

DEVELOPMENT OF IOT BASED DIGITAL TIMER  
CONTROLLER FOR MUSHROOM HOUSE WATERING  
SYSTEM



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2020



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**DEVELOPMENT OF IOT BASED DIGITAL TIMER  
CONTROLLER FOR MUSHROOM HOUSE WATERING  
SYSTEM**

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

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

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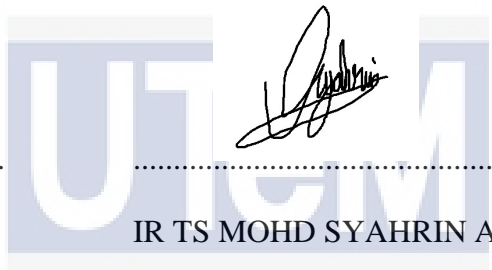
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## APPROVAL

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



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## ABSTRAK

Projek yang dicadangkan bertujuan untuk menghasilkan sistem pemantauan automatik pam air bersama dengan suhu dan kelembapan pada peranti luaran seperti telefon pintar atau komputer dengan menggunakan platform IoT. Masalah baru-baru ini dalam industri berkaitan ladang cendawan adalah sistem pemantauan terhad dan pengubahsuai masa untuk hidupkan dan matikan pam air secara manual. Oleh itu, projek ini akan membantu menyelesaikan masalah yang dihadapi dalam bidang berkaitan ini. Ringkasan aliran projek ini terdiri daripada penetapan pemasa pam air untuk mengawal dan memantau kelembapan dan suhu di platform IoT. Sistem ini terdiri dari sensor yang dapat mengesan suhu dan kelembapan yang akan bertindak sebagai parameter bagi pam air untuk melakukan tugas yang diberikan. Data yang dikumpulkan dari sensor dan pam air akan dihantar ke NodeMCU Wifi Modul ESP 8266 (ESP-12E). Kemudian, modul Wi-Fi akan menghantar data pelayan awan di platform IoT yang merupakan Blynk untuk melakukan sistem pemantauan pada peranti luaran seperti telefon pintar. Jadi, dalam platform Blynk melalui telefon pintar, akan ada visual data suhu dan kelembapan dengan keadaan pam air. Pengujian akan dilakukan dalam urutan berulang sehingga pengaturan pemasa terbaik untuk pam hidup atau mati dapat dilaksanakan untuk menjaga suhu dan kelembapan pada tahap optimum iaitu bawah 30<sup>0</sup>C dan 60% ke atas.

## ABSTRACT

The proposed project intended in producing automated monitoring system of water pump along with the temperature and humidity in external devices such as smartphones by using IoT platform. The recent problem in related industry of mushroom fields is the limited monitoring system and manual setting of timer devices for watering pump to turn on or off. So, this project will help in resolving the problem encountered in this related field. The summarize flow of this project comprised of the setting of timer of water pump to control and monitor the humidity and temperature in IoT platform. The system consisted of sensors that can detect temperature and humidity which will act as the parameters for the water pump to do the task given. The data that collected from the sensors and water pump will be sent to NodeMCU Wi-Fi Module ESP 8266(ESP-12E). Then, the Wi-Fi module will send the data the cloud server in IoT application which is Blynk to do the monitoring system on external devices such as smartphones. So, in Blynk application through smartphones, there will be visuals of data of temperature and humidity with the condition of the water pump. The testing would be done in repeating sequence so that the best setting of timer for the pump to on or off can be implemented to keep the temperature and humidity at the optimum level which are below 30<sup>0</sup>C and above 60% respectively.



## DEDICATION

I would like to dedicate this project this to my beloved parents in encouraging me on finishing this project. Not to forget, to my friends and course mates in giving supports and positive feedbacks throughout the semester on completing this project.



