UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SENSOR DURABILITY AND CALIBRATION OF A RTCS BASED ON REAL-TIME COLLECTION

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DECLARATION

I declare that this thesis entitled " Sensor durability and calibration of a RTCS based on real-time data collection" is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Name : Nurfatin Amirah Binti Abdullah

Date : 10/01/2023

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Technology Mechanical Engineering Technology (BMMV) with Honours.

Signature : 

Supervisor Name : Sayed Kushairi Bin Sayed Nordin

Date : 20.1.2023

DEDICATION

This final year project is dedicated to my parents, who are the motivating factor behind my efforts to complete it successfully. This project is also dedicated to my supervisor, Sayed Kushairi Bin Sayed Nordin, and my co-supervisor, TS. Mohd Idain Fahmy Bin Rosley, for their endless hours of reflection, reading, encouraging, and, most importantly, patience throughout the process.

ABSTRACT

Water contamination has become a severe concern as a result of increasing water-related activities such as transportation, fishing, and entertainment. It jeopardises human and ecological health, as well as the quality of the water in the surrounding region. The goal of the River Garbage Collector System (RTCS) project is to create a system that can collect floating trash, oil, gasoline, and detergents from water bodies. As a consequence, the water pollution problem will be resolved, and the River, as one of the most importance ecosystems, as well as its marine life, will be protected. It has a sensoring system for evaluating water quality as well as a waste weight restriction. Sensors are crucial in the development of IoT solutions. Sensors are devices that detect and replace external data with a signal that humans and machines can understand. Sensor will make the data collection be much easier rather than manual collection. . By the completion of the research, a fully functional garbage collector should be removing debris along the Malacca River's shoreline. This newly constructed RTCS will also help with water pollution concerns, notably along the River.

ABSTRAK

Pencemaran air telah menjadi kebimbangan yang teruk akibat peningkatan berkaitan air aktiviti seperti pengangkutan, memancing, dan hiburan. Ia membahayakan manusia dan kesihatan ekologi, serta kualiti air di kawasan sekitar. Matlamat untuk projek River Trash Collector System (RTCS) adalah untuk mewujudkan satu sistem yang boleh mengumpul sampah terapung, minyak, petrol, dan detergen daripada badan air. Akibatnya, air masalah pencemaran akan dapat diselesaikan, dan Sungai, sebagai salah satu ekosistem yang paling penting, serta hidupan marinnya, akan dilindungi. Ia mempunyai sistem penderiaan untuk menilai kualiti air serta sekatan berat sisa. Penderia adalah penting dalam pembangunan penyelesaian IoT. Penderia ialah peranti yang mengesan dan menggantikan data luaran dengan isyarat yang boleh difahami oleh manusia dan mesin. Sensor akan menjadikan pengumpulan data menjadi lebih mudah daripada pengumpulan manual. . Menjelang selesainya penyelidikan, pemungut sampah yang berfungsi sepenuhnya harus mengalihkan serpihan di sepanjang pantai Sungai. RTCS yang baru dibina ini juga akan membantu dengan masalah pencemaran air, terutamanya di sepanjang Sungai.

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RTCS	-	River Trash Collector System
ANOVA	-	Analysis Of Variance
TDS	-	Total Dissolved Solid
DO	-	Dissolved Oxygen

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CHAPTER 1

INTRODUCTION

1.1 Background

Hundreds of aquatic species have been discovered dead along the historic Sungai Melaka canal following a significant pollution event caused in part by industrial waste discharge.According to Malaysian press sources, pollution has killed thousands of fish in the Malacca River, rendering its waters "black and foul-smelling". In an effort to wash the filthy water out to sea, PPSPM opened the dam at the river's mouth around midnight on Tuesday (May 21). Around 60 PPSPM personnel have also been deployed to help clean up the dead fish before they fall to the river's bottom.

Water supplies have been decreased in the recent year. According to worldwide water pollution statistics, developing nations produce 70% of untreated industrial wastes that end up in water, and they use an average of 99 million pounds (45 million kilogrammes) of fertiliser and chemicals each year (National Geographic Portal, 2016). In the Malacca River, this is a regular occurrence. The river is now poisoned, resulting in the extinction of several fish species. Law enforcement, water resource regulations, religious and moral teaching, and public awareness about the importance of the environment, particularly riverine water resources, have all been adopted by the state government. However, the state government's adoption of such programs to protect river water quality has not resulted in lower levels of water contamination. The situation has grown more dangerous as it has progressed to a higher level. As a result, the principal pollutants emitted by the major sources of pollution

should be researched and quantified, particularly in terms of geographical variation in the Malacca River. Several systems for monitoring and analyzing river water have been designed and marketed. The Malacca River, on the other hand, has yet to be implemented due to a lack of information or technological know-how.

