AQUAPONIC AND VERTICAL PLANT MONITORING

NURLIYANA ATHIRAH BINTI SAID
B071710231

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AQUAPONIC AND VERTICAL PLANT MONITORING

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

By

NURLIYANA ATHIRAH BINTI SAID

B071710231

950716-01-6550

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: AQUAPONIC AND VERTICAL PLANT MONITORING

Sesi Pengajian: 2021

Saya **NURLIYANA ATHIRAH BINTI SAID** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐ SULIT* Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

☐ TERHAD* Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

☒ TIDAK TERHAD

Yang benar,

.....

NURLIYANA ATHIRAH BINTI SAID

Alamat Tetap:

No. 36 Lot T06, Lorong Sierra 7/1b

Bandar Sierra, Km 20 Jalan Tuaran,

88450 Kota Kinabalu, Sabah.

Tarikh: 18 February 2021

Disahkan oleh penyelia:

.....

TS. TENGKU MOHD FAISAL BIN TENGKU WOOK

Cop Rasmi Penyelia

Ts. TG MOHD FAISAL BIN TENGKU WOOK
Jurutera Pengajar Kanan
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 18 February 2021

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini

DECLARATION

I hereby, declared this report entitled AQUAPONIC AND VERTICAL PLANT MONITORING is the results of my own research except as cited in references.

Signature: ……

Author : NURLIYANA ATHIRAH BINTI SAID

Date: 18 February 2021

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 Mechanical Engineering Technology (Industrial Electronic) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor: TS. TENGKU MOHD FAISAL BIN TENGKU WOOK

Signature: .....

Co-supervisor: TS. NADZRIE BIN MOHAMOOD

ABSTRAK

Tajuk projek ini adalah Pemantauan Akuaponik dan Tanaman Menegak. Objektifnya adalah untuk mengembangkan akuaponik automatik dan pemantauan ikan menggunakan Arduino NANO, untuk mengembangkan akuaponik automatik dan pemantauan tangki ikan menggunakan Arduino NANO. Seterusnya, untuk mengembangkan aplikasi IoT yang memantau sistem akuaponik. Akhirnya, untuk menyediakan kelestarian lingkungan dengan penggunaan air yang rendah dan penggunaan tenaga yang rendah.

ABSTRACT

The title of this project is Aquaponic and Vertical Plant Monitoring. The objective is to develop automated aquaponics and fish monitoring using Arduino NANO. Next, to develop an IoT application that monitors aquaponics system. Lastly, to provide sustainability environmental with low water usage and low power usage.

DEDICATION

First and foremost, I would like to dedicate this project report to my supervisor Ts. Tengku Mohd Faisal Bin Tengku Wook, my co-supervisor Ts. Nadzrie Bin Mohamood, family and friends for their guidance, effort and moral in every aspect, as well as support during the project period of time, in which inspiring to accomplish in finishing this report. Best regards to my beloved parents, thank you for giving all the encouragement and support in finishing this report.

ACKNOWLEDGEMENT

I would like to express grateful to Allah S.W.T for letting me accomplish this project. Best sincere thanks to Ts. Tengku Mohd Faisal Bin Tengku Wook, my supervisor and Ts. Nadzrie Bin Mohamood, my co-supervisor who always contributed a great amount of time and effort for their guidance, valuable opinions, support and encouragement. 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.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF SYMBOLS

cm	-	Centimetre
mm	-	Millimetre
g	-	Gram
kg	-	Kilogram
mA	-	Milli ampere
mg	-	Milli gram
l	-	Litre
ºC	-	Degree Celsius
kb	-	Kilo byte
MHz	-	Mega hertz
V	-	Voltage

LIST OF ABBREVIATIONS

IOT	Internet of Things
pH	Potential for Hydrogen
LCD	Liquid-crystal display
TDS	Total Dissolved Solids
SAL	Salinity
EC	Electrical Conductivity
SMS	Short Message Service

CHAPTER 1

INTRODUCTION

This chapter is about project background, statement of the purpose, and problem statement. Project background section covers about how project is initiated, problem statement section describes the problems that the people or technologies are facing nowadays and statement of purpose explains the stating the purposes of project. Therefore, the structure of the whole project can be precisely visualized.

1.1 Background

The combination of aquaculture and hydroponics is called as Aquaponics. For aquaponics, fish and plants placed together in an integrated, soilless environment. Fish waste is a food supply for the plants, and the plants have a natural filter for the water in which the fish live. When aquaponics is combined with a managed greenhouse environment, quality crops can be grown for a few months anywhere in our world.

A vertical farming is the method of raising crops in vertical layers. This often includes controlled-environmental cultivation, which seeks to increase plant productivity, and soilless farming strategies such as aquaponics. Plants are developed at various rates, such that the water moves down from the top to the bottom and back to the fish tank. The aquaponics system can grow around twice as many plants as it can with the traditional

agricultural land system of the same region and the system used the waste of fish to act as a crop fertilizer.

The combination of aquaculture and hydroponics, and with this system rids the negative aspects of each with a natural chain in between of fish and plants. Aquaponics requires highly nutritious fish effluent, which contains almost all the nutrients required for optimum production rather than by adding chemical solution to grow plants. Rather than waste water discharge, aquaponics uses the plants and the environment under which they thrive to disinfect and purify the water, which is then returned to the fish tank. The water will be recycled continuously and only has to be replaced if it is wasted by transpiration and evaporation.

1.2 Statement of the Purpose

The purpose of the project is to develop automated aquaponics and fish monitoring using Arduino NANO, to monitor aquaponics performance versus manual method and to provide sustainability environmental with low power usage and low water usage.

1.3 Problem Statement

In a combination of aquaculture and hydroponics process, there are challenges that user had to deal with. Most of the problems come from time management and man power. The user had to monitor near to the plant and fish repeatedly in daily life, due to

the user had to go work in working hours or short-term away, the plant and fish couldn't be taken care as the user had to check the fish and plant condition such as pH value of water, water temperature, water level, and feed the fish. Furthermore, this process takes more time for user to be alert in manage fish feeding time because feeding too often or too much may lead to several problem. The excessive digestive waster and uneaten food can lead to water pollution, where it creates a high ammonia, nitrate levels, makes a lower oxygen level and as well as low pH levels. Other than that, excessive food floating in the water can clog the filters, therefore it produces toxic into the water.

However, this problem can be solved to execute faster responds. Instead of using monitor in a small range, Internet of Things (IoT) an internet application is a perfect monitoring system to monitor the aquaponics. It is much easier and save time as it is automated by using sensors. This process will be taken more easily and save time for user by taking care of aquaponics condition at anywhere and anytime.

1.4 Objective

Below are the objectives of this project:

(a) To develop automated aquaponics and vertical plant monitoring using Arduino NANO

(b) To develop an IOT application that monitors aquaponics system

(c) To provide sustainability environmental with low water usage