Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF RIVER CLEANING ROBOT USING IOT TECHNOLOGY

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Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

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A project report submitted
in partial fulfillment of the requirements for the degree of
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DECLARATION

I declare that this project report entitled “Development of River Cleaning Robot Using IOT Technology” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Student Name : NUR SYAIDATINA FARAHIN BINTI ANUAR

Date : 27 January 2023

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

Signature : 

Supervisor Name : DR. MD ASHADI BIN MD JOHARI

Date : 27 January 2023

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

Specially dedicated to my supportive and lovely parents, Mr Anuar bin Kamarudin, and Mrs Roziah binti Muhammad Ramly, siblings and friends that always gave me full support, encouragement, and advice throughout this project and throughout my degree journey.

ABSTRACT

In our country, it is getting increasingly difficult to obtain clean drinking water. Human survival and the functioning of the global ecosystem depend on the availability of potable water. Aquaculture, fishing, industry, and transportation are all made possible by the availability of water. One of the many things that contribute to river pollution is the dumping of rubbish from residential areas near rivers, lakes, and the ocean. Eventually, the water supply will be polluted because of the unregulated dumping of debris, such as garbage, and oil. A garbage collecting system, a robot for cleaning up rubbish from rivers, channels, and lakes, will be created experimentally for real-world application, and this project aims to build and model such a system. A robot that can be operated through an Android app has been developed for the purpose of cleaning water bodies. The NODE MCU-ESP8266 micro-controller and the accompanying Android application have been programmed in the Arduino IDE and communicate with one another using the micro-Wi-Fi controller's module. Microcontrollers can function on small amount of power. A microprocessor only requires 3.3V of power, while a motor needs 12V.Powering the motor is a microcontroller board motor driver circuit. The motor driver circuit boosts Node-MCU 3V to 12V to power the motor. The motor driver circuit spins the two propellers. An Android IoT app may adjust propeller direction. The robot will collect and measure water quality using the TDS sensor on ESP32 and the ThingSpeak app. This idea proposes a low-cost, safe, and successful floating garbage disposal technology with low maintenance, easy management, and a monitoring system to reduce river pollution.

ABSTRAK

Di negara kita, semakin sukar untuk mendapatkan air minuman bersih. Kelangsungan hidup manusia dan fungsi ekosistem global bergantung kepada ketersediaan air minuman. Akuakultur, memancing, industri, dan pengangkutan semuanya dimungkinkan dengan adanya air. Salah satu perkara yang menyumbang kepada pencemaran sungai ialah pembuangan sampah dari kawasan kediaman berhampiran sungai, tasik dan lautan. Akhirnya, bekalan air akan tercemar kerana pembuangan serpihan yang tidak terkawal, seperti sampah, minyak, dan najis. Objektif projek ini adalah untuk mereka bentuk dan mensimulasikan sistem pengumpulan sampah yang merupakan robot untuk membersihkan sisa dari sungai, saluran, dan tasik yang akan terus dibangunkan secara eksperimen untuk kegunaan dunia sebenar. Untuk membersihkan badan air, robot yang boleh dikawal oleh aplikasi android telah dicipta. Persekitaran pengaturcaraan Arduino IDE dan modul Wi-Fi dalam pengawal mikro telah digunakan untuk menyalurkan aplikasi NODE MCU-ESP8266 dan Android. Voltan dan arus tahap rendah digunakan oleh pengawal mikro untuk beroperasi. Walaupun motor kerja hanya memerlukan 12V, mikropengawal hanya memerlukan 3.3V untuk beroperasi. Litar pemandu motor disambungkan ke papan mikropengawal untuk menggerakkan motor. Litar pemandu motor membantu memandu motor dengan meningkatkan 3V dari Node-MCU hingga 12V. Kedua-dua kipas yang disambungkan ke litar pemandu motor digerakkan oleh mereka. Arah kipas boleh ditukar dengan menggunakan aplikasi Android yang dibina untuk Internet of Things. Di samping itu, sensor TDS akan dilampirkan pada ESP32 dan disambungkan ke aplikasi ThingSpeak, yang membolehkan robot mengumpul dan mengukur kualiti air. Dengan idea ini, kaedah pelupusan sisa terapung yang kos rendah, selamat dan berkesan, dengan kos penyelenggaraan yang rendah, pengurusan mudah, dan sistem pemantauan, dibentangkan sebagai penyelesaian yang berdaya maju terhadap pencemaran sungai.

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A big-thank you goes to all my housemates for sharing their knowledge and experience with me. Their overwhelming support and cooperation will be remembered. The tips had leaded me to the right path in completing the research project. Thank you again for them.

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CHAPTER 1

INTRODUCTION

1.1 Background

Water is a vital resource for human survival on Earth; it covers more than 70% of its surface, but just 3% of that is potable. All living organisms on the Earth need to survive. Seawater makes up most of the world's water, yet it can't be utilized without human intervention. The sole source of freshwater that can be used for drinking is groundwater. However, provided it is of high quality, the proportion of its volume is sufficient to supply the needs of living creatures [1]. Aside from that, water is known as a universal solvent since it can dissolve a wide range of compounds, including toxic industrial waste, sewage, chemicals, and so on. Human activities have entirely poisoned the water as a result. According to a WWF-Malaysia report, river pollution is one of the most critical hazards to rivers. A reduction in water quality is a clear indicator of river basin environmental health. River contamination has far-reaching consequences. In humans, it can cause various water-borne severe infections, including diarrhea, trachoma, and hepatitis. According to the WHO, water-borne infections account for 22% of all infectious diseases [2].

Furthermore, in 2017, the Deputy Minister of Energy, Green Technology, and water declared numerous rivers in West Malaysia "dead" due to pollution, resulting in a decrease in dissolved oxygen, resulting in critical conditions for fish and other species in those rivers [3]. As a result, a solution that would at the very least enhance its state, such as a river cleaning robot, is essential.

1.2 Problem Statement

One of the challenges that can affect rivers is water pollution or the introduction of foreign substances into a body of water. The dumping of sewage, rubbish, and liquid waste from households and the chemical industry is the primary water contamination source. Many aquatic life species are on the verge of extinction as a result of this. Without the help of technology, sanitation staff and volunteers are now cleaning the lake. This initiative aims to provide an alternative approach by cleaning up garbage with robotic technology. Besides that, some communities dumping garbage into nearby rivers have had long-term negative impacts on both the species and habitats of the area and the local environment. With the help of the TDS sensor, the data from the ThingSpeak application can be used to evaluate the performance quality of the river.

1.3 Project Objective

The objectives of this project are:

a) To design and prototype a trash collection system that will be further refined experimentally for usage in the real world and used to clean up garbage from rivers

b) To creating a Wi-Fi connection between a Blynk app and a Arduino Uno is required for system integration.

c) The collected data from the ThingSpeak app will be used to assess the water's performance quality.

1.4 Scope of Project

The main purpose of this study is to make a cost-effective remote-controlled robot with advanced control characteristics that can assist humans in eliminating floating water waste easily and safely, thereby making work easier and more environmentally friendly. This project is the integration of the software component and hardware. For the software part, the circuit design was created with Proteus software to get a simulation before constructing the mechanism, and Arduino Compiler was used to write the necessary coding for the river cleaning robot on the microcontroller. A microcontroller based IoT application running on Android is used to operate this robot. This robot helps the staff and volunteers thoroughly and hygienically clean the river. We must use robotics in waste collection and green management right away to curb the disruptions brought on by excessive pollution.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides background research and a literature review throughout the project, with articles, book reviews, and journals as sources. This study will elaborate on the issues that have been raised in relation to the river cleaning machine. River pollution can be solved with the use of a river cleaning robot. With the help of a literature study and project-related assessment, this section will go into further detail, making it easier to understand the entire project.

2.2 What exactly is Water Pollution?

Water is one of the essential natural resources given to humans. Rivers, on the other hand, are not immune to pollution. Rivers are divided into three categories based on their pollution level: low, medium, and high. The rapid expansion of civilization and numerous human activities have accelerated pollution and the deterioration of the water supply. Aside from that, the pollution of freshwater resources caused by wastewater discharge and garbage disposal is the root cause of freshwater scarcity. Water is one of the essential natural resources given to humans. Rivers, on the other hand, are not immune to pollution. Rivers are divided into three categories based on their pollution level: low, medium, and high. The rapid expansion of civilization and numerous human activities have accelerated pollution and the deterioration of the water supply. Aside from that, the pollution of freshwater resources caused by wastewater discharge and garbage disposal is the root cause of freshwater scarcity. As well as natural causes like acid rain. Water pollution happens when

organic and inorganic compounds and biological compounds build up to dangerous levels and contaminate water.

2.3 Factor and effect of Water Pollution

Water pollution is widely regarded as the world's leading cause of death and disease caused by human activity. Water pollution is caused by various chemicals, microorganisms, and physical factors. Both organic and inorganic compounds can be contaminated. High temperatures can also cause water pollution. Power plants and industrial enterprises that use water as a coolant are typically the sources of heat pollution [4]. Rising water temperatures reduce oxygen levels, kill fish, alter the food chain, reduce biological diversity, and promote the invasion of new thermophilic species.

Furthermore, sewage disposal is one of the sources of water pollution. Sewage disposal pollutes the public's immediate environment and causes water-borne diseases such as diarrhea, which killing 525,000 children under the age of five each year [5]. Sewage comprises a wide range of compounds, including pharmaceutical drugs, paper, plastic, and other contaminants dumped into toilets. When humans become ill with a virus, the pathogen is spread throughout the environment by the sewage they produce. Diseases such as hepatitis, typhoid, and cholera can spread through waterways [6]. Farmers' chemical fertilizers feed the soil, which then flows into rivers and the sea, enhancing the effect of sewage fertilization. Combinations of sewage and fertilizers can cause a significant increase in algae or plankton growth, destroying vast areas of oceans, lakes, and rivers. These toxic algae flowers are known as. It is hazardous because it depletes the oxygen in the water, kills other forms of life, and creates a "dead zone."[7].

Lastly, plastics and garbage are significant contributors to global water pollution. Every year, 1.4 billion tons of waste are produced [7]. Plastic accounts for 10% of this annual

waste. Experts estimate that 4.8–12.7 million tons of waste enter the ocean each year due to the widespread use of plastics. The plastic is lightweight and floats effortlessly, allowing it to travel long distances. Because most plastics are non-biodegradable (they do not decompose naturally in ecosystems), items like the tops of plastic bottles can linger in the ocean for a long time. While not as dangerous as toxic chemicals, Plastics are still a significant threat to seabirds, fish, and other marine species. Plastic fishing lines, for example, can suffocate or strangle fish. As a result, the UN estimates that plastic debris in the oceans kills over a million seabirds each year. Plastic debris is also to blame for the deaths of over 100,000 marine mammals each year [8].

2.4 River Water Pollution in Malaysia

The problem of river pollution in Malaysia is no longer minor. It must be stopped and addressed early so that it does not worsen and harm the ecosystem. The rivers listed below have experienced water pollution in Malaysia.

Plastic, garbage, and heavy metal are released into the aquatic environment due to a variety of human-made activities, including chemical manufacturing, mining, municipal effluents, and other human-made activities. Chemical manufacturing, municipal effluents, and other human activities along the Perak River have all contributed to the degradation of the heavy metal content of this water source [9].