1.2 Problem Statement

Water is a vital component of human life that must be used in daily activities while also satisfying the needs of business and ecosystems. Liquids, solids, and gases can all make up the water component. The essential qualities that are highlighted so that there are no adverse effects to humans and other living species are clean, safe water sources. Rivers, oceans, and lakes are examples of natural water sources. Rivers are important for removing urban and industrial effluent from rural areas. However, due to the amount of waste generated by human activities, the river system frequently suffers from water pollution issues. Contaminants turn bodies of water unsafe for human consumption while also disrupting aquatic ecosystems. To mention a few examples, Toxic waste, gasoline, and disease-causing bacteria are among contaminants that may contaminate water.

In surface waterways, trash, litter, and rubbish are common sources of solid waste. In metropolitan settings, stormwater runoff is commonly used to move trash and waste. People who fish or engage in water-related leisure also produce trash. Trash, regardless of its source or sort, pollutes water. Some people continue to dump unneeded items, such as couches and beds, in waterways. Some abandoned goods, ironically, provide home for aquatic species. Trash, on the other hand, is unattractive and an indication of human disrespect for aesthetic standards and natural ecosystems.

One of the main sources of water pollution in the Malacca River is the state of Malacca's rapid development. This can be seen in the changes in water quality as a result of the modernization that is taking place without any constraints or restrictions. As depicted in Figure 1, river water is becoming progressively contaminated, blackish, and emitting an awful stench. The Malacca River is one of the tourism attractions, so this scene is really disappointing to exhibit to visitors.

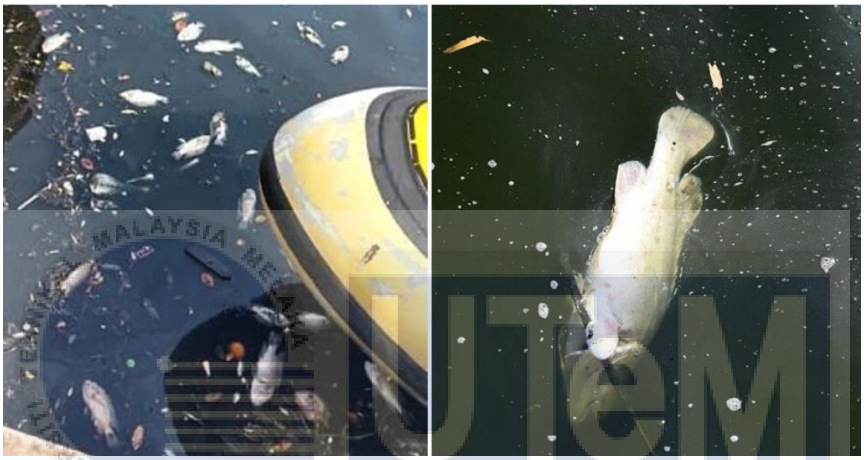

Figure 1.1 Water Pollution at Malacca River

1.3 Research Objective

The research paper focuses on the following specific objectives in order to fulfil its ultimate aim of collecting trash at the Malacca River:

- To develop sensoring system for RTCS
- To optimize sensoring system for RTCS
- To compare if there is a significance different of pH,DO, turbidity, TDS and temperature of water in different time

1.4 Scope of Research

- This study will be implemented using sensoring system.
- This study will be implemented using low-cost devices integrated with the Internet of Things (IoT) to facilitate remote monitoring the sensor to get data.
- This study will be conducted in the Malacca River area.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Background research and a literature evaluation are included in this chapter throughout the project, with articles, book reviews, and journals serving as resources. This chapter will focus on the difficulties of water pollution as well as all of the materials that will be used in River Trash Collecting System (RTCS). It will also do a literature review on the SLS 3D printing machine as well as all of the sensors that will be used. With the help of the literature review, this section will explain the project in greater detail and make it easier to understand.

2.2 Water Pollution

Water is a renewable resource that is required for all forms of life, as well as food production, economic growth, and overall well-being. It is difficult to clean and transport, and it is definitely a one-of-a-kind natural gift (Singh & Gupta, 2017). As a result of rapid population increase and industrialisation, the demand for freshwater has risen considerably in recent decades (Ramakrishnaiah et al., 2009). Water contamination may be classified into two types: point and non-point. A point source is pollution that has a single identifiable source. Pollution released into the environment in one place can have an impact hundreds, if not thousands, of kilometres elsewhere. Cross-border pollution is the term for this. Pollution may occur when large volumes of foreign particles enter the environment (Bin Zakariah et al., 2022).

