Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF IOT-BASED SMART FARMING MONITORING SYSTEM FOR AGRICULTURE APPLICATION USING ESP8266

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

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Student Name : MOHAMED AIMAN BIN ISMAIL

Date : 14/1/2023

APPROVAL

I approve that this Bachelor Degree Project 1 (PSM1) report entitled "Development of IoT-Based Smart Farming Monitoring System for Agriculture Application Using ESP8266" is sufficient for submission.

Signature : 

Supervisor Name : TS SALEHA BINTI MOHAMAD SALEH

Date : 23/2/2023

APPROVAL

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.

Signature : 

Supervisor Name : TS SALEHA BINTI MOHAMAD SALEH

Date : 23/2/2023

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

Specially dedicated to:

Our beloved father and mother, family, supervisor, lectures and all our friends for their eternal support, encouragement and inspiration throughout our journey of studies in University Technical Malaysia Melaka.

May Allah Bless Us.

ABSTRACT

IoT is a technology that facilitates the communication and connectivity of items. This allows the change of industrial and agricultural methods and patterns toward increased efficiency. Smart farming is outlined in a suggested method designed to improve the planting production process. The sensor system and the control system are the two major components of intelligent agriculture A sensor system consists of a collection of measuring equipment. The control system consists of a manually-operated blower, smart security system an irrigation system. ESP 8266 are programmed to serve as the sensor and control system. C++ is utilised to programme the controller of the system. Each sensor's measured values are shown on an OLED display and a serial monitor. A database of the findings is stored in an Excel spreadsheet, and a graphical representation of the results is generated. The control system is activated using the C++ controlling console depending on the sensor system's output. Following the proper decision-making process increases the product's quality and quantity.

ABSTRAK

IoT ialah teknologi yang memudahkan komunikasi dan ketersambungan item. Ini membolehkan perubahan kaedah dan corak perindustrian dan pertanian ke arah peningkatan kecekapan. Penternakan pintar digariskan dalam kaedah yang dicadangkan yang direka untuk meningkatkan proses pengeluaran penanaman. Sistem penderia dan sistem kawalan adalah dua komponen utama pertanian pintar Sistem penderia terdiri daripada koleksi peralatan pengukur. Sistem kawalan terdiri daripada blower yang dikendalikan secara manual, sistem sekuriti pintar, sistem pengairan. ESP 8266 diprogramkan untuk berfungsi sebagai sensor dan sistem kawalan. C++ digunakan untuk memprogramkan pengawal sistem. Nilai diukur setiap sensor ditunjukkan pada paparan OLED dan monitor bersiri. Pangkalan data penemuan disimpan dalam hamparan Excel, dan perwakilan grafik hasil dijana. Sistem kawalan diaktifkan menggunakan konsol kawalan C++ bergantung pada output sistem sensor. Mengikuti proses membuat keputusan yang betul meningkatkan kualiti dan kuantiti produk.

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CHAPTER 1

INTRODUCTION

1.1 Background

The aim of this project is to help farmers monitor plants that need extra care with the help of microcontroller and IoT. It is a portable and low-cost device that will have instantaneous transmission data between sensors and smartphone using WiFi. Feedback system will be incorporated in the device to further aid farmers in improving the soil through an automated water system and warning notifications from the smartphone. The plant chosen for this project is mushroom and the fulfilment of growing a healthy mushroom will determine the successfulness of this project.

1.2 Problem Statement

Mushrooms can be difficult to grow because they require specific growing conditions, including the right temperature, humidity, and type of substrate (material used for growing the mushrooms). Additionally, mushrooms are a type of fungus, which can be sensitive to contaminants and pests. Proper sterilization and sanitation techniques must be used to prevent contamination of the mushroom cultivation. Some species of mushrooms are also more difficult to grow than others, requiring specialized equipment and knowledge to cultivate successfully.

1.3 Project Objective

The objectives of the project are stated as follows:

a) To develop a real time monitoring system for agriculture with smart irrigation, blower and security system using Arduino for IoT based smart technology.

b) To design an application that can monitor the plant and control the system via online.

c) To test and analyse the moisture,temperature and humidity of the plant using different type irrigation system and the growth of the plant with IoT smart agriculture.

1.4 Scope of Project

The scope of this project are as follows:

a) Display plant parameters in real-time using IoT technology

b) Control Irrigattion system and blower system using Wi-Fi technology.

c) Control systems are automated when the plant parameters are not optimal.

d) Warning will be given to the user if the plant's condition is not optimal.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the overall concepts and theories of the IoT-enabled smart faming system. The main goal of this chapter is to clarify related studies in the past five years. The concepts and theories used to solve the project's problems were discussed in this chapter. The primary sources of information are journals, articles, and case studies. These resources were chosen based on their similarity in project scope.

2.2 Review of Current Simulation

Since 1880, climate change has led the earth's temperature to increase by 0.14°F (0.08°C) every decade, and since 1981, the rate of warming has been more than twice that: 0.32°F (0.18°C) per decade. 2020 was the second hottest year on record, with new highs for land areas, according to NOAA's temperature data [25]. Human activity is the major cause of global warming. The human race uses fossil fuels and converts wooded land into agricultural land. Since the beginning of the Industrial Revolution, mankind have expanded their usage of fossil fuels and transformed vast areas of forest to agriculture. Carbon dioxide, a greenhouse gas, is produced when fossil fuels are burned. This gas is referred to as a greenhouse gas because it causes the "greenhouse effect." The greenhouse effect heats the

earth similarly to how a greenhouse is heated by its environment. The major contribution to anthropogenic climate change is carbon dioxide.