Figure 2.1 Condition of Perak River [10]

The Klang River has become a critical resource because of river pollution and ineffective water management. Industrial discharge, inappropriate sewage treatment, residential discharge, land development, and soil erosion are significant sources of pollution in the Klang River Basin.

Figure 2.2 A solid waste wall piled up in the Klang River [11]

The river water quality and during the Movement Control Order (MCO) in Malaysia. Over the years, river pollution has increased, and the number of rivers has also decreased as most of the rivers are polluted. Most of the river pollution is caused by industrial factories, residential areas, farms, and agriculture.

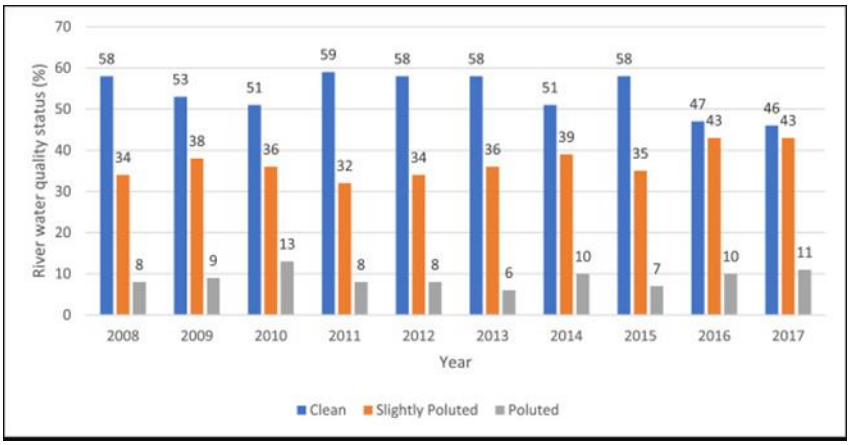

Figure 2.3 River water quality status (%) vs Year [10]

Based on Figure 2.4 below, the research carried out has shown that the highest contribution is from suspended solids load from piggery.

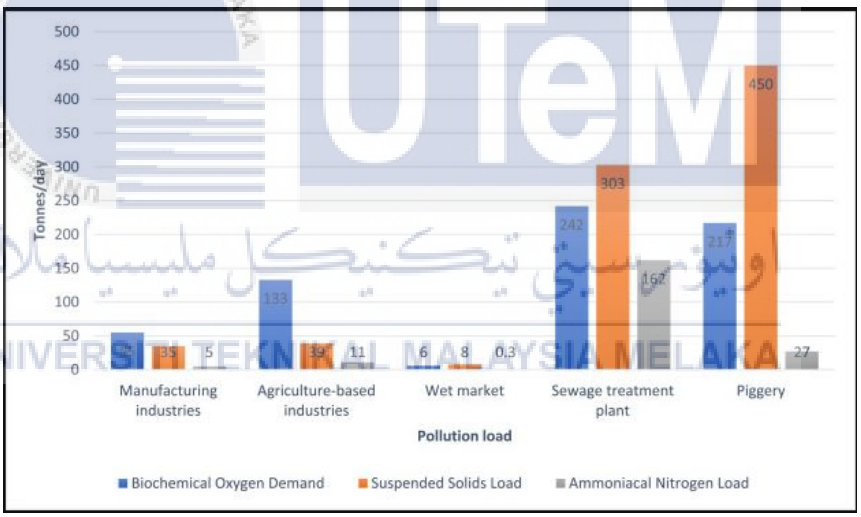

Figure 2.4 Tons/day vs Pollution Load

The rate of pollution that is increasing each year is alarming on the ecosystem. Most countries are rich in aquatic ecosystems where now, it is starting to deplete with time [11]. Water supply is needed every day in Malaysia as well as every other country. Locals still face water issues from time to time where with pollution it disrupts the supply and decreases the quality of drinking water.

2.5 River Water Pollution in Malacca River

Melaka's water catchment includes River Putat, Cheng, Durian Tunggal, Tampin, and Batang Melaka. Because of water quality issues such as fish fatalities, foul-smelling rivers, and a lot of waste, Sungai Melaka was chosen to host the river cleaning robot. As evidenced by fish deaths and river erosion, rivers have been overused as a result of fast expansion [12]. Rapid expansion can also pollute river water, causing the spread of infectious illnesses, the loss of aquatic species, the degradation of landscapes, the production of foul odors, and the disturbance of human engagement with the environment, such as through recreational activities. Large-scale operations in the Melaka River have resulted in water contamination and deterioration of river water quality [12]. At the mouth of the Melaka River, a number of fish died.

The safety of drinking water is crucial as water is drunk daily. One of the ways to ensure that the water resources are well taken care of is to implement water related policies and programs for awareness also to teach people to use water efficiently to avoid undersupply and wastage [11].

2.6 Health impact of river water pollution in Malaysia

The Department of Environment (DOE) is the person in-charge of monitoring the quality of the river [13]. Water pollution affects consumers' health which will also cause rage among people as well as higher expenditure in purchasing filters. Rage from the infectious diseases that will occur due to unclean water. As the country grows, the expectation of services as well as basic needs such as water has to be improved.

In Segamat, a study has shown that the river has been polluted due to the palm oil plantation and the lack of quality of water during the dry season. It stated that contaminated

water has caused breast cancer and prostate [14]. It is related to breast cancer when the area lived near industrial areas.

Besides that, poor management and collaboration between people or organizations in charge reduces the quality of water as no action was taken. When the residential people and organizations approach the issue by taking action that is to source the root cause of pollution in the area as well as exploring tools that can be used to reduce water pollution [15].

Furthermore, deforestation that causes landslides and unstable structures are also contributing to river water pollution as everything on land will flow into the river water [16]. River cleaning and restoring have been a combination of efforts from all parties such as the government to non-profit organizations (NGOs) and communities all around to upkeep the river.

Lastly, the maintenance of the sewage and clearing of rubbish that flows in the river as well as toxic chemicals plays a role in maintaining a river. From the water quality index (WQI) it is seen that the river water is more on the polluted side than clean [17].

Parameter	Unit	Class				
		I	II	III	IV	V
Biochemical Oxygen Demand (BOD)	mg/L	<1	1-3	3-6	6-12	>12
Chemical Oxygen Demand (COD)	mg/L	<10	10-25	25-50	50-100	>100
Ammonical Nitrogen (AN)	mg/L	<0.1	0.1-0.3	0.3-0.9	0.9-2.7	>2.7
Dissolved Oxygen (DO)	mg/L	>7	5-7	3-5	1-3	<1
pH	mg/L	>7	6-7	5-6	<5	<5
Total Suspended Solid (SS)	mg/L	<25	25-50	50-150	150-300	>300
WQI	-	>92.7	76.5-92.7	51.9-76.5	31.0-51.9	<31.0

*WQI: 81-100 =clean, 60-80 = slightly polluted and 0-59 = polluted

Figure 2.5 Water Quality Index (WQI) in Malaysia

2.7 River Cleaning Robot

This Section describes previous works on the water cleaning robot based on various technologies developed by other researchers worldwide. According to [18], the article suggests the design and operation of a self-contained boat to remove rubbish floating on the

lake. The boat was tailored to perform both physically and intuitively, with a movement control approach for ultrasonic distance estimation. The main flaw discovered was that the boat's development was uneven, and there was no control over the rubbish collection.

Next, The Floating Rubbish Scooper Robot (FWSR) was created to replace human waste collection in urban waterways, lakes, and pools [19]. The FWSR, which consists of two barges with paddle haggles rudder, moves the trash bin and transport line. The front scooper was added, and the previous design included a bar structure that made collecting plastic containers on the water nearly impossible. A half-barrel shaped nylon-net framework supports the balance's dynamism in the new layout. Through Arduino Mega 2560, the control order is transferred from Arduino Uno to the robot's engine drivers. GPS, IMU, slant sensor and encoders track the robot. A camera is mounted on the robot for VDO acquisition during the route and telework control.

The "Stream tidy up machine" is used where squander particles in the water outline should be disposed of. This machine consists of pushing arm components powered by a DC engine that collects and removes waste, trash, and plastic waste from water bodies [20]. This also helps alleviate some of the problems that arise when garbage is collected. A device will remove unwanted surface particles from water bodies, resulting in less water contamination and, as a result, fewer sea-going species deaths as a result of these difficulties. It has a mechanical arm that grabs trash from the water and collects it in a bushel made by a robot. This task will be used to remove surface water waste from our bodies from streams, lakes, and other waterways.

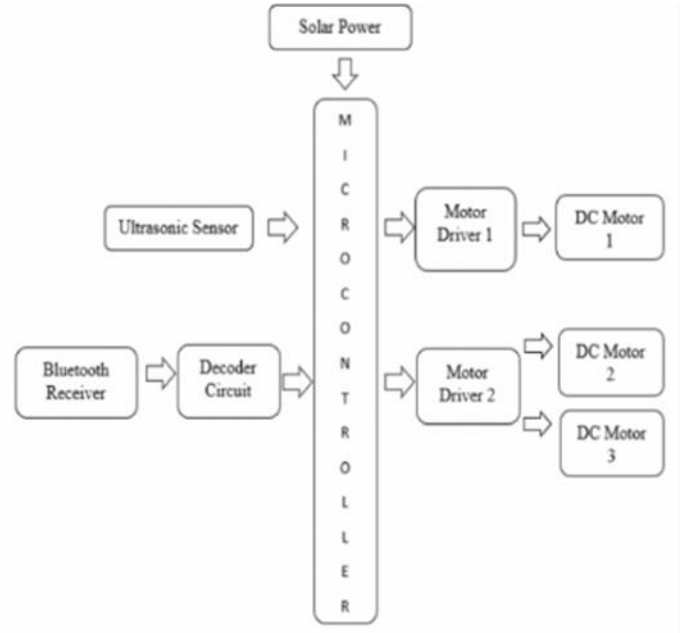

Figure 2.6 The proposed block diagram of river cleaning robot

Based on Figure 2.6, the proposed block diagram river cleaning robot is divided into three sections where it is controlled by the mobile application, energy to work the robot is from the solar panel and the programmed software to execute its functions. The Microcontroller, that is Arduino IDE, was the platform used to program as it has a wide range of features that can be incorporated to ensure the system worked as planned. The hardware plays a role in ensuring the functions are as programmed from being able to float on water to collecting the trash and its mobility to move and detect trash.

According to [21], an airboat is a self-driving motorized boat that can carry 100 kg of cargo and travel at a maximum speed of 2 m/s for collecting water waste and protecting biological data. An IoT-enabled steam cleaning robot is created with an Arduino and a NodeMCU V2 CPU. The "Stream waste cleaning machine" is used when waste rubbish in a water body needs to be removed. The sewage is collected in a bucket that is hoisted with one arm. The framework operates even in a sewage area with water (limited to a particular total).

The paper describes [22] the operation and positioning of various machine components. To take waste, the machine in the proposed system is controlled by a remote control. As a result, the system avoids the negative effects of sewage waste and gases. When the system is turned on, the wiper motor begins to run. The two power window motors are connected to the wheel and are controlled by the remote-control setup. The system collects sewage wastes with the arm and deposits them in the machine's waste bin. The system circulates water in the sewage area, collecting floating waste. Waste that has an impact on drainage is also collected and removed. This system requires less human intervention in the cleaning process, which reduces disease spread.

