Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF PROGRAMMABLE CONTROLLER FOR FARM FERTILIZATION SYSTEM

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Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours

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DEVELOPMENT OF PROGRAMMABLE CONTROLLER FOR FARM FERTILIZATION SYSTEM

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A project report submitted
in partial fulfillment of the requirements for the degree of
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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

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DEDICATION

This paper is devoted to my family for supporting me throughout my degree life. My father, Mohd Sokri Bin Hassan. My mother, Rohana Binti Abdullah and my friends. Special thanks to my project supervisor, Ts. Shahrizal bin Saat always keeps me on track and gives full guidance in completing this project.

For all your care, support and believe me.

ABSTRACT

In this age of globalization, many advances were achieved according to technological advances. Agricultural technology is therefore evolving drastically compared to what it was before. Technology heavily affects agricultural variables. Agriculture previously relied on all labour. But now, it's all easy, as only one machine is in control. A more convenient digital system replaced previously necessary labour. The agricultural method created has made fertilization and watering easier. However, the fertilization process has not yet achieved progress that is equivalent to other processes. The fertilization process still uses the workforce in controlling the rate of crop fertilizer even though fertilizer has used the latest flow system. Grown crops need enough nutrients to stay fertile. The process of fertilizing crops is not as easy as expected because the plants planted require different nutrients according to the plants. Because humans have limited abilities, electronic systems are created using special components to help compensate for human shortcomings. Therefore, the purpose of this project developed is to develop a plc based system for automatic mixing of AB nutrients for multiple types of plants, automatic fertilizer dripping based on soil moisture and humidity sensor. Besides that, farmers can monitor the current level of fertilizer in the tank and the status of the pump, valve and other equipment. As a result, this project will combine with this hydroponic system to take over the work of mixing fertilizer according to the plants that the user selects. The ratio of the desired nutrients of multiple types of plants has been set in Programmable Logic Controller (PLC). The help of soil moisture and humidity sensor will help this system optimise the fertilizer system to the plant. The Programmable Logic Controller (PLC) system used in this system simplifies the process of controlling fertilization activities. Control of the fertilizer process is also easier with the visual facilities displayed on the touchscreen provided. Aside from that, farmers can monitor the whole process using an application that can warn them when the device is fully operational. The presence of this project would promote future agricultural activities and assist in the development of agricultural skill.

ABSTRAK

Di era globalisasi ini, banyak kemajuan dicapai sesuai dengan kemajuan teknologi. Oleh itu, teknologi pertanian berkembang secara drastik berbanding sebelumnya. Teknologi sangat mempengaruhi pemboleh ubah pertanian. Pertanian sebelum ini bergantung pada semua tenaga kerja. Tetapi sekarang, semuanya mudah, kerana hanya satu mesin yang terkawal. Sistem digital yang lebih senang menggantikan tenaga kerja yang diperlukan sebelumnya. Kaedah pertanian yang dibuat telah menjadikan pembajaan dan penyiraman lebih mudah. Namun, proses pembajaan belum mencapai kemajuan yang setara dengan proses lain. Proses pembajaan masih menggunakan tenaga kerja dalam mengawal kadar baja tanaman walaupun baja telah menggunakan sistem aliran terkini. Tanaman yang ditanam memerlukan nutrien yang mencukupi untuk kekal subur. Proses membaja tanaman tidak semudah yang disangka kerana tanaman yang ditanam memerlukan nutrien yang berbeza mengikut tanaman. Kerana manusia mempunyai kemampuan yang terbatas, sistem elektronik diciptakan menggunakan komponen khas untuk membantu mengimbangi kekurangan manusia. Oleh itu, tujuan projek yang dibangunkan ini adalah untuk mengembangkan sistem berasaskan plc untuk pencampuran nutrien AB secara automatik untuk pelbagai jenis tanaman, siraman baja automatik berdasarkan sensor kelembapan dan kelembapan tanah. Selain itu, petani dapat memantau tahap baja semasa di tangki dan status pam, injap dan peralatan lain. Hasilnya, projek ini akan bergabung dengan sistem hidroponik ini untuk mengambil alih kerja mencampurkan baja mengikut tanaman yang dipilih pengguna. Nisbah nutrien yang diinginkan dari pelbagai jenis tanaman telah ditetapkan dalam Pengawal Logik Boleh Atur Cara (PLC). Bantuan sensor kelembapan dan kelembapan tanah akan membantu sistem ini mengoptimumkan sistem baja ke tanaman. Sistem Pengawal Logik Boleh Atur Cara (PLC) yang digunakan dalam sistem ini memudahkan proses mengawal aktiviti persenyawaan. Pengawalan proses pembajaan juga lebih mudah dengan kemudahan visual yang dipaparkan di skrin sentuh yang disediakan. Selain itu, petani dapat memantau keseluruhan proses menggunakan aplikasi yang dapat memberi amaran kepada mereka ketika perangkat beroperasi sepenuhnya. Kehadiran projek ini akan mempromosikan aktiviti pertanian masa depan dan membantu pengembangan kemahiran pertanian.

