UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF AQUARIUM MONITORING SYSTEM

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

By

SHAIRAZI AKMAL BIN ANUAR

B071610461

960415-13-5117

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

TECHNOLOGY

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF AQUARIUM MONITORING SYSTEM

Sesi Pengajian: 2019

Saya **SHAIRAZI AKMAL BIN ANUAR** 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,

.....

SHAIRAZI AKMAL BIN ANUAR

Alamat Tetap:

J60, TRSS, SEC HOUSING,

RANCHA2, JLN SG KELING,

87000, WP LABUAN

Tarikh:

Disahkan oleh penyelia:

.....

TS. EFFENDY ONN BIN SIAM

Cop Rasmi Penyelia

Tarikh:

*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 DEVELOPMENT OF AQUARIUM MONITORING SYSTEM is the results of my own research except as cited in references.

Signature: ……

Author : SHAIRAZI AKMAL BIN ANUAR

Date:

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 requirement for the degree of the Bachelor of Electronic Engineering Technology (Industrial Electronic) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : TS. EFFENDY ONN BIN SIAM

ABSTRAK

Ikan hiasan adalah antara haiwan belaan yang popular. Ikan hiasan amat menarik dan cantik. Tetapi ikan hiasan juga tergolong dalam kategori haiwan belaan yang sangat susah untuk dikendalikan. Ikan hiasan harus diberi pemerhatian selalu. Sistem yang boleh memerhati ikan hiasan ialah suatu yang baik untuk pemilik ikan hiasan. Cabaran untuk memelihara ikan hiasan ialah mereka tidak berinteraksi seperti mana kucing dan anjing. Sebagai contoh, kucing akan berbunyi apabila mereka lapar. Ikan hiasan tidak memberikan isyarat tersebut kepada manusia. Aquarium Monitoring System (Sistem Pemerhati Akuarium) dicipta to menyelesaikan masalah yang dihadapi oleh pemilik ikan hiasan yang tidak dapat memerhatikan ikan hiasan mereka terutama apabila mereka bekerja dan mereka selelalu jauh. Aquarium Monitoring System akan mengesan pH dalam air, paras air dalam akuarium and suhu air dengan menggunakan pengesan suhu, pengesan paras air dan pengesan pH. Semua keadaan itu akan dipaparkan pada paparan LCD and pada telefon secara langsung dengan menggunakan Internet Of Things (IOT). Raspberry Pi Model 3 B akan menjadi asas utama untuk projek ini. Dengan Aquarium Monitoring System, ia akan membantu pemilik ikan hiasa memerhati keadaan asas ikan hiasan setiap masa.

ABSTRACT

Fish is one of the famous pet nowadays. Fish are attractive and beautiful. It has a lot of species. But fish are also among the hardest pet to be handled no matter what age of the fish are. Fish needs to be monitored always. A system that can monitor the fish is indeed a blessing for those who owns fish. The challenges of petting fish is that they cannot interact with human unlike cat and dog. For an example, cats meowing when they are hungry. Fish do not give that sign to human. The Aquarium Monitoring System is invented to overcome the problem of the fish owners who cannot monitor their fish every time especially to those who are working and always going outstation. This Aquarium Monitoring System will detect the pH of the water, water level of the aquarium and temperature of the water with the aid of temperature sensor, water level sensor and pH sensor. All those conditions will be displayed on the LCD Displays and on the phone lively with the uses of Internet of Things (IoT). Raspberry Pi 3 Model 3 B will be main core for this project. With this Aquarium Monitoring System, it will helps the aquarium fish owner to monitor basic conditions of the fish consistently.

DEDICATION

To my beloved parents, Anuar Bin Berzuri and Dayang Aznah Binti Chuaka Ting and for my beloved family who encourages me, also not to forget to whom that may involve in helping me to complete my project. I also dedicate this report to my Project Principal Supervisor, Ts. Effendy Onn bin Siam who always inspires and guides me until the completion of this project. Finally, I dedicated this report to my helpful friends that provided me with supports and always teaching me to better every time.

Thank you.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank Allah for giving me strength, knowledge, ability and opportunity to undertake this project and to complete it successfully. Without His blessings, this achievement would not have been possible.

I would also like to thank my parents for giving me supports especially in term of financial. Without them I will never able to complete my project especially on the hardware part. This project is dedicated to both of my parents whose dream for me to have resulted in this achievement.

I would also like to express my sincere gratitude to my Project Principal Supervisor Ts. Effendy Onn Bin Siam for giving me continuous guidances, comments and supports. He played a very important roles in the completion of this project. He always be there for me when I need him. He always helping me regarding my project and always correcting me when I did any wrong.