River polluted water has gotten a lot of attention in recent years, and it continues to be a major source of concern around the world. The deterioration of water quality is primarily

linked to the issue of population development and city expansion. This is a threat to human and ecological health, as well as the supply of drinking water and economic development (Li & Zhang, 2010). Human activities that provide a financial benefit to society have harmed the river's water quality indirectly (Muyibi et al., 2008).

2.3 Water Quality

After air, water is likely the most valuable natural resource, yet it is also a finite resource. Water's appropriateness for usage must be examined before it is drunk or bathed, as it is required for a variety of usesWater quality refers to the chemical, physical, and biological characteristics of water, as well as its suitability for a particular application. Recreation, drinking, fishing, agriculture, and industrial uses are all possible with water. Drinking water and swimming water, for example, are held to far higher standards than water used in agriculture and industry (Roy, 2018). States and authorized tribes are responsible for setting water quality standards that "...consist of the designated uses of the navigable waters concerned and the water quality criteria for such waters based on such uses," according to Section 303(c)(2)(A) of the CWA. "...protect the public health or welfare, improve the quality of water, and serve the goals of this Act," according to the criteria (USEPA, 2017).

According to the World Health Organization, millions of people suffer from a variety of ailments as a result of drinking contaminated water (WHO). Drinking clean, safe water has been linked to better health results around the world. As a result, determining the water use potential of any water supply is critical (Madilonga et al., 2021).

Human civilisation, industrial, and agricultural activities are the primary contributors of water contamination. Unsanitary disposal and poor treatment of human and animal wastes are two negative aspects of these operations. These contaminants will poison the water

system whether they are discharged directly or indirectly into water bodies. (Obilonu et al., 2013). Increased acidity, higher concentrations of nutrients, sediments, salts, trace metals, chemical and other pollutants, as well as hazardous pathogenic organisms that flourish in warmer temperatures, are all signs of pollution and contamination from such sources. Nutrient enrichment has become one of the most common water quality issues, wreaking havoc on freshwater and coastal ecosystems (UNESCO, 2009)

2.4 Sensor

A sensor is an electronic device that receives a signal or stimulus and replies with an electrical signal. Some types of electrical signals, such as current or voltage, are represented by the output signals. Based on the application, input signal, and conversion method, sensors are divided into distinct categories (Vetelino & Reghu, 2017).

2.4.1 Analog TDS Sensor

A TDS meter is a compact hand-held device that measures the amount of Total Dissolved Solids (TDS) in a solution, often water. TDS is the proportion of all inorganic and natural substances present in water in various forms that has been disintegrated and consolidated. TDS is used to indicate the taste of water. The presence of chemical pollutants in water is indicated by TDS (Kondle et al., 2020). TDS (Total Dissolved Solids) is a measurement of how many milligrams of soluble solids are dissolved in a liter of water. The less clean the water is, the higher the TDS value. As a result, it can be used as one of the benchmarks for measuring the purity of drinking water. TDS is measured in parts per million (ppm) or milligrams per liter (mg/l). The allowable TDS limit is 500 ppm. The TDS value of the sample water is within the acceptable range, being as low as 161. This product accepts a wide voltage range of 3.3 to 5.5V and outputs a 0 to 2.3V analogue voltage, making it

suitable with 3.3V and 5V control systems. This water-resistant probe can be submerged in water for long periods of time to test TDS readings (Ragavan et al., 2016).

2.4.2 Temperature Sensor

Temperature sensors are used in a wide range of products and services, including everything from domestic appliances to medical devices. Humans are surrounded by temperature sensors. They monitor the temperature of HVAC systems, refrigerators, freezers, and computers in our buildings and houses. Temperature is constantly monitored and controlled in industrial applications such as motor controls, assembly lines, processing, and manufacturing. Temperature sensors come in a variety of shapes and sizes, as well as a variety of functions, making them ideal for a variety of applications. Resistance temperature detectors (RTDs), local temperature sensor ICs, and remote thermal diode measuring ICs are the most often utilized in modern electronics ("Temperature Sensor," 2001). The resistance temperature detector (RTD, also known as a resistance thermometer) is a popular temperature sensor. RTDs are noted for their great accuracy and precision. Due to the degradation of the outer sheath, which holds the thermometer, RTDs become exceedingly inaccurate at high temperatures (C. Sensors, 2007).

2.4.3 Analog Dissolved Oxygen Sensor

Analog Dissolved Oxygen Sensor is used to assess water quality by measuring the amount of dissolved oxygen in the water. Aquaculture, environmental monitoring, natural science, and other water quality applications use it extensively (Robotshop, n.d.). It is used to determine the amount of dissolved oxygen in water and thus the water quality. This sensor kit makes it easy to make your own dissolved oxygen detector rapidly. The probe is galvanic, requires no polarization time, and is always available. The probe must be calibrated for