POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

SMART RIVER CLEANER

JABATAN KEJURUTERAAN AWAM

LOW LIN HUNG

(08DKA21F1030)

SESI II :2023/2024

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Laporan ini dikemukakan kepada Jabatan Kejuruteraan Awam sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Awam

JABATAN KEJURUTERAAN AWAM
SESI II :2023/2024

STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

TITLE OF PROJECT

1. I, LOW LIN HUNG (030304-14-0019) am a Civil Engineering Diploma student, Sultan Salahuddin Abdul Aziz Shah Polytechnic, whose address is Persiaran Usahawan, Seksyen U1, 40150 Shah Alam, Selangor
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Done and truly acknowledged	)	
by the said;	)	
LOW LIN HUNG	)	……
(ID Card No.:- 030304-14-0019),	)	LOW LIN HUNG
	)	
Before me, SALIZAWATI BINTI	)	……
KAMARUZZAMAN (760908-05-5418) as	)	SALISAWATI BINTI KAMARUZZAMAN
project supervisor on the date: 21/1/2023		

APPRECIATION

In the spirit of compassion and enlightenment, may peace and serenity be with you. We express gratitude for the interconnections of all beings and the wisdom found in every moment. With hearts open to understanding and harmony, we begin this journey, guided by the teachings of compassion and mindfulness.

Firstly, we extend our heartfelt thanks to Puan Salizawati, our project supervisor, for her invaluable guidance and support throughout our research and report writing process. Her patience, expertise, and encouragement were instrumental in the successful completion of this project.

We also wish to acknowledge the contributions of our final year project coordinator and all the lecturers who provided us with valuable insights and guidance during the course of our study. Their dedication to our academic development has been truly commendable.

Furthermore, we are grateful to our parents, relatives, and close friends for their unwavering support and encouragement. Their belief in us motivated us to persevere through challenges and strive for excellence.

In conclusion, we are deeply thankful to all those who have supported us in completing this project. May Allah bless you all abundantly for your kindness and assistance.

ABSTRACT

Water pollution has emerged as a critical environmental issue worldwide, necessitating innovative solutions for its mitigation and management. In this context, the development of a remote-controlled smart river cleaner represents a significant advancement in waterway maintenance technology. This abstract provides an overview of the design, functionality, and potential impact of such a system..The remote-controlled smart river cleaner is enabling precise navigation and efficient debris collection within rivers, streams, and other water bodies. Operated remotely by trained personnel, the cleaner offers a safe and cost-effective solution for the removal of various pollutants, including plastics, organic waste, and chemical residues.. Key features of the smart river cleaner include real-time monitoring capabilities, allowing operators to assess water quality parameters such as turbidity, pH levels, and dissolved oxygen concentrations. This data enables informed decision-making regarding cleaning priorities and pollution hotspots, contributing to more targeted and effective pollution control strategies. Furthermore, the remote-controlled functionality of the cleaner enhances operational flexibility, enabling it to access and clean hard-to-reach areas that are inaccessible to traditional cleaning methods. By employing environmentally friendly cleaning techniques and minimizing disturbance to aquatic ecosystems, the smart river cleaner promotes sustainable waterway management practices. can be tailored to the specific needs of diverse geographical locations and environmental conditions. In conclusion, the development and deployment of remote-controlled smart river cleaners represent a promising approach to addressing the complex challenges of water pollution and ecosystem degradation. Through continued research, innovation, and collaboration, these technologies have the potential to play a vital role in safeguarding the health and sustainability of our planet's aquatic environments.

Keywords: remote-controlled, environmentally friendly cleaning, efficient debris collection.

ABSTRAK

Pencemaran air telah muncul sebagai isu alam sekitar yang kritikal di seluruh dunia, yang memerlukan penyelesaian inovatif untuk mitigasi dan pengurusannya. Dalam konteks ini, pembangunan pembersih sungai pintar kawalan jauh mewakili kemajuan ketara dalam teknologi penyelenggaraan laluan air. Abstrak ini memberikan gambaran keseluruhan reka bentuk, kefungsian dan potensi kesan sistem sedemikian..Pembersih sungai pintar kawalan jauh membolehkan navigasi yang tepat dan pengumpulan serpihan yang cekap dalam sungai, sungai dan badan air lain. Dikendalikan dari jauh oleh kakitangan terlatih, pembersih menawarkan penyelesaian yang selamat dan kos efektif untuk penyingkiran pelbagai bahan pencemar, termasuk plastik, sisa organik dan sisa kimia.. Ciri utama pembersih sungai pintar termasuk keupayaan pemantauan masa nyata, yang membolehkan pengendali untuk menilai parameter kualiti air seperti kekeruhan, tahap pH, dan kepekatan oksigen terlarut. Data ini membolehkan membuat keputusan termaklum mengenai keutamaan pembersihan dan kawasan panas pencemaran, menyumbang kepada strategi kawalan pencemaran yang lebih disasarkan dan berkesan. Tambahan pula, kefungsian kawalan jauh pembersih meningkatkan fleksibiliti operasi, membolehkannya mengakses dan membersihkan kawasan yang sukar dicapai yang tidak boleh diakses oleh kaedah pembersihan tradisional. Dengan menggunakan teknik pembersihan mesra alam dan meminimumkan gangguan kepada ekosistem akuatik, pembersih sungai pintar menggalakkan amalan pengurusan jalan air yang mampan. boleh disesuaikan dengan keperluan khusus lokasi geografi yang pelbagai dan keadaan persekitaran. Kesimpulannya, pembangunan dan penggunaan pembersih sungai pintar kawalan jauh mewakili pendekatan yang menjanjikan untuk menangani cabaran kompleks pencemaran air dan kemerosotan ekosistem. Melalui penyelidikan, inovasi dan kerjasama yang berterusan, teknologi ini berpotensi untuk memainkan peranan penting dalam menjaga kesihatan dan kemampanan persekitaran akuatik planet kita.

Kata kunci: kawalan jauh, pembersihan mesra alam, pengumpulan serpihan yang cekap.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In our rapidly evolving world, the conservation and preservation of natural resources are becoming increasingly imperative. Among these vital resources, rivers play a pivotal role in sustaining ecosystems, providing drinking water, and supporting various industries. However, pollution and waste accumulation pose significant threats to their health and longevity.

Enter the Smart River Cleaner, a cutting-edge solution engineered to address the challenges of river pollution head-on. This innovative technology represents a paradigm shift in waterway management, combining advanced robotics, artificial intelligence, and environmental awareness to efficiently and effectively clean rivers.

At its core, smart river cleaners use electricity to convert it into mechanical energy by using a DC motor to pull trash in the river. This Smart River Cleaner uses a rubber band connected with a DC Motor and a paint roller, forming a cycle that allows the garbage catcher to turn and pull the garbage in the water into the basket that has been installed in the middle.

Moreover, the Smart River Cleaner is designed for versatility and scalability, capable of navigating diverse river environments with ease. Whether deployed in urban waterways or remote natural habitats, its modular design allows for seamless integration and customization to suit specific cleaning requirements.

In essence, the Smart River Cleaner represents a beacon of hope for our planet's rivers, offering a sustainable and proactive approach to combating pollution and safeguarding aquatic ecosystems for future generations. With its blend of innovation, efficiency, and environmental stewardship, it stands poised to redefine the way we protect and preserve our most precious waterways.

1.2 PROJECT BACKGROUND

During the selection of a title for our FYP 1, my group members and I engaged in a discussion to brainstorm various ideas to present to our supervisor, Mrs. Salizawati. Among the proposals put forward, it was my suggestion—The Smart River Cleaner—that ultimately captured our supervisor's attention. The genesis of this idea stemmed from a personal experience: while passing by a river, I was struck by the sight of numerous floating pieces of garbage. It was this observation that sparked the inspiration for our project.

After the supervisor finalized the title, we embarked on a journey to gather information related to our FYP, "The Smart River Cleaner." We employed various methods to collect data, including internet research, insights from senior students, lectures, discussions with experts, newspaper articles, and direct interactions with river cleaning workers. Our aim was to comprehensively understand the challenges faced by river cleaners, explore existing initiatives and projects related to our title, and identify potential stakeholders and supporters for our project.

Furthermore, we engaged in multiple discussions with our supervisor to ensure compliance with her requirements and expectations for the project. Along the journey of gathering information and executing tasks, we encountered numerous challenges. For example, we developed a meta questionnaire to systematically collect data on the challenges faced by river cleaning workers. Our supervisors and panel also provided extensive advice and solutions to facilitate the smooth gathering of information and task execution. For instance, during a panel meeting, one member advised us to select the nearest river as the project site, leading us to choose the TTDI river. Throughout our journey, our supervisors played a pivotal role, offering guidance and support to help us fulfill our duties effectively.

