UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF OCEAN CURRENT LEVEL AND RED TIDE MONITORING PORTABLE SYSTEM FOR BIG DATA APPLICATION

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

by

MUHAMMAD HAZWAN BIN MOHD ARIFF

B071710507

960805086613

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF OCEAN CURRENT LEVEL AND RED TIDE MONITORING PORTABLE SYSTEM FOR BIG DATA APPLICATION

Sesi Pengajian: 2019

Saya **Muhammad Hazwan Bin Mohd Ariff** 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,

.....

MUHAMMAD HAZWAN BIN MOHD ARIFF

Alamat Tetap:
193, Jalan Masjid, Kampung Manjoi
30020 Ipoh,
Perak

Tarikh: 14/2/2021

Disahkan oleh penyelia:

.....

TS. FAKHRULLAH BIN IDRIS
Cop Rasmi Penyelia

FAKHRULLAH BIN IDRIS
Jurutera Pengajar
Jabatan Teknologi Kejuruteraan Elektrik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 14/2/2021

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

DECLARATION

I hereby, declared this report entitled DEVELOPMENT OF OCEAN CURRENT LEVEL AND RED TIDE MONITORING PORTABLE SYSTEM FOR BIG DATA APPLICATION is the results of my own research except as cited in references.

Signature: .....

Author : MUHAMMAD HAZWAN BIN MOHD ARIFF

Date: 14/2/2021

APPROVAL

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

Signature: .....

Supervisor : TS. FAKHRULLAH BIN IDRIS

ABSTRAK

Projek ini menerangkan kajian tentang kepentingan mengesan air pasang merah dan nilai semasa paras pasang surut air laut menggunakan sensor seperti Gyroscope dan Colour Sensor. Alat pengesan ini mampu mengesan kehadiran air pasang merah pada peringkat awal dan mengukur paras ketinggian pasang surut air laut pada jarak yang jauh menggunakan aplikasi mudah alih. Selain itu, aplikasi ini juga mampu menghasilkan dan menganalisis data yang diterima daripada sensor dan memaparkan data melalui sistem Internet Perkara (IoT) yang menghantar maklumat secara terus ke aplikasi mudah alih.

ABSTRACT

This project describes the study of the importance of detecting red tide and the value of current tide levels using sensors such as Gyroscope and Color Sensors. This detector is able to detect the presence of red tides in the early stages and to measure the height level of tide in the distance using mobile applications. In addition, the application is also capable of generating and analyzing data received from sensors and displaying data through the Internet of Things (IoT) system that sends information directly to mobile applications.

DEDICATION

Alhamdulillah, praise to the Almighty Allah S.W.T

This thesis is dedicated to:

My beloved family,

My Parents,

My Supervisor,

My lecturers

And all my friends

Thanks for their encouragement and support

ACKNOWLEDGEMENTS

Alhamdulillah, thank you Allah for letting me finish with a great health so that my final year project ended successfully.

I would like to express my gratitude towards the following groups. Without them, this paper will not be completed in time. I would extend my deepest appreciation to my beloved parents that I treasured the most, Mohd Ariff Bin Ali and Noor Hajar Bt Zainal that giving me the endless supports throughout this entire project.

Not to forget, my supervisors Ts. Fakhrullah Bin Idris for his guidance and encouragement towards this project until I complete this report. Last but not least, to my friends who have always been there through my ups and downs, helped and motivated me in when I need the most. This paper would not be possible without all of them.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APENDICES

CHAPTER 1

INTRODUCTION

1.0 Background

One of the most prominent harmful algal blooms is the "red tide" from Florida caused by Karenia brevis, a form of algae that produces potent neurotoxins (Fleming *et al.*, 2011). The red tide is causing alga where the bacteria exist at the same time or in the same place in xenix cultures of Alexandrium tamarense (Wang et al., 2010). The toxins can be suspended in the air near beaches and cause respiratory disease in humans. These can also accumulate in shellfish and cause human neurotoxic shellfish poisoning, so impacted states track shellfish closely and may close the harvest to protect public health for a period of time. An algal bloom or algae bloom is a rapid increase or aggregation in the algae population in freshwater or marine water systems and is often identified from their pigments by discoloration in the water (Kirkpatrick *et al.*, 2004). Algal form a extracellular product into ocean environment in process of enlarge that release essential source of ocean organic element such as carbohydrates, sugars, vitamins, toxins, enxymes, polyalcohols, peptides and amino acids (Wang *et al.*, 2010). Paralytic shellfish poisoning (PSP) was reported first time in Sabah, Malaysia cause six persons warded including one casualty after contaminated benthic clams. In Tumpat, a massive blooms of marine dinoflagellate have been reported over the past decade cause shellfish intoxication (Teen, Gires and Pin, 2012).

