Faculty of Electrical and Electronic Engineering Technology

FUZZY LOGIC FOR HERB AND VEGETABLE SMALL- SCALE AGRICULTURE

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Bachelor of Electronics Engineering Technology with Honours

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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 Electrical Engineering Technology with Honours.

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Date : ....

DEDICATION

Special dedication to my beloved parent,
ZAINALARIFFIN BIN MOHD HUSSIN & ZAITY ZALIZA BINTI ZAINAL
To supportive supervisor
TS MOHAMED AZMI BIN SAID
My family members & my friends.

ABSTRACT

All things if it involves in a large scale, it might require special observation to obtain the desrired results. Then, if took a look in agricultural sector, even in small scale, they always want have a big return for their crops. But if the larger the crop, the greater the cost and manpower need to spend. Because now are in era of technology, this paper propose the implement of fuzzy logic concept for small agricultur. The farmer might optimize the crops and record growing data of their crop with less interaction at farm. By this paper, the simulation of fuzzy logic will use as to get the simulation result of the crop and the prototype system will be produce based on simulation input that are being used. In the end, the result will show the simulation output and two plant that one of it use tradisional farming and other one use fuzzy logic system.

ABSTRAK

Semua perkara jika melibatkan dalam skala besar, mungkin memerlukan pemerhatian khas untuk mendapatkan hasil yang diharapkan. Kemudian, jika dilihat pada sektor pertanian, jika dalam skala kecil, mereka selalu menginginkan hasil yang besar untuk tanaman mereka. Tetapi jika semakin besar tanaman, semakin besar kos dan tenaga kerja yang perlu dikeluarkan. Kerana sekarang di era teknologi, makalah ini mengusulkan pelaksanaan konsep logik kabur untuk pertanian kecil. Petani mungkin mengoptimumkan tanaman dan mencatat data tanaman mereka yang semakin bertambah dengan kurang interaksi di ladang. Dengan makalah ini, simulasi logika kabur akan digunakan untuk mendapatkan hasil simulasi tanaman dan sistem prototaip akan dihasilkan berdasarkan input simulasi yang sedang digunakan. Pada akhirnya, hasilnya akan menunjukkan keluaran simulasi dan dua kilang yang salah satunya menggunakan pertanian tradisional dan satu lagi menggunakan sistem logik kabur.

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V	-	Voltage
A	-	Current

LIST OF ABBREVIATIONS

Iot	-	Internet of Things
LDR	-	Light Dependent Resistor
LED	-	Light Emitting Diode
DC	-	Direct Current
FIS	-	Fuzzy Interface System

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CHAPTER 1

INTRODUCTION

1.1 Background

This chapter describes the project summary, and the main objectives of the project. This section covers the background of the project, the problem statement of why the discovery was developed, the priority of the project's requirements to resolve the problem statement with the purpose at the end of the project and the scope of the analysis to be carried out throughout the course of the projects.

1.2 Problem Statement

In the light of the world rapidly rising population, the agricultural sector is becoming increasingly significant. Rather than purchasing, more people are opting for a personal garden where they can grow flowers or vegetables. Plants are important to the ecological cycle's maintenance. This project will use Internet of Things (*IoT*) technology and Arduino to build a smart plant monitoring system. The aim of this project will be on software development for the web platforms. Sensors are used to calculate certain environmental parameters that affect plants parameters such as soil moisture, pH level, and light intensity. Relevant data from the sensors is sent to the *IoT* (Internet of Things) platform via Arduino boards. This device, which will be monitor with looking at web and it implement the result of simulation, then it will minimize manual interference and increase the plants' overall efficiency.

This system is designed by using IoT technology simulation of fuzzy logic to overcome the limitations of farmers in conducting manual continuous monitoring of crops and obtain the status from their crops. In this system, Arduino microcontroller, pH sensor, LDR sensor, ultrasonic sensor, and moisture sensor are used to detect the environmental parameters. The pH sensor is used to determine whether a water solution is acidic or alkaline. The LDR sensor detects light intensity, the ultrasonic sensors sense the water level in the water storage, and the soil moisture sensor analyses the soil volumetric water content and displays the moisture level to the user. These sensors are connected to the controller and the status on each sensor can be viewed by using the application from the smartphone.

Irrigation is an important factor in producing healthy crops. The water provided is a key element that ensures that the plants can survive under certain conditions. Most of the user used a manual system to irrigate crops but this system is not efficient. [1] Intensive agriculture is labor-intensive, as it necessitates constant monitoring of the crops, and the use of a timer for watering plants is not always realistic in real-life situations. As a result, the authors provided a paper framework that enables advanced fuzzy logic to be used in smart farming plant monitoring systems to cut employment costs. Plants will die if the water supply to the plant is insufficient or vice versa. In addition, gardeners must regularly monitor their crops to ensure that their crops are in good health.

