LOW-COST WEB-BASED GREENHOUSE MONITORING SYSTEM USING NODEMCU ESP8266

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked the project entitle "Low-Cost Web Based Greenhouse Monitoring System using NodeMCU ESP8266" in this technical report and assure that his report is adequate in terms of scope and quality for the award of the degree in Bachelor of Computer Science (Graphic and Multimedia Technology) with Honours.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Pertanian adalah sektor yang sangat penting yang perlu kita kekalkan kerana ia telah memberi banyak faedah kepada manusia dan ketamadunan. Terdapat banyak cabaran dalam mengekalkan produk pertanian. Rumah hijau adalah antara usaha dalam mengeluarkan produk pertanian yang boleh diguna pakai. Walau bagaimanapun, ianya amat mencabar bagi pekebun untuk menjaga tumbuhan di dalam rumah hijau bagi menghasilkan produk pertanian yang bermutu tinggi. Antara masalah nya adalah, pekebun perlu menyiram tumbuhan yang ditaman secara manual, pekebun sukar untuk mengawal suhu di dalam rumah hijau dan juga ketiadaan system keselamatan di dalam rumah hijau. Sistem Pemantauan Rumah Hijau Berkos Rendah, Berasaskan Web dengan menggunakan NodeMCU ESP8266 adalah sebuah system yang di bina untuk membantu para pekebun memantau keperluan asas tumbuhan di dalam rumah hijau demi menghasilkan produk pertanian yang berkualiti tinggi. Sistem ini menggunakan NodeMCU ESP8266 untuk menghantar bacaan sensor seperti suhu rumh hijau, kelebapan tanah dan keamatan cahaya ke server sistem melalui HTTP untuk diproses oleh web aplikasi. Di penhujung projek didapati bahawa sistem ini mampu untuk membantu para pekebun memantau tumbuhan di dalam rumah hijau dan efektif dalam tumbuhan di dalam rumah hijau. Secara konklusinya, sistem ini mampu mnyediakan penyelesaian kepada pekebun dalam pemantauan tumbuhan di dalam rumah hijau.

ABSTRACT

Agriculture is a very important sector that we need to take care of since it gives benefits to human kinds and civilization. There are many challenges need to face to maintain the agriculture products. Greenhouse is a part of effort to produce agriculture product that can be use. However, it is challenging to take care of those crops inside the greenhouse to ensure it can produce high quality product. The problem statements are the farmer must manually water their plant, cannot control the greenhouse temperature and lack of greenhouse security. The objective of this project is to study current greenhouse monitoring system, to design and develop greenhouse monitoring system and to evaluate the functionalities of the greenhouse monitoring system. Low-Cost Web-Based Greenhouse Monitoring System Using NodeMCU ESP8266 is a system to helps the farmer to monitor the basic needs of their crops in the greenhouse to produce better quality agriculture product. This system uses NodeMCU ESP8266 to send sensors readings which are temperature, soil humidity and light intensity by using HTTP to communicate with the server of the system to be processed in the web applications. At the end of this project, the developer found out that this system able to help the farmer in monitoring their crops in the greenhouse and effective in monitoring the crops. In conclusion, this system able to provide solution to farmer in monitoring their greenhouse.

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LIST OF ABBREVIATIONS

SDLC	Software development life cycle
IoT	Internet of thing
WSN	Wireless sensor network
ADC	Analog digital converter
GUI	Graphical user interface
USB	Universal serial bus
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets
PHP	Hypertext Pre-processor
Relay	Electromechanical switch. Switch operated with electromagnetic.
HTTP	Hypertext Transfer Protocol. Protocol used to handle connection between web-client and server.
IDE	Integrated Development Environment. Software environment, which provides tools for programmers, meant for software development.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Agriculture can be defined as the art and science of growing the plant and other crop which is provide animals and human needs and contribute to economic gain. Agriculture started more than 10,000 years ago and nowadays, it is an important sector to be maintained since it gave much beneficial toward the living things on the earth. To preserve the product of agriculture, there are difficulties that need to be face such as decreased in variabilities, loss of agriculture land and many more. The evolution of agriculture improves human standard of living to higher stage due to the advancements of agriculture technologies. The technologies of agriculture have been escalated todays and helps the farmers out there to overcome their problems, improve the productivity and indirectly make agriculture less onerous.

