Choose the baud rate from the drop-down menu that matches the rate passed to Serial.begin in your sketch. Note that on Windows, Mac or Linux the board will reset (it will rerun your sketch) when you connect with the serial monitor. Please note that the Serial Monitor does not process control characters; if your sketch needs a complete management of the serial communication with control characters, you can use an external terminal program and connect it to the COM port assigned to your Arduino board.

2.4.2.2 Blynk application (Blynk Iot NEW)

Blynk application is a fully integrated suite of IoT software. Everything you need to build and manage hardware connection: device provisioning, sensor data visualization, remote control with mobile and web applications, Over-The-Air firmware updates, secure cloud, data analytics, user and access management, alerts, automation and much more.

Blynk platform powers low-batch manufacturers of smart home products, complex HVAC systems, agricultural equipment, and everyone in between. You can build branded apps with no code and get the full back-end IoT infrastructure through one subscription.



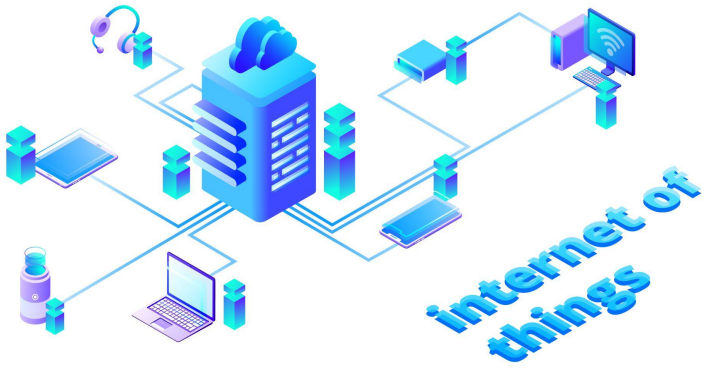
2.4.2.3. Internet of Things (IoT)

Nowaday, the Internet of Things is an important technology that plays a role in the widespread use of everyday life and work. The definition of the Internet of Things is a technology that makes it easy for electronic devices to link and transmit information for each other and to control devices through the internet networks, including Smart Devices, Smart Home, Smart Networks, and Smart Farm. Can be systematically stored and collected, with the cloud storing and processing data online that can control or define privacy and access to information at any time.

The Internet of Things can use technology effectively both digital traffic managing big data or sub-levels, and timely and real-time analysis of things, including AI connectivity.

This technology reduces personnel workload and potential job risks in the future.

Therefore, the Internet of Things is useful equipment that makes it easier to work in agriculture to meet the development and use of the data collected as big data that can be used for analysis to truly understand and deploy. To develop agriculture systems to work more efficiently and better to accommodate various situations.



CHAPTER 3

RESEARCH METHODOLOGY

In this project, the research methodology is divided into 3 parts, install and setup software, code and hardware and dashboard on Blynk application.

First of all, design of this project as Figure 3.1:

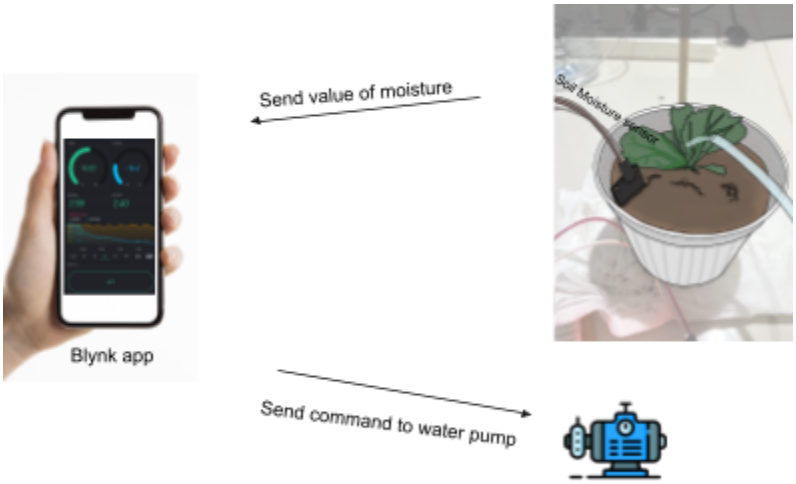


Figure 3.1 Concept diagram of Mobile Automatic Watering Machine

First part: Install and setup software

3.1 For arduino IDE part

Install esp32 board by click tool >> board >> board manager >> search for esp32 in the search box then choose the first one and install.

