UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATIC WATERING THE PLANT WITHOUT HUMAN INTERFERENCE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) With Honours

by

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DECLARATION

I hereby, declared this report entitled “Automatic Watering the Plant without Human Interference” is the result of my own research except as cited in reference.

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APPROVAL

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

…….

(Siti Nur Suhaila Binti Mirin)

ABSTRAK

Penyiraman adalah menjadi tugas harian yang penting bagi pekebun di rumah hijau. Seperti yang diketahui kebanyakan pekebun menggunakan sistem manual untuk menyiram pokok, tetapi sistem ini tidak sesuai digunakan. Tumbuhan akan mati jika tidak mendapat air yang mencukupi atau ia akan menggunakan air secara berlebihan dan membuang masa jika menyiram secara berlebihan. Untuk mengatasi masalah ini, "Automatic Watering the Plant without Human Interference" dicipta. Projek ini menggunakan sistem penyiraman tiub kerana ia menyiram pokok didalam pasu. Selain itu, projek ini juga menggunakan Arduino Uno sebagai pengawal sistem. Ia di programkan untuk mengesan tahap kelembapan tanah dan membekalkan air kepada tumbuhan. Kebiasaanya sesi penyiraman akan dilakukan sebanyak tiga kali sehari. Apabila kelembapan tanah bawah 70%, pam air akan menyedut air dari tangki dan akan memulakan sesi penyiraman. Ia akan berhenti menyiram apabila tahap kelembapan tanah mencapai 70%. Sensor yang digunakan untuk projek ini adalah "Moisture Soil Sensor". Sensor ini akan membaca tahap kelembapan di dalam tanah. Skrin LCD akan menunjukan data apabila tanah dalam keadaan kering dan basah. Projek ini tidak menggunakan pekerja untuk menyiram dan memerhati tumbuhan, semua sesi akan dijalankan secara automatik. Kesimpulanya, mengunakan penyiraman tumbuhan akan lebih senang jika menggunakan sistem automatik

ABSTRACT

Watering is the most important cultural practice and most labour intensive task in daily greenhouse operation. As we all know, most of the gardener use the manual system to irrigate their plant but this system is not efficient. The plants die if there is not enough water supplies to the plant or it waste water and time if over watering. To overcome this problem, the "Automatic Plant Watering without Human Interference" is created. For this project, it is used watering tube system because it can water the plants located in the pots. Besides, this project uses Arduino UNO board. It is programmed in such a way that it will sense the moisture level of the plants and supply the water if required. Normally, the plants need to be watered three times daily. So, the microcontroller has to be coded to water the plants when the content of moist in soil dries. When the content of water in the soil below than 70%, a pump will automatic suck the water from the tank and spray to the plant. It will stop when the content of the water above 70%. The sensor will be used in this project are moisture sensor. This moisture sensor can read the amount of moisture present in the soil surrounding it. The monitor will show the data when the soil in wet, dry or dampness. This project does not use human effort to watering and monitoring the plant, all operation will be automatic. Conclusion, watering the plant make easier when the operation automatic. When the soil reaches dry condition the motor will trigger the pump to watering the plant, and it will make the plant growth. In agricultural lands with the severe shortage of rainfall, this model can be successfully applied to achieve great results with most types of soil.

DEDICATION

Special dedicated to my beloved parents, family, friends and lecturers, who had strongly encouraged, inspired and supported me in my entire journey of learning

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LCD	-	Liquid Crystal Display
°C	-	Celcius
Cb	-	Centibar
GSM	-	Global System for Mobile Communications
PH	-	Potential Hydrogen
I/O	-	Input/Output
PWM	-	Pulse Width Modulation
SRAM	-	Static random-access memory
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
FDR	-	Frequency Division Reflectometry

CHAPTER 1

INTRODUCTION

1.0 Introduction

The purpose of this project is automatic watering the plant without human interference. In this chapter will explain about project briefing, the problem statement for this project, objective for this project and work scope.

