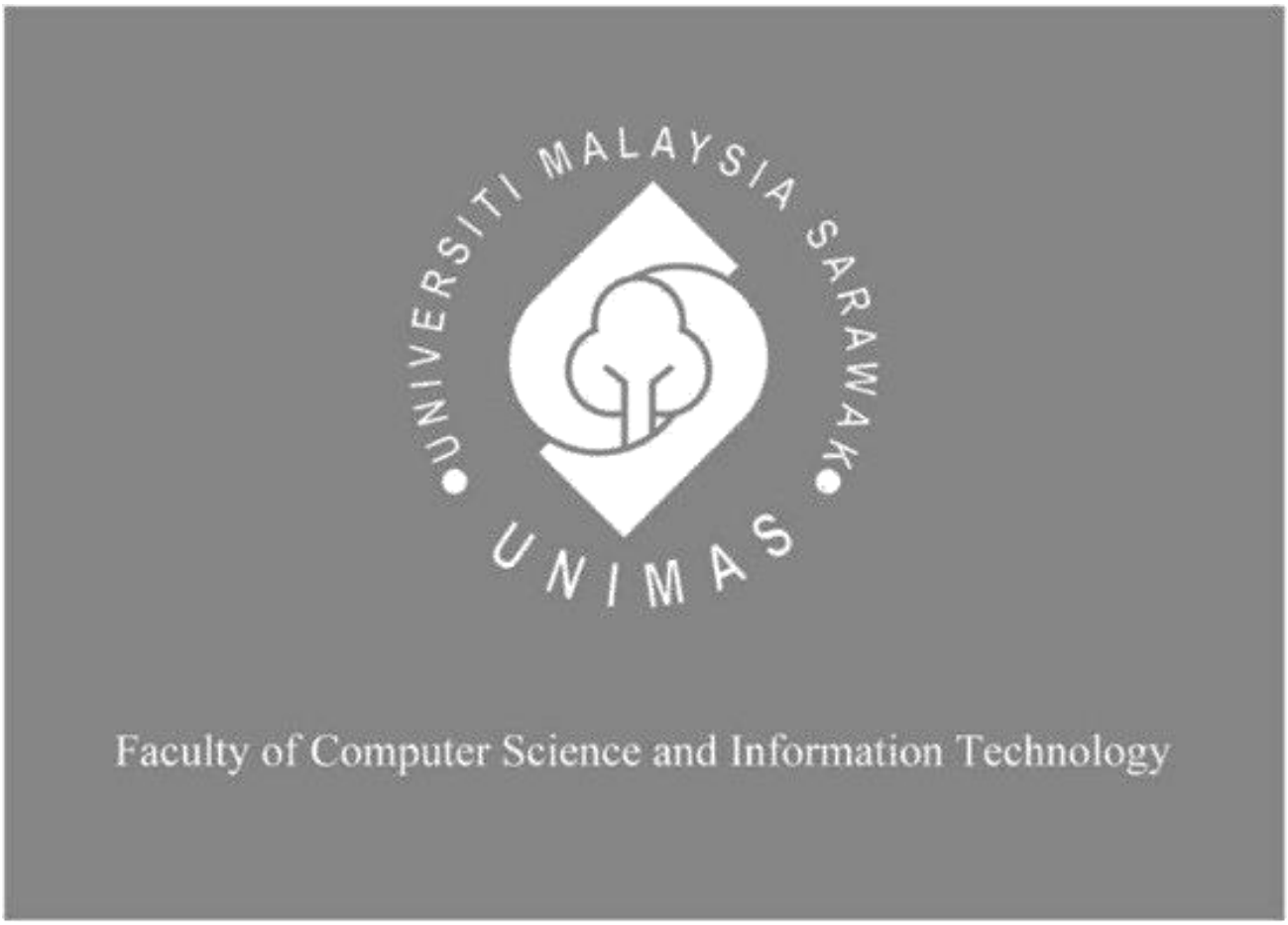

Internet of Things (IOT) Based Smart Irrigation system for Gardening Using Arduino

Shafizul Izzat bin Rosidi

Bachelor of Computer Science with Honors (Software Engineering)

2020

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Abstract

Water is a vital natural resource and therefore should be properly protected. Implementation of the right irrigation systems is an important part of water conservation. A system that irrigates your lawns, flowers and crops will save you money, energy, and increase growth.