For blynk library, click sketch >> include library >> manage libraries >> search for blynk in the search box then choose the first one and install

For connect the to the blynk application must has the code as below:

FIRMWARE CONFIGURATION

```
#define BLYNK_TEMPLATE_ID "TMPLmQj0tHuW"
#define BLYNK_DEVICE_NAME "Quickstart Template"
#define BLYNK_AUTH_TOKEN "kWZxnTpjQJP3Jb7-c93vj2bbuLHyPdHP"
```

3.2 For blynk part

Go to website blynk.cloud and sign up then create the template and defined all variables use to control blynk application

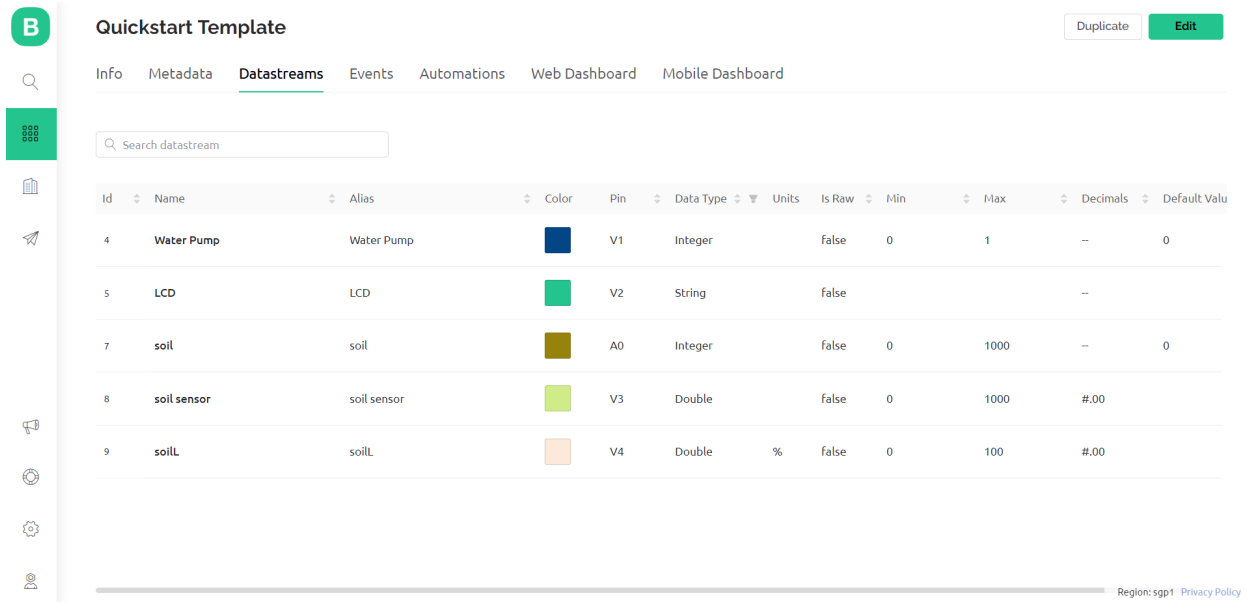


Figure 3.2 Variable on blynk template

Second part: Hardware and Coding

3.3 Step of Hardware

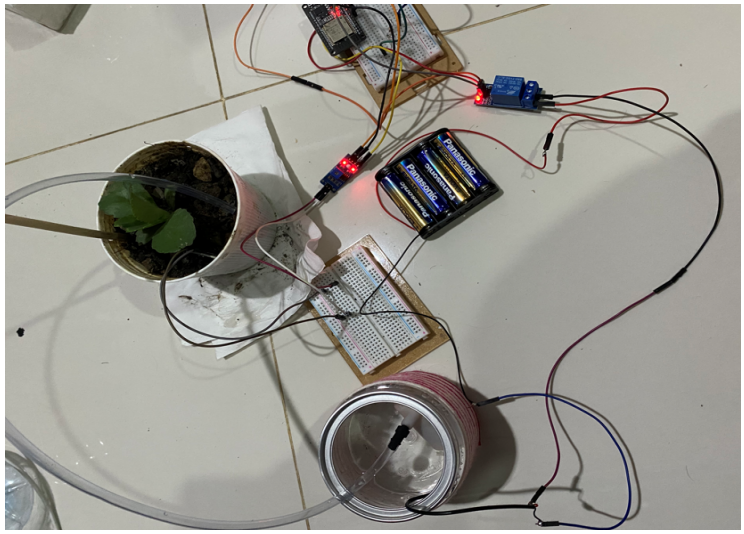


Figure 3.3 Mock up circuit for trial equipment

Step 1 vcc pin of water pump connect to NO pin of relay

Step 2 vcc pin of battery holder connect to COM pin of relay

Step 3 GND pin of water pump connect to GND pin of battery holder

Step 4 vcc pin of relay connect to VDD 3v3 pin of esp32

Step 5 GND pin of relay connect to GND pin of esp32

Step 6 IN pin of relay connect to GPIO 27 pin of esp32

Step 7 vcc pin of soil moisture sensor connect to Vin pin of esp32

Step 8 GND pin of soil moisture sensor connect to GND pin of esp32

Step 9 A0 pin of soil moisture sensor connect to GPIO 4 pin of esp32

Step 10 connect esp32 to notebook for upload command by USB

3.4 Code on arduino IDE

```
// Fill-in information from your Blynk Template here
#define BLYNK_TEMPLATE_ID "TMPLmQj0tHuW"
#define BLYNK_DEVICE_NAME "Quickstart Template"
#define BLYNK_AUTH_TOKEN "jwVOpfkPVvsQD0WtMOVJ1Jg_tBgnpI6K"

#define BLYNK_FIRMWARE_VERSION        "0.1.0"

#define BLYNK_PRINT Serial
//#define BLYNK_DEBUG

#define APP_DEBUG

// Uncomment your board, or configure a custom board in Settings.h
//#define USE_WROVER_BOARD
//#define USE_TTGO_T7

#include "BlynkEdgent.h"
#define WATER_PUMP 27
#define SensorPin A0 // used for Arduino and ESP8266
//#define SensorPin 4  // used for ESP32

float soilLevel, soilR;
boolean state = false;

BLYNK_WRITE(V1)
{
  if (state == false) {
    state = true;
    digitalWrite(WATER_PUMP,HIGH);
    delay(1000);
  }
  else {
    state = false;
