AGRITEC –
SMART AGRICULTURE FOR SMALL MEDIUM SIZE PLANTATION

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Tarikh: 2/9/2021

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TENGKU MAHMUD HAZIM BIN TENGKU ABDUL AZIS

This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development) with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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 : Tengku Hazim Date : 2/9/2021
(TENGKU MAHMUD HAZIM BIN TENGKU ABDUL AZIS)

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 (Software Development)] with Honours.

SUPERVISOR : Ummi Raba'ah Date : 2/9/2021
(DR UMMI RABA'AH HASHIM)

DEDICATION

To my beloved parents, Ayah and Cik, who always constantly support, love, encouragement, and prayers at all hours of the day and night and motivate me with words and encouragement, I dedicate this project to you.

Those who have lent a helping hand, such as my colleagues, thank you because you guys have been my best cheerleaders.

To my supervisor, a special thanks to you for always guide me and encourage me to complete my final year project.

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ABSTRACT

This project is an android based application that implements the Internet of Things (IoT) for plantation purpose. This project aims to develop an android based application integrated with several sensors that might solve farmers problem. Farmers face many problems, such as unable to get quality crops because have been attacked by pests. This application will give notification that helps farmers to know when the pests attack their crops. Furthermore, the passive Infrared (PIR) sensor integrated with the application will detect any pests at farmer's crops. Farmers might also face problems getting information about their soil condition, whether the soil is dry or wet. Soil Moisture sensor integrated in the application will detect the soil condition and display the soil condition in the application. Lastly, this application will help farmers determine what substance they need to add to their soil, whether acidity or alkaline. pH sensor will check the soil and show the reading in the application.

ABSTRAK

Projek ini adalah aplikasi berasaskan android yang menerapkan Internet of Things (IoT) untuk tujuan perladangan. Projek ini bertujuan untuk mengembangkan aplikasi berasaskan android yang disambungkan dengan beberapa sensor yang dapat menyelesaikan masalah petani. Petani menghadapi banyak masalah seperti tidak dapat memperoleh tanaman berkualiti kerana diserang oleh serangga perosak. Aplikasi ini akan memberi pemberitahuan yang membantu petani mengetahui bila serangga perosak menyerang tanaman mereka. Sensor Infrared pasif (PIR) yang disatukan dengan aplikasi akan mengesan sebarang serangga perosak di tanaman petani. Petani juga mungkin menghadapi masalah mendapatkan maklumat mengenai keadaan tanah mereka, sama ada tanah itu kering atau basah. Soil Moisture sensor yang diintegrasi dalam aplikasi akan mengesan keadaan tanah dan memaparkan keadaan tanah dalam aplikasi. Akhir sekali, aplikasi ini akan membantu petani menentukan bahan apa yang sesuai untuk mereka tambahkan ke tanah mereka, sama ada keasidan atau alkali. Sensor pH akan memeriksa tanah dan menunjukkan bacaan dalam aplikasi.

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LIST OF ABBREVIATIONS

FYP	-	**Final Year Project**
Passive Infrared	-	**PIR**
Entity-Relationship Diagram	-	**ERD**
Active Virtual Device	-	**AVD**
Analog Output	-	**AO**
Digital Output	-	**DO**
Operating System	-	**OS**
Internet of Thing	-	**IoT**
Visual Studio Code	-	**VS Code**

LIST OF ATTACHMENTS

CHAPTER 1: INTRODUCTION

1.1 Introduction

All farmers want their plants or crops to give them a good production. Technology can help them to increase efficiency significantly in a broad agricultural ecosystem. However, farmers could face big losses due to post-harvest loss and environmental problems in any worst-case situation. It is noticed that in our country, Malaysia, the government and the farmers are highly dependent on the technology overseas, where they tend to outsource or acquire machines and technology instead of self-manufactured them. Based on statistics released from UPM, fruit production in Malaysia has a slight drop of 1.2% from 2005 to 2014, from 1,607,611 tones in 2005 to 1,589,118 in 2014. This drop is expected to persist if the data include local farmers. On the other hand, Malaysia's government recently emphasised more on fruit export than local fruit production.

AgriTec is a system targeting to reduce any risk of loss from the in-harvest and post-harvest. Thus, the local farming company does not need to face any colossal failure and increase its profit compared to previous years. Therefore, we propose a comprehensive technology that can automatically identify soil humidity, pH, and motion sensor that act as the farm's defence systems to reduce the farmers' burden. This can help the farmer continue monitoring all the nutrients needed by the plants and protect their products from any pests that may destroy and disturb the plant growth. The farmer will also quickly get the statistics and results of his plants, as the computer will analyse the effect.

1.2 Problem Statement

Most local farmers lack knowledge in applying technology to their plantations. Therefore, they are more likely to depend on human resources in observing and protecting their plantation.

Most of the farmers have a problem identifying the soil condition of their farms. They need to maintain good soil water content and pH level is a fundamental requirement for plant growers at any production scale. The suitable pH value of the soil is between 5.5 and 7.5. Soil water deficiencies directly translate into reduced photosynthesis for any plant and a decline in other biological processes such as nitrogen fixation. Unfortunately, most local farmers do not have the time and knowledge to construct an experiment to identify the soil condition in their farms. They can only identify the problems of his soil based on the final products, such as the fruits bearded or the shapes of the leaves. Hence, it will be too late for the farmers to do anything because the production cannot be reversed.

Besides, since human workers need to rest, they cannot take care of the security of the farm and the crops. It is also hard to depend on a security guard to monitor a farm's security every time. Hence, theft cases often occurred on a farm. Any pesticides and hidden traps cannot prevent these thefts, and they can be either a human or an animal like birds and monkeys, which can cause the farmers to face a severe financial loss.