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Keeping in mind the preceding, I would like to use this occasion to offer my heartfelt appreciation and special thanks to all of the lecturers who taught over the last four years and made a substantial contribution to my qualification to complete my final year project.

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Lastly, I want to thank all of my colleagues, whether elderly or middle-aged, for assisting me with computer software. Regardless of the financial or energy input, my project would not have concluded.

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+	-	Positive
-	-	Negative
	-	
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LIST OF ABBREVIATIONS

PLC	-	Programmable Logic Controller
HMI	-	Human Machine Interface
MCB	-	Miniature Circuit Breaker
VDC	-	Voltage Direct Current
VAC	-	Voltage Alternating Current
I/O	-	Input Output
	-	

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CHAPTER 1

INTRODUCTION

1.1 Background

Agriculture is the foundation of our country's economy, however the rough form of agriculture can no longer satisfy the development needs of modern agriculture. Agriculture depended entirely on labour. However, in this age of globalization, everything is easy as one computer is in control. The new system is IOT (Internet of Thing). IOT was created by Kevin Ashton, executive director of the MIT Auto-ID Centre, in 1999. Many gadgets have now grown into complex devices, improving their utility. As we know, the Internet of Things (IoT) is a network system designed to enable objects to share data online. This technology allows devices linked to the system to control and monitor the system's activities without the requirement for wire connectivity. The system is a huge system but simplified for the user to facilitate a certain task.

According to research, from 2016 to 2020, the number of people using this system grew by around 65%. The increase shows that the system has a very strong impact. Having such a system will help users to do something remotely, as we can see right now. The Internet of Things has created opportunities for those that require a remote control, such as businesses. There were 4,437,215,927 (4+ billion) internet users worldwide on January 5, 2020. In comparison, at the end of 2016, there were 3.42 billion users registered. It demonstrates that users are more likely to use the internet and systems that make their work life easier.

1.2 Problem Statement

Agriculture used to be performed manually using the workforce in the agriculture field for a long time. The employee manually performs a watering and fertilization procedure regularly based on the types of plants. The employee manually mixes the AB nutrients based on plants because every variety of plants need enough nutrients to stay fertile. Both procedures are carried out following the number of scheduled frequencies. This approach is used without specifying the plant's actual needs. As a result, the process can result in a lack of nutrients or resources required by the plants in real time.

Agriculture technology is slowly developing, with the manual labour process being replaced by a machine that makes work simpler. The plant's manual irrigation and fertilization processes have been replaced with irrigation systems that can irrigate the plant by directly supplying water into the main tank. However, these developments are only on systems that facilitate the work. The quality of the crop still depends on the previous calculation and estimation.

As a result, to avoid such incidents and reinforce the current framework. The project that will be set up will improve the plant's productivity and avoiding the plant's lack of needs. The machine automatically performs fertilization and watering processes on a daily basis, according to the parameters defined on the system. The system to be developed will complement the lack of the previous system. A system will be developed that will allow farmers to control the frequency of water and fertilizers to the plant. A fertilization system will also be set up to keep track of the plant and decide the best fertilizer rates for each tree. As a result, the tree will receive enough nutrients over time and will not suffer from nutrient shortages.

1.3 Project Objective

The main aim of this project is to propose a systematic and effective methodology to estimate automatic fertilizer system with reasonable accuracy. Specifically, the objectives are as follows:

i. To develop an automatic mixing of AB fertilizer system for multiple types of plants based on specific ratio.

ii. To develop a monitoring system for the current level of fertilizer in the tank and status of pump, valve and other electrical equipment.

iii. To develop an automatic and optimized system for fertilizer dripping to the plant based on soil moisture and humidity sensor.

1.4 Scope of Project

The goal of this project's scope is to notify the features and modules that will be included. One of the project's goals is to use a Programmable Logic Circuit (PLC) system to manage all of the project's components. The touch screen monitor module is also used to display and manage the processes that take place in plants. Communication between systems is also connected through the internet and mobile applications downloaded on smartphones. Each piece of information displayed and managed by the touch screen interface module will also displayed on the smartphone by the applications. With this system, user can monitor the quantity of fertilizer and the process that running at that time. The currennt level of fertilizer in the tank and status of pump, valve and other equipment can be monitor on the smartphone. Other than that, this system will automatically watering the fertilizer to the plant based on the sensor. After the amount of fertilizer in the mixer tank has decreased, the fertilizer will be automatically topped up depending on the selected plant by the farmers.

1.5 Summary

In conclusion, this chapter explains the importance of integrated circuits in the agricultural system. With such a system, farmers can more easily control the quality of the crop and monitor the growth of the crop from time to time. The integrated circuits and sensors used are limited because they affect the durability, duration of operation, sensitivity, and performance to control and provide accurate data. This project requires a user-friendly method to make it easier for farmers to use it.