In their study, G. Shivashankar et al. demonstrate how they are employing this autonomous robot to gather the waste from an environment by autonomously discharging the debris to a predetermined region [23]. It completes tasks such as avoiding all barriers and removing rubbish. A combination of S-shaped and wall follow algorithms is utilized to clean the entire room efficiently. They used Arduino to verify the technique using a MATLAB simulation. In mobile robot navigation, the complex environment and impediments are lackin

2.8 Comparison of Literature Review

The comparison of papers from previous related work are presented in Table 2.2.

Title	Year	Components / Hardware	Software / Application	Advantages	Disadvantages
1. An autonomous ship for cleaning the garbage floating on a lake [18]	2009	Solar battery, Ultrasonic sensor, two screw propellers, A photo-resistance, Wireless remote control, keyboard display, computer, single-chip microcomputer (SCM) system	Arduino IDE	- Forward well - Save power energy - User friendly	- Not required for higher accuracy -If much load the robot will not balance
2. A floating waste scooper robot on water surface [19]	2017	Arduino Uno, GPS, IMU, laser, Tilt sensor, scooper, camera, encoders track	Graphic User Interface.	- More efficient -Good performance	Have specific speed to collect the garbage
3. Design and Development of River Cleaning Robot Using IoT Technology [20]	2020	Ultrasonic sensor, Solar power, Bluetooth, Receiver, Microcontroller, DC motor, Belt, Conveyor, Battery, PH sensor and GPS Module	Arduino IDE, Solidworks software, Amazon web Service (AWS)	-User friendly -Reducing time taken	Expensive to be implemented.

4. Smart Aqua Cleaning Robot Using IoT Technology [21]	2021	NODEMCU V2 processor, Ultrasonic sensor, Garbage bin, Pivot shaft, Dc engines, Battery, Waterproof ultrasonic sensor, and PH sensor	Amazon web Service (AWS)	-Climate well-disposed framework - Works totally fine significantly under slippery condition -Introductory position cost is less	-The pace of trash the assortment is low. -The waste gathering limit of machines is restricted at a time.
5. Design and fabrication of remote-controlled sewage cleaning machine [22]	2022	Motor, Sprocket, DC series motor, Chain, Forks, Frame and wheels, Receiver, Relay and RF module	Proteus software	-Easy to operate -Large amount of garbage is collected	Expensive to be implemented.

6. Automatic River Cleaning Machine [24]	2020	Floating Frame, Base frame, Conveyor belt, Power transmitting Shaft, Collecting tray, Wiper motor, Battery, Dc motor, shaft speed and radio frequency transmitter.	Not mentioned	-It is non-conventional river cleaning machine -Easy to operate -Environmental friendly system -No requirement of skilled worker -Maintenance cost is low	-Underwater wastes cannot be collected - Algae's which are deep rooted in water are difficult to remove. - The application depends on the velocity of flow of water.
7. Swatch Hasth – A Water Cleaning Robot [25]	2020	Microcontroller (Arduino Uno), Ultrasonic sensor, PIR sensor, Bluetooth Module hc05, DC motor, Robotic Arm, and Smartphone	Arduino IDE, Tinkercad and Blynx App	-Low cost -Environmental friendly system	Need to maintain the cost.
8. Android Application Controlled Water Trash Bot Using Internet of Things [26]	2021	Motor, Solar- battery, Node MCU-ESP8266, Motor Driver, Propeller	Blynx App, Arduino IDE	-Can use for large scale -Very much cost efficient	Cannot be controlled manually

9. Aqua Dredger River Cleaning Machine [27]	2020	Cutter and cutter shaft, Chain, Propeller, Conveyor Shaft, Base frame, and float	Not mentioned	- Can use for big capacity -Effective at clearing aquatic weeds	- Expensive -Unable to access restricted locations
10. Design and Development of Smart Self-Cleaning Solar Panel System [28]	2019	PV solar panel, Arduino Uno, Relay, PH sensor,	Blynx software and Arduino IDE	- Easy to be used - Eco-accommodating	When the weather is severe, it doesn't run as smoothly as usual.

Table 2.1 Comparison of Literature Review

2.9 Summary

In conclusion, previous studies have been discussed in the literature review chapter on this project issue. This study introduces a new generation of river cleaning robots. Improvements made by new designs and features make river cleaning robots with IoT technology more competitive. Furthermore, the proposed method will be effective and user -friendly, which will improve the garbage collection process by directing to pick up various types of high -quality debris and jetsam while reducing the time required as it potentially replaces manual labor measures.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter basically provides an outline of how the work was completed from start to finish to build a river cleaning robot using IoT technology. The methodology describes the processes and procedures used to complete the project according to the project goals. The specifications, design, programming, and testing approaches and methodologies are all explored in depth.

3.2 Methodology

The method of this project will be presented in this part. As shown in Figure 3.1, a project flow methodology is established to ensure that the task is more productive. It represents the steady progress of events in this project, which requires careful planning, research, implementation, design, programming, and testing. The project flow started with careful planning for how the project would be completed. It is necessary to have a plan since it will achieve a specified goal. Then, the data and references used in this project will be researched. The next step is to decide how to conduct the project. As soon as the requirements for use are confirmed, the next step is to describe how to make a project prototype, and it can begin. Following that is the programming step, in which the hardware and software components are created. This step also describes the method and tools used to combine the hardware and software components. The last step of this project's development is testing. This step will outline the tasks completed during the prototype stage.

Figure 3.1 General Methodology

A block diagram for controlling system is depicted in Figure 3.2. There are three important pieces to implement this project successfully namely Arduino Uno, ESP8266 and Open-Source Database (Blnyk application). The system inputs include driver motor, Relay module, battery cell, and push button that will help the changing movement direction of the robot. Finally, the TDS sensor will be connected to the ThingSpeak application and attached to the ESP32, allowing the robot to collect and measure the quality of water.

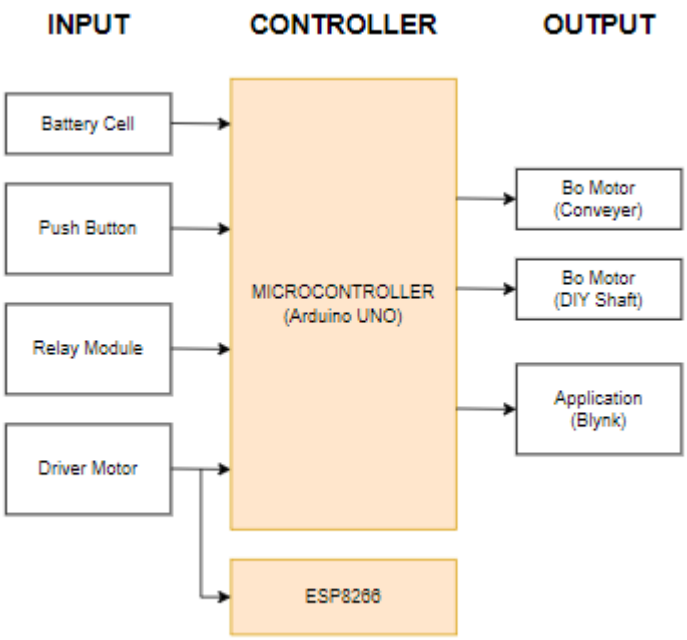

Figure 3.2 Block Diagram for controlling system

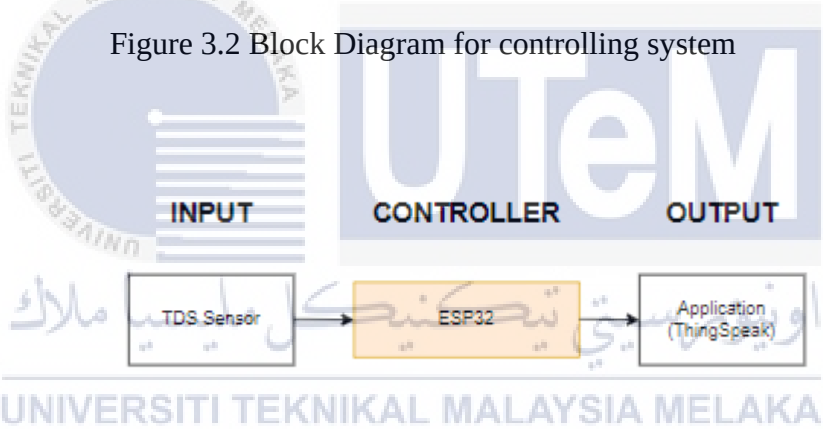

Figure 3.3 Block diagram water quality monitoring system

This section will explain the operation of a river cleaning robot. Figure 3.3 presents a flow chart that demonstrates the operation of the river cleaning robot as well as the sensor installation process.