1.3 **PROBLEM STATEMENT**

Through our data collection efforts for the smart river cleaner project, we identified three primary challenges plaguing the TTDI River: river pollution, the arduous nature of river cleaning work, and the health impacts on cleaning workers. Pollution in the TTDI River manifests in various forms, including odor pollution, water contamination, degradation of the river's aesthetic appeal, and threats to aquatic life. Such pollution not only jeopardizes the ecosystem but also poses health risks to nearby communities. Contaminated river water can lead to the spread of infectious diseases, as organisms affected by the pollution may transmit pathogens to humans through consumption. Consequently, fish caught in polluted waters and sold in markets may carry diseases, potentially exposing the community to health hazards like COVID-19.

In examining the challenges faced by workers responsible for cleaning the TTDI River, we gathered data from various sources, including internet research and questionnaire surveys conducted with the workers themselves. Our findings revealed that a majority of these workers utilize garbage-resistant traps that float on the river's surface to collect debris, resorting to manual methods such as using their hands or garbage clamps. This manual approach is primarily adopted due to the time-consuming nature of river cleaning and the difficulty in accessing debris located in the middle or at the end of the river. Moreover, the task of collecting garbage in polluted river water poses significant health risks to the workers involved.

1.4 OBJECTIVES OF THE PROJECT

The objective of the study is to solve or provide a solution to the existing river cleaner problem. The following are the objectives of the project:

i. To identify the criteria for effective river cleaner.
ii. To produce the Solar River Cleaner (SRC).
iii. To determine the weight of rubbish using Solar River Cleaner (SRC).

PROJECT QUESTIONS

Here are some questions for the project.

i. Will the Solar river cleaner be an effective tool for cleaning a river ?
ii. Can Solar River Cleaner help reduce river pollution and keep river cleanliness ?

1.5 SCOPE OF THE PROJECT

The scope of the project for this smart river cleaner entails creating an automated machine capable of remotely collecting garbage, thereby simplifying the tasks of river cleaners and modernizing garbage traps. Furthermore, the scope of our project necessitates fulfilling the objectives set forth, and this smart river cleaner product will be operational in the river Klang.

FIGURE 1.1 : RIVER KLANG

1.6 IMPORTANCE OF THE PROJECT

The significance of this project/study lies in its potential to offer valuable insights and contributions to addressing existing challenges in river maintenance. Firstly, it expands the repertoire of brainstorming methods available to river users for problem-solving, thus enhancing their ability to tackle ongoing issues effectively. Additionally, the project serves as a reference material for future innovations in Solar River Cleaner products, offering a foundational framework for further advancements in river cleaning technology.

Operational definitions are pivotal in research, offering clear, concise, and measurable descriptions of procedures or actions used to define and measure specific concepts or variables in scientific studies. These definitions are essential for ensuring precise understanding and consistent application of terms and concepts, thereby enhancing the reliability and validity of research findings. For instance, the project aims to provide river users and workers with knowledge on effective and efficient river cleaning methods. The Solar River Cleaner serves as a valuable tool in this endeavor, simplifying the cleaning process and contributing to the reduction of river pollution. By ensuring improved cleanliness statistics year by year, this initiative aims to elevate the overall health of rivers. The expansion of the Solar River Cleaner project is inspired by the desire to offer practical solutions that positively impact river workers. This concept holds numerous benefits for river cleaners, including expedited and streamlined cleaning processes, ultimately enhancing their effectiveness and efficiency.

We have identified that the most significant positive impact of this product lies in its ability to enhance river cleanliness, thereby ensuring access to clean water resources for communities. The effectiveness of this product in collecting rubbish from the river plays a crucial role in achieving this goal. Primarily designed to ease the tasks of river cleaners, this product facilitates faster and more efficient cleaning by eliminating the need to reach distant debris. Through adherence to standardized designs, the development of the Autonomous Smart River, Remote Monitoring and Control System project, and solar-powered Smart River Cleaner, we aim to provide modern tools for river cleaning. Overall, the solar river cleaner represents a contemporary approach to river maintenance, safeguarding society's access to clean and clear water, vital for human use as a primary water resource.

The Smart River Cleaner Tool represents an innovative and advanced solution crafted to tackle environmental challenges within river ecosystems. This state-of-the-art device harnesses cutting-edge technology to effectively and sustainably cleanse rivers, thereby promoting ecological balance and safeguarding aquatic habitats.

Autonomous Operation: The Smart River Cleaner operates autonomously, leveraging artificial intelligence and sensor technology to intelligently navigate waterways. This ensures optimal coverage and targeted cleaning of polluted areas.

Adaptive Cleaning Mechanism: The tool incorporates an adaptive cleaning mechanism that can be tailored based on the type and quantity of pollutants present. This versatility allows for the effective handling of various contaminants, ranging from floating debris to oil spills, ensuring a thorough and customized cleaning process.

Environmental Impact Mitigation: Designed with environmental conservation at its core, the Smart River Cleaner minimizes its ecological footprint. It utilizes eco-friendly materials and low-energy consumption mechanisms, thereby mitigating any potential negative impact on the river ecosystem during its operation.

Remote Monitoring and Control: Operators can remotely monitor and control the Smart River Cleaner through a user-friendly interface. This feature enhances operational efficiency, enabling real-time adjustments and interventions based on the changing conditions of the river.

Overall, the Solar River Cleaner stands as a testament to modern environmental stewardship, offering a comprehensive solution to river pollution while prioritizing sustainability and efficiency.

The implementation of the project/study involves a comprehensive array of learning and teaching processes (PDP), encompassing theoretical exploration, practical application, scientific writing, monitoring, and evaluation. Under the guidance of supervisors, students embark on a journey to acquire new knowledge and skills, integrating them with existing understandings to ensure the successful completion of the project within the designated timeframe. Each project serves as a case study or scientific endeavor intricately linked to the field and level of study, aligning with the requirements of the study program. Throughout the process, students receive supervision from at least one lecturer and undergo assessment by academic institutions and/or industries. Project courses, typically conducted within a single semester, entail a series of activities ranging from problem identification and objective delineation to literature review submission, research methodology determination, data collection, analysis, result validity assessment, result debate, conclusion drawing, and proposal formulation.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION OF TITLE

Rivers are vital ecosystems that support diverse flora and fauna, provide essential resources for human communities, and play a crucial role in global water cycles. However, rapid urbanization and industrialization have led to increasing pollution levels in rivers worldwide, threatening both the environment and public health. In response to this challenge, innovative technologies such as smart river cleaners have emerged as promising solutions to mitigate pollution and restore the health of river ecosystems.

In a study by M. Elamparthi et al., the authors discuss the ‘Design and Fabrication of Remote-Controlled Sewage Cleaning System'. The aim of the project is to automate the sewage cleaning process in drainage systems, thereby reducing the spread of diseases to humans. The cleaning of black water helps prevent pest infestations by reducing residues that can attract and support pests, ultimately enhancing the shelf life and sensory quality of food products.

In the proposed system, the machine is operated using remote control to clean the sewage, thereby avoiding direct contact with sewage waste and its harmful gases. This approach also helps prevent the generation of mosquitoes from the waste.

The system features a wiper motor that activates as soon as the setup is switched on. Two power window motors are connected to the wheels and are controlled using the remote control setup. The cleaning process begins by using an arm to collect sewage waste, which is then deposited into a bin fixed at the bottom of the machine. A lifting arm is employed to elevate the sewage, with a bucket used for collection.

2.2 PREVIOUS STUDIES / FIELDS / REVIEWS/ INVESTIGATIONS

A preliminary literature search related to this research topic revealed several studies by different authors. M. Elamparthi et al., M. Mohamed Idhris, C. Manoj Kumar, Dr. N. Nithyavathy, Mr. K. Suganeswaran, and Mr. S. Arunkumar, all from the Department of Mechatronics Engineering at Kongu Engineering College in Erode, Tamil Nadu, India, discuss the 'Design and Fabrication of Remote-Controlled Sewage Cleaning System'. This project aims to automate sewage cleaning processes in drainage systems to reduce the spread of diseases to humans. The proposed system utilizes remote control operation to clean sewage, thereby avoiding direct contact with sewage waste and its harmful gases. The system incorporates a wiper motor that initiates upon setup activation, with two power window motors connected to the wheels and controlled via a remote setup. Sewage waste is collected using an arm and deposited into a bin fixed at the bottom of the machine. Limited human intervention in the cleaning process reduces the spread of diseases.

Similarly, M. Bhavani, S. Kalaiselvan, S. Jagan, and S. Gopinath discuss a 'Semi-Automated Wireless Beach Cleaning Robot Vehicle', which shares similarities with the previous project in terms of trash collection methodology. The beach cleanup machine collects floating waste such as bottles, plastic cans, and covers using lifters connected to a chain driven by a motor. Trash and debris are picked up by the lifters and deposited into a bin. The project is operated remotely using radio frequency modules and aims to reduce water pollution in beaches and rivers, with potential applications in public areas like malls, temples, bus stops, and railway stations.