1.1 Project Briefing

Most of the gardener uses a manual system for watering the plant, but this system is not efficient to use now (BIN 2007). When the gardener watering manually, the possibility of planting overwatering is high and can cause plant drown, also it will waste the water and time for the gardener.

According to Clay, J. (2004), water consumption for agriculture over than 70%, compare to water consumption industry (28%) and municipal (8%) use less than twice from agriculture. Below is water consumption in sector:

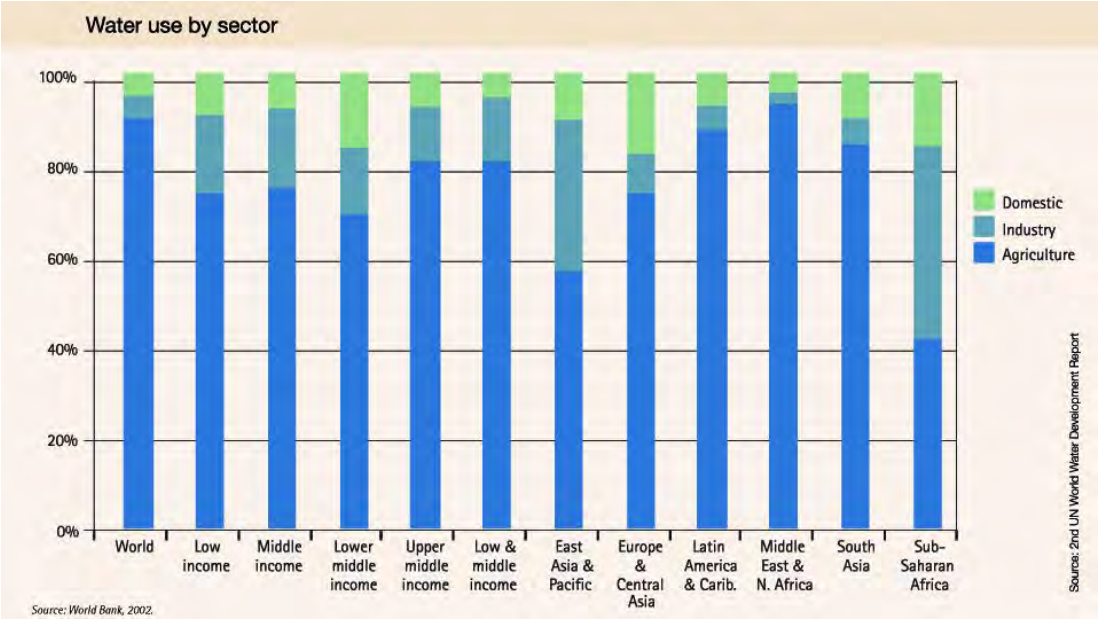

Figure 1.1: Water Consumption by Sector

From the figure 1.1 graph, water consumption for agriculture at Asian more than 50%, the main reason wasteful water are leaky irrigation system, overwatering the plant, cultivation of thirsty crops not suited to the environment. By using this project, automatic system will reduce the consumption water in agriculture and save the time for worker. The effect of using this system will make the plant grow up healthy the plant no died overwatering, saving the water consumption, and reduce the cost and time as compared to manual system.

In this project, automatic watering the plant without human interference are using moisture soil sensor type capacitance to measure water content in soil, Arduino UNO R3 to control sensor and water pump for watering operation, LCD to display the moisture level, water pump to inhale the water and DC servo motor for adjust the position of pipe to where the soil need water.

1.2 Problem Statement

Water is most importance in our life without it, the plant cannot survive. When the gardener using a manual system, the probability to over watering is high and it will waste water and time.

In the earlier, it was proposed (BIN 2007) most of the gardener use the manual system to irrigate their plant but this system is not efficient. The plants will either die if there is not enough water supplies to the plant or vice versa. This will reduce the time if using automatic rather than the manual way of watering.

The best humidity for soil is 70% - 80% (Leonard Perry 2003). To overcome this problem, automatic watering the plant without human interference is created. To get the almost perfect humidity, the content of the humidity soil must 70% or more.

