UNIVERSITI TEKNIKAL MALAYSIA MELAKA

HOME PLANTATION SOIL MOISTURE MONITORING SYSTEM USING IOT

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

by

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TAJUK: **Home Plantation Soil Moisture Monitoring System using IoT**

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I hereby, declared this report entitled Home Plantation Soil Moisture Monitoring System using IoT is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Tumbuhan memerlukan air untuk membesar. Air yang berlebih kepada tumbuhan akan memudaratkan tumbuhan. Sistem Pemantauan Kelembapan Tanah Pokok Rumah dicipta untuk memantau kuantiti kelembapan tanah pada tumbuhan. Bacaan paras kelembapan tanah akan dipaparkan kepada pengguna menggunakan paparan LCD dan telefon pintar Android melalui aplikasi Blynk. Arduino digunakan di dalam projek ini kerana kebolehan Arduino ialah beroperasi tanpa pengawasan dari pengguna. Untuk mengesan kelembapan tanah tumbuhan alat pengesan kelembapan tanah akan mengesan kelembapan tanah tersebut dan akan menghantar data tersebut ke Arduino. Arduino akan menghantar data tersebut ke paparan LCD dan telefon pintar Android melalui IoT medium. Tujuan memaparkan paras kelembapan tanah tersebut ialah untuk pengguna supaya memastikan sistem ini sentiasa berjalan dengan sempurna.

ABSTRACT

Plants require right amount of water to grow. Too much water will bring harm to the plant. The Home Plantation Soil Moisture Monitoring System is designed to monitor the soil moisture of the plant. The level of percentage of the soil moisture will display to user using LCD display and smartphone through Blynk application. Arduino UNO will use in this project in order to control the system. The ability of Arduino UNO is to perform work automatically with minimum or without human supervision or intervention. The soil moisture of the plant will detect by soil moisture sensor and the data will send to the Arduino UNO. Arduino UNO will send the data to LCD display and Blynk application by using ESP8266-01. The purpose to display the level of percentage for the soil moisture to the user because the user will able able monitor the system.

DEDICATION

I would like dedicate this final year project of bachelor degree to my lovely parents who always besides me through my up and down no matter what happens. Without their encouragement and support I will not be at the point where I am standing since the starting day. The journey of making the project has been tough and teach me how the people surround me drive me to have strong heart in order to survive the challenging path.

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I would like thank you to my great supervisor Madam Siti Asma Binti Che Aziz for the guidance and advise that she give to me in the process of making the project of bachelor degree. Not to forget to The Creator Allah swt, I express my gratitude for giving me chances and simplify all the matters throughout the journey of making the project.

I also would like to thank you to my beloved parents who never stop to pray for me to complete the project. Without their encouragement and support I will not be at the point where I am standing since the starting day.

Lastly, I would like to appreciate to my friends who also with me throughout the journey of making the project and who give support me with ideas and suggestion on the project.

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INTRODUCTION

1.0 Introduction

This chapter roughly will go through the introduction about project Home Plantation Soil Moisture Monitoring System using IoT. The purpose of this project is mainly focus on home plantation that monitoring the percentage of the moisture level of the soil by using soil moisture sensor.

1.1 Project Background

Nowadays, having a small garden in area of own house is getting love by every household in residential area. Many house owner believe that having a small garden in the area of the house could bring freshness or attraction. Not just that, having a small garden in the area of the house also could give positive impact to the world as well. But to take care of the plant is not quite ease as certain plant have their own characteristic to grow up perfectly. Other than that, there are several matters could bring harm to the plant such as pesticide or lack of fertilizer. Moreover, some of the house owners are lose of desire feel to have a small garden inside the area of their house because of their work make them require to go outstation and without nobody will take care of their plant especially watering their plant.

This project is to build to overcome a problem to the house owner that have desire to have small garden in their area of house but having a problem to take care in term of watering the plant even they frequently outstation due to work or other matter. To overcome the issue, this project is capable to monitor the level percentage of the soil moisture of the plant and automatically will watering the plant when the level percentage of the soil moisture is decrease to the certain level. The percentage of the soil moisture will display to the user through IoT website via internet. So, user is able to monitor their plant without supervision from other.