2.3 DESIGN AND FABRICATION F REMOTE CONTROLLED SEWAGE LEANING MACHINE LITERATURE REVIEW

Based on the research conducted on the internet, relevant literature regarding the Smart River Cleaner includes the study titled "Design and Fabrication of Remote-Controlled Sewage Cleaning Machine" authored by M. Mohamed Idhris, M. Elamparthi, C. Manoj Kumar, Dr. N. Nithyavathy, Mr. K. Suganeswaran, and Mr. S. Arunkumar from the Department of Mechatronics Engineering at Kongu Engineering College, India. This literature serves to identify areas where further research is needed, define the scope and boundaries of the research, and highlight gaps, controversies, or unresolved questions in the existing literature.

TYPE OF PROJECT

Based on the article "Design and Fabrication of Remote-Controlled Sewage Cleaning Machine" by M. Mohamed Idhris, M. Elamparthi, C. Manoj Kumar, Dr. N. Nithyavathy, Mr. K. Suganeswaran, and Mr. S. Arunkumar, the paper aims to design and fabricate an automated machine for drainage cleaning to mitigate the risk of human exposure to various diseases caused by infectious microbes present in sewage during manual cleaning. The paper is motivated by the issue of waterlogging resulting from the accumulation of plastic, thermocole, and metal wastes in sewage drains, which fosters pest proliferation and facilitates disease transmission.

MATERIALS OF PROJECT

The paper proposes a system utilizing several components, including a wiper motor, a power window motor, a chain and sprocket, a lifter, a bucket, and a bin, to collect and dispose of sewage wastes. The system is operated remotely using RF transmitter and receiver modules. It can navigate inside drainage pipes and eliminate both floating and submerged wastes by employing the arm and bucket mechanisms. The collected wastes are then deposited into the bin fixed at the bottom of the machine.

THE RESULT AND DISCUSSION

The paper delves into the mechanical and electrical setup of the system, along with software simulation using Proteus. Additionally, it discusses the applications, advantages, and future scope of the system. The paper asserts that the system is easy to operate, cost-effective, portable, low-power consuming, and capable of reducing manual labor and health risks associated with sewage cleaning. Furthermore, it suggests that the system's functionality can be enhanced by implementing control algorithms, potentially leading to a fully automated system.

2.4 SEMI AUTOMATED WIRELESS BEACH CLEANING ROBOT VEHICLE LITERATURE REVIEW

The webpage features a research paper titled "Semi-Automated Wireless Beach Cleaning Robot Vehicle" authored by M. Bhavani, S. Kalaiselvan, S. Jagan, and S. Gopinath from New Prince Shri Bhavani College of Engineering and Technology in India.

TYPE OF PROJECT

The paper proposes the design and fabrication of a semi-automated wireless beach cleaning robot vehicle capable of collecting and removing trash and synthetic waste from beach surfaces using a chain drive and a collecting plate. The paper utilizes keywords such as automation, cleaning, waste, and robot.

MATERIALS OF PROJECT

The paper elucidates the working principle of the beach cleaning robot, which is controlled by a radio frequency module transmitter and receiver. Additionally, it describes the experimental setup of the robot, comprising a motor-operated wheel, a chain drive with a lifter, a collecting tank, and a spur gear.

ADVANTAGES AND CONCLUSION

The paper enumerates the advantages of the beach cleaning robot, including its low cost, low maintenance requirements, ease of operation, and environmental friendliness. It concludes that the robot is beneficial in automatically removing debris from the beach, thereby reducing the need for human intervention and mitigating the spread of diseases.

2.5 DESIGN AND ANALYSIS OF RIVER WATER CLEANING MACHINE LITERATURE REVIEW

The webpage features a research paper titled "Design and Analysis of River Water Cleaning Machine" by Madhavi N. Wagh and Kashinath Munde from Anantrao Pawar College of Engineering, Pune. The paper reviews the current situation of water pollution in India and emphasizes the necessity for an efficient and economical river cleaning system. Additionally, it discusses the existing methods and techniques for water cleaning along with their limitations. The paper states the main objective of the project, which is to reduce human efforts, time consumption, and environmental impact associated with river cleaning.

TYPE OF PROJECT

The paper unveils a cutting-edge project whose objective is to craft and scrutinize an apparatus capable of gathering and eliminating buoyant debris in rivers and water channels. The mechanism runs on solar energy, while its operations are overseen by Arduino technology with the aid of Bluetooth. The manuscript delineates the constituents, assembly process, and evaluation of this contraption alongside its benefits and potential applications.

MATERIALS

The article delineates the primary constituents of the apparatus, encompassing the Arduino board, solar panel, conveyor belt, battery, motors and Blu control Android application. It expounds on the attributes, technicalities and operations of each component in detail while elucidating their integration into a cohesive unit.

CONSTRUCTION AND ANALYSIS OF RIVER WATER CLEANING MACHINE

The article showcases the construction and configuration of the apparatus through SolidWorks software. Additionally, it conducts a comprehensive structural evaluation via ANSYS software to assess stress, strain, and displacement patterns under varying loading scenarios.

ADVANTAGES AND APPLICATIONS

The article enumerates the merits of the apparatus, including its non-traditional nature, affordability, user-friendliness, and eco-friendliness. Moreover, it highlights plausible utilizations of the equipment such as ameliorating water contamination in rivers and ponds and eradicating sediments from swimming pools.

2.6 DESIGN OF AUTOMATIC RIVER CLEANING ROBOT

Design of Automatic River Cleaning Robot Savitha.H.S1 , Anushree.N.R2 , Anilkumar.M3 , Harshitha.A4 , Harshitha.M5 1 Assistant Professor, Department of ECE, Sri Sairam College of Engineering, Anekal 2,3,4,5 U.G Students, Department of ECE, Sri Sairam College of Engineering, Anekal

TYPE OF PROJECT

The "River tidy up machine" utilized in that places where there might be waste garbage in the water outline that will be removed.This machine comprises of L23D9 engine pushed arm components which gathers and dispose of the wastage, garbage and plastic wastages from water bodies. This also diminish the issues which we are confronting when accumulation of waste materials and unwanted materials happen. A device will convey the waste surface particles from the water bodies, this could be toward the end it will realize reduction of water contamination and eventually the oceanic creature's demise to these issues can be diminished. It incorporates electrical component which lifts the waste materials and unwanted particles from the Water and gathers the loss in a container outfitted in Robot. The use of this undertaking will be made in streams, lakes, and other water our bodies to smooth the floor water garbage from our bodies.

MATERIALS

The aim of the undertaking is to mechanize the sewage cleaning process in waste, to diminish the spreading of sickness to human. The dark water cleaning process anticipates bother every part of a thing by diminishing the buildups that can pull in and provide support. In the proposed framework, the machine is worked with remote control to clean the sewage Thus, this system keeps up a vital separation from the impacts from the sewage waste and its risky gases. This system has a wiper motor that starts running when the set-up is traded on. Two control window motors are related with the wrangle is driven with the help of the remote control set-up. The process starts assembling the sewage wastes by using the arm and it tosses back the loss into the rectangular container fixed in the machine at the bottom. This framework has restricted human the act of influence during the time spent cleaning and thus diminishes spreading of diseases to humankind.

CONCLUSION

The robot can be physically controlled with the assistance of a remote. The course of the robot can be controlled utilizing a Bluetooth. Stream contamination is expanding in a fast rate in the present situation so this venture is of high need. This advancement is simple and less exorbitant and has part of space to develop progressively practical. This venture "Programmed River/waste Cleaning Machine" is planned with the expectation that it is particularly efficient and supportive to waterway and channel cleaning. Based on its structure and evaluating cost and accessibility it is poor Condition.

2.7 SWACH HASTH-A WATER CLEANING ROBOT

Swachh Hasth-A Water Cleaning Robot Siddhanna Janai , H N Supreetha , Bhoomika S , Yogithashree R P, Pallavi M Maharaja Institute of Technology Mysore

TYPE OF PROJECT

Water is a critical resource for survival on Earth, covering over 70% of the planet's surface. However, only 3% of this water is drinkable. Water possesses unique properties as a universal solvent, allowing it to dissolve most substances, including toxic materials from factories and chemicals in sewage. Unfortunately, human activities have resulted in complete pollution of our water resources. The introduction of foreign materials into water bodies has become a major issue facing living organisms today. Sewage disposal, garbage dumping and liquid waste from households and chemical industries are among the leading causes of water pollution worldwide. Discharging these hazardous substances into natural aquatic ecosystems not only harms marine life but also renders the water non-potable for human consumption.