. Irrigation systems are designed to guarantee adequate water to your lawns and crops, with minimal water needed. This is because different customers have different requirements, depending on the nature of the region. Irrigation systems are a key element of modern economies. The productivity of acres of land can be increased. You only need a correctly installed system of irrigation. The functionalities of this system are to monitor soil moisture, temperature, and humidity

Abstrak

Air adalah sumber semula jadi yang penting dan oleh itu harus dilindungi dengan betul. Pelaksanaan sistem pengairan yang betul adalah bahagian penting pemuliharaan air. Sistem yang mengawal rumput, bunga dan tanaman anda akan menjimatkan wang, tenaga, dan meningkatkan pertumbuhan.Pengairan termasuk penggunaan sistem pengairan buatan untuk menggantikan atau menambah air hujan. Sistem pengairan direka untuk menjamin air yang mencukupi untuk rumput dan tanaman anda, dengan air minimum yang diperlukan. Ini kerana pelanggan yang berlainan mempunyai keperluan yang berbeza, bergantung kepada sifat rantau ini. Sistem pengairan adalah elemen utama ekonomi moden. Produktiviti tanah ekar boleh ditingkatkan, walaupun hujan tidak mencukupi. Anda hanya perlu sistem pengairan yang dipasang dengan betul. Fungsi sistem ini adalah untuk memantau kelembapan tanah, suhu, kelembapan dan untuk mengesan hujan

Chapter 1 Introduction

1.1 Introduction

Since the Industrial Revolution, world has gone through enormous transition. Forest was cleared for the growth of urban cities. Nevertheless, more and more people want a green and healthy environment in their area especially in urban area. From planting to growing food, to growing flowers, its undeniable fact that gardening has become part of our way of life in society. But there is a problem in gardening such as high surrounding temperatures, , and humidity that is not ideal for growing plants. This problem can cause the poor condition of their plant to grow and sometimes it does not grow at all. Therefore, Smart irrigation useful to overcome the problem. Smart irrigation is based on internet of things (IoT) technologies that enable growers to enhance productivity and quality of the plant. This smart irrigation can water flow to the garden based on the sensor installed. This sensor also will able to collect the information and generate a report to the users. The main feature is to turn on or off the irrigation system and it will be in automated which mean it will automatically do it work when it meets it requirement. A smart irrigation can help to maintain the recommended and good condition for plant to grow and produce healthy plant.

1.2 Problem Statement

Recent year gardening has become more popular. It is not just for food and for the business but as a hobby. Although just a hobby they need to monitor condition their garden in order to make the plant grow healthier and produce a high-quality product they need their plant grow in a good environment.

Therefore, Irrigation system will be useful because it has a lot of control over how much water to supply and when to apply it but the irrigation system determines uniformity. The problem with this is how to ensure the condition is the good climatic condition that we want. Therefore, Irrigation system must be smart and full automation. A Smart Irrigation system will able to determine whether the condition is good or not by taking measurement of soil moisture, humid sensor, and temperature sensor. This measurement is then compared with recommended measurement in the application. A smart irrigation must also be automated to maintain the condition. The smart Irrigation system will automatically supply the water needed to t whenever there is anomaly measurement such as if the soil moistures is above average, a water will automatically turn off. That way the condition can be maintain and plant can grow into healthy plant.

1.3 Project description

The project is about a device that can control the water flow to the plant that can be used by the farmer. The name of the project is “IoT based Smart Irrigation System for Gardening”

About the” IoT based Smart Irrigation System for Gardening”, this project is mainly to detect, measure and record the soil moisture, temperature, humid and the weather. This to help the farmer to monitor their garden and it also work smart and automatically, so it helps the farmer control the water flow to their garden.

1.4 Scope

The project is about a device that can control the water flow to the plant that can be used by the farmer, this project is mainly to detect, measure and record the soil moisture, temperature, humid and the weather.

The limitation of Smart Irrigation system is for each measurement it needs other type of sensor to be used and generate report based on sensor used. For example, to measure the soil moisture it needs the measurement of the soil by using the soil moisture sensor. This mean it need other sensor to measure the different measurement and maybe need more than one Arduino boards to do computational. Other than that, the system will operate in Blynk iot

1.5 Objective / Aim

The objective of this projects is to lighten the farmer in Malaysia to monitor the plant. This IOT devices will help to maintain soil moisture.

