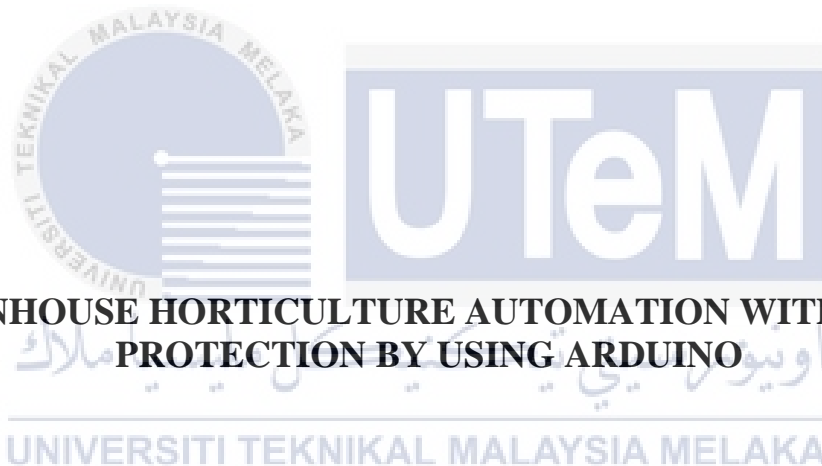




**Faculty of Electrical and Electronic Engineering Technology**



**GREENHOUSE HORTICULTURE AUTOMATION WITH CROPS  
PROTECTION BY USING ARDUINO**

**CHEE KAI HERN**

**Bachelor of Computer Engineering Technology (Computer Systems) with Honours**

**2021**

**GREENHOUSE HORTICULTURE AUTOMATION WITH CROPS PROTECTION  
BY USING ARDUINO**

**CHEE KAI HERN**

**A project report submitted  
in partial fulfillment of the requirements for the degree of  
Bachelor of Computer Engineering Technology (Computer Systems) with Honours**



**Faculty of Electrical and Electronic Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2021**



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
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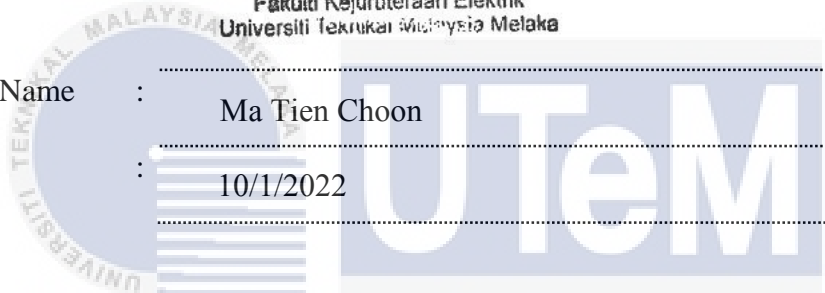
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## DEDICATION

*Special thanks to my beloved family member for their unconditional support regarding my studies. Thanks for supervisor who fully guided in the whole journey of my project. I would like to express the sincere appreciation to Universiti Teknikal Malaysia Melaka (UTeM) in providing an opportunity of participation in Bachelor Degree Project (BDP) in this pandemic session. I am sincerely appreciated towards everyone who gave me support and assistance as their contribution had make my final project completed successfully.*



## ABSTRACT

In Malaysia, sector agriculture has become one of the key factors as income generator which encouraging the economic development for the country. Tropical climate also the sufficient land resources encourage the influence from large plantation suppliers to the small-scale farming owner to demonstrate agriculture practices even in rural areas. But, unpredictable weather condition, natural disaster approaches, unpleasant intruder causes the huge loss of money and reduction of the crop production. The current studies examines that the automation greenhouse enable to control the environmental condition which is perfect for plantation growth. Besides, the intrusion detection system enables to detect the approaches of intruder and gives responses immediate. Implementation of Internet of Things (IOT) in automation greenhouse enable to send the current environment measurement towards the cloud platform and allow the supervision indirectly by using mobile application. Thus, invention of this automation greenhouse system carries out perfect environment to accelerate the growth of plants which increasing the daily productivity also provides protection for crops from being stolen or destroyed.