MARERIALS

This section discusses previous research on water cleaning boats from around the world. One study proposed an autonomous ship for cleaning lake garbage, but had issues with movement and garbage collection control. Another introduced a flexible crawling mechanism for underwater cleaning of bio-fouled surfaces. A third study presented a pedal-operated boat for efficient lake garbage collection, but lacked automatic control. A fourth method used a robot to pick up floating debris but did not have automated trash detection. Another proposed pond cleaning robot operated by smartphone, while the last developed a water surface cleaning robot with water quality monitoring sensors but was not cost-efficient or easy to manufacture.

ADVANTAGES AND APPLICATIONS

To address the concerns raised in the previous section, this manuscript presents "Swachh Hasth- A water cleaning robot" as a solution. The proposed system design utilizes sensors to capture data on various parameters such as obstacle detection and their distance from the boat, as well as identification of living or non-living organisms. Based on these readings, both the boat and robotic arm are controlled for effectively collecting floating debris in the water body. Figure 1 depicts a block diagram of this proposed system design. The design concept is explained in two stages; firstly involving assembly of sensors onto the water boat followed by implementation of a robotic arm during stage two.

CONCLUSION

This paper presents the design and development of a real-time robotic system, based on Arduino uno, aimed at collecting surface trash in waterbodies. The proposed work utilizes two sensor mechanisms to detect and collect garbage. To simulate the proposed concept, an opensource tool tinkercad is used. The simulation results suggest that the proposed Swachh hasth robot will be a cost-effective alternative for surface water trash collection while preserving the quality of water and aquatic life with minimal human efforts. Our future work aims to employ machine learning and internet of things (IOT) technologies to enable complete autonomy and remote operation of the system.

2.8 SUMMARY

A thorough literature review can significantly enhance the design and testing phases of a smart river cleaner by providing valuable insights and data from existing research. By analyzing prior studies on similar technologies, such as water penetration resistance and compressive strength of materials like cement bricks, designers can identify the most effective materials and construction methods. Furthermore, reviewing past methodologies for water quality improvement and debris removal can inform the development of efficient and reliable testing protocols. This comprehensive understanding helps in optimizing the smart river cleaner's performance, ensuring it is robust, effective, and capable of operating under diverse environmental conditions.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter elucidates the development of our Final Year Project for Semester 4. Notably, we have included a comprehensive flow chart to demonstrate the sequential order of operations required to accomplish this work. Typically, we draw up this chart at the outset of our project as an essential guide to its completion. In addition, the Gantt chart illustrates how we have planned out every aspect of this undertaking and also allows us to determine whether or not it is progressing on schedule. Indeed, the main purpose of this tool is to ensure that our project plan remains on track throughout its duration.

3.2 STUDY /PROJECT DESIGN

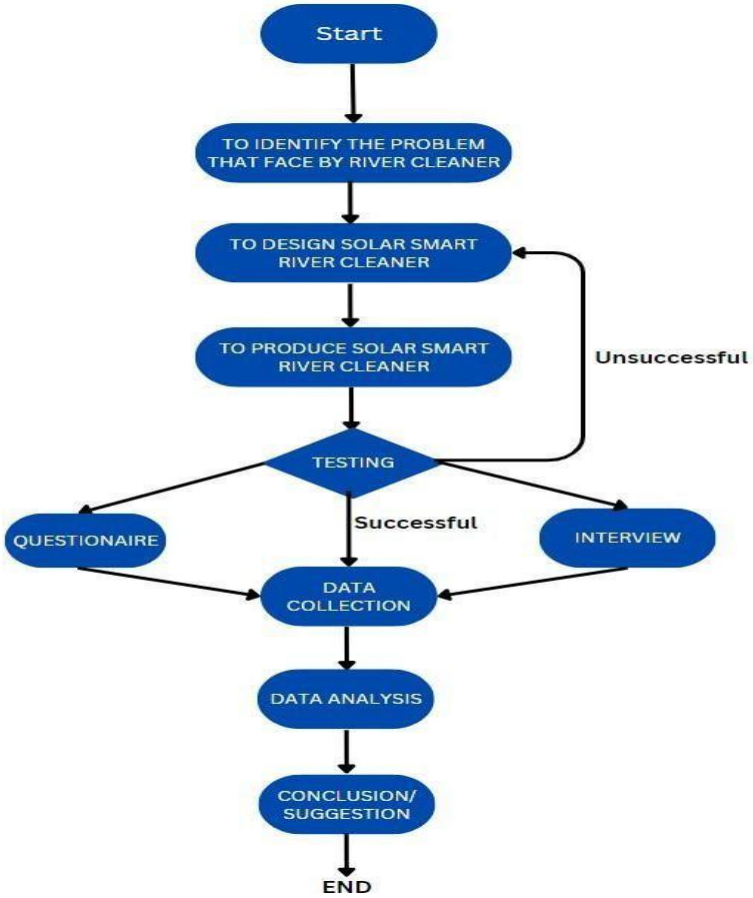


FIGURE 3.1 : FLOW CHART REPRESENT A PROCESS TO BUILD SMART RIVER CLEANER

3.3 RESEARCH DESIGN

We have devised an innovation aimed at the development of a Smart River Cleaner. To gain clarity on our project, we created a detailed product design and subsequently produced it using AutoCAD software.

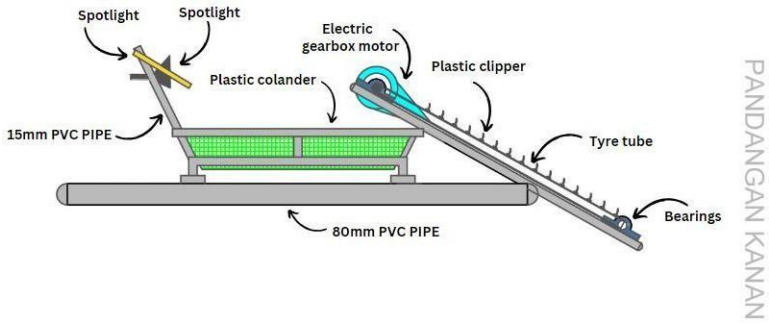


Figure 3.2 :SRC Right View

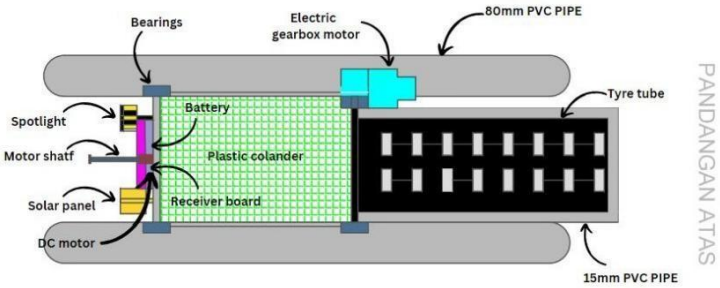


Figure 3.3 : SRC Top View

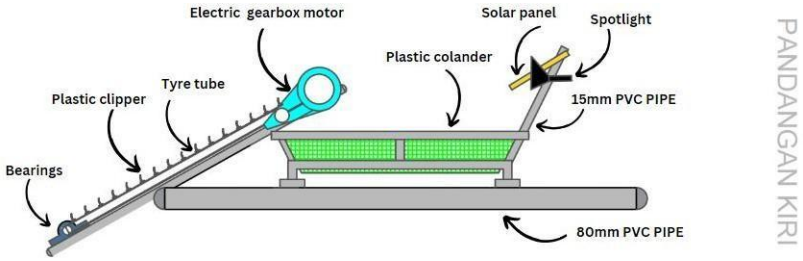


Figure 3.4 :SRC Left View

To determine the methods for our project, we procured materials and components from online sources to construct the "Smart River Cleaner." Our initial step involved fabricating a frame using ½ inch pipe to support the plastic colander. We measured the perimeter of said colander and cut the ½ inch pipe accordingly before joining it up with the plastic colander's frame.

For our second step, we bound a DC motor to the frame using steel banding. The DC motor functioned as a power source that pulled up plastic window netting when connected with rubber bands. To reinforce this netting, we utilized a paint roller as additional support while also hanging solar panels and LED lights on top of the frame.

Furthermore, we secured both our battery and motherboard into a small plastic box tied down by steel banding at the back of our frame to prevent water damage. The battery was responsible for powering our entire electrical system while solar panels provided supplemental energy for LED lighting.

Once activated, rubber bands facilitated rotation in conjunction with motor pulleys which then rotated plastic window netting to collect waste materials from sewage systems. Control over movement direction could be achieved through use of leaf fans installed alongside small DC motors controlled remotely via an RF transmitter that regulated speed settings for each individual DC motor component within our Smart River Cleaner (SRC) system.

At the outset, the installation and development of this SRC(SMART RIVER CLEANER) encountered a plethora of obstacles and challenges, notably in crafting a suitable SRC design and selecting materials.

Step 1

Site Assessment: Begin by thoroughly assessing the river site where the SRC will be installed. Take into account factors such as water flow, depth, and debris accumulation.

Step 2

Design Planning: Based on the site assessment, finalize the design plan for the SRC installation. Consider the optimal positioning and orientation of the cleaner for efficient operation.