1.3 Objective

These were the objective of this project:

1. To design plant watering device by using moisture soil sensor.

2. Auto watering the plant when humidity less than 70%.

3. To reduce cost and time of plant watering

1.4 Scope

To achieve the objectives, collected data watering the plants eight hours per day and take the data for 21days continuous. The data collected are value of water content in soil using moisture soil sensor, watering the plant when the value more or

equal to 70%, the cost of water in 21days, costing for the material of the system, and how often happen overwatering.

For the final year project, using moisture soil sensor type capacitance connect to Arduino Uno R3 board for the main component in this project, water pump also connect to Arduino Uno R3 board for watering the plant, DC servo motor for controlling the position of pipe outlet and Arduino UNO R3 is the main controller for operating the automatic system.

After finished collect data for 21days, then it will compare the results. The temperature of the surrounding will be monitored in order to understand the impact of temperature on the evaporation of water from the soil.

1.5 Summary

In this chapter was discuss about the background project, overcome the problem statement, objective for this project and limitation of this project.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter discusses the types of sensors and monitor there around the world, a further study will be conducted to determine how it can be related with this system.

2.1 Moisture Sensor

The moisture sensor is a device to measure water content in the soil(S. V. Devika, Sk. Khamuruddeen, Sk. Khamurunnisa, Jayanth Thota 2014). Methods used to measure soil water are classified as direct and indirect. The direct method is soil sample by volume and indirect method is any method(Prichard n.d.) which relates a reading to soil sampling moisture sensor. Moisture sensor suitable to use in the agriculture sector. This sensor is passive type cause gather the data through detection.

2.1.1 Moisture Sensor Type Capacitance

Moisture sensor type capacitances have two plates of conductor material and between of both plate have the electromagnetic field to calculate dielectric material. When the material between the plates is air, the capacitor measures 1 (the dielectric constant of air). Most materials in soil, such as sand, clay and organic matter, have a

dielectric constant from 2 to 4. Water has a higher dielectric constant of 78. (Enciso et al. 2007)

If the water has higher value dielectric, than the other dielectric constant higher too. Volumetric water in soil or water content in soil is measured indirectly. This sensor is passive type.

Figure 2.1: Sensor Type Capacitance

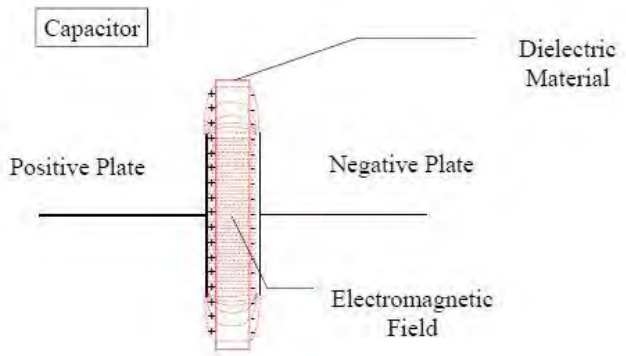

Figure 2.2: Typical Capacitor

Method is using in moisture sensor type capacitance gives a reading of volumetric soil water content. Put the sensor in the soil at a few profundities in a

region of the field so as to evaluate soil water development and exhaustion in the root zone. This is observed after some time and with crop water use.

Since sensors measure the water content near their surface, it is important to avoid air gaps and excessive soil compaction around them. This enables readings to be most representative of undisturbed soil.(Enciso et al. 2007). Table 2.1 shown below is advantage using moisture soil sensor type capacitance.

Table 2.1: Advantage Moisture Sensor Type Capacitance

Moisture Sensor Type Capacitance	Ability to read soil volumetric water content directly
	No special maintenance necessary
	Highly accurate when sensors are installed properly in good contact with soil
	Large range of operating environment (0 to 50°C) and range of measurement (0% to saturated water content)
	Continuous measurements at same location

2.1.2 Moisture Sensor Type Resistance

Moisture sensors type resistance sort resistance react to soil water conditions at the profundity they are put by measuring electrical resistance between two circles of wire work that are associated with a permeable material.