Agriculture technology todays contribute to world in many aspects such as in fabric industries, food industries etc. There are a lot of new agriculture technologies out there including sensors, devices, machine and information technologies such as GPS technology, robots, temperature and moisture sensors and aerial images for monitoring being implemented in agriculture. Monitoring the agriculture site is another thing that need attention to sustain the crop productivity with high quality. Crops growth affected by some specific conditions which are temperature(Hatfield & Prueger, 2015), climate(Zhang, Zhang, & Chen, 2017), humidity and water needs. By monitoring those factors, the productivity of crop can be improved and produce higher quality of harvested crop. Therefore, in narrower perspective of agriculture, implementing the monitoring system in agriculture is good idea because those factors can be monitor by the farmers for better crops productivity.

This project focused on developing a greenhouse monitoring system and suitable interface for the farmers for monitoring purpose which is helping the farmers in monitoring their greenhouse for better interpretation of the required information of the greenhouse. The variables that be monitor in the greenhouse are the surrounding temperature, soil humidity, light intensity and door activity. This project is web-based system where the user able to monitor their crops from anywhere if they have devices that support internet browsing such as smartphone for example while it connecting to the internet. This system included automated watering where will be activate when the reading from soil humidity below certain levels. Automated temperature control system provided in this system to avoid high temperature inside the greenhouse by using the fan attached to the greenhouse model. The data from the sensors readings will be uploaded to the database which will be use by the system to generate visualization that will helps the farmers to study the trends and make decision from the interpreted visualized data. What makes this project differs is it consist security system which detect the intruders in the greenhouse that will keep the farmers alert.

1.2 Problem Statement

Monitoring crops in the greenhouse is very important to make sure the basic needs of the plants being fulfilled such as water and light. By providing data visualization trend from the greenhouse monitoring system, the farmers can know what they should do to their plants based on the interpretation that they made. From the observation, the farmers face some problems in their greenhouse such as listed below.

The first problem is the farmers need to water their plants manually. Manually watering the plants in a large-scale greenhouse is time and energy consuming because the farmers need to water the plants one by one. Even worst, the farmers need to hire workers to do that task and it is costly.

Next problem is the farmer unable to control the surrounding temperature in their greenhouse. Even they can control the temperature manually but, the effectiveness of controlling the temperature may be differ compared to automated system. Controlling surrounding temperature is very important because certain plants have their finest

temperature for the optimum growth rate and producing high quality fruits or vegetables. Therefore, to maintain optimum growth rate and quality, the temperature must be control at a certain reading to achieve better productivity.

The last problem is the greenhouse does not have security system to keep the farmer's crops secure. Security of greenhouse is important because it make sure the plants in the greenhouse are secure from thief. If the thief activity happens, the farmers will loss in term of maintenance and other costs related. Even worst, it causes damage to the crops. Therefore, security is another important factor that need attentions. Table 1.1 shows a summary of problem statement.

Table 1.1 Summary of problem statement

No.	Problems	Description	Effect
1.	The farmers must water the crops in the greenhouse manually.	Watering the plant in large-scale greenhouse manually one by one.	a) Time consuming b) More labour c) Costly
2.	The farmers unable to control the surrounding temperature in the greenhouse.	The farmers do not have specific system that can read the surrounding temperature and control the greenhouse temperature.	a) Affecting crops growth rate b) Do not know to plant suitable crops at their agriculture site.
3.	The greenhouse does not have security.	The greenhouse does not have specific security system for their greenhouse to make sure their crops secure.	a) Potentially causes loss. b) Causes damage to plants in the greenhouse.

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