Tidal is rise and fall of ocean level caused by the combined influence of the Moon and the Sun's tidal powers and the Earth's rotation. The best describe about tide is from the book Principia Mathematica by Newton(1687a) where there is relationship between lunar and solar gravitational force regarding to laws of mechanics. The theory proved that tides is produced by sun which modulated the lunar tides. The tidal level is rising at full or new moon while the tidal will decreasing when reach to half-moon than the average (Guzewich *et al.*, 2016). Although tides are typically the primary cause of short-term variations in the sea level, the sea level is often subject to factors such as changes in wind and barometric pressure, resulting in storm surges, especially in shallow seas and near coasts (Nicholls, 2011). Tides differ between hours and years due to a variety of reasons that decide the lunitidal time. Tide gauges at fixed stations monitor water levels over time and make accurate records. Tidal anomalies are not confined to oceans, but can exist in other environments if there is a gravitational force differing in time and space (McCarthy *et al.*, 2015).

1.1 Problem Statement

Red tide in ocean can cause terrible to marine life. This problem responsible for huge fish kills and cause endangered species to death such as dolphins, sea turtle, blue whale, sea lion and fin whale. Besides, this also causes lost millions of dollar to fisherman communities, hotel, restaurant and water based tourism attraction like boating, fishing, seafood supply and more. As human being, there can cause implication to respiratory system especially in sensitive population like asthma and skin irritation. This symptom can lead to Neurotoxic Shellfish

Poisoning (NSP) disease which caused by the consumption of molluscan shellfish contaminated with brevetoxins, these are a group of more than ten natural neurotoxins produced by the marine dinoflagellate (Watkins, 2008). First case documented with the effect of Paralytic shellfish poisoning (PSP) was at the U.S west coast where five staff crew of Captain George Vancouver's get sick and one of the member died after eating mussels that carries PSP poisoning. Then, second case where staff worker for Alexander Baranof died after eating mussels at Sitka, Alaska. This two cases was related to red tide problem after done a few investigation (Horner, Garrison and Plumley, 1997).

These present days, the major issue of ocean-level rise is caused by anthropogenic global warming that put future investigating development for ocean level. Ocean level rising is one of the dangerous effect from ongoing global warming, which can make some particular area easily exposed to flooding and land loss (Cazenave *et al.*, 2014). Another huge impact from ocean level rising including higher extreme sea levels, beach erosion, surface and ground waters pollution and destruction of beach habitats place such as wetlands. Without any monitoring or a good care of ocean level will affect a million of people and beach habitats land areas (Nicholls, 2011).

1.2 Objective

1. To design and develop a system that can detect the existence of red tide in the ocean water and measure tidal current of an ocean level.

2. To measure the tidal height and get the image of red tide current condition.

3. To analyze by comparing tidal current value using design of experiment method.

1.3 Scope

This project is focus on safety of fisherman community in Malaysia that use big data application to enable use of in gathering information regarding to the current ocean situation in Malaysia. There are certain places in Perak that focus into as an example, test will be done using sample of water from rivers and seas around Perak. A piece of red card will be added into water sample for red tide sample. This project will use NodeMCU as a microcontroller to collect all big data from body of water ocean around Perak and analyze to come out with the result. The hardware of this project will combine together and locate at certain ocean spotted. Generally, this system will put into every fisherman boat. This will easily get information needed.

1.4 Expected Project

As the outcome of this project, the report consists of five chapter which is introduction, literature review, methodology, result analysis and conclusion. All the details, process, concept, description and result will be discussed on the chapter specified.

For introduction, this chapter will be introducing the action or the beginning section to understanding the general knowledge about main element in this project. Basically, will describe and review the background of the project, problem statement of an issue to be addressed or to be improved upon, objective that need to achieved and scope of the project which the work that must be done to deliver the project.

In second chapter, a literature review is a comprehensive summary of surveying scholarly source such as articles, books and journal that relevant to particular area of red tide and tidal current level. This topic provides an overview of describing, summarize, current knowledge, objective evaluate, identify relevant theories and clarify of existing research. It also covers the effect of both situation red tide and tidal ocean current level.

For chapter 3, the methodology of the project will be conducted and discussed. The method of flowchart, procedure, data collection, calculation and description of design will briefly be enlightened in this chapter. Project methodology can be used as validation point by explain the process step by step to get the real condition of red tide or tidal ocean level at every device installed. Besides, the software development that use in this project will be describe.

In chapter 4, the result and analysis part aim at narrating the finding in orderly, meaningful and simple way. From the result that recorded, it will analyze using graph, detection colour and image of every device installed. The data will save and show in detail information to every software development created.