## ***ABSTRAK***

Di Malaysia, sektor pertanian telah menjadi salah satu faktor utama sebagai penjana pendapatan yang menggalakkan pembangunan ekonomi negara. Iklim tropika juga sumber tanah yang mencukupi menggalakkan pengaruh daripada pembekal ladang besar kepada pemilik ladang berskala kecil untuk menunjukkan amalan pertanian walaupun di kawasan luar bandar. Tetapi, keadaan cuaca yang tidak menentu, pendekatan bencana alam, penceroboh yang tidak menyenangkan menyebabkan kerugian besar wang dan pengurangan pengeluaran tanaman. Kajian semasa mengkaji bahawa rumah hijau automasi membolehkan untuk mengawal keadaan persekitaran yang sesuai untuk pertumbuhan ladang. Selain itu, sistem pengesanan pencerobohan membolehkan untuk mengesan pendekatan penceroboh dan memberikan respons segera. Pelaksanaan Internet of Things (IOT) dalam rumah hijau automasi membolehkan untuk menghantar pengukuran persekitaran semasa ke arah platform awan dan membenarkan penyeliaan secara tidak langsung dengan menggunakan aplikasi mudah alih. Oleh itu, penciptaan sistem rumah hijau automasi ini menjalankan persekitaran yang sempurna untuk mempercepatkan pertumbuhan tumbuhan yang meningkatkan produktiviti harian juga memberi perlindungan kepada tanaman daripada dicuri atau dimusnahkan.



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## LIST OF SYMBOLS

$\Omega$	-	Ohm
A	-	Amprere



## LIST OF ABBREVIATIONS

<i>V</i>	-	Voltage
<i>LDR</i>	-	Light Dependent Resistor
<i>IOT</i>	-	Interet of Things
<i>GSM</i>	-	Global System for Mobile Communications
<i>GUI</i>	-	Graphic User Interface
<i>WIFI/Wi-Fi</i>	-	Wireless Fidelity
<i>LCD</i>	-	Liquid Crystal Display
<i>WSN</i>	-	Wireless Sensor Network
<i>PIR</i>	-	Passive Infrared Resistor
<i>HTUA</i>	-	High-technolgy urban Agriculture
<i>TDS</i>	-	Total Dissolve Sensor
<i>OLED</i>	-	Organic Ligh -Emitting Diode
<i>API</i>	-	Application Interfaces Integration
<i>SMS</i>	-	Short Message Service
<i>RTC</i>	-	Real Time Clcok
<i>LED</i>	-	Light Emitter Diode

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Agriculture industrial is the one of the important role in the development of economic in Malaysia. In this agriculture sector who has generates nearly about RM 1.2 trillion of national Gross Domestic Product (GDP) in a year. Agriculture sector is profitability and able to support the finances among the stakeholders. Besides, it contributed high employment as creating more requirement of job towards farmer. High demanding of farm crops in domestic and international market has leads implementation of small-scale stakeholders also the large industrial to increase crops productivity to supply the requirement of consumer.

Greenhouse horticulture is a kind of agricultural activity that mostly concentrated in highlands of Cameron Highlands, Pahang Malaysia. Greenhouse defines as a totally encircle structural which isolated the indoor environment inside the greenhouse from external environment to produce a perfect environment condition for plant growth. Usually, it is a framed house that fully covered by transparent cladding which allowed the sunlight rays penetrate inside the greenhouse. Sufficient of sunlight and optimum environment parameters accelerates the speed of plant growth also shorten the harvest duration. Other than that, implementation of greenhouse promotes high productivity also minimize the effects of weather condition, pest or diseases towards the plants [1]. Even though, greenhouse gain the crops yield but the requirement of the high of manpower in management and monitoring during the old time. In the traditional greenhouse, farmer need to always observe the changes inside the greenhouse by naked eyes and depending on own gardening experiences.

Sometimes, this method is not able to get the accurate measurement, if one steps goes wrong, bad result may be consequences.

As the expanding of 4.0 Industry, there are various enhancement which occupying technologies on equipment, gadget or even the remotely system into the greenhouse system in agriculture. IoT based greenhouse system is upgraded with automation which capable to monitor all the desired measurement includes temperature, humidity and soil moisture level in the greenhouse atmosphere by replaced the manual supervision from human. Improvement of advances greenhouse has promoted the efficient the crops production as detecting and managing the environmentally parameters by sensor system with telecommunication technologies support by access of Internet services. Internet of Things will collect data information from sensor system and exchanging the data within the Cloud Computing by network interconnection. Then, the cloud platform will recorded also kept traces these parameters simultaneously when detected by sensor system [2]. The intense agriculture production by emerging the innovation of technology in agriculture sector promotes Netherlands becomes the one of the most food productive in the world. In the big city like Amsterdam practices the high -tech urban agriculture (HTUA) that applying the advance environment controlling system, horticultural lighting used for indoor light source provider and also the growing crops in vertically which is save of spaces. These advances equipment promotes sustainability of crops since the harvesting quantity been maximise within shortest duration. As conclude, Netherlands had considered as the second greatest exporter which relies on exporting the agriculture goods [3].