Figure 2.3: Moisture Sensor Type Resistance

Method by using this type is in spite of the fact that the electrical resistance is measured in ohms, the handheld meter changes over the reading consequently to centibars (1 bar = 100 centibars) (Getu & Attia 2015). Electrical resistance increase as soil water suction increase, or as soil moisture decrease.

The sensors set at different profundities, contingent upon the crop developed (and effective root zone profundity). This is to evaluate moisture development and depletion inside the root zone over time and with crop water use.

The placement of the sensors will vary slightly according the irrigation technique. In addition, they must be placed in a representative area, such as within the plant row for row crops, in the bed for vegetable crops or in wetted areas under drip irrigation. Depth of placement should also be representative of the effective root zone. Table 2.2 shown below is advantages and disadvantages using this sensor.

Table 2.2: Advantage and Disadvantage for Moisture Sensor Type Resistance

Moisture Sensor Type Resistance	Good accuracy in medium to fine soils due to their fine-sized particle similar to its inner granular matrix	Slow response to changes in soil water content, rainfall or irrigation (minimum 24 hours)
	Easy handling (light weight, pocket-size, easy installation and direct reading)	Lack of accuracy in sandy soils due to their large particle
	Continuous measurements at same location	Need for each soil type to be calibrated

2.1.3 Tensionmeter

A tensiometer measures the tension of the soil water or soil suction. This instrument consists of a sealed water-filled tube equipped with a vacuum gauge on the upper end and a porous ceramic cup on the lower end (Figures 5 and 6).

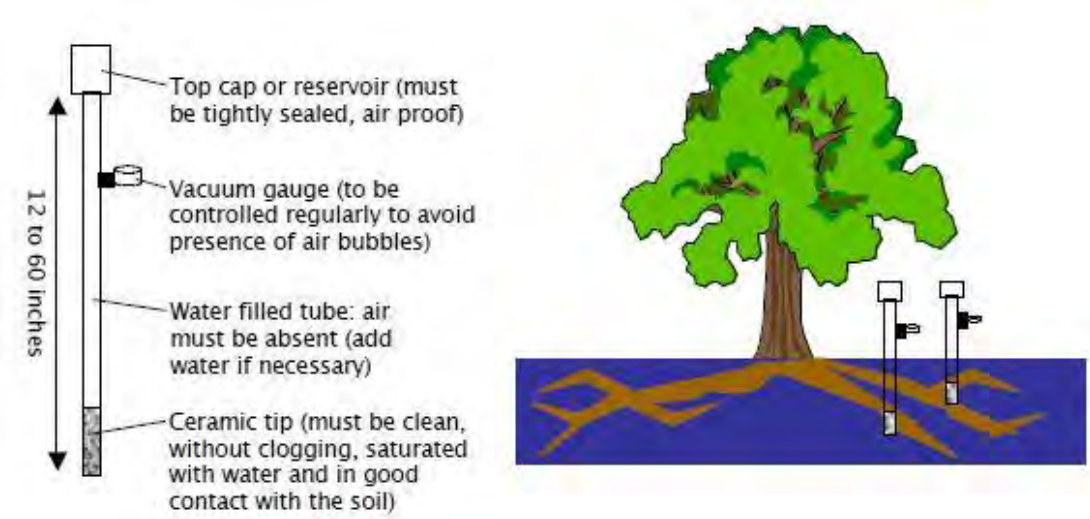

Figure 2.4: Diagram Of A Tensionmeter And A Station Of Two Tensiometers Installed At Different Soil Depths.

Figure 2.5: Station of Three Tensiometers

Method by using tensionmeter is water flow from the tube tensionmeter to soil in response to soil water section. Water also can flow from the soil to the tube tensionmeter during irrigation. Vacuum measure limitation is 100centibar (cb). When the meter at value 0, it means a saturated soil and if the value of measure increases the condition soil increase too.

This sensor limit about 80centibar (cb), if this sensor measure above 80cb possibility to damage the sensor. This sensor most helpful on sandy soils and sensitive crop, because the range soil is narrower.(Enciso et al. 2007). Table 2.3 shown below is advantages and disadvantages using tensionmeter.