Step 3

Component Preparation: Ensure all components of the SRC are prepared and organized for installation, including the cleaner unit, power source, and any additional accessories.

Step 4

Foundation Preparation: Prepare the foundation for the SRC installation, ensuring it is stable and level. This may involve clearing debris and leveling the riverbed as needed.

Step 5

Anchor Placement: Securely anchor the SRC to the riverbed using appropriate anchors or mounting mechanisms. Ensure the anchors are installed according to the design specifications to provide stability.

Step 6

Electrical Connections: If the SRC requires electrical power, carefully make the necessary connections to the power source. Follow all safety protocols and regulations during this step.

Step 7

Testing Phase: Conduct thorough testing of the SRC system to ensure all components are functioning correctly. Test the cleaner's movement, power supply, and any integrated sensors or controls.

Step 8

Adjustments and Calibration: Make any necessary adjustments or calibrations to the SRC system based on the testing results. This may include fine-tuning the cleaner's movement or adjusting sensor sensitivity.

Step 9

Safety Measures: Implement appropriate safety measures around the installed SRC, such as warning signs or barriers, to ensure the safety of bystanders and wildlife.

Step 10

Final Inspection: Perform a final inspection of the installed SRC to ensure everything is in place and functioning properly. Address any last-minute issues or concerns before completing the installation process.

3.4 MATERIALS AND EQUIPMENT

DC MOTOR

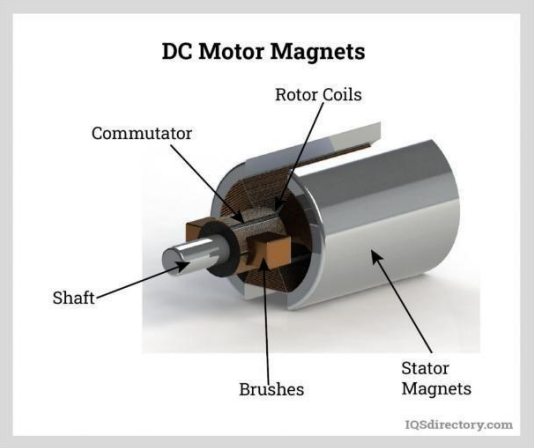


Figure 3.5 :DC Motor

A DC motor, as depicted in Figure 3.4 :DC Motor, is an electro-mechanical apparatus that transforms electrical energy into mechanical energy by means of the interaction between magnetic fields. Its operation relies on the principle of Lorentz force, where a conductor carrying current within a magnetic field experiences a force.

For our project, we have opted to employ a DC motor due to its simplicity, controllability, and versatility in various applications. Moreover, DC motors are extensively used in robotics, electric vehicles, conveyor systems, fans and many other industrial and consumer devices for their advantages such as straightforwardness of design and ease of speed regulation.

SOLAR PANEL

Figure 3.6 : Solar Panel

Solar panels, depicted in Figure 3.4: Solar Panel, are sophisticated devices that transform photons from the sun into electricity capable of powering electrical loads. The intelligent river cleaner harnesses this green power source directly from the solar panel for its operation. These versatile energy converters have a broad range of applications such as remote power systems for cabins, telecommunications equipment and remote sensing technologies; not to mention their ability to generate electricity for residential and commercial solar electric systems.

Renewable energy is harvested by solar panels through sunlight absorption and subsequent conversion into electrical current which can supply power to various electrical loads. Our team utilized a solar panel as an alternative electrical source in support of our 10W spotlight project.ht.

PVC PIPE

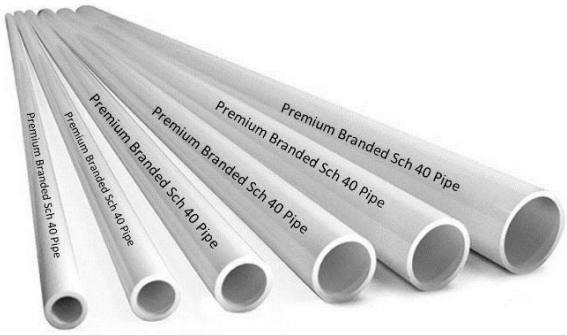


Figure 3.7 : PVC pipe

Figure 3.4 displays polyvinyl chloride (PVC) piping, a versatile and extensively utilized thermoplastic material renowned for its durability, affordability, and corrosion resistance. PVC pipes are available in various sizes and types, including both rigid and flexible options. The former is often employed in water distribution systems, irrigation processes, and plumbing due to its high tensile strength and pressure-resistant characteristics.

Moreover, owing to the low density of PVC piping as a relatively lightweight substance that displaces more water compared to its weight when fashioned into hollow structures such as pipes; it can float on top of water surfaces with ease. This buoyancy effect renders the use of PVC pipes suitable for varied applications.

In this particular case scenario involving our smart river cleaner project, we intentionally utilize the buoyancy feature of PVC piping by creating floating structures using them as bases for our innovative technology.

MOTOR TYRE TUBE

Figure 3.8: Motor tyre tube

Figure 3.4 illustrates the utilization of a motorized tire tube assembly as a support mechanism, connected by steel rods at both the upper and lower ends, facilitating the elevation of rubbish. This innovative system employs a motor to drive the tire tube, which in turn rotates and lifts the attached steel rods, effectively raising debris from the ground or a designated area. The tire tube serves as a robust and flexible support structure, capable of withstanding varying loads and environmental conditions.

Additionally, the steel rods provide stability and durability to the assembly, ensuring reliable operation during rubbish collection activities. This design offers a practical solution for efficiently managing waste disposal in diverse settings, such as industrial facilities, construction sites, or municipal cleanup operations.

WIRE FOR WIRING

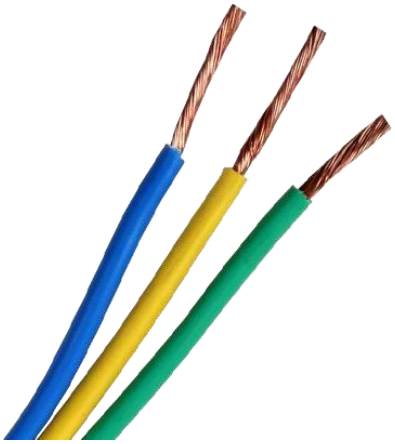


Figure 3.9 : Stranded wire

The conductive core of the wire effectively facilitates the flow of electrical current, as illustrated in Figure 3.4 Meanwhile, its outer insulation serves to shield against environmental factors and prevent inadvertent contact with conductive materials. The insulation material employed may vary depending on specific application requirements, taking into account considerations such as temperature resistance and flexibility; examples include thermoplastics, somersetting plastics or rubber. We have chosen to use stranded wire for our wiring system due to its suitability for the project's specifications which do not necessitate a large wire size. In conclusion, stranded wire has been found to meet our project's requirements satisfactorily.

HEAVY DUTY PLASTIC COLANDER

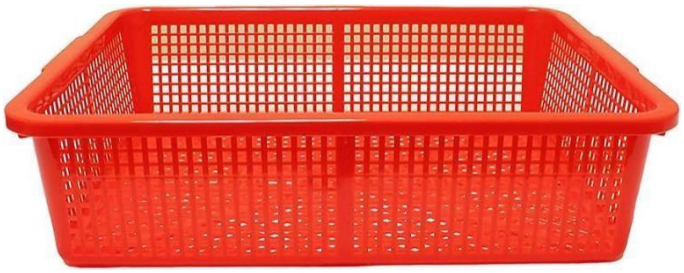


Figure 3.9.1 :Plastic colander

Figure 3.4 displays a heavy-duty square plastic colander that is specifically designed for more demanding culinary tasks. This robust and durable kitchen tool is constructed from sturdy, high-quality plastic materials, rendering it capable of withstanding the rigors of heavy use. Its perforated structure enables water to pass through while efficiently trapping solid waste, preventing it from re-entering the water system when repurposed as a trash storage component for smart river cleaner.

The adaptability of this plastic colander makes it an effective tool for storing rubbish in order to maintain water quality continuously. Additionally, the collected waste can be easily emptied and disposed of properly. The integration of technology and a repurposed plastic colander exemplifies forward-thinking approaches to environmental issues by demonstrating how simple yet innovative solutions contribute to conserving and preserving water ecosystems.

