Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART GARDENING BY USING MICROCONTROLLER

MUHAMMAD AMIRUL BIN SAZALI

Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours

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DEVELOPMENT OF SMART GARDENING BY USING MICROCONTROLLER

MUHAMMAD AMIRUL BIN SAZALI

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Signature	:	
Student Name	:	Muhammad Amirul Bin Sazali
Date	:	7/1/2022

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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 (Industrial Automation & Robotics) with Honours.

ROZILAWATI BINTI MOHD NOR
Pensyarah
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
Universiti Teknikal Malaysia Melaka

Signature :

Supervisor Name : Puan Rozilawati Binti Mohd Nor

Date : 07/02/2022

DEDICATION

This report is dedicated to my beloved parents and family member, thank you for showering me with your continuous love and devotion. It will always be remembered and kept in my heart. They always support me through thick and thin throughout the process of completing this report. Next, to my Supervisor, thank you for all the knowledge and support. Your patience, support and words of encouragement gave me enormous strength throughout the whole project. Then, to my seniors, my bestfriends and fellow friends, thank you for offering guidance and directions when I am at also lost the advice, support and motivations for the start of this project until the end of the project.

ABSTRACT

This project is proposed to build an automatic crop management system using ESP32. The idea to develop this prototype was because of the problems faced by many individuals who love farming, and there is no time to take care of the crop regularly. This matter is raised because the plant needs careful care to ensure that the plant is always healthy. Apart from this, this can also implement the project on a large scale, such as farm care which can help farmers reduce labor costs. That is why the idea arose to develop this automated system. The first objective is to build a prototype of the project. Within this system, there are several systems used to build a complete system. The first system is to control the irrigation system, where the plants will be watered periodically according to the rate of soil moisture or according to a set time to water the plants. The second system is the humidity control system, where the plant will be placed indoors and can cause fungus to form on the plant to tone a vent hole that can be opened and closed automatically. This system uses the Internet of Things (IoT) to link the data to the smartphone application. We can monitor all the data taken by the sensor to ensure that the system is running well, as we need to ensure the plant is in good condition. Overall, From this project it can be concluded that the use of greenhouses can reduce the observation of soil moisture and ambient temperature manually by 40%. For the conclusion, this Smart Garden can be run smoothly and give a excellent result for the plant growth but still need some improvement.

ABSTRAK

Projek ini dicadangkan untuk membina sistem pengurusan tanaman automatik menggunakan ESP32. Idea untuk mengembangkan prototaip ini adalah kerana masalah yang dihadapi oleh banyak individu yang gemar bertani, dan tidak ada masa untuk mengurus tanaman secara teratur. Perkara ini dibangkitkan kerana tanaman memerlukan penjagaan yang rapi untuk memastikan tanaman itu sentiasa sihat. Projek juga dapat dilaksanakan dalam skala besar, seperti penjagaan ladang yang dapat membantu petani mengurangkan kos buruh. Itulah sebabnya timbul idea untuk mengembangkan sistem automatik ini. Di dalam sistem ini, terdapat beberapa sistem yang digunakan untuk membina sistem yang lengkap. Sistem pertama adalah mengendalikan sistem pengairan, di mana tanaman akan disiram secara berkala mengikut kadar kelembapan tanah atau sesuai dengan waktu yang ditentukan untuk menyiram tanaman. Sistem kedua adalah sistem kawalan kelembapan, di mana tanaman akan ditempatkan di halaman rumah dan boleh menyebabkan kulat terbentuk di tanaman untuk menanganimasalah tersebut ia memerlukan satu lubang udara yang dapat dibuka dan ditutup secara automatik. Sistem ini menggunakan Internet of Things (IoT) untuk menghubungkan data ke aplikasi telefon pintar. Kami dapat memantau semua data yang diambil oleh sensor untuk memastikan sistem berjalan dengan baik, kerana kami perlu memastikan loji dalam keadaan baik. Idea ini muncul ketika saya melihat projek rumah pintar automasi di mana telefon pintar dapat mengawal setiap perkakas rumah dengan menggunakan telefon pintar. Secara keseluruhan, fungsi keseluruhan sistem telah diuji secara meluas dan dikatakan berjaya.