Basically, the project do consist of several electronic components or devices such as Arduino UNO as the microcontroller and soil moisture sensor as the sensor to detect the moisture of the plant soil. Furthermore, in order to send the data to the internet the Arduino UNO requires an external Wi-Fi module to able send the data to user. The Arduino UNO is a main component of this system and requires a source code that need to be program into it so it can operate with minimum supervision from user.

1.2 Problem Statement

In this vast modern era, especially at urban area a house owner that having a small garden in their house area is become a common thing. Having a several pots of flower in area of the house also could bring freshness to the house and attraction to the neighbor. But in the urban area, some of the house owners are occupied with their work that requires them to left the house several days. Due to the matter, they tend to feel scare to spend a bit of money to have a flower in their house without anyone take care of it in term of watering and at the end the flower is down to the earth.

Plant demands a right amount of water to grow up perfectly. Over amount of water could bring harmful to the plant. Human senses are unique but are not able to sense or measure the moisture level of the plant soil when they watering the plant manually. Because of lack of water or excessive water will ruin to the plant or crop. As the result, the plant could lead to dead because less soil moisture or too much. This project is to overcome the problem because it able to measure the value of soil moisture.

In agriculture sector, the excessive usage of water is become a common major setback. The traditional watering system is not considered as a water saving mechanism. Moreover, some of the countries in this world is facing water crisis problem which have lack of water resources and economically poor. This is massive problem to the agriculture sector because water is the important thing. So, this project is able to reduce the problem which the excessive usage of water starting from small scale agriculture sector by use right number of water when watering the plant.

1.3 Objectives

In this project, there are some objectives need to be achieve and the purpose of this project is to monitoring home plantation soil moisture. The objective of the project are:

1. To design a project of home plantation soil moisture monitoring system using IoT.
2. To develop a system able user to monitor the soil moisture and automatically watering the plant.
3. To analyze the level of soil moisture of a plant at the house.

1.4 Project Scope

This project targeting to the house owner that have desire to have a several plantation at this house but not able to commit 100% to taking care of the plantation due to the outstation because of work or personal matter. The system able to measure the plant percentage level of the soil moisture and send the data to the user via IoT so that the user can monitor whether their plant is already been water or not. Moreover, the system is capable to watering the plant automatically by pump water into the pot. Soil moisture sensor is used in this system in order to measure the percentage level of the soil moisture. Arduino UNO will be the main component in this project because it can control the operation of the system.

CHAPTER 2

LITERATURE RIVIEW

2.0 Introduction

This project is focus on monitoring soil moisture of plant at house even though the house owner not at their house. It require several researches from journals as the source. This chapter will explain about the research that has been done.

2.1 Related Research Work

The project is require some researches that was done by collected data and information from journal that related to this project.

2.1.1 Plantation Soil Moisture Monitoring System using IoT

(Singh and Saikia 2017) developed a project that used to help farmer by watering farmer's crop through IoT via website. The project used Arduino device that used to control the operation of the system. Besides that, it also consist of several components such as water flow sensor, soil moisture sensor, temperature sensor, ESP8266 WiFi module, irrigation pumps and sprinklers. The ESP8266 WiFi module is used to transmit and receive data from user. Moreover, the project developed a system that can monitor the soil moisture, temperature and water flow of the crops and watering the crop by click to turn on and off the pumps and sprinklers as shown in figure 2.1. This process can done from around the world due to the IoT and user only requires a device that connect to the internet.