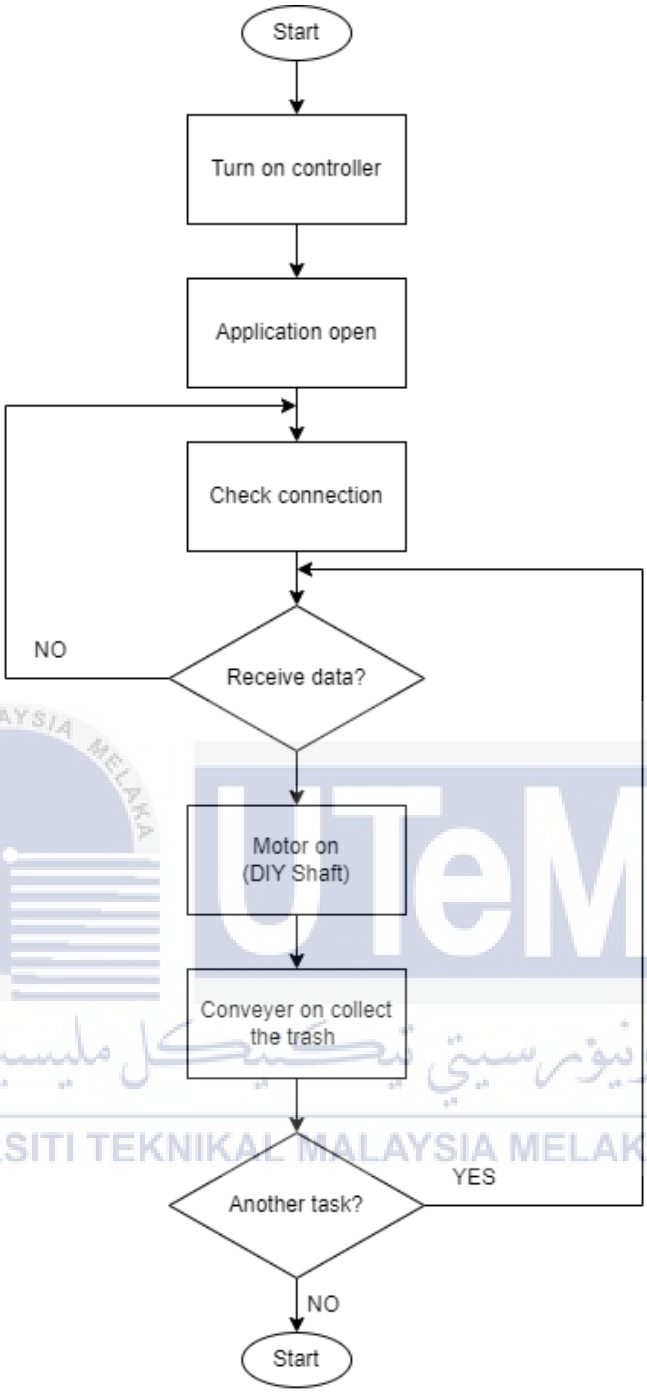

Figure 3.4 Flowchart for Arduino

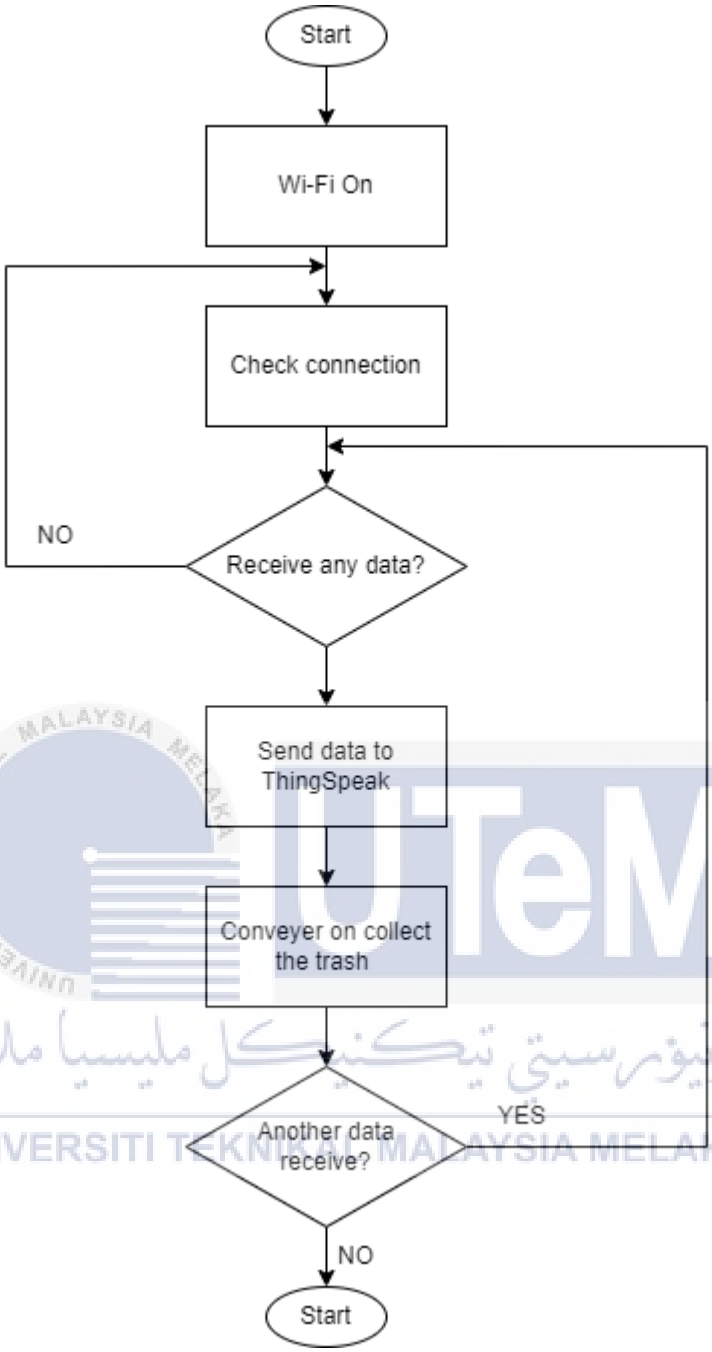

Figure 3.5 Flowchart for ESP32

3.3 Experimental setup

Before establishing a project, design is essential to realize the concept for the project and identify the proper hardware. The major hardware that will be utilized for this project is Arduino Uno, ESP8266 wifi module, Relay module, Driver module, BO motor, ESP32 module, battery and push button. Implementation of circuit design by utilizing circuit.io before building the real one. Besides, the circuit also can be designed with Proteus software, the benefit of Proteus software is the program can run to receive the output and also to know if the system in this project is successful.

3.3.1 Parameters

Project/Description	Development Of River Cleaning Robot Using IoT Technology
Concept	In order to clean up the river, monitoring and controlling of the robot are required.
Components	Arduino Uno, ESP8266 Wi-Fi module, Relay module, Driver module, BO motor, ESP32 module, battery, and button switch
Software	Blnyk and ThingSpeak application

Table 3.1 Real-time parameter for IoT-based system monitoring and control

3.3.2 Hardware Equipment

Hardware is essential to the success of this project's research. In conducting this investigation, each piece of hardware has a specific function.

3.3.2.1 Arduino Uno

Microcontrollers are compact microcomputers used to control the functions of embedded systems in office equipment, robotics, home appliances, automobiles, and a variety of other devices. Memory, peripherals, and, most crucially, a CPU are all included in a microcontroller [29]. The ATmega328 controller was utilized on the Arduino UNO platform. The controller receives data from the smartphone and sensors and controls the boat and robotic arm as needed.

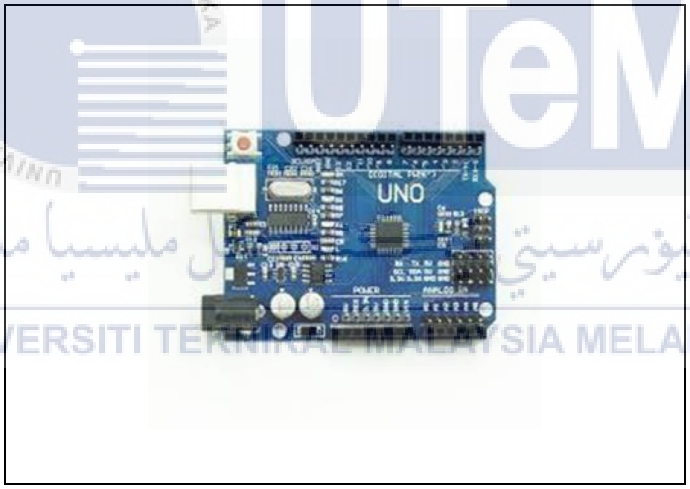

Figure 3.6 Arduino Board [30]

3.3.2.2 ESP8266 Wifi Module

The ESP8266 wifi module is a low-cost standalone wireless transceiver that can be used to develop end-point IoT applications. The ESP8266 wifi module connects embedded applications to the internet. To communicate with the server/client, it employs the TCP/UDP communication protocol. The microcontroller must use a set of AT commands to communicate with the ESP8266 wifi module. The microcontroller communicates with the ESP8266-01 wifi module via UART at a set Baud rate (Default 115200). For this project,

Arduino UNO was programmed to configure ESP8266 wifi module as TCP Client and Receive data to Server using WIFI. TCP Client is the Blynkk app to controlling the machine.

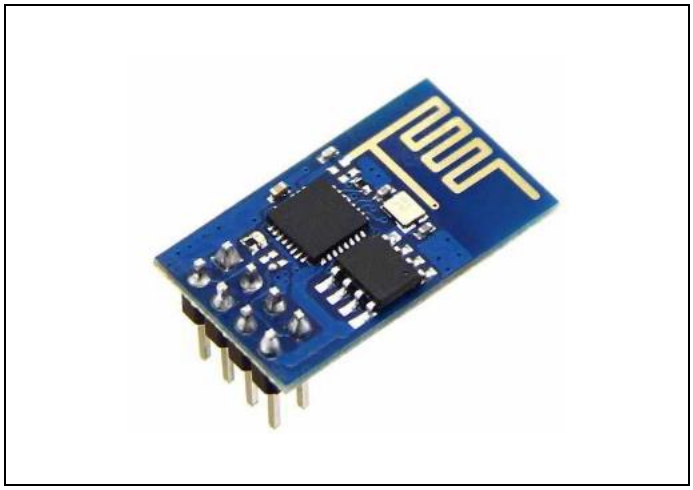

Figure 3.7 ESP8266 Wifi Module [31]

3.3.2.3 Relay module

The relay module's primary function is to turn electrical devices and systems on and off. It also serves as a barrier between the control circuit and the device or system being controlled. This is significant because it allows you to control devices with much higher voltages and currents using a microcontroller or other low-power device.

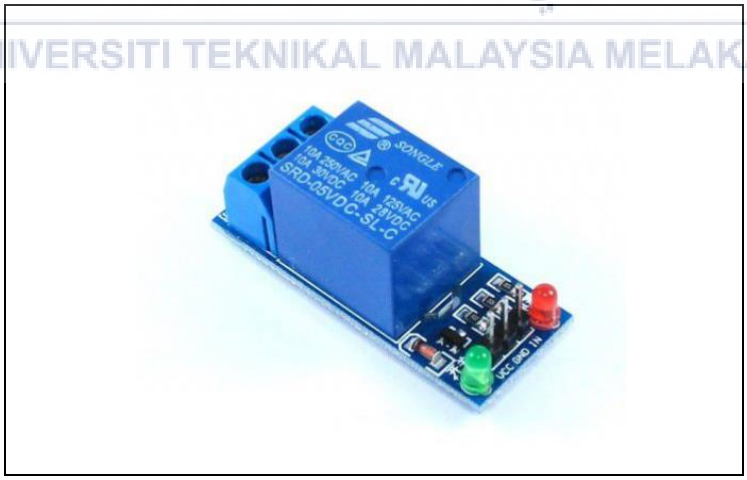

Figure 3.8 Relay module [32]

3.3.2.4 Driver motor

The dual H-Bridge motor driver L298N enables simultaneous speed and direction control of two DC motors. The module can run DC motors with peak currents up to 2A and voltages between 5 and 35V. We have connected the motor driver circuit in order to step up the voltage from Node MCU in order to run the propeller. An L293D motor driver, which operates two DC motors with a single IC, was used in the project. Bi-directional currents of up to 1A at voltages as low as 4.5V are offered by the L293D driver.The motor driver operates according to the H-bridge principle. The polarity of the motor can be reversed using an H-bridge setup [33]. In a H bridge, there are four switches (S1-S4). When switches S1 and S4 are closed and S2 and S3 are open, a positive voltage is applied across the motor, causing it to rotate clockwise. The voltage is reversed by opening S1 and S4 switches and closing S2 and S3 switches, allowing the motor to run counter-clockwise. When S1 and S3 are closed, or S2 and S4, the motor stops rotating.

