UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATED ROBOT FERTILIZER FOR PINEAPPLE USING ARDUINO MICROCONTROLLER

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

by

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2020

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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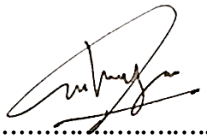

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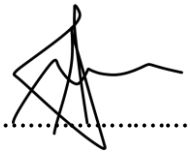

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APPROVAL

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

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ABSTRAK

Konsep projek ini berdasarkan fenomena kaedah pembajaan yang digunakan dalam bidang pertanian masa kini. Masalah kajian ini ialah proses pembajaan dilakukan secara manual dan jumlah baja yang diberikan pada nenas tidak mencukupi dan tidak teratur. Selain itu, pekerja dalam industri pertanian memerlukan lebih banyak tenaga dan jangka masa yang lama. Oleh itu, kerana terlalu banyak kawasan untuk diberi perhatian untuk konsistensi pemberian baja tidak sama. Seterusnya, permasalahan yang lain ialah kos membayar gaji yang tinggi kerana penggunaan pekerja yang tinggi di ladang dan jenis baja yang berbahaya kepada kesihatan pekerja. Robot Automatik Pembajaan dicadangkan untuk memastikan tanaman nenas tumbuh lebih sihat. Robot ini dilengkapi dengan tangki simpanan untuk palet baja dan sistem pergerakan menggunakan system empat tayar bergerak. Untuk mekanisme, servo digunakan pada sisi dua belah robot untuk mengeluarkan baja palet. Mekanisme ini dipasang di tepi tangki simpanan, yang menjadi sebagai proses untuk membuang baja palet keluar dari tangki. Oleh demikian, baja palet yang keluar disalurkan menerusi paip dan seterusnya keluar dengan baik pada tanah. Selain itu, sensor seperti encoder adalah untuk mengesan kedudukan dan memastikan kedudukan tepat supaya pengukuran. Bahan ringan seperti aluminium akan digunakan untuk membina struktur robot. Dengan bantuan Robot Automatik ini, ia dapat meminimumkan masa yang diperlukan untuk melakukan tanaman di ekosistem pertanian dan industri.

ABSTRACT

The concept of this project is based on the current phenomenal of fertilization methods used in today's agricultural field. The problem of this study is currently the fertilize process had done manually and the amount of fertilizer to be provided not irregular. Besides, workers in the agriculture industry require more effort and prolonged amount of time. Therefore, because too many areas to cover the consistency of giving the fertilizer is not same. Next, the problem is the cost of paying high wages due to high amount of workers used at farm and the use of fertilizer and type of fertilizer that harmful to the health of workers. The Automated Robot Fertilizer is proposed to ensure the pineapple plant grow healthier. This robot is equipped with the storage tank for the pallet and for moving it used of four wheels system. For the mechanism it used of servo motor in both sides to dispense of pallet fertilizer. This mechanism is attached on side of the storage tank, which a trigger to perform the pallet fertilizer dispense action. Hence, pallet fertilizers had been dispensed, it will travel through a pipe and the pallet fertilizer can be dispensed easily to the soils. Moreover, the sensor such as encoder to detect the position and to make sure measurement position is accurate Lightweight material such as aluminum will be used to construct the chassis of the robot. With the aid of this Automated Robot, it can minimize the time required to perform fertilizing of the plants in the agricultural ecosystem and industry.

DEDICATION

I would like to express my special dedication to people who support me with this thesis. I am grateful and acknowledge for both of my parent also sibling for gives me encouragement and endless support to me for complete this bachelor's degree Project (BDP). Without them, I probably not reach this stage. Besides, special thanks for all of my fellow lecturer for advice, taught and guidance through my studies. Not forgetting, all of my beloved friend throughout this wonderful journey. Finally, thank you to all people who help me directly or indirectly for the support in completing this project.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
1	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
s	-	Second
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

PCA	Principal Component Analysis

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will discuss about the background of the project, problem statement, objectives, scope of the project, significance study and the thesis outline.

1.2 Background

Pineapple or the name of scientific *Ananas Comusus* from a most significant plant in family *Bromeliaceae*. Pineapple also a tropical fruit and the most edible fruit in worldwide. There are 37 varieties in rest of the world, and it divided into 4 categories such as, Queen, Smooth Cayenne, Abacaxi and Red Spanish. In Malaysia, pineapple is the main fruit that has been produced.