BOAT SHAFT

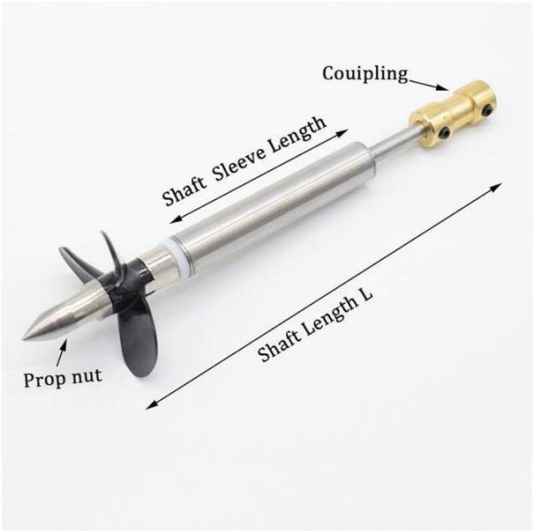


Figure 3.9.2 : Boat shaft

The boat shaft serves as a crucial component in marine propulsion systems, transferring power from the engine to the propeller to propel the boat forward or in reverse. Typically made of sturdy materials like stainless steel or bronze to withstand the harsh marine environment, the shaft rotates within a bearing system to minimize friction and support the propeller's weight. Its length and diameter are carefully selected to match the engine's power output and the boat's size and intended use. Additionally, the shaft may incorporate features such as shaft seals to prevent water from entering the boat's hull. Overall, the boat shaft plays a fundamental role converting engine power into forward motion, making it an essential element

CONTROLLER

Figure 3.9.3 :Remote Controller

The remote controller depicted in Figure 3.4 which is designed for a smart river cleaner, assumes a crucial function in directing its activities and ensuring efficient navigation and waste elimination. Serving as the cleaner's central processing unit, this device empowers operators to remotely steer and oversee its course of action. Outfitted with an array of sensors, the controller receives up-to-the-minute data from the smart river cleaner regarding water quality, debris density, and current whereabouts.

DC MOTOR SPEED CONTROL

Figure 3.9.4 : Dc Motor Speed Control

DC motor speed control involves adjusting the rotational speed of a DC motor by manipulating factors like voltage, current, or pulse width modulation (PWM). Voltage control alters the voltage supplied to the motor, while PWM rapidly switches power on and off to vary the average voltage. Current control regulates the current supplied to the motor, affecting torque and thus speed. Feedback control incorporates sensors to monitor speed and adjust input accordingly, while closed-loop control combines feedback with control algorithms for precise regulation. Micro controller-based solutions offer advanced control options for optimized performance. Factors like motor characteristics and load requirements dictate the most suitable control method for a given application.

BATTERY

Figure 3.9.5 :12v Battery

This product employed a 12-volt battery, depicted in Figure 3.4, as the primary power source for our intelligent river cleaner's DC motor. This portable and rechargeable energy storage device furnishes the essential electrical power to drive the DC motor, which subsequently energizes different components of the cleaner such as its propulsion system or other electric mechanisms. The 12V output aligns well with the energy prerequisites of our DC motor, ensuring an efficient and dependable supply that enables independent operation of our aquatic cleaner.

SPOTLIGHT

Figure 3.9.6 :Spotlight

The strategically positioned spotlight, as depicted in Figure 3.4: Spotlight, illuminates the surrounding area of the cleaner and enables operators to closely monitor its progress while identifying potential obstacles or debris. This feature proves particularly valuable in nighttime or dimly lit environments where it ensures that the smart river cleaner can navigate effectively and target areas with higher concentrations of pollutants. The design of this spotlight takes into account the unique challenges presented by water environments, providing a focused and adjustable beam that facilitates precision cleaning and maneuvering.

27MHZ 4CH REMOTE CONTROLLER

Figure 3.9.7 : 27Mhz 4ch Remote Controller

A 27MHz 4-channel remote controller is a device used to wireless operate various electronic systems or devices. It typically operates in the 27MHz frequency band and provides four independent channels for controlling different functions or actions. Each channel corresponds to a specific control input, such as throttle, steering, or additional functions depending on the application. The controller sends signals encoded in the 27MHz frequency to a receiver unit connected to the device being controlled, such as a remote-controlled car, boat, or other RC (radio-controlled) vehicle. Users manipulate joysticks, buttons, or switches on the controller to generate control signals, which are then transmitted wireless to the receiver unit, initiating the corresponding actions in the controlled device. The 4-channel capability allows for versatile control over multiple functions, providing flexibility and precision in operating RC vehicles or other remote-controlled equipment.

3.5 DATA ANALYSIS METHOD

INTERVIEWS

Generate interview queries: Develop a comprehensive set of well-crafted questions that encompass all the relevant aspects of the smart river cleaner. Ensure that these questions are open-ended to allow for detailed responses from the interviewees. Consider inquiring about user experience, functionality, ease of comprehension, visual design, and any other factors pertinent to the effectiveness of the signboard.

Record and transcribe data: Obtain consent from participants before recording interviews through audio or video means. Accurately transcribe each interview for easier analysis purposes. If possible, take additional notes during the interview to capture non-verbal cues and extra details.

Analyze data: Begin analyzing transcribed data by systematically reviewing each interview conducted with utmost attention to detail. Identify recurring themes, common feedback as well as noteworthy insights. Look out for patterns trends and notable quotes that offer valuable information on performance levels usability or user preferences concerning the signboard's operation efficiency

3.6 QUESTIONNAIRE

This approach employs technology to create Google Forms questionnaires that can be accessed and completed online by local cleaners in the surveyed area. The questionnaire is designed to gather information on public awareness of river cleanliness.

The questionnaire includes inquiries regarding the duration of their experience as a river cleaner, challenges encountered during cleaning, and whether they possess any tools for river cleaning. Additionally, questions are posed regarding what type of tool would be most beneficial for them if available.

3.7 PROJECT COST

NO	CONTENT	UNIT	PRICE	TOTAL
1	DRILL MOTOR	3	RM17.02	RM51.06
2	DC MOTOR 3V	2	RM2.00	RM4.00
3	12V LITHIUM BATTERY	1	RM60.90	RM60.90
4	PVC END CAP	2	RM12.73	RM25.45
5	MICRO DC FAN	2	RM3.30	RM6.60
6	27MHZ REMOTE &12V RECEIVER BOARD	1	RM50.13	RM50.13
7	CABLE TIE	1	RM6.90	RM6.90
8	RABBER BAND	1	RM3.90	RM3.90
9	PVC MESH 1 METER	1	RM6.00	RM6.00
10	PAINT ROLLER REFILL	2	RM2.10	RM4.20
11	CABLE INLINK 4.0MM	1	RM2.20	RM2.20
12	CABLE LINK 2.5 MM	1	RM1.80	RM1.80
13	CABLE LINK 1.5 MM	1	RM1.40	RM1.40
14	PVC BRACKET	1	RM1.50	RM1.50
15	ARROW PVC SOLVENT GLUE	1	RM4.50	RM4.50
16	PVC PIPE 15 MM	1	RM13.20	RM13.20
17	PVC END CAP 15 MM	6	RM0.30	RM1.60
18	PVC TEE 15 MM	12	RM0.60	RM7.20
19	PVC ELBOW 15 MM	12	RM0.50	RM6.00
20	50P DRYWALL SCREW	1	RM1.33	RM1.33
21	10M 12MM STEEL BAND	1	RM8.74	RM8.74
22	1.15M CLASS 80 MM PIP	2	RM7.70	RM15.39
23	BASKET	1	RM2.40	RM2.40
24	BOAT SHATF	3	RM 26.50	RM 79.50
25	MOTOR DC SPEED CONTROL	1	RM 5.90	RM 5.90
26	10 MM COPPER CONNECTOR	1	RM 9.08	RM 9.08

27	STEERING RUDDER	1	RM 11.43	RM 11.43
28	STAINLESS STEEL ROD	2	RM 11.50	RM 23.00
29	PULLEY AND BELT	1	RM 6.50	RM 6.50
30	MG90 180 DEGREE	1	RM 11.90	RM 11.90
31	PILLOW BLOCK BEARINGS	4	RM 3.30	RM 13.20
JUMLAH				RM446.91

Figure 3.9.8 : Table of Project Cost

3.8 SUMMARY

The smart river cleaner project, with an overall cost of RM446.91, utilized interviews and questionnaires to gather data from individuals involved in river cleaning to better understand the challenges they encounter. This feedback provided critical insights into the practical difficulties faced during the cleaning process, such as accessibility issues, debris types, and frequency of cleanups. By incorporating this real-world data, the project aimed to design a more efficient and user-friendly smart river cleaner that addresses these specific problems, ultimately enhancing the effectiveness and sustainability of river cleaning efforts.

CHAPTER 4
FINDINGS AND DISCUSSION

This chapter encapsulates the comprehensive data and analysis conducted in the study. It encompasses the presentation of overall findings and analysis through tables, diagrams, and statements, facilitating the discovery of critical insights. The organization of this chapter adheres to the hierarchy of research questions, ensuring that all inquiries posed throughout the study are adequately addressed. Moreover, a critical discussion of the findings underscores the scientific rigor of the study, demonstrating its alignment with the requirements and objectives of the project course and study program.