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LIST OF SYMBOLS

l	-	Litre
˚C	-	Degree Celcius
A	-	Ampere
%	-	Percentage
Cm	-	Centimetre
m	-	Meter

LIST OF ABBREVIATIONS

V	-	Voltage
IoT	-	Internet of Things
DHT22	-	Digital-output relative humidity & temperature sensor
TCP/IP	-	Transmission Control Protocol/Internet Protocol
SMS	-	Short Message Service
GSM	-	Short Messaging Service
LED	-	Light Emitting Diode
NFT	-	Nutrient Film Technique
DC	-	Direct Current
PA	-	Precision Agriculture
MCU	-	Microcontroller unit
GPRS	-	General Packet Radio Service
WSN	-	Wireless Sensor Networks
PVC	-	Polyvinyl Chloride
EBB	-	Flood and Drain
HTTP	-	Hypertext Transfer Protocol

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CHAPTER 1

INTRODUCTION

1.1 Background

In modern environment, automation is king. It is a method of monitoring and controlling basic parameters of daily life using computers or mobile phones. The practise of using automation for simple tasks will improve the standard of our lives. We develop sensors that communicate with each other using the Internet of Things (IoT) concept, which is extremely useful in automation. This prototype is significant in that it saves money while also ensuring safety.

Maintaining a garden is a time-consuming and laborious effort in and of itself on top of that, watering plants with little waste has become a must to reduce energy usage and conserve water. Garden automation is required in order to gain a stronger feeling of aesthetics and a breath of fresh air without having to be a propagator.(Bhadra and Chakraborty, 2020)

People were cautious in their early stages of trying to make plantings and set up their own garden. Plants are gradually being destroyed as a result of a lack of maintenance. This prototype will assist people in monitoring parameters and ensuring garden maintenance. It is an important component of the ecosystem and a good plant companion. The Internet of

Things (IoT) offers solutions to a variety of problems by allowing things to be sensed and controlled remotely in network infrastructure.

IoT refers to a network of items or entities that can communicate with one another through the Internet. Things are predicted to become active participants in the fields of business, social processes, information, and communication by utilising IOT. They must be able to interact with the environment as well as communicate with one another while exchanging and altering environmental data and information. The mechanisms that develop services and initiate activities, with or without human participation, have an automatic influence on it.(Thamaraimanalan *et al.*, 2018).

1.2 Problem Statement

There are a few challenges that may occur for those who enjoy and are interested in gardening. They want to take care of their plants in order for them to grow up. However, they are unable to do so in specific situations. For example, some employees must travel to an outstation for a few days or weeks, preventing them from caring for the plants and flushing them.

They also have a hard time keeping track of their plants' health. When they can monitor, the plant can grow and produce greater, especially plants that require monitoring 24 hours a day, seven days a week, such as strawberry farms, grass farms, and vegetable farms. If they are unable to monitor, the plant may become withered or die.

If they are unable to monitor, the plant may become withered or die. The plant can monitor at any time and from any location with this technology. The plant's data will be sent to the internet's IoT cloud. This device also has the ability to rinse the plant when the soil becomes dry and open the window when the humidity level is low.

1.3 Project Objective

1. To develop an automated garden prototype by using Microcontroller
2. To design the monitoring garden system by use IOT.
3. To analyses the performance of the proposed method of smart garden system.

1.4 Scope of Project

This project is special for the implementation of an automated system for plants or gardens in the home area. It uses an ESP32 microconroller to run this automatic system. the creation of this project it will use several sensors that complement the automated system in this project. The sensors that will be used are soil moisture sensor, humidity sensor, ultrasonic sensor.