- To measure and record the water level, temperature and humidity of the soil
- To Maintain the moisture of the soil by installing the moisture sensor this feature allows the water flow to switch off or on if the moisture of the soil reach it threshold value
- To display monthly report of water level, temperature and humidity of the soil

1.6 Methodology

This project will use Prototyping Modelling for the development of the Smart Irrigation for Gardening. The prototyping model is a systems development method in which a prototype is built, tested and then reworked as necessary until an acceptable outcome is achieved from which the complete system or product can be developed. This true prototype will be used to complete the final product. During develop the prototype, more feature can be added and improve the function of the system. This will be continuing until all the suitable feature and function is installed in the product. The advantages using this method is it can detect error much earlier and can fix the error as soon as possible. This allow developer to fix any error before delivering it as final product or fix it before reach another phase. Another advantages of using this method is that it saves time. This in terms of finding the error and fix it quickly at early stage

rather than discover error at the last stage at development which can cost time just to find the error. By using prototyping model, the smart water features can be improved.

1.6.1 Requirement Gathering

For prototyping model is start implemented with the requirements analysis and requirements of the system that defined in detail. The research on irrigation system, sensor and Arduino kit to be implemented in the system is done in this phase. Then, the full document for this system prepared.

1.6.2 Quick Design

When the requirement of the system is identified, the preliminary design for the system is created. In this phases design for the prototype is not details and only includes important aspects of the system, it only gives an idea of the system to the user. For every meeting stage, the prototype design has either an upgrade or downgrade depend on the user.

1.6.3 Building Prototype

Information gathered from quick design phase, then modified to form the first prototype that will represent the working model of required system. The prototype for this system will built stage by stage according to latest requirements given by the user.

1.6.4 User evaluation

The model presented to the user to consider the strengths and weaknesses such as what needs to be improved and excluded for a thorough review of the design. The client gathers comments and suggestions to make any changes to improve the program. The system will be evaluated based on system performance parameters, thorough reading of measurements and user-friendliness level.

1.6.5 Refining Prototype

The user tests the design and the new model will be modified depending on the criteria if the user is not pleased. The refining process often took place while speaking to the consumer. A new model with additional user information will be created. Like the previous prototype, the new prototype is evaluated. This process continues until all the requirements specified by the user are met. When the user is satisfied with the developed prototype, a final system will be developed for the final prototype.

1.6.6 Engineer Product

The user accepts the final prototype once the criteria are met. Followed by routine maintenance, the final system is thoroughly evaluated to prevent large-scale failures and minimize downtime. The final prototype for this device will be created and delivered to the user

1.7 Significance of Project

The significance of this project is:

1. To provide the user the information and monitor the condition of the environment.
2. To create good recommended condition for the plant in the garden or farm to grow.
3. To regulated and maintain the recommended condition of the garden or farm by running the feature such as turn on or off the irrigation system.

1.8 Expected Outcome

The expected outcome of this project is the working prototype where the Irrigation system will have automatic provide enough water to the soil and allow the plant to grow healthy condition

1.9 Project Schedule

The following schedule is represented in the Gantt Chart. The duration of the project is shown form FYP 1.

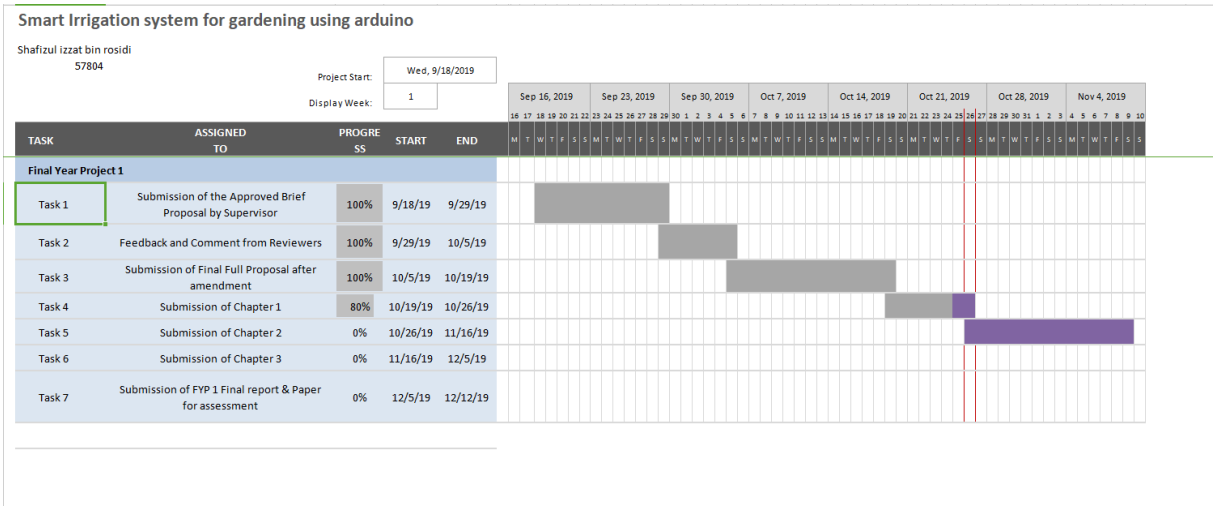

Figure 1.1Gant chart

1.10 Conclusion

The Smart Irrigation system is mainly focused on solving the lack of monitoring of the farmer due to the climate change. The solution is to develop the smart irrigation system for gardening.