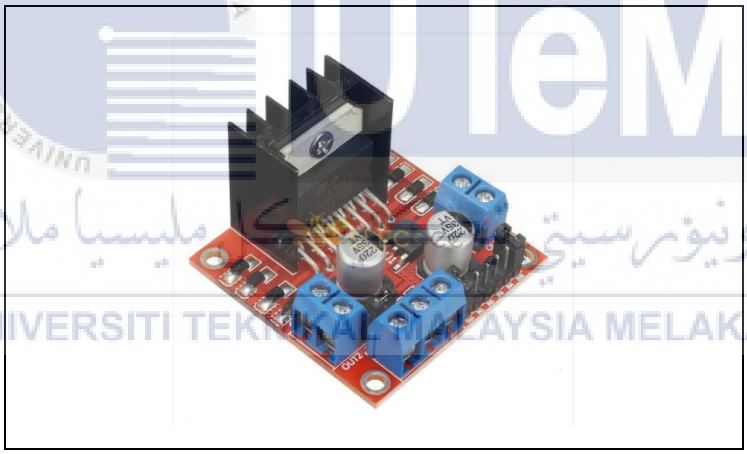

Figure 3.9 Driver motor [34]

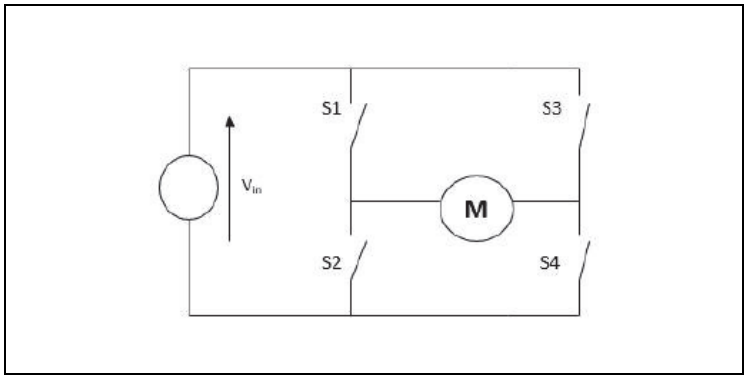

Figure 3.10 H-Bridge Circuit [33]

3.3.2.5 BO Motor

BO Dual Shaft Motor, 130 RPM Plastic Gear Motor - The main advantage of these motors is that they provide good torque and rpm at low operating voltages. The combination of a small shaft and matching wheels results in an optimised design for robot because of the mounting holes on the body and the light weight, it is suitable for in-circuit placement. This motor is compatible with 66 mm diameter plastic gear motor wheels and 87 mm diameter multipurpose plastic gear motor wheels. Geared DC motor at a low cost. It is an alternative to our DC motor with metal gears. It has an operating voltage of 3 -6V and is ideal for building small and medium-sized robots. RPMs of 60 and 150 are available. For this project used three motors. Two BO 12V motors Dc shaft 200 Rpm geared motor connected to either side of the conveyor belt. The propellers relate to a waterproof brushless 12V Dc motor. The motor is a dual shaft dc motor.

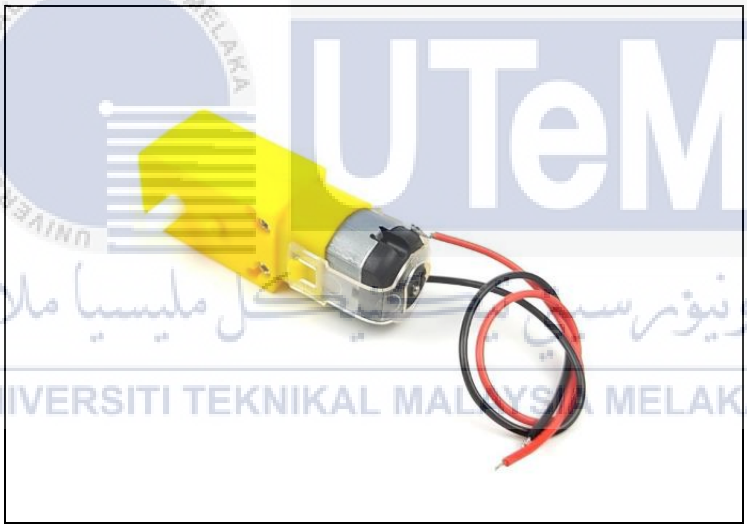

Figure 3.11 BO Motor [35]

3.3.2.6 Battery and switch

A 12-volt solar-powered battery supply powers the robot. If the robots are to be handled manually, switches to turn off the power supply to NODE MCUESP8266 are provided.

Figure 3.12 Battery [36]

3.3.2.7 ESP32 Module

The ESP32 can operate as a fully autonomous system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. Through its SPI / SDIO or I2C / UART interfaces, the ESP32 can communicate with other systems to provide Wi-Fi and Bluetooth functionality. For this project using ESP32 module and connected with TDS sensor to collect data and test water quality by using Thingspeak application.

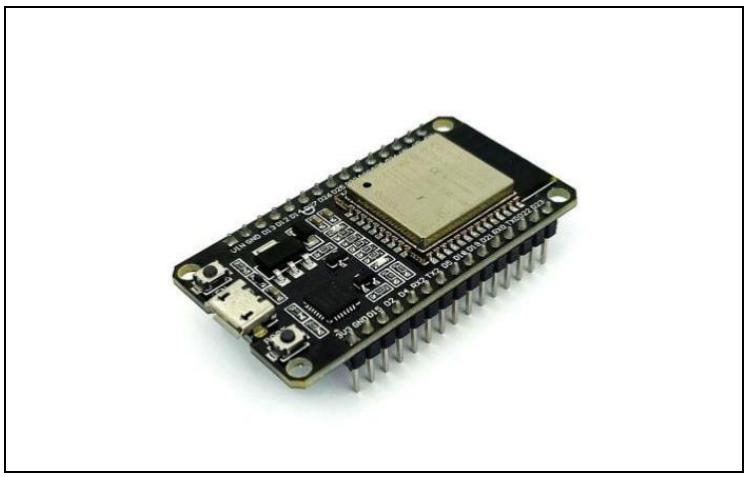

Figure 3.13 ESP32 Module [37]

3.3.2.8 TDS sensor

A TDS sensor/Meter Kit for Arduino that measures the TDS value of water is called Gravity Analog TDS Sensor. It can be used to test the water quality of domestic water, hydroponic systems, and other systems. This product is compatible with 5V or 3.3V control systems or boards because it supports a wide voltage input range of 3.3 to 5.5V and an analogue voltage output range of 0 to 2.3V.

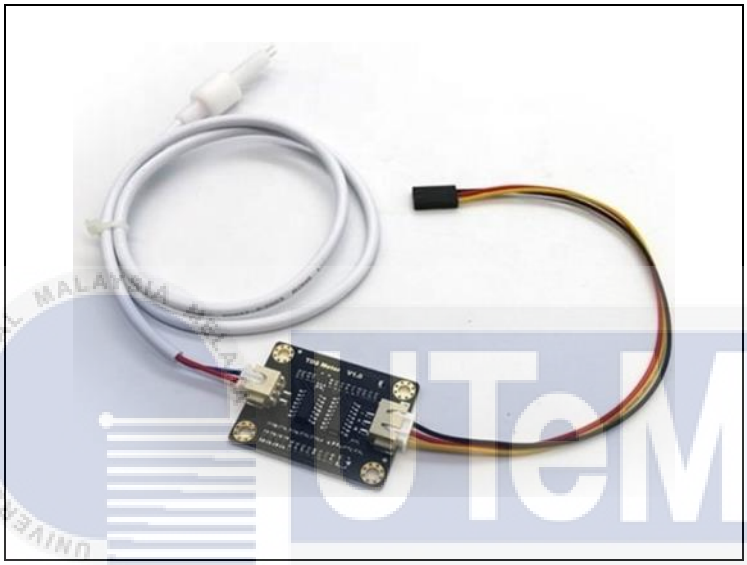

Figure 3.14 TDS Sensor [38]

3.3.3 Software Equipment

There are several options for choosing the best software to build this project because the choice of software is based on the project's requirements.

3.3.3.1 Arduino IDE

The Arduino Integrated Development Environment (IDE), also known as the Arduino Software (IDE), includes a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. It communicates with and uploads programs to the Arduino hardware [35]. It is an open-source integrated development environment (IDE) that allows users to program compatible boards. In this project, Arduino boards are programmed using the Arduino IDE to controlling the mechanism and it is also compatible with the Blynk app.

Figure 3.15 Logo of Arduino IDE software [39]

3.3.3.2 Proteus Design Suite

The Proteus Design Suite is a window application for schematic catch, diversion, and PCB group plan. It tends to be obtained in various arrangements, dependent upon the range of frameworks being conveyed and the necessities for microcontroller requirements. All PCB Design things consolidate an auto switch and basic mixed mode spice requirement limits. In this task, Proteus is utilized by making the schematic of Arduino UNO and connecting with the sensors that will be utilized to deliver an incitement so the programming that is made will work when the gathering procedure in genuine occurs. It's important to use the Proteus software for this development of the project and the fact that the incitement eases us to comprehend the phase of procedure that need to experience. Furthermore, it improves amid the arranging of programming with the current stimulation circuit for real purpose use later.

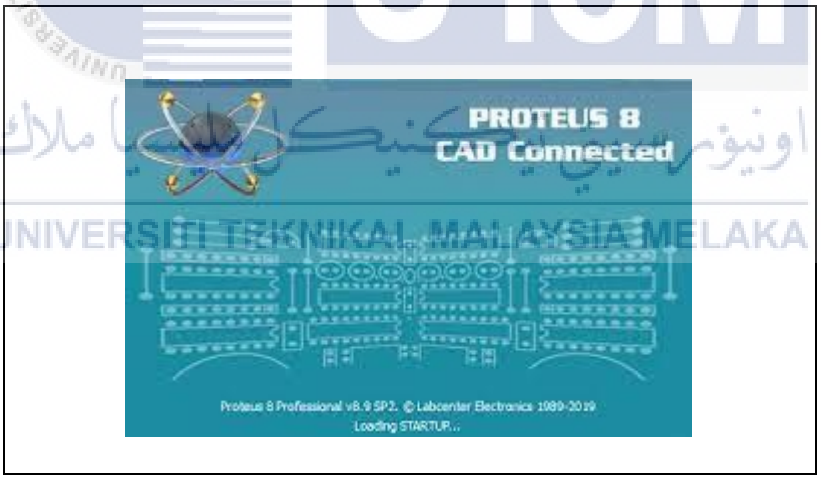

Figure 3.16 Proteus 8 schematic design and simulation software [40]

3.3.3.3 BLYNK

Blynk is a hardware-independent IoT platform with an Android app . It can remotely control hardware, display sensor data, and act as a cloud platform. We used the Blynk application in the project to control the direction of the propellors. The IEEE 802.11 Wi-Fi protocol is used to establish communication between the Blynk application and the Node-MCU Wi-Fi module. When a user attempts to connect to the robot, Node-MCU looks for the authentication token from the Blynk app. Communication is established when the token is matched. When a user presses the direction button in the Blynk app while connected to the same Wi-Fi network, a ping message is sent to the Blynk cloud and then to the Node-MCU board in the robot.

Figure 3.17 Blynk Application [41]

3.3.3.4 ThingSpeak

An application platform for the Internet of Things is called ThingSpeak. ThingSpeak can be used to create applications that utilize sensor data. Real-time data collection, processing, visualisations, apps, and plugins are among the features of ThingSpeak. A ThingSpeak Channel serves as the foundation of ThingSpeak. This project sends data to be stored through a Thingspeak channel by using TDS sensor.

Figure 3.18 ThingSpeak [42]

3.4 Circuit Diagram

The arrangement of the circuit's components is shown in Figure 3.15 below. It consists of some elements that were mentioned in 3.2.3 subtopic.

