



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF AUTOMATED FARMING
SYSTEM USING IOT**

This report is submitted in accordance with the requirement of the University Technical Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) With Honours.

by
اونيورسي تيكنيكل مليسيا ملاك
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AHMAD FAISAL HAZIQ BIN MANSOR

B071710503

960803055039

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
TECHNOLOGY

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan
Elektrik dan Elektronik
Universiti Teknologi Malaysia Melaka

AHMAD FAISAL HAZIQ BIN

MANSOR

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246, LORONG ANGSANA 1/2,

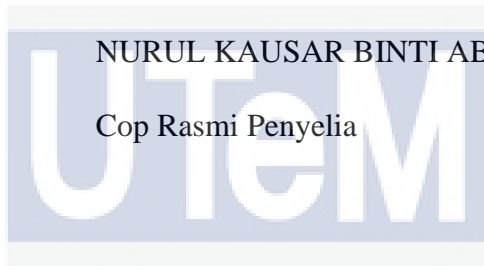
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Author : AHMAD FAISAL HAZIQ BIN

MANSOR

Date: 16/1/2021



APPROVAL

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

Signature: 

Supervisor: **NURUL KAUSAR BINTI AB MAJID**
Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan
Elektrik dan Elektronik
Universiti Teknologi Malaysia Melaka

اوتيزور يوتيزورتي بيكي كل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Signature:



AMALIA AIDA BINTI ABD HALIM
Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan
Elektrik dan Elektronik
Universiti Teknologi Malaysia Melaka

Co-supervisor: **AMALIA AIDA BINTI ABD HALIM**

ABSTRAK

Berkebun di dalam rumah adalah tindakan di mana individu mengembangkan atau menanam tanaman di tempat tertutup. Pada zaman pemodenan ini, banyak orang menganggap berkebun di dalam rumah sebagai aktiviti menarik untuk dilaburkan pada waktu lapang. Namun, masalah utama telah muncul. Sebagai pemula, mereka harus meluangkan banyak masa dengan tanaman mereka untuk memastikan tanaman tumbuh dengan sihat kerana terdapat banyak elemen ekologi yang dapat mempengaruhi kesihatan dan pertumbuhan tanaman. Sepanjang masa yang mereka perlukan dibatasi oleh waktu dan tanggungjawab kerja mereka. Projek 'Plant Monitor' diusulkan bersama instrumen khusus untuk memberikan pengaturan. Melalui projek ini, sistem pemantauan tanaman akan ditujukan untuk membantu menjaga pertumbuhan kesihatan tanaman. Pada ketika itu, dengan melakukan tugas ini, keadaan sihat tanaman akan disiasat dan diuji. Beberapa sensor ditanamkan ke projek ini yang akan menghantar isyarat input ke mikrokontroler yang akan menghantar data maklumat kepada pengguna melalui aplikasi dengan menggunakan IOT. Pada ketika itu, beberapa penggerak juga dipasang ke dalam projek ini, di mana ia akan digerakkan oleh sensor mereka sendiri. Lebih kurang, diharapkan 'Plant Monitor' dapat membantu menjaga pertumbuhan dan kesihatan tanaman

اونيورسي تيكنيكل مليسيا ملاك

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ABSTRACT

Indoor gardening is an action where individuals develop or grow plants inside enclosed places. In this modernization time, numerous people have discovered indoor gardening as a fascinating activity to be invested during their free time. Yet, a major issue has come to presence. As a beginner, they have to invest a decent amount of time with their growing plant to ensure the plants grow healthily since there are numerous ecological elements that can influence the plant's health and growth. All the time they need have been restricted by their working hours and responsibilities. The Plant Monitor project is proposed alongside specific instruments to give the arrangement. Through this project, a plant monitoring system will be intended to help keeping up the growth of the plant health. At that point, by doing this task, plant's healthy condition will be investigated and test. A few sensors are implanted to this project that will send input signals to the microcontroller that will send information data to the user through an application by using the IOT. At that point, a few actuators additionally are installed into this project, where they will be actuated by their own sensors. More or less, it is expected that the Plant Monitor will help in keeping up the plant's growth and health.