Chapter 2 Literature review

2.1 Introduction

In this chapter, there will be discussion on existing system or project that are relevant to the proposed system. Next, the presentation on existing system and their functions. Then the reviewed existing system will be compared with the proposed system. Finally, the brief overview of the proposed system will be presented.

2.2 Overview of objectives

There are four objectives in developing this project. These objectives are:

- To measure and record the water level, temperature, and humidity of the soil.
- To Maintain the moisture of the soil by installing the moisture sensor this feature allowed the water flow to switch off or on if the moisture of the soil reach it threshold value.
- To display monthly report of water level, temperature, and humidity of the soil.

Water, temperature, and humidity excessive values can affect plant growth in the garden. Such four components would be used to measure the volume of garden water and provide the optimal quality for heat. This minimizes damage to the plant in the garden. An IOT-based Arduino smart irrigation project is conducted as a prototype to fulfil the above objectives. A soil moisture sensor will be used to detect soil moisture to detect the water in the garden. To display the reading of the garden outside, a temperature sensor is installed for temperature. A humid sensor is used to detect changes in humidity around the greenhouse. This project is then integrated with android to develop a mobile application for notifying the user and display report.

2.3 Reviews on existing system

2.3.1 Design and implementation of Automatic Plant watering system

Archana and Priya (2016) proposed a paper that would position the sensors of humidity and soil moisture in the plant's root zone. The system is using Arduino which is based design which control the water supply for plants and the field to be irrigated. The microcontroller is used to control the supply of water to the field based on the sensed values. This system does not inform the farmer about the status of the field.

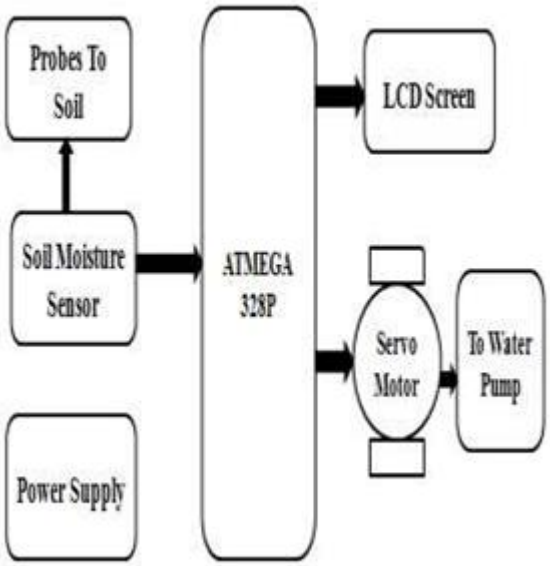

Figure 2.1 Blockdiagram

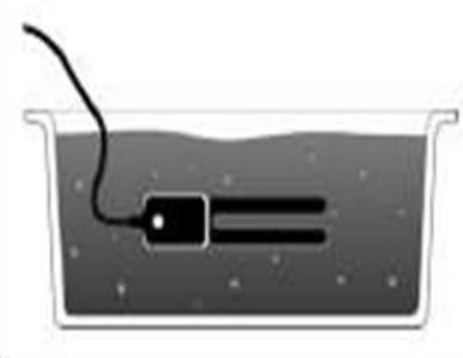

Figure 2.2 Soil Moisture Sensor

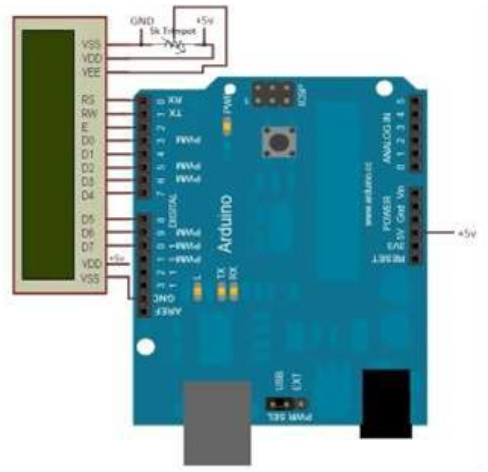

Figure 2.3 LCD Display

Figure 2.4 Servo Motor

Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4 show the hardware Design. Figure 1.1 shows the overall block diagram of watering system. For this project it used an Arduino which is an open source computer hardware and software, project and user community

that designs and manufactures Microcontroller-based tools for building digital devices and interactive objects that can sense and control the real world

Figure 1.2 shows the Soil moisture sensor ,this sensor will be connected to the Arduino microcontroller pins and it is to measure the volumetric water content in soil, Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

Figure 1.3 show the LCD Display A liquid crystal display (LCD) is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector

Figure 1.4 show the servo motor, which it is a circuit that is used to control the position of a servo motor. A servo motor controller consists of a controller, the servo motor and the power supply unit.