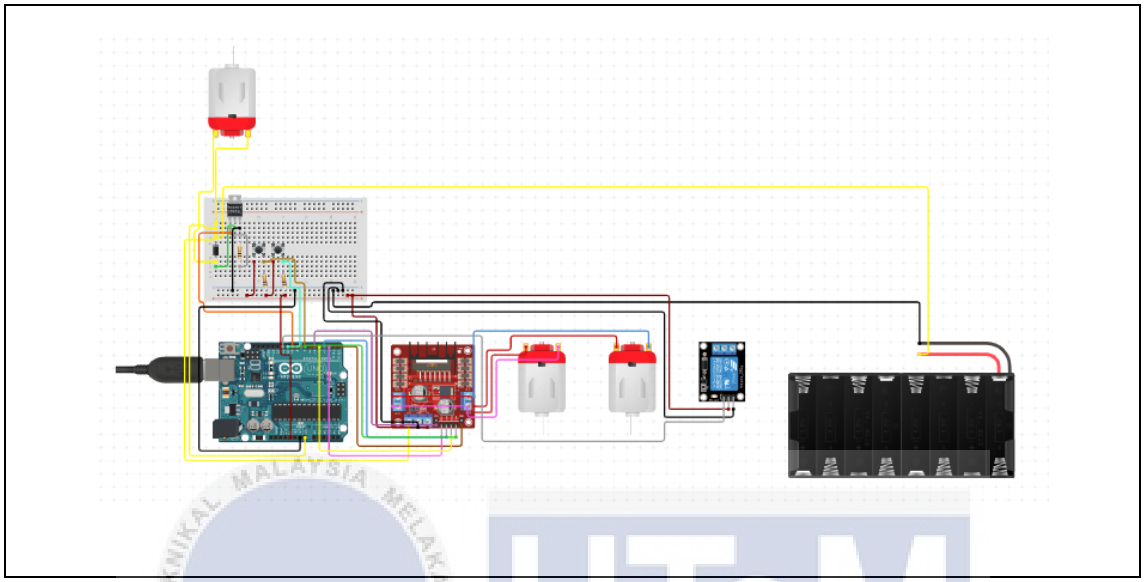

Figure 3.15: Circuit diagram of River cleaning robot

3.5 Summary

The methodology is an especially important part throughout this project completion. The literature searches that have been conducted before are valuable methodology. Understanding each part of the block diagram as well as are important to obtain the expected output. Furthermore, the expected component list is also being portrayed as it shows the components and circuits that are being used in this project. The method conducted in this project remained the same.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter will describe the results and findings of this project, which aimed to construct a cost-efficient robot to clean the waste that was in the lake and to call attention to the national motto of reducing, reusing, and recycling as much as possible. The waste is gathered from the lake by the robot with the assistance of a conveyor belt, and then it is stored in a container. An application that runs on the internet of things is used to control robots. It is possible to regulate the direction of the fan that assists the robot in navigating the body of water by establishing a connection with the Node-MCU board through the application of the Wi-Fi protocol. This work on the project intends to reduce the amount of effort that humans put into cleaning water bodies.

4.2 Schematic Diagram

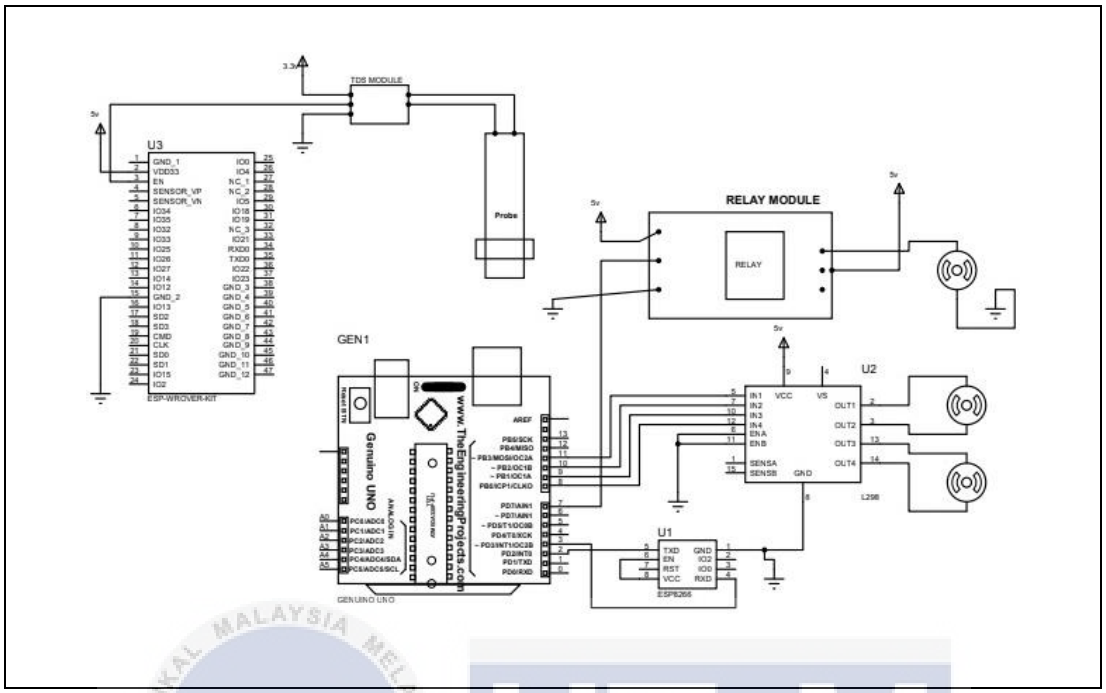

Figure 4.1 Schematic Diagram

An android app control robot has been developed in order to assist with the cleaning of bodies of water. In order to establish a communication channel between the android application and the NODE MCU-ESP8266, the programming tool known as Arduino IDE as well as the Wi-Fi module that is integrated within the microcontroller are used. For optimal operation, microcontrollers require current and voltage values that are on the lower end of the spectrum. The operational voltage of the microcontroller is 3.3 volts; however, 12 volts are necessary for the motor to work properly. In order to supply electricity to the motor, the circuit that drives the motor is paired with a board that contains a microcontroller. The motor driver circuit helps to operate the motor by increasing the voltage from 3V (supplied by the Node-MCU) to 12V. This helps the motor move. The circuit is responsible for driving the two DIY shaft that are coupled to the motor driver circuit. It is possible to adjust the direction of the DIY shaft by using an Android application that was developed specifically for the internet of things. In addition, a garbage net has been attached to the back of the conveyor, and this garbage can is used to collect the trash that is pulled up from the lake by the conveyor. The waste that was collected will either be recycled or reused.

4.3 Design of Project

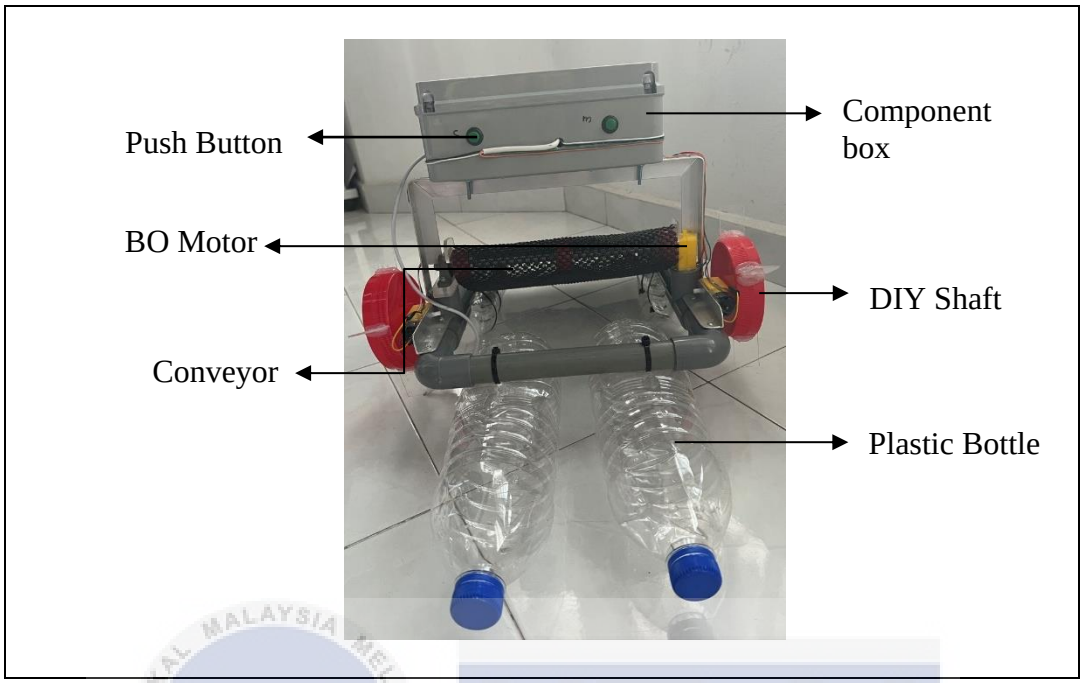

Figure 4.2 Back view of the project

Figure 4.3 Side view of the project

Figure 4.4 Front view of the project

Figure 4.5 Top view of the project

4.3.1 Application Blynk implementation information

In the context of this project, the Blynk application served as a means of providing manual control over the robot's movement. After the user has successfully logged in to the Android application, they must then enter their username and password into the respective areas located within the connection settings for the application. The Wi-Fi protocol will be utilized to establish communication between the Blynk application and the Node-MC Wi-Fi module only in the situation that the authentication token for the Node-MCU and the Blynk application are discovered to match one another. If the user does not connect their device to a Wi-Fi network, the Blnyk application will display the device in an offline state, as seen in Figure 4.1. Meanwhile, figure 4.2 shows the device connected and ready to use through Wi-Fi. After conducting some tests on this project, I've determined that the maximum distance possible when using a Wi-Fi hotspot ranges from 9 to 18 meters.

Figure 4.7 Device in offline state

Figure 4.6 Device in online

Then, if the user decides to change the direction of the robot by pressing the direction button in the android application as shown in figure 4.3. Then this signal is passed to the microcontroller board and as a result, the fan changes direction. In response to messages that have been received, the microcontroller and motor driver circuit are in charge of changing the direction in which the fan is spinning. Meanwhile, pressing the conveyor's button will start or stop the conveyor.

