UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SEMI-AUTOMATED MUSHROOM PICKER DEVICE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

by

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TECHNOLOGY

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Tajuk: DEVELOPMENT OF SEMI-AUTOMATED MUSHROOM PICKER DEVICE

Sesi Pengajian: 2019

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APPROVAL

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

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ABSTRAK

Tajuk projek ini ialah Peranti Pemetik Cendawan Semi-Automatik. Tujuan projek ini adalah untuk menyelesaikan masalah tenaga pekerja dan pengurusan masa. Objektif projek ini adalah untuk membangunkan peranti pemetik cendawan separa automatik menggunakan aplikasi motor servo dan pada masa yang sama memantau perbandingan prestasi antara alat pemetik cendawan separuh automatik dan kaedah manual.

ABSTRACT

The title of this project is Development of Semi-Automated Mushroom Picker Device. The reason is to solve man power and time management problem. The objective of this project is to develop a semi-automated mushroom picker device using servo motor application and to monitor the performance of semi-automated mushroom picker device versus manual method.

DEDICATION

I would like to dedicate this project report to Ir. Ts. Mohd Syahrin Amri Bin Mohd Noh for his guidance and advice in finishing this project. Also, I would like to take this opportunity to thank you for sharing your knowledge and support during the project period of time. To my beloved parents, thank you for giving all the support in finishing this report.

ACKNOWLEDGEMENTS

First of all, I would like to express grateful to Allah SWT for letting me complete this project. I wish to express my sincere thanks to Ir. Ts. Mohd Syahrin Amri Bin Mohd Noh, my supervisor and Ts. Shahrizal Bin Saat, my Co-Supervisor for their opinions, valuable guidance, encouragement and support. I take this opportunity to record my sincere thanks to all the faculty members for their help and effort. None the less, I also want to thank my parents for their unceasing encouragement and support. I also place on record, our sense of gratitude to one and all who, directly, or in directly, have lent their helping hand in this venture.

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LIST OF SYMBOLS

mm   -   Millimeter

kg   -   Kilogram

%   -   Percentage

LIST OF ABBREVIATIONS

3D	3 dimension
2D	2 dimension
CAD	Computer -aided design
U_{OH}	Output voltage high
U_{OL}	Output voltage low
dH	Distance high
dL	Distance low
DC	Direct current
CW	Clockwise
CCW	Counter-clockwise
PWM	Pulse width modulation
LCD	Liquid-crystal display
GPS	Global positioning system
USB	Universal serial bus
RM	Ringgit Malaysia

CHAPTER 1

INTRODUCTION

1.1   Background

Figure 1.1.1: Sinar Syukrawie Enterprise at Alor Gajah, Melaka

According to M. Zaffrie, M. Yasser Suhaimi and H. Azahar (2013), oyster mushroom is the most popular mushroom type of food among the consumers and entrepreneur. The factors of its being so popular than other mushroom are because of its easy production process and delicious taste. More than 95% entrepreneur harvest oyster mushroom while the rest are shiitake, button and ganoderma.(M. Zaffrie, M. Yasser Suhaimi and H. Azahar , 2013)

With this, more mushroom can be produced and more demand to be expected from the consumers. However, there are challenges in mushroom harvesting such as lack of man power and time taken to harvest. These challenges occur during the picking hour of mushroom. In Figure 1.1.1, a visit to Sinar Syukrawie Enterprise at Bt. Gadek, Alor

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Gajah, Melaka is done to understand deeper on how the whole mushroom process is made in mushroom industry.

The production of mushroom starts with mushroom block preparation. There are three main ingredients inside the mushroom block which are rubber wood dust, rice bran, kapur. These ingredients are mixed in 100:10:1 ratio using a mixing machine. During the packaging process, the mixture is filled in a plastic bag of 9 x 13 cm sizing. The mixture inside the plastic bag is compacted and covered with a neck cap and cover.

Figure 1.1.2: Mushroom Blocks in a Steamer

The next step is steaming process as in Figure 1.1.2. The mushroom blocks are steamed in a steamer for 5 hours at 103 degree Celsius. The steamer can load 500 mushroom block at one time. Bigger scale entrepreneur use bigger steamer for bigger production. After this process is complete, the mushroom block is let to cool down for 2 days and 1 night in an inoculation room. Afterwards, the mushroom block is injected with miselium.

Miselium is a mushroom seed that has smooth texture. Usually, wheat and corn are sued for the seed's housing. It is best to use 7-10 seeds for each block. A pure white color shows the best condition of mushroom seed. Before injecting the seeds, it is

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important to ensure that there are no dust and dirt during this process. The reason is to avoid bacteria from affecting the mushroom seed.

Then, the next step is ripening process. The function is to activate the miselium that is implanted inside the mushroom block. This process usually takes 40 to 50 days for miselium to spread fully and purely white inside the mushroom block. It is recommended that the temperature should be above 30 degree Celsius and humidity below 80%. This way, ripening process will be much faster.

Figure 1.1.3: Growth condition of mushroom after ripening process

The last step is harvesting process. Usually, a small form of mushroom will appear after 2-3 days of neck cap removal as in Figure 1.1.3. The mushroom will only be harvest and mature after 4-5 days of neck cap removal. This is where this project takes part into.

1.2 Problem Statement

In harvesting process, there are challenges that entrepreneur had to deal with. Most of the problems come from man power and time management. The worker had to pick and drop the mushroom into the box collector and repeat that process for each mushroom block which cause worker to have back pain as they had to constantly sit down and stand back up to pick the mushrooms. This in the end disturbs the efficiency of worker to keep picking the mushroom continuously. Furthermore, this process takes a lot of time where worker had to think first whether the mushroom is mature enough to be picked or not. All of this process is done manually.

However, this problems can be resolved to execute faster responds. Instead of using manpower, a picking device is a perfect application to pick the mushroom. It is much faster and easier as it is automated by servo motor. This will shorten the time taken for harvesting process and undamaging the physical condition of the matured mushroom.

1.3 Objectives

With this, we would like to take this opportunity to take this opportunity to build an automated picking device to solve the problems of harvesting mushroom in mushroom industry.

The objective for this project are:

- To develop a semi-automated mushroom picker device using servo motor application
- To monitor the semi-automated picker performance versus manual method

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1.4   Project Scope

This scope focus mainly on how to pick the mushroom with the usage of microcontroller application. This project does not cover other processes than harvesting process. The parameter for this project can be divided into several parts which are:

1.4.1 Arduino Uno

In this project, Arduino Uno is used to monitor and control the process of picking mushroom. It is much cheaper and easier to use compared to other microcontroller. It can connect to servo motor as output signals as it has 5 analog input ports, transmit and receive pin, 1 USB module and power supply pin.

1.4.2 The Harvesting process

Mushroom harvesting for oyster mushroom type has been done manually by the worker till this day. However, in this project, the mushroom is picked and gripped between the mushroom block neck cap and the mushroom by servo motor gripper. The mushroom then is pulled up and dropped into a collector bin when the gripper release the mushroom.

The mushroom can only be picked when it is mature enough depends on the size. This part will not be covered as all the matured mushroom will be re-positioned into a mushroom holder to ease the process of harvesting.

1.4.3 Oyster mushroom

There are many types of mushroom harvested and consumed in Malaysia. However, oyster mushroom is the most popular and high demand than other mushroom. Therefore, only oyster mushroom is used in this project.

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