4.1 INTRODUCTION

In this project, our data analysis will focus on **quantifying the weight of rubbish** collected and the corresponding time intervals recorded by the smart river cleaner. By leveraging this method, we aim to gain insights into the efficiency and effectiveness of the cleaning process, enabling us to make informed decisions for optimizing river cleaning operations.

4.2 RESEARCH /TEST FINDINGS

Research-type projects focusing on smart river cleaner involve various methodologies to assess its efficacy and impact. These projects typically employ quantitative and/or qualitative research methods to gather data on factors such as debris accumulation rates, water quality improvements, and operational efficiency. Quantitative research may involve data collection remotely on the cleaner, while qualitative research may include interviews with stakeholders to understand perceptions and experiences related to the cleaner's deployment. These projects aim to provide empirical evidence and insights into the effectiveness of the smart river cleaner in addressing pollution and enhancing river health.

In our data collection process, we conducted five iterations, culminating in an average dateset derived from the smart river cleaner's operations. This aggregated data serves as compelling evidence to assess the efficacy and performance of the smart river cleaner, offering valuable insights into its effectiveness in removing debris and maintaining the cleanliness of the waterway.

For the research type of project we using the method of collecting data involves assembling the necessary equipment and materials. This includes preparing the weighing apparatus, ensuring the proper functioning of the smart river cleaner, and organizing plastic bags for containing the collected rubbish, among other essential items. By meticulously setting up these components beforehand, we ensure a smooth and efficient data collection process, laying the groundwork for robust analysis and insights into river cleanliness and maintenance. To ensure our project objective can be achieved.

4.3 LIST OF TESTING TOOLS

Function : Testing and determine weigh of rubbish

Figure 4.1 : Weigh and Smart River Cleaner

Function : Prevent Smart River Cleaner drop at River and measure distance

Figure 4.2 : Plastic Rope

Function : Record weigh data

Figure 4.3 : Book and Pen

Function : For safety and prevent dirty stains

Figure 4.4 : Glove

4.4 STEP OF COLLECTING DATA

Planning and Preparation:

This initial step involves outlining the objectives of the data collection, identifying the variables to be measured, and designing the data collection methodology. It also includes preparing any necessary equipment and materials for the data collection process.

Setting Up Equipment:

Ensure that all necessary equipment, such as the smart river cleaner, weighing apparatus, sensors, and data recording devices, are properly set up and calibrated before data collection begins.

Data Collection Procedure:

Execute the planned data collection procedure systematically. This may involve deploying the smart river cleaner into the river and initiating its operation while recording relevant data such as time stamps, debris weight, water quality measurements, and any other variables of interest.

Quality Control:

Throughout the data collection process, ensure that data is being collected accurately and consistently. Monitor equipment functionality and make adjustments as needed to maintain data integrity.

Data Recording and Storage:

Record all collected data in a structured format, such as a spreadsheet or database, ensuring that it is organized and labeled appropriately for ease of analysis. Store the data securely to prevent loss or corruption.

Data Validation and Cleaning:

After data collection is complete, validate the collected data to check for errors or inconsistencies. Clean the data by removing any outliers or erroneous entries to ensure its reliability for analysis.

Analysis Preparation:

Prepare the collected data for analysis by performing any necessary transformations, aggregations, or calculations to derive meaningful insights. This may involve statistical analysis, data visualization, or other analytical techniques depending on the research objectives.

Analysis and Interpretation:

Conduct the analysis of the collected data to identify patterns, trends, and relationships between variables. Interpret the findings in the context of the research objectives and relevant literature to draw meaningful conclusions.

Reporting and Presentation:

Communicate the findings of the data analysis through reports, presentations, or publications, adhering to the conventions of academic or scientific discourse. Clearly articulate the methods used, the results obtained, and the implications of the findings for future research or practical applications.

4.5 DATA ANALYSIS

In our data collection process, we conducted five iterations, culminating in an average dateset derived from the smart river cleaner's operations. This aggregated data serves as compelling evidence to assess the efficacy and performance of the smart river cleaner, offering valuable insights into its effectiveness in removing debris and maintaining the cleanliness of the waterway.

Data analysis Testing 1 di Klang River :

Number of data collection	Time	Weight
Data 1	30 minute	5.6 kg
Data 2	30 minute	6.0 kg
Data 3	30 minute	4.7 kg
Data 4	30 minute	6.3 kg
Data 5	30 minute	5.8 kg

Figure 4.5 : Table Data Testing 1

Average = 5.6 + 6.0 + 4.7 + 6.3 + 5.8 / 5 = 5.68 kg

Effective result = 30 minute per 5.68kg

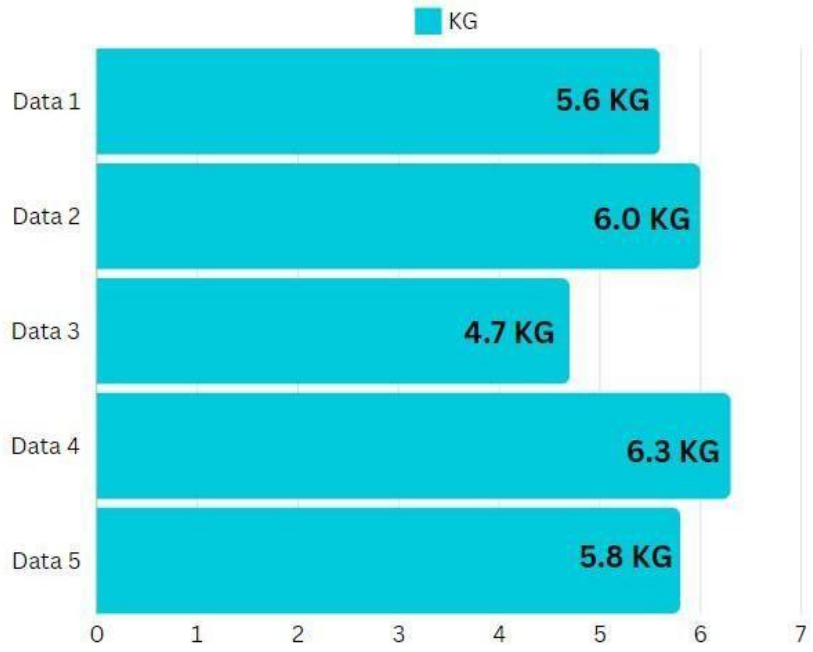


Figure 4.6 : Graph Data Analysis

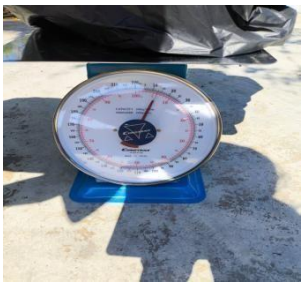
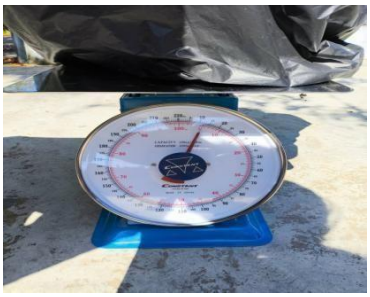
PICTURE OF WEIGH	
 **DATA 1 : 5.6 KG**	 **DATA 2 : 6.0 KG**
 **DATA 3 : 4.7 KG**	 **DATA 4 : 6.3 KG**
	**DATA 5 : 5.8KG**

Figure 4.7 : Table Data Weigh of Rubbish

Data Analysis Testing 2 di Tasik Widuri Rawang Bukit Beruntung

To evaluate the effectiveness of the SRC in preventing the accumulation of garbage, we conducted a test by placing a 5 kg weight of non-polluting debris such as plastic bottles and tree debris on the surface of the lake water. This simulated real-world conditions and assessed the system's capability to intercept and manage such debris. Additionally, we monitored the time taken by the SRC to capture and contain the 5 kg of debris, providing valuable insights into its operational efficiency and performance.