    digitalWrite(WATER_PUMP,LOW);
  }
}


void setup()
{
  pinMode(WATER_PUMP, OUTPUT);
  pinMode(4,OUTPUT);

  Serial.begin(115200);
  delay(1000);

  BlynkEdgent.begin();
```

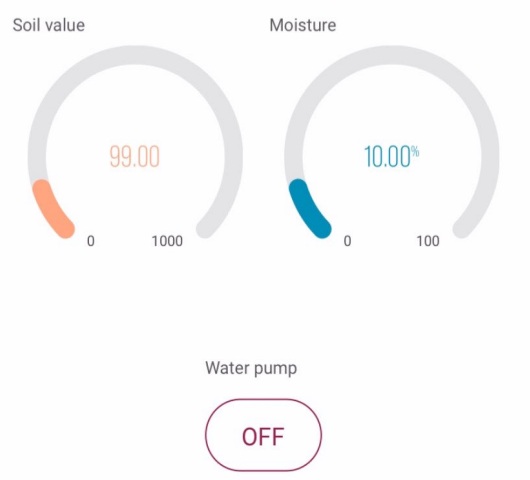
```
void moisture(){
  double val=analogRead(A0);
  Blynk.virtualWrite(V3,val);
  Serial.println(val);

  double soil=map(val,0,1023,0,100);
  Blynk.virtualWrite(V4,soil);
  Serial.println(soil);
}


void loop() {
  Blynk.virtualWrite(V2,V1,V3,V4);
  BlynkEdgent.run();
  soilR = analogRead(SensorPin);

  Serial.print("Sensor value = ");
  Serial.println(soilR);

  double value = map(soilR,0,1023,100,0);

  Serial.print("Soil Moisture = ");
  Serial.print(value);
  Serial.println(" %");
  delay(1000);

  moisture();
}
```

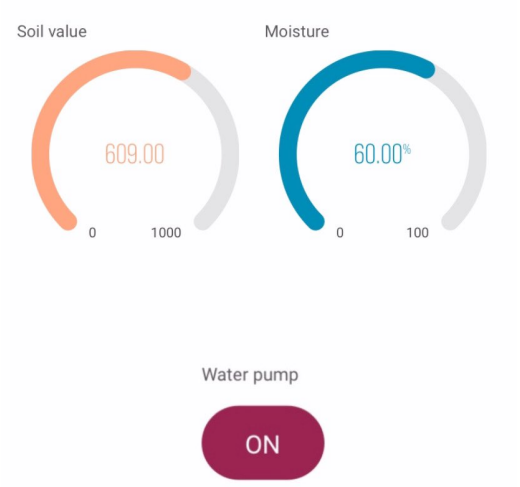
Last part: Dashboard on Blynk application

3.5 Create Dashboard and show result

Use blynk application to create dashboard and show the result realtime via wifi

1. Humidity
2. Status
3. water pump switch





CHAPTER 4

CONCLUSION

4.1 Conclusion

We built a mock-up of the device to test its functionality before using it. which our devices and applications can be ordered via mobile by Wifi connection

4.2 Discussion

The problem we encountered is

1. Time management, where we don't allocate time well enough to cause some steps to be out of schedule.

2. Test soil moisture sensor, found that the value is not stable. We have experimented with digging in the soil, dunking in water, or modifying the code. Sometimes the values do not change or change in leaps and bounds (unstable).

3. The applications we use have limited functionality. In order to use the full performance, we need a monthly subscription.

REFERENCES

[1] "ESP32 pin" [Online].Available:
https://cu.lnwfile.com/_/cu/_raw/jt/0k/1c.png. [Accessed: 13-Apr-2022]

[2] "Blynk platform" [Online].Available:
https://blynk.io/. [Accessed: 30-Apr-2022].

[3] "Soil Moisture Sensor Tutorial for Arduino, ESP8266 and ESP32" [Online].Available:
https://diyi0t.com/soil-moisture-sensor-tutorial-for-arduino-and-esp8266/.
[Accessed: 1-May-2022]

[4] "Watering control" [Online].Available:
http://sci.chandra.ac.th/ncst2021/jdownloads/99/2/12.P-81.pdf.[Accessed: 8-May-2022]