SMART GARDEN MONITORING APPLICATION

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Computer Networking) with Honors.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
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2021

DECLARATION

I hereby declare that this project report entitled

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is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : NUR SHAHIRAH BINTI AZMI Date : 10/9/2021

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I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Computer Networking) with Honors.

SUPERVISOR : TS. MUHAMAD SYAHRUL AZHAR BIN SANI Date : 10/9/2021

DEDICATION

In the name of God, the Most Gracious, the Most Merciful.
I dedicate this project to my beloved parents, Azmi Bin A.Ghani and Norizan Binti Salleh who always support me, inspired me, guided me tightly, support me with words of encouragement from the beginning of my PSM journey. To my supervisor, evaluator, and lecturers for modelling me into a knowledgeable person. To my friends and course mates for guidance, sharing information, and giving support throughout my study in UTeM.

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ABSTRACT

The Internet of Things (IoT) is a network of connected devices that interact with one another. Using IoT, it allows user to monitor and control a device remotely with a computer or smartphone to collect and share information. This project presents a cost-effective automated Smart Garden Monitoring Application which can be utilized to monitor the plant in the garden every day. This technology was designed to replace the traditional method of plant monitoring, which required people to be present. The objective of this project are to study on smart garden method with Internet of Things technology, to develop hardware prototype that able to monitor garden's environment and to integrate hardware prototype with mobile application to provide alert. The Node MCU ESP 8266 has an inbuilt WiFi system is used as the central core for IoT applications where the code is implemented in developing an algorithm to differ the data from sensors. The system include a variety of sensors, such as humidity and temperature sensors, moisture sensors in the soil, and movement detection sensors. All sensors are connected to the Node MCU ESP 8266, and the data is saved in the cloud and displayed on the mobile app. Certain parameters is notified to the user if they detect certain condition. This project describes a wireless network and sensor-based Internet of Things architecture for a garden. The expected output result of this project is to provide and alert user with notification about the condition of the plant while remotely monitoring it via mobile application. Hardware testing is carried out to verify that the proposed system is completely functioning.

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ABSTRAK

Internet of Things (IoT) adalah rangkaian peranti bersambung yang saling berinteraksi antara satu sama lain. Dengan menggunakan IoT, pengguna dapat memantau dan mengendalikan peranti dari jauh dengan komputer atau telefon pintar untuk mengumpulkan dan berkongsi maklumat. Projek ini membentangkan Sistem Pemantauan Taman Pintar automatik yang dapat digunakan untuk memantau tanaman di taman setiap hari. Teknologi ini dirancang untuk menggantikan kaedah tradisional pemantauan tanaman, yang memerlukan individu untuk hadir. Objektif projek ini adalah Untuk mengkaji kaedah taman pintar dengan teknologi IoT, untuk mengembangkan prototaip perkakasan yang dapat memantau lingkungan taman dan untuk mengintegrasikan prototaip perkakasan dengan aplikasi mudah alih untuk memberi peringatan. Node MCU ESP 8266 mempunyai sistem WiFi yang digunakan sebagai teras utama untuk aplikasi IoT di mana kod tersebut dilaksanakan dalam mengembangkan algoritma untuk membezakan data daripada sensor. Sistem ini merangkumi pelbagai sensor, seperti sensor kelembapan dan suhu, sensor kelembapan di dalam tanah, dan sensor pengesanan pergerakan. Semua sensor disambungkan ke Node MCU ESP 8266, dan data disimpan di awan dan dipaparkan di aplikasi mudah alih. Parameter tertentu akan diberitahu kepada pengguna jika mereka mengesan keadaan tertentu. Projek ini menerangkan rangkaian tanpa wayar dan seni bina Internet of Things berasaskan sensor untuk taman. Hasil keluaran yang diharapkan dari projek ini adalah memberi dan memberi tahu pengguna tentang pemberitahuan mengenai keadaan taman sambil memantau secara jarak jauh melalui aplikasi mudah alih. Ujian perkakasan dilakukan untuk mengesahkan bahawa sistem yang dicadangkan berfungsi sepenuhnya.