Because people are now busy working, the proposed article intends to offer comfort to people by decreasing manual effort and improving the overall performance of any system without requiring user input [2]. They designed a smart monitoring and smart gardening system that enables IoT to perceive and regulate garden parameters without requiring their physical presence.

People do not know when to undertake proper watering activities according to the soil moisture rate and the crop's needs, according to the problem statement in the study [3].

As a result, they offered a paper on the design of an automatic watering system for plants with IoT monitoring and notification to control the amount of water required by the plants based on soil moisture.

1.3 Project Objective

The main objective to run this project is to create a framework for fuzzy logic application for small agriculture. Specifically, the objectives are as follows:

a) Simulate Fuzzy logic system as to get prediction on FUZZY LOGIC FOR HERB AND VEGETABLE SMALL-SCALE AGRICULTURE project result.

b) Develop experimental hardware consist of ThingSpeak cloud storage to store data, monitor and control of FUZZY LOGIC FOR HERB AND VEGETABLE SMALL-SCALE AGRICULTURE and validate the simulation result.

c) Analyzing and propose good method for growing mini scale agriculture utilizing recent fuzzy logic control method.

1.4 Scope of Project

The scope of this project are as follows:

a) The project utilize Fuzzy logic for small agriculture is a system for household to use new plant proses as to help improve quality plant crops.

b) The simulation of fuzzy logic was developed using MATLAB and the input were getting from fuzzy logic in agricultural implementation paper.

c) ESP 32 is a microcontroller build in Wi-Fi that used for the harware. Its such as control unit that used as to send result curent situation of the plant to users and can storage the result data. The tabulate data from ESP 32 will keep update to interface system as long the system run.

d) The result from the simulation will be compare with real result as to make comparisons and make minor improvement when it needed for future planting process.

e) The moisture sensor will detect the moisture of the soil and give signal to ESP 32 to dispense water if the soil not in moisture range level. The quality of water that use for irrigation will monitor by pH sensor frequently.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The term "literature review" refers to an examination of previous debates, journals, and research papers on Smart Plant Monitoring System. This chapter will be utilised as a reference in the future to aid with the experience of problems during project execution to ensure that this project is successful.

2.2 Research, Ideology and Concept from Previous Project

2.2.1 Automatic Plant Watering System

The paper suggests a design for an automated plant watering system for small gardens in the house, based on the journal Automatic Plant Watering System for Small Garden [5]. Basically, during at home there are space at front and back yards that can be a place to small gardening. But not at all the space have suitable to use as gardening. Then, daily activities lead many people had not enough time to water their plants. All the plant if not get enough water, they can wither and damaged.

So, the researcher uses the smart way as to manage the solution for get better crops production. The researchers improve by make an efficiency of watering system even in advance weather conditions. Because they are various plant need different amount of water, an intelligent system needed to apply with using sensor and actuators.

They suggest a system for watering plants in the journal Automatic Watering System for Plants with IoT Monitoring and Notification [2.] According to the findings of the researchers, the plants receive adequate water for their growth. The plant also needs suitable water volume because it will make a direct impact for the plant. The researcher said the watering can be manually and automatically device. So, they propose watering system that can control by situation of soil moisture. The researcher uses Microcontroller WeMo's D1 as the processor to integrates the sensors that are be used as to control the sensors and make connection Wi-fi as to connect the watering device to the internet. The researcher makes collection data from interview with open questions, and obtained date based on observation that related through water requirement for the plant that want to plant.