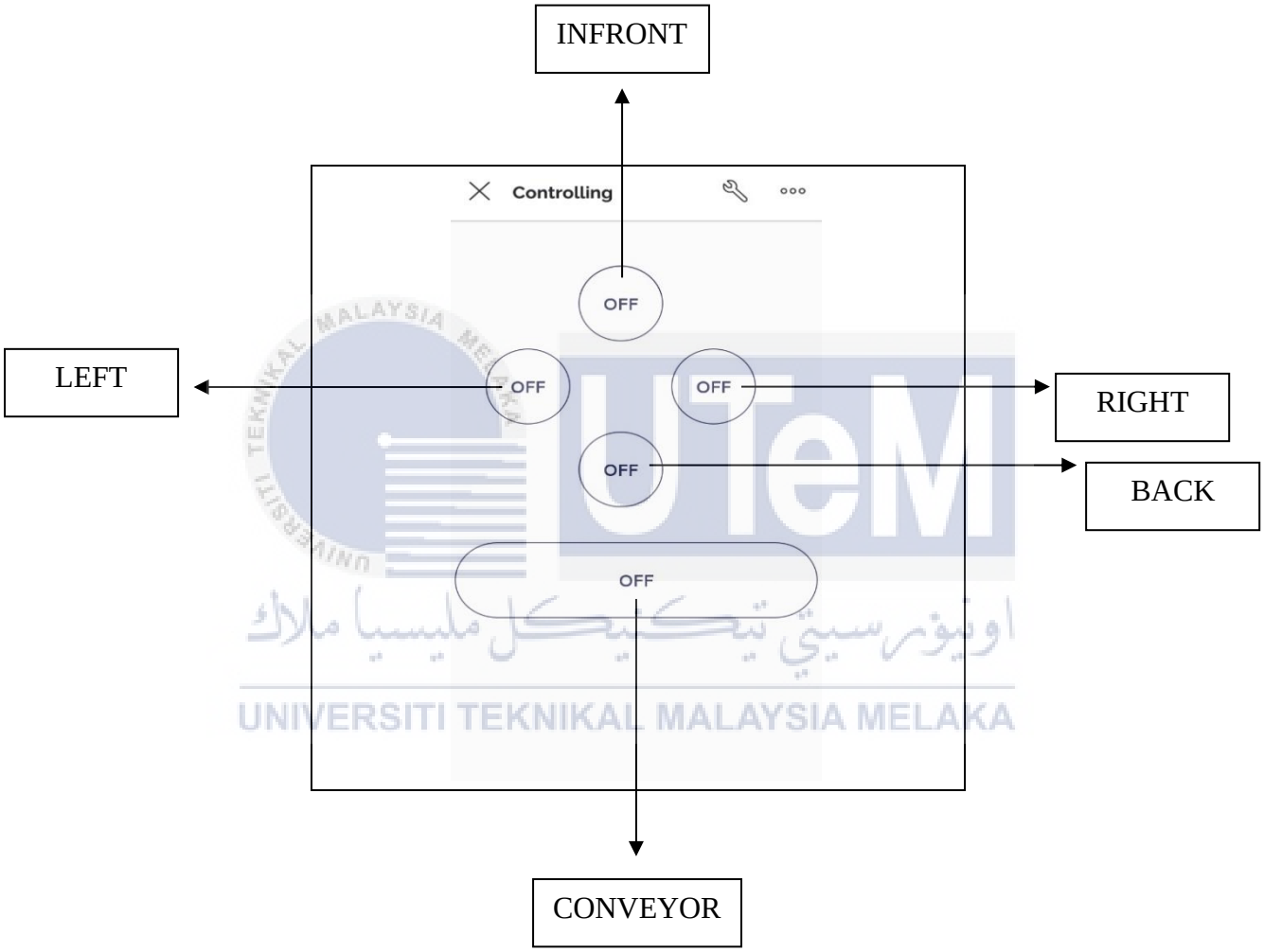

Figure 4.8 Direction Button

4.3.2 TDS monitoring

This TDS sensor is primarily used to assess water quality. In general, a higher total dissolved solids (TDS) value of water indicates that the water is less pure because it contains a greater number of dissolved solids. As a result, the TDS value can be used as a reference to reflect the levels of cleanliness in the water. TDS levels in water must be between 400 and 450 PPM for most aquatic species. Meanwhile, the ideal TDS range for saltwater fish is 5000–50,000 ppm. The ideal levels for the various types of water are shown in figure 4.9.

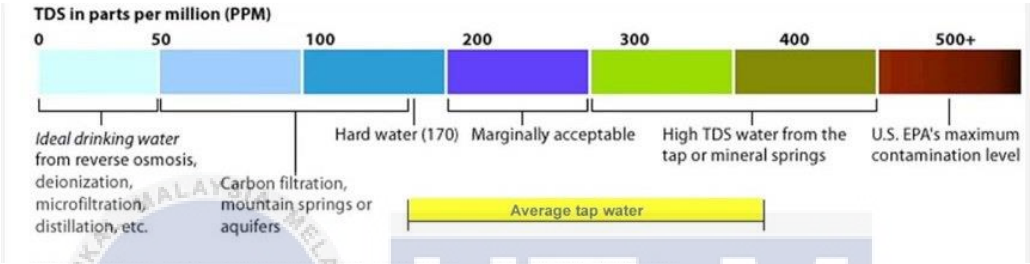

Figure 4.9 TDS PPM water level

This project will use an ESP32 Wi-Fi Module linked to a TDS sensor to update data collected in ThingSpeak application. The results of the TDS value test that users performed on tap water are displayed in figure 4.11. The value that the user obtained was approximately 100ppm, which is an appropriate level for drinking water. The user additionally tested the coffee water and found an unacceptable increase in TDS to well over a thousand parts per million (PPM).

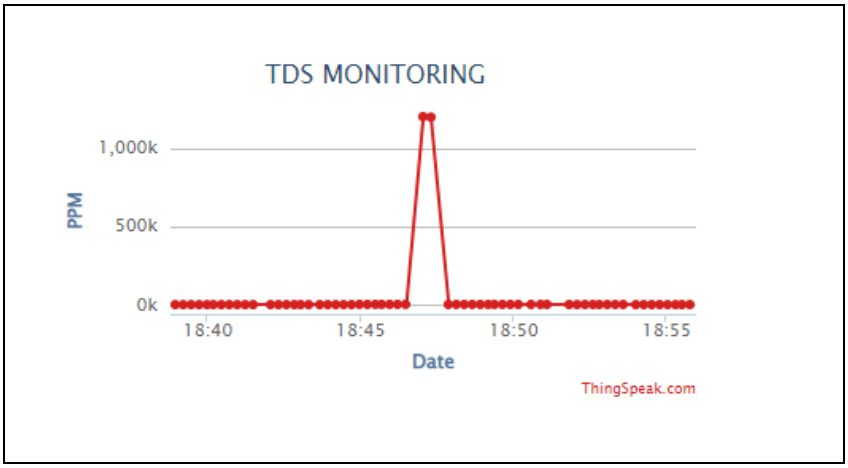

Figure 4.10 TDS Monitoring

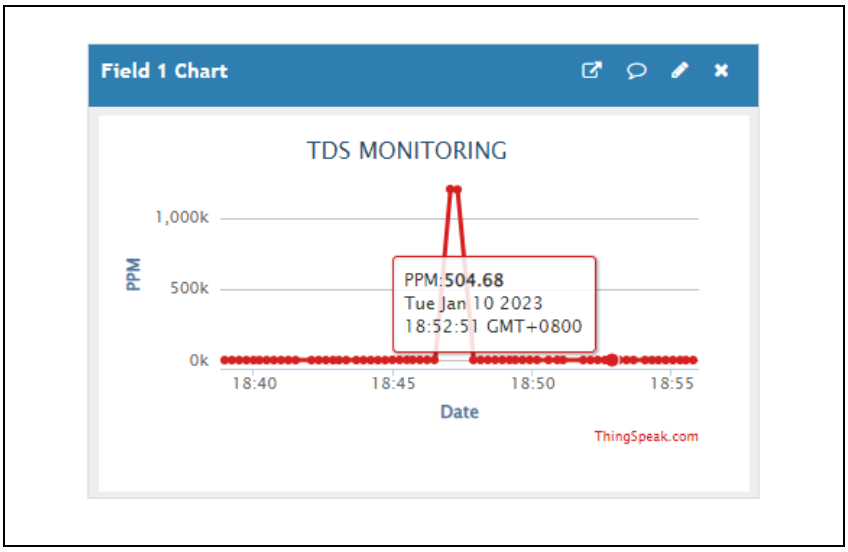

Figure 4.10 Result for Tap water

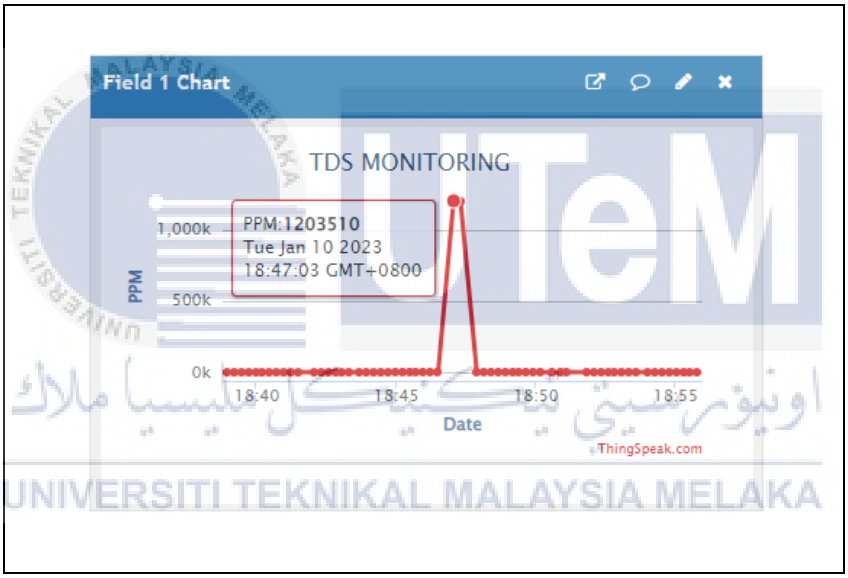

Figure 4.10 Result for coffee

4.4 Summary

This chapter demonstrates the method as well as the device that were used in the creation of river cleaning robots using IOT technology in order to accomplish the goals. The workflow of the project is defined in an easy-to-understand flowchart, which makes it simple to understand.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter will explain the project's conclusion. This chapter concludes the overall project that was completed. More functions in this project can be upgraded. So, in this chapter, I make some suggestions for the future of this project in order to make it more effective and beneficial to the users.

5.2 Conclusion

The Node MCU-ESP8266 Wi-Fi module and L293D Motor Driver circuit have been used to build an android application-controlled Internet of Things (IoT) based robot, and the performance is evaluated. The entire piece of work has been shown. The reduction of the robot's size and cost represents the work's main challenge. Many of these robots could aid in restoring the ecosystem of the planet's stunning blue lakes with the help of a common Wi-Fi network. With little resource investment, this project helps humanity manage the environment more sustainably.

Overall, I can conclude from this project that I can work independently on a project from planning to design to completion. I also understand the basic principles of river cleaning robot systems. The garbage is collected from the lake by the robot using a conveyor belt and stored in a garbage can. An IoT application is used to control the robot. We can control the direction of the propellers by connecting to the Node-MCU board via the Wi-Fi protocol, which allows the robot to navigate the water bodies. By completing this project, I was also able to manage my work to complete it before the deadline

5.3 Future Work

Further research could examine the evaluation of what the current needs are for river cleaning robot system in terms of the electronics in the robot. For example:

1) It can also be used to measure water depth and for deep cleaning.
2) Solar panels can also be used to power the boat as an alternative source of energy.
3) Implement control algorithms to make it a fully automated system.
4) By making some changes to its size and capacity, it can be used in large lakes