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LIST OF ABBREVIATIONS

FYP	**-**	**Final Year Project**
IoT	**-**	**Internet of Things**
USB	**-**	**Universal Serial Bus**
Wi-Fi	**-**	**Wireless Fidelity**
Apps	**-**	**Application**
GUI	**-**	**Graphical User Interface**
RAD	**-**	**Rapid Application Development**
Mobile Apps	**-**	**Mobile Application**
Fig.	**-**	**Figure**

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Gardening is extensively done by Malaysians, especially those who live in rural areas. They garden for various purposes, including food production, money generating, home decoration, and even self-satisfaction or as a hobby. Although gardening is not as widely embraced in cities as in rural areas, the development of edible gardens, urban farming, and community gardens in cities has inspired residents to start their gardens. Furthermore, it has driven the growth of urban farming or urban gardening among Malaysians for food supply, environmental sustainability, and health. (Navesh, 2014)

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In 2006, the Malaysian government launched a campaign called "Bumi Hijau" to encourage Malaysians to grow their food while encouraging people to care for the environment (LAr. Noriah Mat, CA, 2017). According to the Putrajaya Corp Landscape and Park Department, there are currently nine community gardens in Putrajaya due to this program. Furthermore, it was recently announced that Universiti Putra Malaysia (UPM) had established Urban Agriculture to encourage contemporary farming among city people in the limited area available in their homes as a guaranteed supply of food for the nation by 2020. (Noh, 2006)

However, gardening, on the other hand, is not an activity that can be completed in a short amount of time. Gardening needs some skill, expertise, and dedication on the part of the gardener. Some plants, for example, require daily watering, which is a difficulty for individuals who are preoccupied with their jobs, particularly those who reside in metropolitan areas. Noriah Mat, senior deputy

director of Putrajaya Corp Landscape and Park Department, claimed that community member involvement in urban gardening projects had fallen 2 to a mere 5% over the years, although many have shown interest. Although some of the projects were successful, some were skeptical about the long-term viability of urban farming, and some were having trouble finding time to accomplish it because they all have day jobs. (Viewed, 2015)

Living in the modern world has shown that technology may be utilized to improve human activities daily. Many inventions have been created to improve human existence, including communication, health, home, and others.

Thus, this project aims to integrate technology in gardening activities to assist people in monitoring their gardens. The project proposed a smart garden monitoring application that allows users to monitor current garden parameters and monitor the system via a mobile.

1.2 Problem Statement (PS)

Gardening is a task that requires human supervision. In today's busy world, the problem arises when people neglect to nourish their plants because they are preoccupied with their jobs and outdoor lifestyle. In addition, the unpredictable nature of the weather also hinders the plant's ability to thrive. As a result, the garden gets destroyed due to environmental conditions and lack of proper care. Because of this problem, a smart garden monitoring application is going to be developed to overcome the problem.

Table 1.1 Problem Statement

PS	Project Statement
PS1	Manual ways of monitoring garden which caused plant in the garden get destroyed due to environmental conditions and lack of proper care.

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1.3 Project Question (PQ)

Project questions are fundamental to help the effectiveness of the project. It is used to identify the existing ways of taking proper care of the plant. Based on the research, it can conclude that there are few weaknesses of the garden system.

Table 1.2 Project Question

PS	PQ	Project Question
PS1	PQ1	How to monitor the condition of the garden remotely?
PS1	PQ2	How to make system work automatically?
PS1	PQ3	How to alert user on certain condition of the garden?

1.4 Project Objective (PO)

Project objective defines the improvement that the project aims to achieve in the completion of the project. The improvement must be considered based on the problem statement and the project question of this project. The objectives for this project are:

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PO1 : To study on smart garden method with IoT technology.

The monitoring methods used in the smart garden system is discussed to ensure it fulfills the user's needs. Besides, the requirement for suitable microprocessors and sensors are studied before proceeding to the development process of the garden's prototype.

PO2 : To develop hardware prototype that able to monitor the garden's environment.

In this project, the prototype is developed using Node MCU ESP8266 and sensors to monitor the garden's environment. The monitoring sensor of the plant includes soil moisture, humidity, and temperature, and motion sensor.

PO3 : To integrate hardware prototype with mobile application to provide alert.

The prototype is integrated with a mobile application that displays the data of monitoring. Thus, users can monitor the plant remotely.

Table 1.3 Project Objective

PS	PQ	PO	Project Objective
PS1	PQ1	PO1	To study on smart garden method with IoT technology.
PS1	PQ2	PO2	To develop hardware prototype that able to monitor garden's environment.
PS1	PQ3	PO3	To integrate hardware prototype with mobile application to provide alert.

1.5 Project Scope

This project is conducted in a small garden for the research area, with a device functions as the system and a user as the administrator. The scope of this project is to discover the feasibility of using a microcontroller. The sensor is applied to the micro-controller to monitor the parameter of the plant. Besides, this system also consists of mobile applications that provide GUI components to interact with.

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i. **Target Area:** The smart garden monitoring application is installed in a garden with Wi-Fi access to facilitate communication inside the garden.

ii. **Device:** The device executes the monitoring system based on the reading of the sensors.

iii. **User :** The user can use a mobile application to control and monitor garden activity through the system.