Number of data	Time	Weight of Rubbish
Data 1	**5 minute 48 sec**	**5 kg**
Data 2	**5 minute 54 sec**	**5 kg**
Data 3	**6 minute 2 sec**	**5 kg**

Figure 4.8 : Table Data Testing 2

Figure 4.9 :SRC Testing 2 at Tasik Widuri

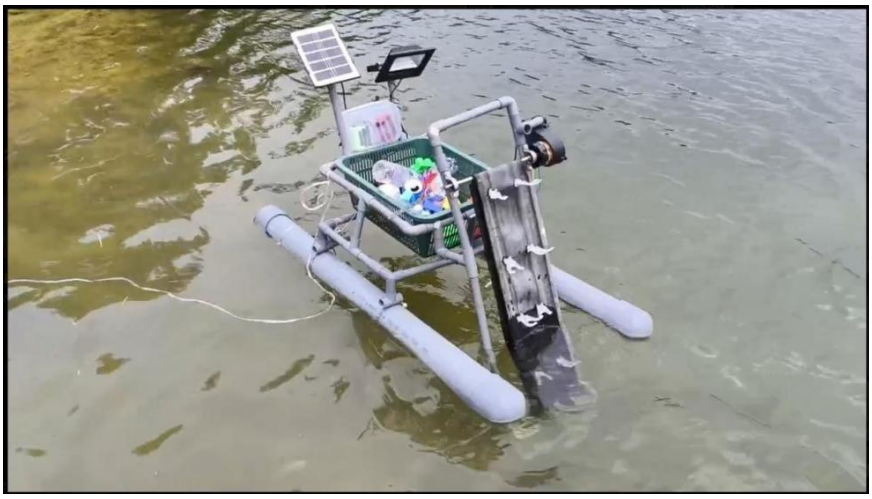


Figure 4.9.1 : SRC testing 2 at Tasik Widuri

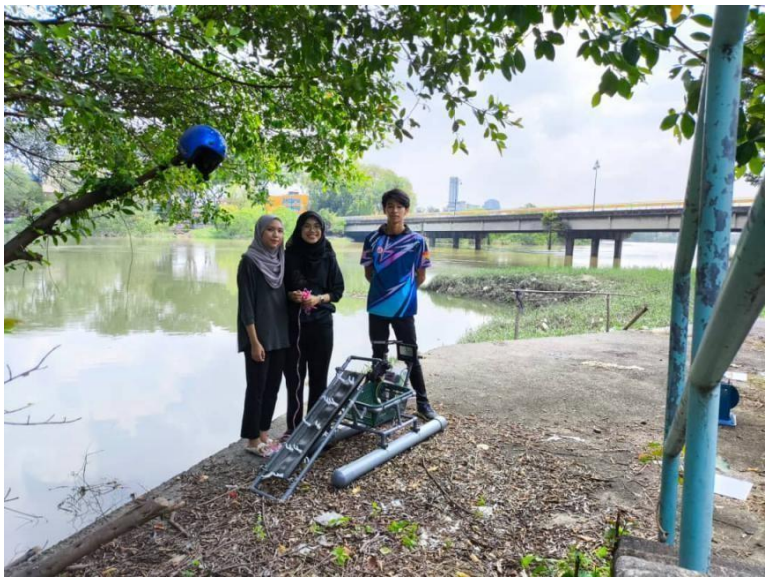
ANALYSIS OF RUBBISH

Figure 4.9.2: Rubbish in River Klang

Various types of waste can be found in during collect from Smart River Cleaner in the Klang River, including organic matter like leaf waste, as well as synthetic materials such as plastic bottles. Additionally, non-traditional items like discarded sports equipment, such as badminton equipment, contribute to the river's pollution. These diverse forms of waste underscore the complex challenge of managing and mitigating pollution in urban waterways like the Klang River.

SMART RIVER CLEANER PRODUCE AT KLANG RIVER

Figure 4.9.3 : Smart River Cleaner Produce



Figures 4.9.4: Team Members Picture during collecting data

4.6 DISCUSSION

In the discussion of this project, the creation of the smart river cleaner posed numerous challenges beyond just cost considerations and project objectives. We encountered difficulties in the installation process and sourcing the appropriate components necessary for its functionality. Despite significant progress, there remains ample room for improvement in our project. Throughout testing, we navigated various obstacles, including project costs, problem-solving strategies, goal attainment, and other pertinent discussions. Notably, the most formidable aspect of this endeavor was the trial-and-error process involved in selecting the optimal components for the smart river cleaner. Additionally, securing suitable locations for testing and finding willing river workers for interviews presented considerable challenges. These experiences underscore the multifaceted nature of developing innovative solutions for environmental challenges and highlight areas for refinement and enhancement in future iterations of our project.

Technical Article

Over the years, LLSB has installed seven log booms — barriers to intercept trash from tributary rivers before it flows into the Klang River — and hired contractors to clear floating garbage in the river frequently.

LLSB also partnered with TOC to install two Interceptors on the Klang River in 2019 and 2020. These solar-powered machines float on the river and trap solid waste before it flows into the ocean.

But LLSB cannot be taking trash out of the river forever, Syaiful acknowledges. “ Can you imagine that from 2016 until 2021, we collected 77,000 metric tons of waste? That’s [equivalent to] over 400 Boeing 747 [airplanes] floating on the Klang River. Yet, with all our massive cleaning operations, we have only managed to reduce the amount of waste collected by 38% [in 2021 compared with 2016].” (By Tan Zhai Yun / The Edge Malaysia)

4.7 SUMMARY

In summary, this project focused on the development and implementation of a smart river cleaner aimed at addressing pollution in the Klang River. Through meticulous planning and testing, we successfully created a prototype that shows promise in improving river cleanliness. However, the project was not without its challenges. From navigating the complexities of installation to sourcing the right components, To encountered various hurdles along the way. Despite these obstacles, our project made significant progress, offering valuable insights into the potential of smart technologies for environmental conservation efforts. Moving forward, there is ample room for improvement and refinement, particularly in optimizing the smart river cleaner's performance and overcoming logistical challenges. Overall, this project represents a meaningful step towards mitigating pollution in urban waterways and underscores the importance of innovation and collaboration in environmental stewardship.

CHAPTER 5
FINDINGS AND CONCLUSION

5.1 INTRODUCTION :

The hypothesis surrounding the smart river cleaner posits that its implementation will lead to a notable reduction in debris accumulation and an overall improvement in the cleanliness of the river. This hypothesis assumes that the cleaner's technological capabilities, such as its ability to autonomously navigate and collect rubbish, will result in more efficient and effective river cleaning operations compared to traditional methods. Additionally, it anticipates that the data collected from the smart river cleaner will support this hypothesis by demonstrating a decrease in debris levels over time and highlighting the cleaner's positive impact on environmental conservation efforts.

5.2 CONCLUSION :

In conclusion, our study on the smart river cleaner reveals promising results in addressing river pollution. Through five rounds of data collection and analysis, we have observed a consistent trend indicating the cleaner's effectiveness in reducing debris accumulation and improving overall river cleanliness. These findings support our hypothesis regarding the positive impact of the smart river cleaner on environmental conservation efforts. Moving forward, further research and implementation of such technologies hold significant potential in mitigating pollution and enhancing the health of waterways worldwide.

5.3 RECOMMENDATION

Based on the panel's feedback, it is highly recommended to incorporate sensors into the smart river cleaner to enable automatic rubbish collection. These sensors can detect debris and activate the cleaning mechanism without human intervention, significantly improving efficiency. Additionally, integrating a solar-powered system will ensure that the cleaner operates sustainably and reduces reliance on external power sources. This eco-friendly approach aligns with modern environmental standards and promotes the cleaner as a green technology solution.

Furthermore, transitioning the control system to leverage 5G network capabilities will allow for real-time monitoring and autonomous operation, eliminating the need for manual control. This advanced connectivity ensures that the smart river cleaner can operate seamlessly and adapt to varying conditions without direct oversight. By adopting these enhancements, the smart river cleaner will become a more robust, efficient, and sustainable solution for maintaining clean waterways, reflecting the latest advancements in technology and environmental stewardship.

5.4 PROJECT LIMITATIONS

The smart river cleaner project faces several limitations that impact its overall effectiveness and efficiency. One significant constraint is its capacity to collect only small-sized rubbish, limiting its usefulness in environments with larger debris. Additionally, the cleaner can gather a maximum of 5 kg of rubbish within 30 minutes, necessitating frequent stops and reducing the operational time. The device's control range is restricted to 12 meters, which confines its usability to smaller sections of the river and requires multiple deployments for larger areas. Moreover, the cleaner is prone to overheating, necessitating a 5-minute cool-down period before it can resume operation, further hindering continuous performance.

Financial constraints pose another major challenge, as the project budget is insufficient, leading to a trial-and-error approach in purchasing and testing components to find suitable ones for the cleaner. This process not only strains the limited funds but also consumes valuable time. The project timeline is additionally burdened by the demands of extra assignments and mini projects from college, which leaves insufficient time to focus on

refining and optimizing the smart river cleaner. These limitations highlight the need for increased funding, better resource management, and extended timelines to achieve a more effective and reliable solution.

5.5 SUMMARY

The smart river cleaner project, aimed at improving river cleanliness, faces several limitations impacting its functionality and development. It can only collect small-sized rubbish, with a capacity of 5 kg every 30 minutes, and operates within a limited range of 12 meters. Additionally, it tends to overheat, requiring a 5-minute cooldown period before resuming operation. Financial constraints necessitate a trial-and-error approach in purchasing and testing components, straining both the budget and timeline. The project's progress is further hampered by the additional academic workload, leaving insufficient time for thorough development and optimization. These challenges highlight the need for more funding, better resource allocation, and extended development time to enhance the cleaner's effectiveness and reliability.

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APPENDIX

APPENDIX A	**Questionnaire**
APPENDIX B	**Collecting data**
APPENDIX C	**Team picture during collecting data**