UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART MUSHROOM HOUSE TEMPERATURE CONTROL SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

by

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Tajuk: DEVELOPMENT OF SMART MUSHROOM HOUSE TEMPERATURE CONTROL SYSTEM

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I hereby, declared this report entitled DEVELOPMENT OF SMART MUSHROOM HOUSE TEMPERATURE CONTROL SYSTEM is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

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ABSTRACT

The temperature sensor DHT11 is used to detect the temperature reading and the temperature range for this sensor is between 0°C to + 50°C. One of the project objectives is to develop the temperature control system by using fan and thermoelectric module powered by the solar power. The development and implementation of temperature control system is presented for the Bachelor Degree Final Year Project. This project is introducing a current and latest update technology which is by using solar power and Internet of Thing (IoT). Solar power is a system that used to power up the operations of this project by convert the energy from the sunlight into electrical power energy with using solar panel and store energy that has being produced into the battery. The advantage is to save up electricity consumption. Furthermore, this project is using an Internet of Thing (IoT) system to transfer data over a network with using Wi-Fi module ESP8266 for purposed to help the user to remotely control and monitor the air temperature reading within the mushroom house through a smartphone device. Moreover, this project used the NodeMCU as an open source platform to read the temperature sensor input data and convert it into output data that triggers the fan and thermoelectric module to turn ON. The purposed is to results a low air temperature at an optimum air temperature range (25-30°C) within the mushroom house. This project gives benefit to Oyster mushroom entrepreneur as it increased the production of mushroom and save up costs by reduced the electrical bills since using the solar power. Lastly, this project also helps the Oyster mushroom entrepreneur to save up time consumption since can remotely control and monitored the mushroom house air temperature reading from a distance.

ABSTRAK

Sensor suhu DHT11 digunakan untuk mengesan bacaan suhu pada julat suhu antara 0°C hingga 50°C. Salah satu objektif projek ini adalah untuk membangunkan sistem kawalan suhu dengan menggunakan kipas dan termoelektrik modul yang dikuasakan oleh tenaga solar. Pengembangan dan implementasi daripada projek ini akan dibentangkan dalam Projek Tahun Ijazah Sarjana Muda Projek. Projek ini memperkenalkan teknologi terkini iaitu menggunakan kuasa solar dan Internet Thing (IoT). Sistem kuasa solar adalah sistem yang digunakan untuk membekalkan kuasa kepada projek ini dengan menukarkan tenaga cahaya matahari ke dalam tenaga kuasa elektrik. Kelebihannya adalah untuk menjimatkan penggunaan elektrik. Tambahan pula, projek ini menggunakan system Internet of Thing (IoT) untuk memindahkan data melalui rangkaian dengan menggunakan modul Wi-Fi ESP8266 untuk tujuan membantu pengguna mengawal dan memantau kadar suhu udara rumah cendawan melalui peranti telefon pintar. Selain itu, projek ini menggunakan NodeMCU sebagai platform sumber terbuka untuk membaca data input sensor suhu dan mengubahnya menjadi data keluaran untuk menghidupkan kipas dan modul termoelektrik. Tujuannya adalah untuk menghasilkan suhu udara yang rendah pada jarak suhu optimum (25-30°C) di dalam rumah cendawan. Projek ini memberikan manfaat kepada usahawan cendawan Oyster kerana ia dapat meningkatkan penghasilan cendawan dan menjimatkan kos dengan mengurangkan bil elektrik dengan menggunakan tenaga solar. Akhir sekali, projek ini juga membantu usahawan cendawan Tiram untuk menjimatkan penggunaan masa kerana dapat mengawal dan mengawasi suhu udara rumah cendawan dari jarak jauh.

DEDICATION

Special dedicate to my parents,

Mohd Azrin Bin Azizan and Norazlina Binti Ahmad Noor,

for support and raising me become who I am today.

To my beloved Supervisor, Co-supervisor and friends,

for give support and helping me in order to finish this thesis.

May Allah Bless Us.