Lastly, the conclusion of this project will conclude the whole project process and development. The improvement or recommendation for incoming project development will discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses on writings by researchers on relevant study on the red tide phenomenon, the impact of red tides on people lives especially in Malaysia. Also discusses the tidal sea phenomena, its monitoring.

2.2 Red Tide

Red tide is one of the caused by algal blooms phenomenon which they discolor ocean water by become a lot of number. Algal blooms produce many bacteria growth stimulate by extracellular product into marine life which this term called “phycosphere”. In phycosphere area, bacteria interact with algae that form a dinoflagellates explodes then called red tide (Wang *et al.*, 2010). There is a mixotrophic dinoflagellate that form a red tide in ocean where it’s called ichthyotoxic dinoflagellate *Cochlodinium polykrikoides.* This mixotrophic dinoflagellate produce 4 red tide in sequence formed diatom without certain distinct pattern which is the phototrophic dinoflagellates Prorocentrum donghaiense, Ceratium furca, and Alexandrium fraterculus (Jeong *et al.*, 2017).

From the research, there are some situation that contribute to the growth of red tide or phytoplankton. The element is Ocean acidification (high pCO2/low pH), ratios, shifts in nutrient availability, and speciation, changing exposure to solar irradiance, greenhouse warming, and altered salinity (Fu, Tatters and Hutchins, 2012). From the research in human exposure and health, brevetoxins cannot easily identify or evacuate by food preparation procedure because this toxics are heat and acids stable, odorless and tasteless but the detection is in substrate environment such as seawater, seafood, air and human clinical specimen by applying new technology (Fleming et al., 2011b).

2.2.1 Red Tide Effect to Marine Life

The present state of awareness stems from a rich literature collectively classified as "harmful algae" on the taxonomy, growth patterns, and ecophysiology of freshwater and marine phytoplankton. This societally specified group involves toxic organisms that transmit toxicity to higher trophic levels, mainly fish, shellfish, marine mammals, or humans, which include members of the cyanobacteria, dinoflagellates, raphidophytes, haptophytes, which diatoms. High-biomass occurrences, which also involve non-toxic phytoplankton organisms, often significantly change habitats by hypoxia or anoxia, altered food web efficiencies, activation of pathogenic bacteria or other ecological effects, are often included under the HAB umbrella (Wells *et al.*, 2015).

During harmful algal bloom happen, the researcher collected a sample from juvenile lemon sharks near the Florida ocean and found mercury and selenium existence in their tissue

muscle. Generally, normal mercury toxic in tissue muscle is 0.34 µg/g. If the level exceed safe limit of mercury, it will hardly impact the aquatic system especially for the species classified as almost extinct such as lemon shark and other species (Nam *et al.*, 2011).

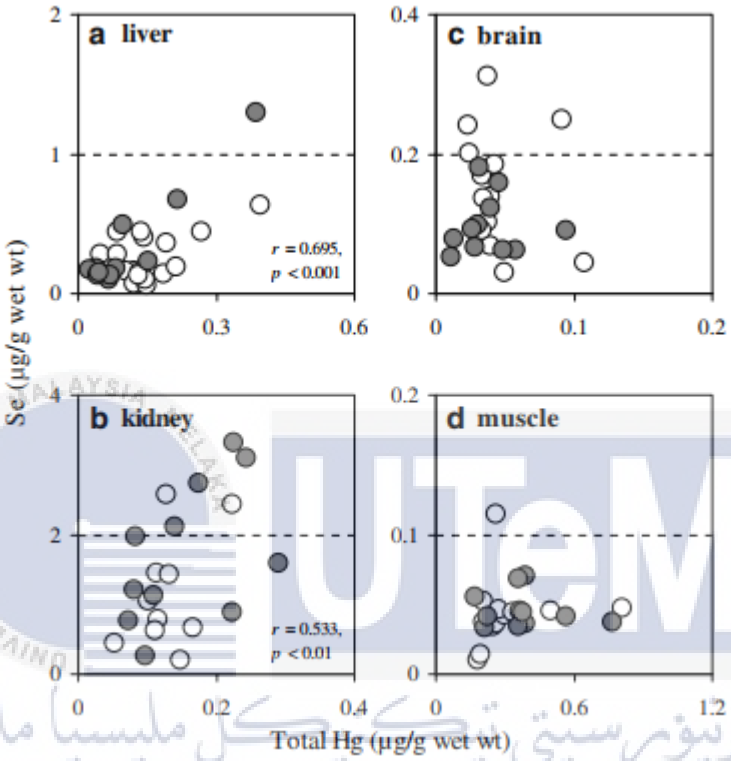

Figure 2.1 Spearman rank correlations between total Hg and Se concentrations in tissues of control (open circles) and HAB-exposed (shaded circles) juvenile lemon sharks (Nam *et al.*, 2011)