The soil moisture sensor function is to measure soil moisture grace to the changes in the electrical conductivity of the earth and the electrical resistance is measured between the two electrodes of the sensor. After that, humidity sensor that have being use in this project is DHT-22 (also known as the AM2302) is a temperature, relative humidity, and digital output sensor. It measures the ambient air with a capacitive humidity sensor and a thermistor and outputs a digital signal to the data pin. Next is ultrasonic sensor(HC-SR04) is a module that employs ultrasound is known as an ultrasonic sensor. Ultrasounds can be used to detect presence or estimate distance. It uses the trig terminals to transmit an ultrasonic pulse and his echo terminals to receive it. This automatic system focuses on ensuring that the plant are always watered as needed, fertilizer can be applied at the right time and can control the presence of pests.

In addition, this automated project will provide a monitoring system for humans to check the condition of the plant as well as be able to control all systems just by using IOT method. In the ESP32 it self already install the build in the Wifi module. So it does not need to add on another external Wifi module.

To operate this system the ESP32 will be connected to the wifi module where our arduino is required to set a fixed wifi into the ESP32. while for smart phones it works to control the system so as long as it has internet data it will be able to be controlled no matter where we are in the world as long as the wifi connection is still connected.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Chapter 2 discussed the overview of smart garden by using ESP32 and IoT. The past research related to the garden technology. This study aims to design the implementation of smart garden that able to solve the plantation problem. The benefits and disadvantages of the previous research were also compared in this project. The literature review examines the source and justifies the statement with evidence of research or study in related fields, respectively.

2.2 History Agriculture

Agriculture, commonly known as farming, is the process of producing and harvesting plants and animals in order to produce food, fibre, animal feed, and other items. Agriculture is practised all around the globe. From the clothing we put on in the morning to the blankets we sleep beneath at night, agricultural goods are used on a daily basis. Think of the five F's when you think about agriculture: food, fabric, forestry, farming, and flowers. (Asouti, 2013)

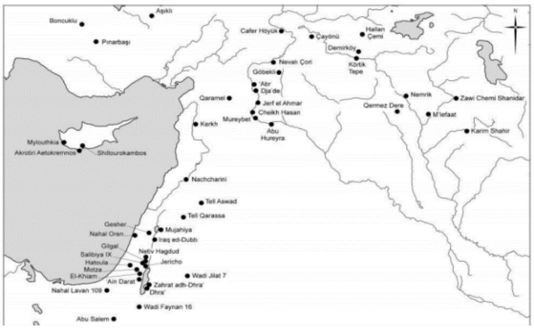

Figure 2.1: Map showing the locations of select early PPN sites in South-west Asia (Asouti, 2013)

Agriculture's origins can be traced back to the Fertile Crescent. The Syrian Desert to the south and the Anatolian Plateau to the north divide this region of Western Asia, which includes Mesopotamia and the Levant. In the early twentieth century, The nickname "Fertile Crescent" was coined by University of Chicago archaeologist James Henry Breasted to emphasise this location's importance as the origin of agriculture. It's also been dubbed the "Cradle of Civilization" because it was where the wheel and writing first arose. The Fertile Crescent is found in modern Turkey, Iran, Iraq, Syria, Lebanon, Israel, Jordan, and the Palestinian territories.(Fuller and Stevens, 2019)

During the Neolithic era, or the New Stone Age, humans invented agriculture between 7,000 and 10,000 years ago. Emmer wheat, einkorn wheat, peas, lentils, bitter vetch, hulled barley, chickpeas, and flax were the eight Neolithic crops. With the invention of metal implements, the Neolithic age came to an end(Salavert, 2017).

Irrigation appears to have initially appeared in Egypt and Mesopotamia around the fourth millennium B.C., according to evidence. Floods triggered by the Nile's regular inundation would have wreaked havoc on ancient farmers, destroying dikes and flooding farms. When the water level was low, the land dried up, killing the crops. Man-made underground streams, known as qanats, were the first type of irrigation, and it is still utilised in parts of the Middle East today. To help manage the flow of rivers like the Nile River in Egypt, several groups of people began digging and restoring previous, more primitive canal networks. The canal networks evolved into complex irrigation systems over time.