1.3 Objective

i. To update farmers with the new technology that can reduce human workloads.

ii. To develop an application that can help farmers monitor their farm by applying soil moisture sensor and soil pH sensor and help them get the report of their soil condition at the same time.

iii. To help farmers protect their plants from any harm by applying Passive Infrared Sensor (PIR) to detect any movement near the crop.

1.4 Scope

i. Target User

This project is a target for a local farmer that will help them to monitor their crops easily. They will use this application to check the soil condition, including soil moisture and soil substance.

ii. Operating System

Smart Agriculture applications use the Android Operating System (OS). Android is an OS created by Google for use on mobile devices, such as smartphones and tablets.

iii. Modules to be developed

- Authentication module
  The farmer need to register and log in to get access to use the application
- Profile management module
  The farmer can view their profile and update their profile.
- Notification module
  The farmer will get a notification from the application if the sensor detects any abnormal data.
- Sensors data acquisition module
  Sensor detects the crop condition and send data to Firebase database. The application will retrieve the data from Firebase database and display it to the farmer
- Monitoring module
  The farmer can view the real-time data and history of crop data in the application

1.5 Project Significance

This application is developed to help farmer who might have a problem monitoring their soil's condition. This application can reduce farmers' burden, which can automatically check the soil's condition. A soil moisture sensor is implemented in the application to help farmers know whether the soil is dry or wet. pH sensors will help farmers measure the acidity or alkalinity of the soil. Passive Infrared (PIR) sensor will utilise the detection of infrared that is radiated from all objects that emit heat. This will help the farmer to detect and protect plants from any pests.

1.6 Expected Output

The expected output in AgriTec is to produce a system that can help farmers quantify the soil conditions of their farm and, at the same time, be the security defence system of the farm. This system is a Wi-Fi-connected sensor embedded with other sensors such as soil humidity, pH, and Passive Infrared (PIR) to help farmers grow their crops.

1.7 Conclusion

This chapter discussed the problem statements, objectives, scopes, project significance, and expected system output. It will provide a way for the user to understand more about the starting point of the development of this system.

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter covers the details of the project related to the literature review and project methodology used to complete and work well on this project. The focus will be on discovering facts, the project's methodology, the project's requirement, and the project's schedule and milestones. Finally, it is used to achieve the project goal that will achieve a perfect outcome.

2.2 Facts and Finding

Fact-finding is the formal process for collecting information or collecting data. Usually, research, interviews or questionnaires are the techniques used. This section represents the data gathered through research and studies.

2.2.1 Domain

AgriTec is an android based application that focuses on a farming topic that will monitor farmer's crops. Several sensors are used in this application to achieve the monitoring goals, reduce farmers' burden, and increase the quality of crops. To get quality crops, farmers need to fully care about their crops to avoid any harm, such as pests.

Figure 2.1 Type of sensors

pH sensor, Soil Moisture sensor and Passive Infrared (PIR) sensor are several sensors needed in smart agriculture. pH stands for the power of hydrogen, which is a measurement of the body's hydrogen ion concentration. The pH scale goes from 1 to 14, with 7 being considered neutral. Acidic solutions have a pH of less than 7, whereas basic or alkaline solutions have more than 7. The Soil Moisture Sensor measures soil moisture grace to the earth's electrical conductivity (soil resistance increases with drought). Lastly, a passive infrared (PIR) sensor recognizes infrared light emitted from nearby objects. This PIR will help the farmer to reduce the number of indirect pests in their farms.

2.2.2 Existing System

1) Farming Solution

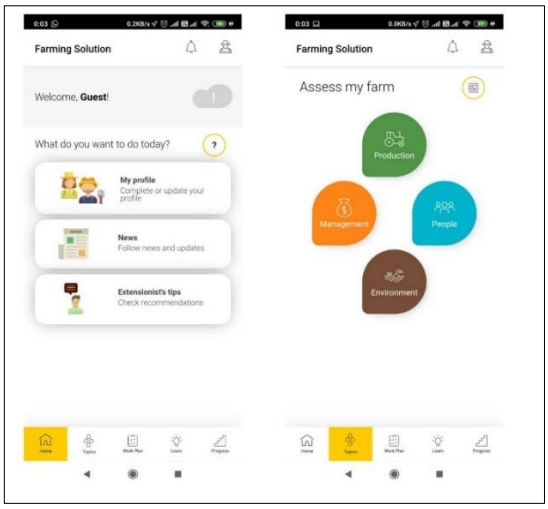

Figure 2.2 Farming Solution application

Figure 2.2 shows the interface of the Farming Solution application. With Farming Solution, farmers can find the information they need to improve their agricultural and management practices in the right format and at the right moment. Thus, Farming Solution complements technical assistance, fostering farmers' autonomy to identify, plan improvements and monitor progress over time in their farms.

2) Agrio App

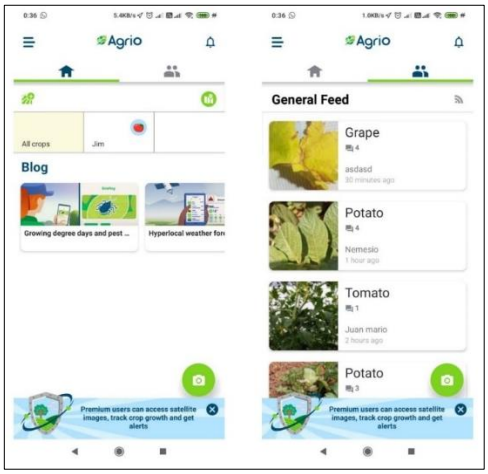

Figure 2.3 Agrio application