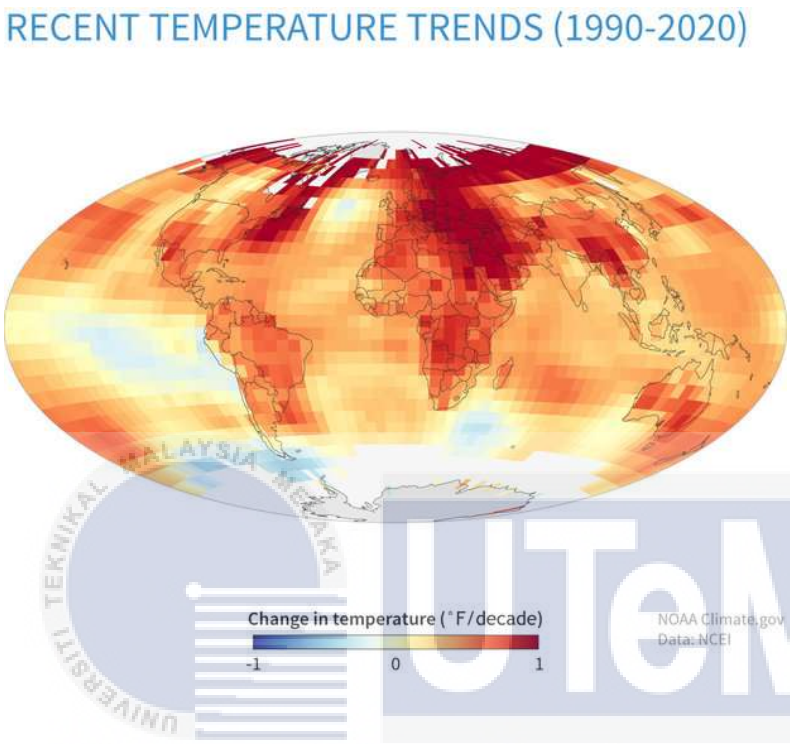

Figure 2.1 Recent temperature trends

Trends in the worldwide average surface temperature in Fahrenheit every decade from 1990 to 2020. Orange and red signify regions that have warmed, whilst blue represents regions that have cooled. NOAA Climate.gov map based on climate change data from the NOAA Centers for Environmental Information.

However, photosynthesis is the process by which plants synthesise oxygen and carbohydrates from sunlight, carbon dioxide in the air, and water. The carbon fertilisation effect happens as atmospheric CO2 levels rise, leading to an increase in photosynthesis. New study suggests that between 1982 and 2020, worldwide plant photosynthesis increased by

12 percent, leading in a 17 percent rise in atmospheric CO2 levels. This enhancement in photosynthesis is mostly attributable to carbon dioxide fertilisation. Due to greater photosynthesis, certain plants grow more quickly. Scientists found that when CO2 levels were raised, plant growth above and below ground rose by 21 and 28 percent, respectively. Due to increased CO2, the yield of some crops, such as wheat, rice, and soybeans, may rise by 12 to 14 percent.

As CO2 levels grow as a result of climate change, plants may benefit from the carbon fertilisation effect and need less water to flourish, but it's not all good news. Climate change effects other essential plant development factors, such as nutrients, temperature, and water, so aggravating the situation. Growing seasons are getting longer and hotter as a consequence of increasing temperatures. In contrast to the advantages of partly shutting their stomata, plants would drink more water due to their accelerated and prolonged development. Contrary to what experts had predicted, the result would be drier soils and less runoff into rivers and streams. This might result in enhanced local warming since evapotranspiration (when plants release moisture into the air) makes the air cooler. Moreover, when soils are dry, plants experience stress and absorb less carbon dioxide, which may hinder photosynthesis.

2.2.1 Environmental factors affecting plant growth

Significant environmental factors affecting plant growth and dispersal (where the plant can grow). Any poor environmental aspect inhibits the growth and/or dispersal of a plant. Light, temperature, water, humidity, and nutrition all have an effect on plant development. It is crucial to comprehend how these elements impact plant development and growth. If you have a basic understanding of these qualities, you may be able to manipulate plants to achieve your desired leaf, flower, or fruit yield. If you comprehend the roles of these components, you will be able to effectively detect plant issues caused by environmental stress [26].

a) Light

Three principal characteristics of light affect plant growth: quantity, quality and duration.

1. Quantity

Light quantity refers to the concentration or intensity of the sun's beams. It varies according on the season. Summer has the most light, whereas winter contains the least. The more a plant's exposure to light, the greater its capacity for photosynthesis.

You may adjust the quantity of light to produce a variety of growth patterns in plants. Light may be boosted by surrounding plants with reflecting materials, a white backdrop, or extra lighting. Reduce it by shading plants with cheesecloth or woven shade cloths.

2. Quality