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LIST OF SYMBOLS

°C	-	Degree Celsius
%	-	Percentage
V	-	Voltage
A	-	Ampere
mAh	-	Mili-Ampere Hour
W	-	Watt
MHz	-	Megahertz
GHz	-	Gigahertz
Kb	-	Kilobyte
p	-	Positive
n	-	Negative
s	-	Second
W / m•K	-	Watts per meter-Kalvin

LIST OF ABBREVIATIONS

LCD	Liquid-crystal display
IoT	Internet of things
PC	Personal computer
LiPo	Lithium Polymer
PV	Photovoltaic
IDE	Integrated Development Environment
USB	Universal Serial Bus
SPI	Serial Peripheral Interface
SRAM	Static random-access memory
DRAM	Dynamic random-access memory
RAM	Random-access memory
GPIO	General Purpose Input/Output
ADC	Analog-to-digital converter
FLA	Flooded Lead Acid
AGM	Absorbed Glass Mat
LED	Light-emitting diode
VI	Virtual Instrument
PSM	Projek Sarjana Muda

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will explain the background of this project in designing a Smart Mushroom House Temperature Control System. This project will act as a device that can control the temperature within the mushroom house on a day light that eliminated the high air temperature and replaced with low air temperature. This chapter includes background, problem statement, objective and scope of the project.

1.1 Background

The main components of this project are a fan that connect with solar power system and this project also provide an air temperature reading of the mushroom house by using DS18b20 temperature sensor. Furthermore, this project used the DS18b20 temperature sensor is because the sensor is less cheap and more effective to compare with other temperature sensor that is more expensive and less effective. The temperature reading will be display on the LCD and can be observe on the smartphone. This project used an Internet of Thing application (IoT). IoT is the extension of internet connectivity into physical devices and the function of this application is to control the system of this project through the smartphone for the purpose to make this project is easier to be used.

This application can be controlled via devices associated with that ecosystem such as smartphones or laptop.

Moreover, this project used relay switching system to automatically trigger the fan to turn on if the air temperature reading exceeds the set limit of the air temperature. A relay is an electric switch and used an electromagnet to control a switch mechanically. The benefit of relay is that with a low power circuit it can control a high-power circuit. With using IoT application, the relay switching system also can be controlled by using smartphones to trigger the fan to turn on. In order to save the electricity consumption, this project is used a solar power system to be operate. Solar power is the transition of energy from sunlight into electricity. With using the solar power system, it can reduce the electricity consumption and reduced the cost for mushroom cultivation field.

1.2 Problem Statement

Malaysia climate is categorised as equatorial, being hot and humid throughout the year. Local climate is affected by the presence of mountain ranges across Malaysia. During a sunny climate, the temperatures ranging from 32°C to 36°C. This show that Melaka has a hot sunny environment. During a daylight, the air temperature inside the mushroom house can exceed 35°C and not suitable for Oyster mushroom growth. When the Oyster mushroom being exposed to the hot air temperature, it can affect the growth of the mushroom. The mushroom that planted in an optimum room air temperature will have a bigger size compare to the mushroom that being planted in high room air

temperature. It shows that the growth of mushroom is also depends on the room air temperature.

Furthermore, the range air temperature for Oyster mushroom to growth is ranging from 23-30°C and the humidity 80-95%. When at a certain high air temperature and low percentage of humidity results of inefficient of growth rate for Oyster mushroom and cause the production of mushroom not effective. The mushroom house air temperature must be well maintained and supervised in order to obtain an optimum air temperature within it for the purpose to increase the mushroom growth rate. In the mushroom house, the issue of high air temperature also caused a significant reduction in the potential for mushroom production. It is also resulting the entrepreneur of mushroom cultivation will face of high cost for purpose to deal with a low percentage of mushroom production. This issue needed to be solved immediately by the entrepreneur for purpose increasing the rate of mushroom production and increases the profit from the mushroom cultivation.

1.3 Objective

The main objective of this project is to control the temperature in the house of mushroom during the day light and to reduce the insect problem that affect the production of mushroom. Moreover, this project also is done for purpose to reduce the electricity consumption with using solar power system. High air temperature inside the house of mushroom affect the reduced of growth rate of mushroom. Therefore, there are 2 objectives of this project:

1. To develop temperature control system that will maintain the temperature 25-30°C.
2. To develop a stand-alone project using solar panel system.

1.4 Scope of Project

Basically, the scope of the project is focusing on the design of a system that can be used to control the temperature in the mushroom room for the purpose to maintain the air temperature ranging from 25-30°C to avoid an inefficient the production of mushroom. This project is using Arduino software and the Internet of Thing for the purpose to control the mushroom house air temperature. Moreover, this project is operated with using solar power that can reduced the electricity consumption and reduced the cost for mushroom cultivation.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter consists of two section where is the first section will explain about the hardware used in this project and the second part will explain about the previous project that related to this project.

2.1 Hardware Used

This part will explain about all the research of hardware that used in this Smart Mushroom House Temperature Control System, which is solar power system, photovoltaic cells, charge controller, temperature sensor DHT11, Internet of Thing (IoT), NodeMCU, ESP8266 Wi-Fi module, relay, thermoelectric module, heat sink, LiPo battery, PC fan and LCD display.