## ACKNOWLEDGEMENTS

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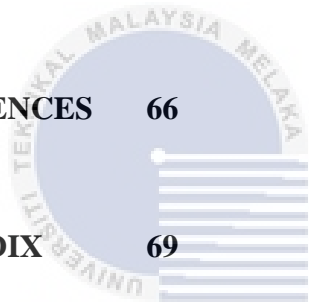
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## LIST OF SYMBOLS

$^{\circ}\text{C}$	-	Temperature
%	-	Humidity



## LIST OF ABBREVIATIONS

<b>IoT</b>	Internet of Things
<b>WMSN</b>	Wireless Mesh Sensor Network
<b>RFID</b>	Radio Frequency Identification
<b>RTC</b>	Real Time Clock
<b>ADC</b>	Analog Digital Converter
<b>LCD</b>	Liquid Crystal Display
<b>FSM</b>	Finite State Machine
<b>MCU</b>	Microcontroller Unit
<b>FPGA</b>	Field Programmable Array
<b>LED</b>	Light Emitting Diode
<b>SDA</b>	Serial Data
<b>SCL</b>	Serial Clock
<b>LAN</b>	Local Area Network
<b>RH</b>	Relative Humidity

# CHAPTER 1

## INTRODUCTION

This chapter gives overview and detailed explanations about the project background, the problem statements, the objectives, and the scope of the project. Finally, the thesis organization of this project were also included in this chapter.

### 1.1 Background

#### 1.1.1 Development of Mushroom in Agriculture

In terms of agriculture product, mushroom proved to be one of reliable source income for small scale farmers. In Malaysia, mushroom industry is still not well known compared to other agriculture product. Mushroom cannot grow easily without suitable environmental condition. As stated, mushroom need optimum humidity and temperature to maximise its productivity as excess moisture can cause contamination (Marzuki and Ying, 2017). In conclusion, environmental system that consisted of humidity, temperature, light intensity, and carbon dioxide concentration need to be monitored and controlled wisely to overcome the problem that may occur in stated above.

#### 1.1.2 Use of Digital Timer Controller in Industries

Digital timer can be categorised or used in many events or applications. Timer can be classified as a device used to determine the time sequence prior to the user demands. It can be used for repetitive action after a period is initiated. In terms of agricultural perspectives, timer would be used on continuous control of watering device

to ensure the maximised product output. But sometimes, farmers or users tend to forget to optimize watering schedule daily which can lead to inefficient growth of plant products (Primisima, Sudiro and Wardijono, 2016). The timer would be used in these circumstances to increase rate production. Nevertheless, the use of manual timer sometimes does not synchronize or in accordance to the condition of plant or mushroom. So, the timer would be added with IOT or monitoring system as a common approach in controlling the efficiency of controlling water usage while able to produce remote monitoring system. To be more detailed, the timer that used to control watering device in mushroom house can be more efficient if added with IOT application to maximise efficiency while reducing power consumption.

### **1.1.3 Internet of Things (IOT)**

IOT or known as Internet of Things proved to be able to build amazing industrial systems and applications. Nowadays, a broad range of industries that uses IOT applications have been developed and deployed. Besides that, IOT consisted of combination of sensor, network connectivity, internet and computer technology to obtain efficient and smart processing (Chieochan, Saokaew and Boonchieng, 2017). Furthermore, IOT is very important within agriculture industries for monitoring system. In agriculture world, IOT tend to help farmers on latest and new methods to improve the productivity of yields. For example, WMSN and RFID are applied as IOT application to do real-time monitoring and control system by producing automated irrigation system. This method would substantially manage in reducing human effort and gives advantages to the agricultural industries. This system proven to be most useful as great irrigation strategies to maximised crop yields as it can communicate with hardware and software

automatically to send and collect data. To be more simple but precise, farmers can monitor their farm in any places by using devices such as smartphones and computers which defines the IOT system if the systems in the farms are connected by wireless network (Zulkifli and Noor, 2017).

## **1.2 Problem Statement**

There is no denying that mushroom farming had huge prospects and able to generate income or profits to the user or farmers. However, there will always be problems when it comes to the process of producing mushroom. The first problem comes from the surroundings of temperature and humidity in mushroom house. To produce the continuous growth of mushroom, the humidity and the temperature are the important factors that need to be handle correctly which the optimum value determined in providing better growth of mushroom. Based on experience, when the mushroom farming house need more monitoring from human or in other words need to be manually monitoring, there will come problems. The afterward problem comes when the house need human assistance at the most to trigger the water pump according to the estimated weather on the same day. So, the farmer required more time for themselves to be in the mushroom house to continue the process. To solve this problem, the presence and use of microcontroller and RTC (Real Time Clock) module helps in setting the timer for the pump so that the pump can turn on and off automatically based on the choice of the user and the estimated weather. However, the user needs more time and a lot of presence in the mushroom house because they need to monitor temperature and humidity with the condition of the pump locally. The user cannot monitor from other locations or far distance.