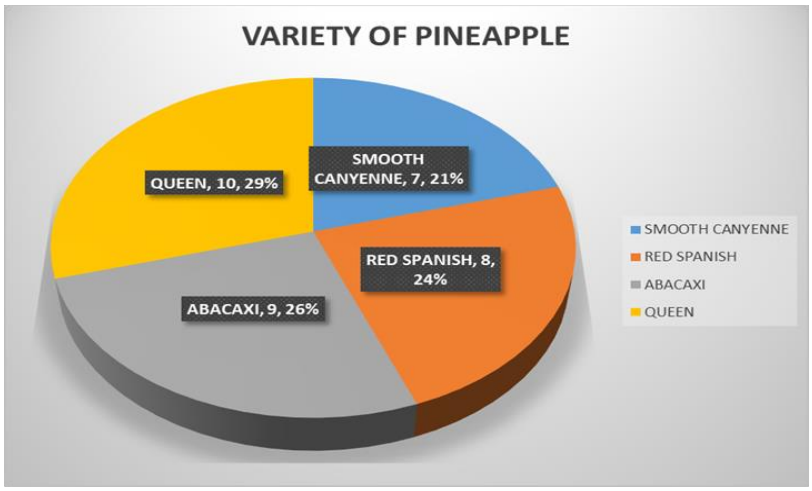

Figure 1. 1: The varieties in the rest of world.

There are nine variety of pineapple that have been register in Malaysia with code which is Moris(AC1), Sarawak(AC2), Gandul(AC3), Maspine(AC4), Josapine(AC5), Yankee(AC6), Moris Gajah(AC7), N36(AC8) and MD2(AC9) (Jabatan Pertanian Malaysia, 2013). Nowadays, the MD2 pineapple are popular and the people are demand for it. The farmers also starting to planting the fruits because high return result.

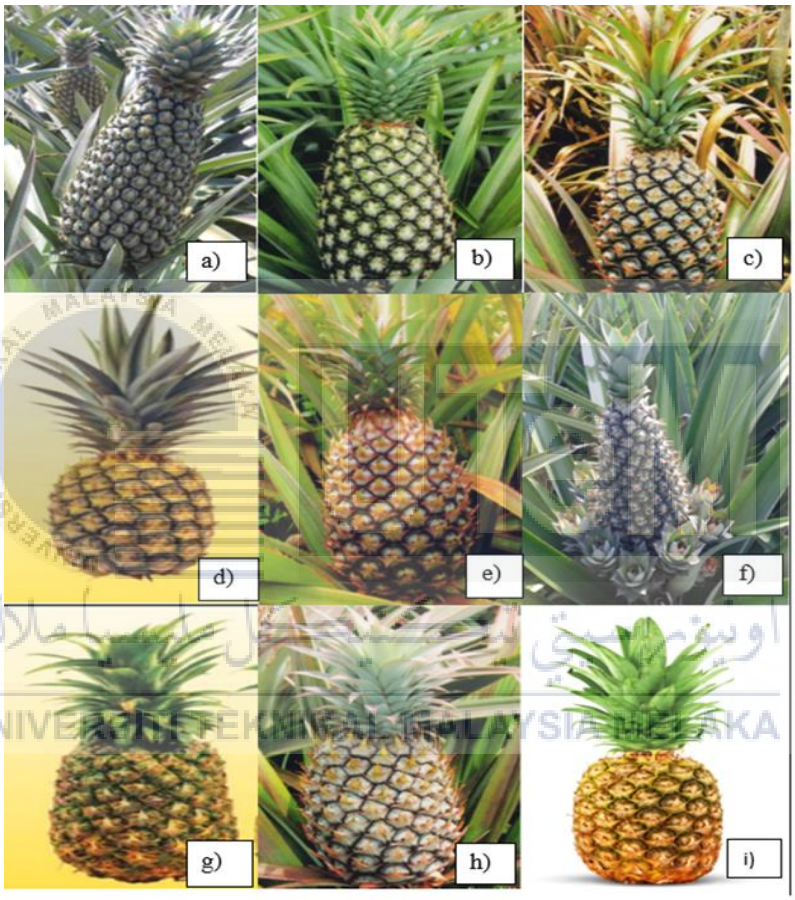

Figure 1. 2: Varieties of Pineapple: a) Moris (AC1), b) Sarawak (AC2), c) Gandul (AC3), d) Maspine (AC4), e) Josapine (AC5), f) Yankee (AC6), g) Moris gajah (AC7), h) N36 (AC8), i) MD2 (AC9).

The MD2 pineapple is named the 'Golden ripe' because the sweetest of the fruit. Moreover, from the 14, 046.33 hectares of pineapple plants grown in Malaysia in 2018 (Department of Agriculture, 2018). It was reported that 1,547 hectares comprised of MD2