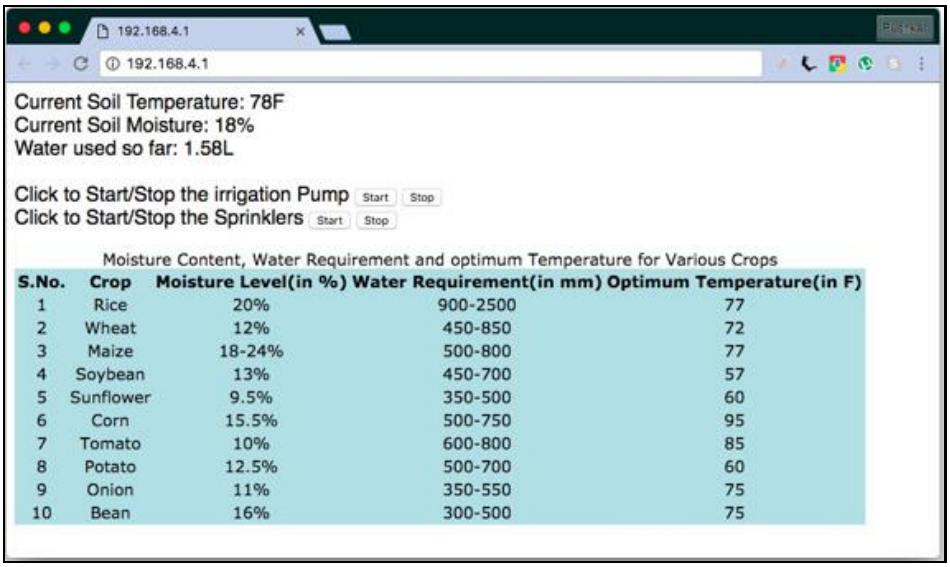

Figure 2.1: The website interface of the system

(Bin Ismail and Thamrin 2018) designed a project that focusing on indoor vertical farming. The purpose vertical farming is to optimize land usage and controlled-environment agriculture (CEA) technology. Besides that, the main purpose of this project is to develop a system that can monitor the soil moisture of the plant through web browser on laptop or mobile phone. The system is design for indoor because it can create a new sustainable farming method so that in the future farming is not only focusing in rural area but more in the urban area. As a result, it can create better environment and good health to people live in urban area. The project used Arduino microcontroller to control all the operation of the system and soil moisture sensor to detect the value of soil moisture of the plant. Figure 2.2 shows the flowchart of the system. The usage of internet is to establish communication between the hardware and software. So, when the connection is been establish user can control the system through web browser or mobile phone. Figure 2.3 shows the interface of status, soil moisture level and water level tank. At the website, there are several information regarding about the system such as water level in the tank, soil moisture of the plant, sensor ADC value, water pump and water valve control. When

the soil moisture value is below threshold value 600, the status of the plant will appear "check status" so that the user need to turn on manually the water pump to watering the plant.