Figure 2.5 Hardware Setup

Figure 2.5 show the complete hardware setup from the figure 1.5 I learned the few ways to display the complete product.

2.3.2 Development of smart irrigation system using Arduino

Aashu Bedrae R. K, Jayalakshmi A, Nayana M, Swetha D, Shridhara Y(2018). published a paper development of smart irrigation system. The system is based on the soil sensor and operated based on the soil's moisture content. Arduino will be use and the soil sensor will be connected to the Arduino microcontroller's input pins. The sensor's reported value will be shown on the smartphone. If the sensed value exceeds the limit values set in the program, the pump will be switched on /off automatically by the program

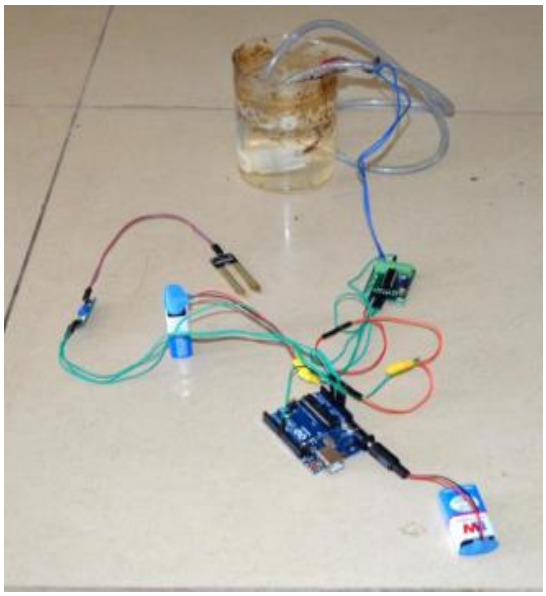

Figure 2.6 Prototype

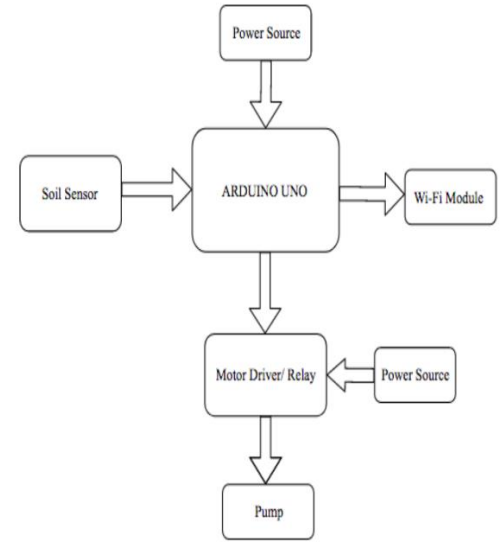

Figure 2.7BlockDiagram

From the Figure 2.6 it shows the prototype for smart irrigation system and Figure 2.7 show block diagram which is a design for the system. The component used for the system is Arduino, soil moisture sensor, Wi-Fi module and submersible water pump. For the software part it used Arduino IDE 1.8.5 and MIT app inventor.

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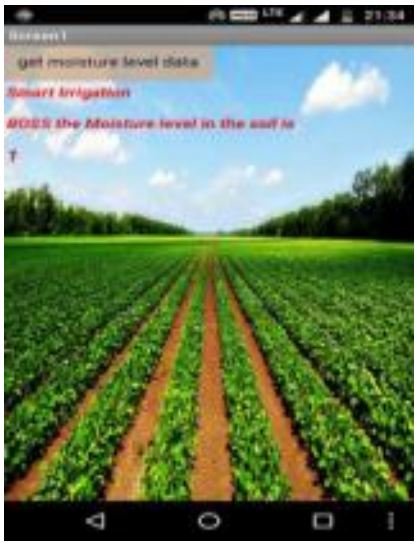

Figure 2.8 Application Layout

Figure 2.8 shows the Android applications that developed for this smart irrigation system. The application allows the users to view the soil sensor data and overview the working remotely.