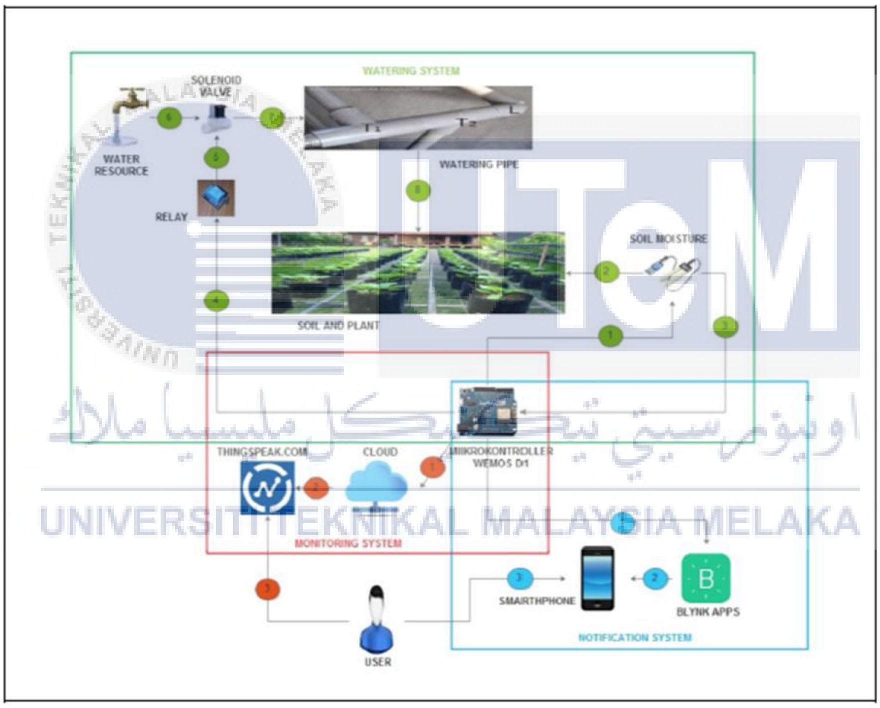

Figure 2.1 : The design of Automatic Watering System (by Jacquline M.S Waworundeng, Novian Chandra Suseno, Robertg Ricky Y Manaha)

2.2.2 Plant Monitoring System with IoT

By this paper of *IoT* Based Plant Monitoring System [6], propose a system that used *IoT* based as to monitor the plants. The researcher used benefit of The Internet of Things (*IoT*) as a platform to improve the accuracy, economic benefits, efficiency and reduce intervention of human. The researcher uses Arduino Uno as microcontroller as to control the sensor that being used. This project used ESP 8266 Wi-fi module as to connect the microcontroller with the connection of Wi-fi. It also used to transmit all the data from the sensor to server as to the monitoring platform. The serve that the researcher use is ThingSpeak.

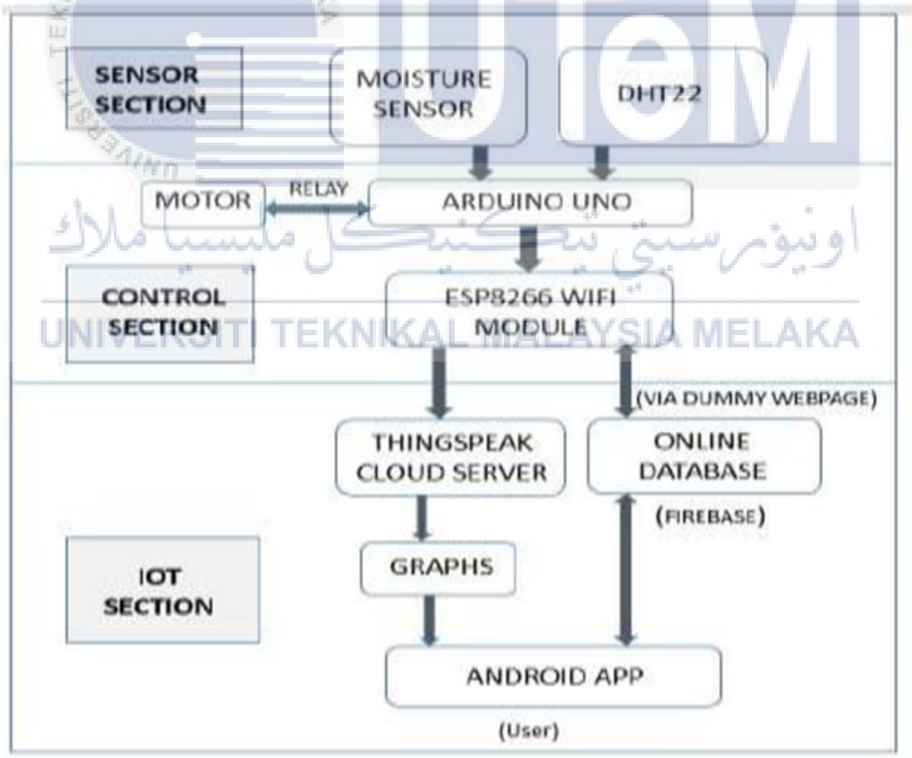

Figure 2.2 : Block Diagram (by Prof. Likhesh Kolhe, Prof. Prachi Kamble, Mr. Sudhanshu Bhagat, Mr.Sohail Shaikh, Mr. Ronak Sahu, Miss.Swati Chavan, Miss. Prajakta Zodge)