Nevertheless, there are still existence some risk causes reduction of crops especially the intrusion of wild animals also culprits. Traditional crops protection applying the humanoid scarecrows to deter threat of wild birds and guard crops field. Scarecrow also corn dolly is the earliest method which conducted as the safeguard for the corn filed in ancient

Egypt [4]. However, as time passes, the birds will be familiar to the scarecrow and reduced the scare of scarecrow. Rural agriculture concerns the high possibility of disturbing and feeding by wild animals includes monkeys, deer, birds, mice or even boar. Destruction from wild animals brings up to 50% of loss in finances of farmer. Elephant-human conflict in India shown the intensely intrusion of wild animals which elephants across the human habitats for raid the crops. Both lives and property are been menace within this conflict [5]. Instead of that, there are some unpleasant thefts who will steal valuable crops production from owner and sell it for personal benefits. Sometimes, some farmer owned their armed fire just ready to shoot and warn the intruder just to protect their property. However, armed the gun fire is illegal and only specific to some unusual occupation such as policeman or bodyguard but no for all farmers. Only the one with legal permit can own their imitation or fake gun with bb bullets. Legally own gun is still available to Malaysia, and strictly for someone who own the gun for protection from predators and property. But reminds, with power comes responsibility, if armed shoot at someone purposely will be treats with strict penalty, even worst the death penalty.

Instead of that, some of the farmer applying the fencing around the plantation area with wire netting. Even though there are some sharp wirings and some thorns, but it cannot be stop larger size animal to cross it. After then, invention of the electric fencing which allows the heavy current flow across the fencing to shock the animal once it is approaches. This electric fencing is effective, but it may cause assaulting of animals. Electric fence is high tensile and permanent, but it will consume huge amount of electricity which burden the expenses of farmer. Unfortunately, the electric fencing only can install after approval from government as farmer cannot kill the wild animal simply which may against the wildlife law [6].

## 1.2 Problem Statement

Traditional conventional agriculture in greenhouse is unable to maintain the ideal temperature during hot weather. High environmental temperature limits the growth of plant also increase the risk of death of plant. Furthermore, as the temperature surrounding increases gradually, the moisture level in soil also effected indirectly. Extreme temperature reduces the humidity in air and decreases the water content in soil which harden the plant to survives. Conventional greenhouse is manually operating which it is not able to obtain the accurate environment parameters to support the plant growth and maximum the crop production. On the other hand, the security of plantation area is not enough to against the attacks from the pests also the criminal. Wild animals may sneak or step into the plantation area and feed the ready harvest crops. As well as there are some culprits may enter the plantation area illegally and steal the crops and sell for money. Some of intruder not only feed or steal the crops while they might causes the harm or killing the young seedling that still growing. In short, the automation greenhouse will be revolute the monitoring and controlling management into technologies. All the parameter of growth of plant will be detected by sensor system and controlling system will working automatically based on the measurement been detected. Hence, automation greenhouse will be the highly security guard with optimum environment condition and avoid the stolen of plantation.

## 1.3 Project Objective

The main aim of this project as follows:

- a) To develop the automation greenhouse system that demonstrates a sustainable environment to increase the crop production.

- b) To implement the intrusion detection and prevention system against the wild animals attacks or unpleasant theft in greenhouse.
- c) To visualize current environment parameters and interact with on-site greenhouse system by using mobile application.
- d) To improve the traditional greenhouse into advanced greenhouse that enable to connect with cloud analytics.

#### 1.4 Scope of Project

The scope of the work is focus on measuring the weather condition and secure the crop within the greenhouse. DHT11 executes temperature and humidity measurement detection in the greenhouse. While the moisture sensor used to detect the moisture level in soil and LDR sensor to measure the light intensity. Apart of that, the laser fence is set up by beaming the laser light source on the LDR module. Once the laser beam is blocked determines the intrusion occurrence, the alarming system invoked. But if the laser beam is unblocked, it will determine no intrusion occurrence. Besides, researcher can check the condition of plant by the mobile application.

The scope of this project to be done as follows:

- a) The simulation of the project is done by using the PROTEUS software application to design the electronics circuit.
- b) The programming code of the circuit is designed by using the Arduino Integrated Development Environment (IDE) which purposed the editor code for Arduino and NodeMCU hardware.
- c) The mobile application using the Blynk Application as monitoring system on user side though connection WiFi.