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DEDICATION

This dedication is sincerely meant for my beloved family, respected lecturers and dear friends. Their loves, affections, guides, helps and encouragements are the things that urge me to advance across the finishing line. There are no words that have the ability to represent my appreciation to these beautiful souls.




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اونيورسيتي تيكنيكل مليسيا ملاك

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LIST OF SYMBOLS

v	-	Volts
A	-	Ampere
W	-	Watt
°C	-	Degree Celsius



LIST OF ABBREVIATIONS

LED Light Emitting Diode

IoT Internet of Things

LDR Light Dependant Resistor

DC Direct Current

SOC System on Chip

IDE Integrated Development Environment

GSM Global System for Mobile

SMS Short Message Service

LCD Liquid Crystal Display

MCU Microcontroller Unit

Hex Hexadecimal

IC Integrated Circuit

I2C Inter-Integrated Circuit

CHAPTER 1

INTRODUCTION

1.1 Background

Indoor gardening is basically growing a plant indoor. Specifically, indoor gardening can be said as an act of growing plant inside an enclosed place, most often a residential home. Many types of plants can be grown indoor such as herbs and decorative plants. Many residents of flats, apartments, condominiums have taken a liking on this type of gardening because the lack of garden spaces at their places.

Apparently, in this era of globalization, almost everyone has a job. This statement portrays that their time to garden will become shorter and shorter thus, jeopardizing their plant's health. In order to help with maintaining their plant's growth and health, 'Plant Monitor: A smart indoor gardening system' has been proposed.

Specifically, a plant needs water, light and warmth in order to grow healthily. Thus, parameters such as soil moisture, light intensity, temperature and humidity needed to be monitored meticulously.

Water or specifically soil moisture, is a very important aspect in plant's growth. This is because water is crucial for photosynthesis as it is a reagent in this process. It is also important for cell enlargement and growth. Then, it also acts as solvent for minerals. But, if

the soil is overhydrated or under hydrated, the root will rot and cause the plant to grow poorly and eventually leading to death.

Plants make their own food through the photosynthesis process. Sunlight is the source of energy for this crucial process to happen. Thus, plant's growth can be affected by the quality, duration, and intensity of light energy.

Temperature also plays an important role in helping plants growth. Firstly, it can affect the metabolic process of a plant. Too high temperature can damage the plant's cell while too low temperature can make the cells become dormant. This certainly will affect the plant's health.

In order to monitor the plant's health and growth effectively, several sensors such as light intensity sensor, temperature sensor, soil moisture sensor and air humidity sensor have been integrated into the 'Plant Monitor'.

Monitoring alone is insufficient to maintaining the plant's health and growth effectively. Thus, several actuators such as water pump, exhaust fan, mister and artificial sunlight also have been integrated into the 'Plant Monitor'.

The water pump will activate when the soil moisture is too low in order to maintain an enough water supply for the plant. Then, the exhaust fan is used whenever the temperature is too high for the plant to bring out the entire hot wave. On the other hand, the mister will be turn on whenever there is a decrease in air humidity in order to provide good humidity for the plant. Finally, the artificial sunlight in connected to the light intensity sensor, so whenever there is insufficient supply of light energy, it will turn on.

Then, in order to applying the Internet of Things concept, the microcontroller of the 'Plant Monitor' will process the raw data from the sensors and send it to the android

application through the Wi-Fi module. The android application will nudge the user if dangerous level of certain parameter has been reached so that the user can take a countermeasure.

1.2 Problem Statement

Plants need water, light, and warmth to maintain a good health and grow healthily. Water is needed since they are the solvent for minerals, reagent in photosynthesis process and important for cell enlargement and growth. Certain plant will require different amount of water, light or warmth.

Thus, it is important to monitor all these parameters and act on it. But the gardeners nowadays may have only a little time to take care of their plants because of their commitment at workplaces. Thus, the 'Plant Monitor' is proposed to help the gardeners to monitor the Light intensity, temperature, soil moisture and air humidity for each plant accordingly. Then, it can actuate some actuators according to the sensors and specified parameters that suit the plant itself. Hence, the plant's grow will be maintained.

1.3 Objective

There are three main aims for this project:

1. To develop a plant monitoring system to help maintaining growing plant health.
2. To develop a mobile phone application to monitor the plant's health or condition.
3. To analyse 'Plant Monitor' performance.