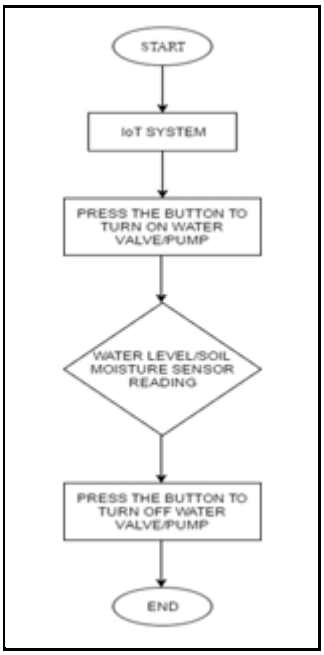

Figure 2.2: Flowchart of indoor vertical farming system

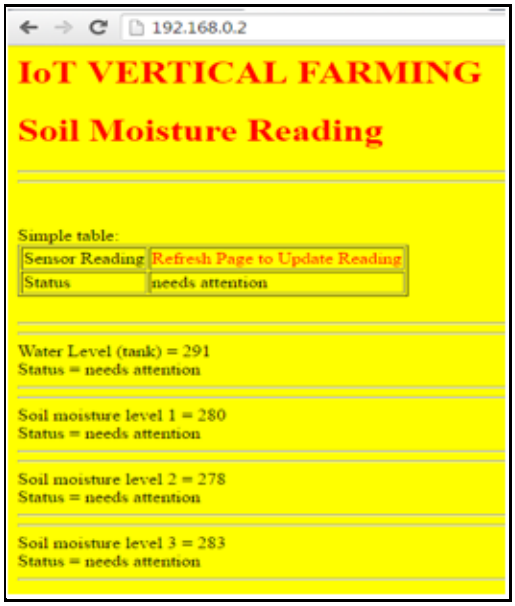

Figure 2.3: Interface of the status, soil moisture level and water level tank

(Anitha et al. 2018) have created a system in agriculture sector that used to farmer to watering their plantation. The conventional watering system are require more labor and used high amount of water. The new system is able to supply water into the plant pot automatically within less water wasted. Moreover, the system used soil nourishment sensor to capture the level soil moisture of the plant. When the level of soil moisture is below the threshold value the water pump is operate automatically and switch off when the level soil moisture is above than threshold value. Figure 2.4 shows the block diagram of the system. The PIC 16F877A microcontroller is used in this project to control the operation of the system. The information from sensor will be transmit to IoT platform. So, farmer able to check their soil moisture of plant through web application due to the system equipped with IoT. Other than that, the system also consist of several other devices such as water sensor and LCD display. The LCD display is used to display value of soil moisture of the plant.

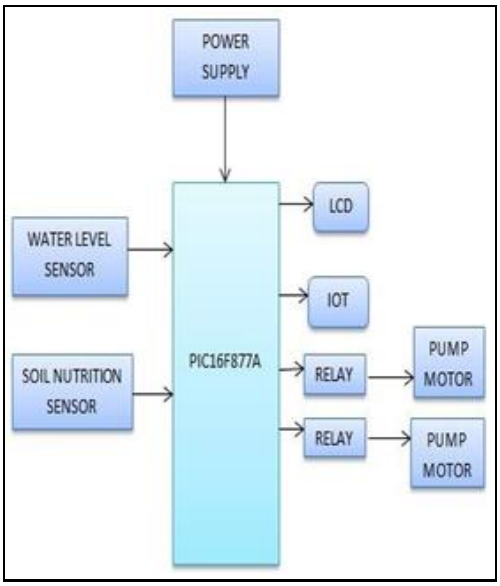

Figure 2.4: Block diagram of the system

(Ahmed et al. 2018) were designed a system for agriculture sector that able to monitoring and watering plantation with integration with IoT. Other than that, the system is capable to reduce losses of water to produce less water wasted. As a result, it able to enhance the crop productivity. The system used soil moisture sensor to measure the soil moisture of the crop. Based on the soil moisture value the system able to watering plant when the value of soil moisture is below the threshold value. Figure 2.5 shows the block diagram of the system. Moreover, the system also equipped with several sensors which are temperature, humidity and ultrasonic sensor that used to measure the water level in the tank. With integration IoT user able to monitor the crop use website IoT platform without limitation of range. Figure 2.6 shows the flowchart of the system. To develop more green energy the system is powered by solar cell and store the voltage into power bank. The system used ThingSpeak as the IoT platform and store the data in cloud so it able to analyze the data. Figure 2.7 and 2.8 shows the graph of temperature and water pump state condition in the IoT platform. ESP8266 is used in this system as Wi-Fi to send all the data to the IoT platform via internet.

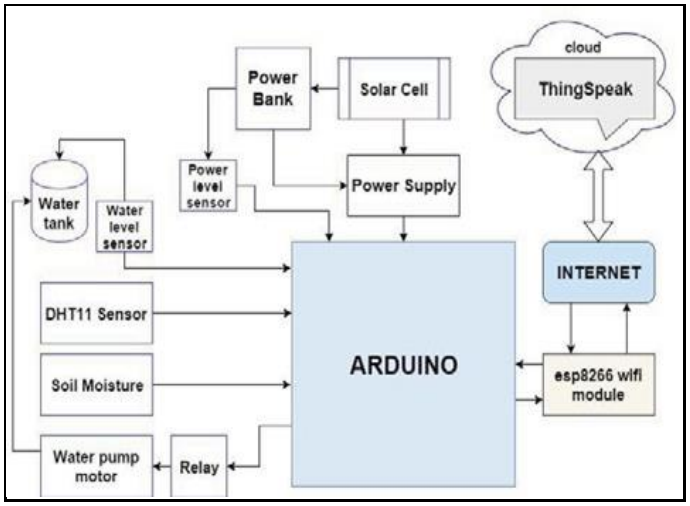

Figure 2.5: Block diagram of system