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APPENDICES

Coding For Arduino

```
#include <SoftwareSerial.h>
SoftwareSerial esp(2,3);

//long int data;
int firstVal, secondVal,thirdVal,fourVal,fiveVal,sixVal;
int pinValue1, pinValue2, pinValue3, pinValue4, pinValue5, pinValue6;

String myString; // complete message from arduino, which consistors of snesors data
char rdata; // received charactors
String cdata; // complete data

// for L298N motor driver
int IR =5;
int bz = 7;
int in1 = 8;
int in2 = 9;
int in3 = 10;
int in4 = 11;
int rly = 12;

int sdata3 = 0; // sensor3 data
int sdata4 = 0; // sensor4 data
//String cdata;


void setup()
{
Serial.begin(9600);
esp.begin(9600);

  pinMode(IR, INPUT);
  pinMode(in1, OUTPUT);
  pinMode(in2, OUTPUT);
  pinMode(in3, OUTPUT);
  pinMode(in4, OUTPUT);
  pinMode(rly, OUTPUT);
  pinMode(bz, OUTPUT);

}

void loop()
{

if(esp.available() == 0 )
```

```
{

  delay(100); // 100 milli seconds

}

if ( esp.available() > 0 )
{

    rdata = esp.read();
  myString = myString+ rdata;
  //Serial.print(rdata);
  if( rdata == '\n')
  {
Serial.println(myString);
// new code
String l = getValue(myString, ',', 0);
String m = getValue(myString, ',', 1);
String n = getValue(myString, ',', 2);
String o = getValue(myString, ',', 3);
String p = getValue(myString, ',', 4);
String q = getValue(myString, ',', 5);

firstVal = l.toInt(); // for left and right
secondVal = m.toInt(); // forward and reverse
thirdVal = n.toInt(); // speed
fourVal = o.toInt();
fiveVal = p.toInt();
sixVal = q.toInt();

 myString = "";


    if (firstVal ==1){
          digitalWrite(in1,LOW);
           digitalWrite(in2,HIGH);
           digitalWrite(in3,HIGH);
           digitalWrite(in4,LOW);
           Serial.print("DEPAN");
  }

    else if (secondVal ==1){

           digitalWrite(in1,HIGH);
           digitalWrite(in2,LOW);
           digitalWrite(in3,LOW);
           digitalWrite(in4,HIGH);
           Serial.print("BLKG");
    }
```

```
    else if (thirdVal ==1){

          digitalWrite(in1,HIGH);
          digitalWrite(in2,LOW);
          digitalWrite(in3,HIGH);
          digitalWrite(in4,LOW);
          Serial.print("KIRI");
    }

    else if (fourVal ==1){

          digitalWrite(in1,LOW);
          digitalWrite(in2,HIGH);
          digitalWrite(in3,LOW);
          digitalWrite(in4,HIGH);
          Serial.print("KANAN");
    }

     else if ((firstVal ==0)&&(secondVal ==0)&&(thirdVal ==0)&&(fourVal ==0)){

          digitalWrite(in1,LOW);
          digitalWrite(in2,LOW);
          digitalWrite(in3,LOW);
          digitalWrite(in4,LOW);
          Serial.print("HENTI");
    }

    if (fiveVal==1){
     digitalWrite(rly,HIGH);
     Serial.print("RLY ON");
    }
    else {
     digitalWrite(rly,LOW);
    }

    if (digitalRead(IR)==1){
     if(sixVal==1){
     digitalWrite(bz,HIGH);
      sdata3= 0 ;
      sdata4= 1 ;
     Serial.print("dustbin_full");
    }
    else {
     digitalWrite(bz,LOW);
      sdata3= 1 ;
      sdata4= 0 ;
    }
    }
  }
/* cdata = cdata + sdata3+","+sdata4; // comma will be used a delimeter
```

```
  Serial.println(cdata);*/
}
//cdata = cdata + sdata3+","+sdata4; // comma will be used a delimeter
//Serial.println(cdata);

}


String getValue(String data, char separator, int index)
{
    int found = 0;
    int strIndex[] = { 0, -1 };
    int maxIndex = data.length() - 1;

    for (int i = 0; i <= maxIndex && found <= index; i++) {
        if (data.charAt(i) == separator || i == maxIndex) {
            found++;
            strIndex[0] = strIndex[1] + 1;
            strIndex[1] = (i == maxIndex) ? i+1 : i;
        }
    }
    return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}
```

Coding For Blynk Application

```
#define BLYNK_TEMPLATE_ID "TMPLQxTM0cBn"
#define BLYNK_DEVICE_NAME "ROBOT DUSTBIN"
#define BLYNK_AUTH_TOKEN "c7zXSX9Z0ylfOogytKD7YUZfJTlSGWZN"

#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <SoftwareSerial.h>
#include <SimpleTimer.h>


int pinValue1;
int pinValue2;
int pinValue3;
int pinValue4;
int pinValue5;
int pinValue6;

int noti =0;
int noti2 =0;

String v2arduino; // values to arduino

char auth[] = BLYNK_AUTH_TOKEN;

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "DUSTBIN";
char pass[] = "12345678";

SimpleTimer timer;

String myString; // complete message from arduino, which consistors of snesors data
char rdata; // received charactors


int firstVal, secondVal,thirdVal,fourVal, fiveVal, sixVal; // sensors
// This function sends Arduino's up time every second to Virtual Pin (1).
// In the app, Widget's reading frequency should be set to PUSH. This means
// that you define how often to send data to Blynk App.
void myTimerEvent()
{
  // You can send any value at any time.
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V1, millis() / 1000);
```

```
}



void setup()
{
  // Debug console
  Serial.begin(9600);

  Blynk.begin(auth, ssid, pass);

    timer.setInterval(2000L,sensorvalue1);
     timer.setInterval(2000L,sensorvalue2);
     timer.setInterval(2000L,sensorvalue3);
      timer.setInterval(2000L,sensorvalue4);
       timer.setInterval(2000L,sensorvalue5);
       timer.setInterval(2000L,sensorvalue6);
}

void loop()
{


   if (Serial.available() == 0 )
   {
  Blynk.run();
  timer.run(); // Initiates BlynkTimer
  toarduino();
   }

  if (Serial.available() > 0 )
  {
    rdata = Serial.read();
    myString = myString+ rdata;
   // Serial.print(rdata);
    if( rdata == '\n')
    {

// new code
String l = getValue(myString, ',', 0);
String m = getValue(myString, ',', 1);
String n = getValue(myString, ',', 2);
String o = getValue(myString, ',', 3);
String p = getValue(myString, ',', 4);
String q = getValue(myString, ',', 5);


firstVal = l.toInt();
secondVal = m.toInt();
thirdVal = n.toInt();
```

```
fourVal = o.toInt();
fiveVal = p.toInt();
sixVal = p.toInt();

  myString = "";
// end new code
    }
  }

}

void sensorvalue1()
{
int sdata = firstVal;
  // You can send any value at any time.
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V2, sdata);

}
void sensorvalue2()
{
int sdata = secondVal;
  // You can send any value at any time.
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V3, sdata);

}

void sensorvalue3()
{
int sdata = thirdVal;
  // You can send any value at any time.
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V4, sdata);

}

void sensorvalue4()
{
int sdata = fourVal;
  // You can send any value at any time.
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V5, sdata);

}

void sensorvalue5()
{
int sdata = fiveVal;
  // You can send any value at any time.
```

```
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V6, sdata);

}

void sensorvalue6()
{
int sdata = sixVal;
  // You can send any value at any time.
  // Please don't send more that 10 values per second.
  Blynk.virtualWrite(V7, sdata);
if(sdata ==1 && noti2==0 )
{

Blynk.logEvent("dustbin_full");
  noti2=1;
  }
else
  {
  noti2=0;
  }
}



String getValue(String data, char separator, int index)
{
    int found = 0;
    int strIndex[] = { 0, -1 };
    int maxIndex = data.length() - 1;

    for (int i = 0; i <= maxIndex && found <= index; i++) {
        if (data.charAt(i) == separator || i == maxIndex) {
            found++;
            strIndex[0] = strIndex[1] + 1;
            strIndex[1] = (i == maxIndex) ? i+1 : i;
        }
    }
    return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}

// in Blynk app writes values to the Virtual Pin V3
BLYNK_WRITE(V9)
{
   pinValue1 = param.asInt(); // assigning incoming value from pin V9 to a variable


}
```

```
// in Blynk app writes values to the Virtual Pin V4
BLYNK_WRITE(V10)
{
  pinValue2 = param.asInt(); // assigning incoming value from pin V10 to a variable

}

// in Blynk app writes values to the Virtual Pin V5, this is for the slider
BLYNK_WRITE(V11)
{
  pinValue3 = param.asInt(); // assigning incoming value from pin V10 to a variable

}

// in Blynk app writes values to the Virtual Pin V6, this is for the slider
BLYNK_WRITE(V12)
{
  pinValue4 = param.asInt(); // assigning incoming value from pin V10 to a variable

}

BLYNK_WRITE(V13)
{
  pinValue5 = param.asInt(); // assigning incoming value from pin V10 to a variable

}

BLYNK_WRITE(V14)
{
  pinValue6 = param.asInt(); // assigning incoming value from pin V10 to a variable

}

void toarduino()
{
v2arduino = v2arduino + pinValue1 + "," + pinValue2 + "," + pinValue3 + "," +
pinValue4+ "," + pinValue5+ "," + pinValue6;
Serial.println(v2arduino);
delay(100);
v2arduino = "";
}
```

Coding For TDS Meter

```
#include <WiFi.h>

String apiKey = "37A9AL7NPUVF5EGL"; // Enter your Write API key from
ThingSpeak
const char *ssid = "DUSTBIN"; // replace with your wifi ssid and wpa2 key
const char *password = "12345678";
const char* server = "api.thingspeak.com";// don't change this

WiFiClient client;
// #include Aln;
 float tds=0;

float Sens1;
int Sens1Pin = 36;  //pin A0

void setup() {
  // put your setup code here, to run once:
  Serial.begin(115200);
  Serial.print("Connecting to ");
  Serial.println(ssid);
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(2000);
    Serial.print(".");
  }
  // Print local IP address and start web server
  Serial.println("");
  Serial.println("WiFi connected.");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());

}

void loop() {
  Sens1 = analogRead(A0);          //read the value from the sensor
  Sens1 = (3.3 * Sens1 * 100.0)/1024.0;  //convert the analog data to DC AC VOLTAGE
  tds=(Sens1*0.44692737430)/10;
 Serial.println(tds);

if (client.connect(server, 80)) // "184.106.153.149" or api.thingspeak.com
   {
      String postStr = apiKey;
      postStr += "&field1=";
      postStr += String(tds);
      postStr += "\r\n";

      client.print("POST /update HTTP/1.1\n");
```

```
    client.print("Host: api.thingspeak.com\n");
    client.print("Connection: close\n");
    client.print("X-THINGSPEAKAPIKEY: " + apiKey + "\n");
    client.print("Content-Type: application/x-www-form-urlencoded\n");
    client.print("Content-Length: ");
    client.print(postStr.length());
    client.print("\n\n");
    client.print(postStr);
  }
}
```

Gantt Chart

No.	PSM 1 Project Activity	Expected /Actual	Weeks														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Registration for PSM	Expected															
		Actual															
2	Final year project briefing	Expected															
		Actual															
3	Title discussion and decision with supervisor	Expected															
		Actual															
4	Study Related Research	Expected															
		Actual															
5	Complete Chapter 1: Introduction	Expected															
		Actual															
6	Progress Update to supervisor	Expected															
		Actual															
7	Complete Chapter 2: Literature Review	Expected															
		Actual															
8	Complete Chapter 3: Methodology	Expected															
		Actual															
9	Submit report	Expected															
		Actual															
10	Preparation for presentation	Expected															
		Actual															
11	Submit presentation video	Expected															
		Actual															
12	PSM 1 presentation	Expected															
		Actual															

No.	PSM 2 Project Activity	Expected /Actual	Week														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Draft Material List	Expected															
		Actual															
2	Purchase Hardware	Expected															
		Actual															
3	Design Schematic and hardware coding	Expected															
		Actual															
4	Set up Hardware Circuit	Expected															
		Actual															
5	Analyse Result	Expected															
		Actual															
6	Complete Chapter 4:Result and Discussion	Expected															
		Actual															
7	Complete Chapter 5:Conclusion	Expected															
		Actual															
8	Submit draft report	Expected															
		Actual															
9	Prepare Project Poster	Expected															
		Actual															
10	Preparation for presentation	Expected															
		Actual															
11	Presentation	Expected															
		Actual															
12	Submit Final Report	Expected															
		Actual															