I would also like to thank all my friends for he helps and information given. Without them, I would not get useful information that lead me to the completion of this project. Last but not least, I want to thank everyone that helps me either directly or indirectly in completing this project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF SYMBOLS

℃	-	Degree Celcius
V	-	Volt

LIST OF ABBREVIATIONS

UTeM	Universiti Teknikal Malaysia Melaka
IoT	Internet of Things
LCD	Liquid-crystal Display
PLC	Programmable Logic Control
SCADA	Supervisory Control and Data Acquisition
I2C	Inter-Integrate Circuit
ADC	Analog-to-Digital Converter
GCM	General Circulation Model
MCU	Microcontroller Unit
UV	Ultraviolet
VB	Visual Basic
LDR	Light Dependant Resistor
GSM	Global System for Mobile Communication
SMS	Short Message Service
USB	Universal Serial Bus
PIC	Peripheral Interface Controller
NOOBS	New Out of the Box Software
HTTP	HyperText Transfer Protocol
VNC	Virtual Network Computing
SSH	Secure Shell
LAN	Local Area Network

BLE	Bluetooth Low Energy
HDMI	High Definition Multimedia Interface
GPIO	General-purpose Input/Output
CSI	Camera Serial Interface
BNC	Bayonet Neill-Concelman
FFC	Flexible Flat Cable
LED	Light Emitting Diode
DC	Direct current
AC	Alternating Current
NoSQL	Not only Structured Query Language

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter discusses the overview of this project and the main problem this project is being developed. This chapter describes the background, objective, scope of the project and the organization of this project.

1.2 Background

Petting aquarium fish is not a new thing nowadays. Aquarium is commonly used not as to keep the fish itself but also as a decoration at home, at the office and many more places. Aquarium fish is not only attractive on our eyes due to its beauty and colourfulness. It is a symbol a nature as it can be said as living decorations (citation needed). But, petting an aquarium fish is not an easy thing.

One of the reason is because fish owner sometimes is lazy to manually check the condition of the fish and the condition of the aquarium that suits the fish. Sometimes, the conditions of the aquarium will be abandoned when there is nobody to monitor the condition of the aquarium when the owner is working, has another business to do or when the owner is outstation. Besides, to check those conditions, the owner must uses separate devices which will cost them cost them their time. Furthermore, checking pH of the aquarium sometimes is very complicated because of an old style way of checking it. It is also hard to monitor the fish because the aquarium fish owner is not sitting next besides the aquarium fish all the time.

This project will be very useful to those who are very lazy to monitor the condition of the aquarium, to those who are not around their aquarium and to those who has other business to do rather than spending their time to monitor the condition of the fish aquarium. This project can helps the owner to monitor the condition of the fish aquarium and displays it anywhere to the owner wherever the owner is.

Mostly, aquariums are not installed with aquarium monitoring system. Most of the fish owners only have a very basic aquarium system which cannot monitor the basic conditions which are temperature, water level and pH. The one that they mostly have at home only has a simple pumping machine that circulates the water. Existing aquarium monitoring system has a limited functions because it only displaying the basic conditions on LCD Screen in offline mode. LCD Screen must be closed to the system so it only shows the condition on a very short range and is not capable of displaying the conditions in a long range. An Aquarium Monitoring System will be incomplete without camera that can display the inside-aquarium view which also can be the tools to monitor dead fish and the turbidity of the aquarium water.

1.3 Problem Statement

This project will display all the basic conditions on the LCD Screen and on the phone on both offline and online modes respectively. Internet of Things (IoT) will be used to display the conditions online. The Aquarium Monitoring System in this project will consists of camera.

1.4 Objectives

1) The purpose of the project is to develop an Aquarium Monitoring System for a freshwater aquarium.

2) To create Aquarium Monitoring System with the implementation of Internet of Things (IoT)

3) Develop a system that can monitor the condition of the fish and live-camera to monitor aquarium.

1.5 Scope of the experiment

In this project, the Aquarium Monitoring System will be developed by the combination of the software and hardware. This project will be developed by using a 240 volts of power supply as in Malaysians' standard home uses. Besides that, the development of this project includes various of sensors to detect pH, water level and the temperature of the water in the aquarium that suits the fish. By including camera, dead fish and the turbidity of the water can be detected. This study covers on how the project is carry out, what the equipment used to build this project, the functions of this project and how those functions can replaces the role of human in petting fish in aquarium. And most importantly, the project is built based on the objective and fulfilling the main objective itself.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss about the previous existing project. All those projects will be referred in the process to complete this projects. Journals, articles and conference paper that related to the project are also studied to gain more knowledge to complete this project. Some of the references are used to generate ideas regarding this project. Some research are also being made about the condition of the aquarium fish in order to fulfil the criteria that is important for aquarium fish to complete this project. This chapter will also comparing all the previous projects. This project will be developed better than some of the previous projects in certain aspects like costing etc. This project will just focusing on the monitoring of the basic conditions of the fish.

2.1.1 Smart Aquarium

This project was finished by (Kaimal *et al.*, 2017) and is concentrating on making the fish aquarium to be consequently working to deal with fish. It replaces the manual support of fish aquarium with its robotized capacities and it will screen the physical changes in the water and keeping up it to the perfect conditions (Kaimal *et al.*, 2017). This venture is created utilizing PLC(Programmable Logic Controller) and SCADA(Supervisory Control and Data Acquisition) to consequently control and keep up parameters, for example, temperature, pH, water level, lighting, nourishing and oxygen level (Kaimal *et al.*, 2017).