POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

PIXEL THE MICROPLASTIC CLEANER

VISHAN A/L SUPPAYA

(08DKM20F2012)

THAESNAAVAN A/L SIVAKUMAR

(08DKM20F2005)

MUHAMMAD SHA HAQIMI BIN MOHD SHARIF

(08DKM20F2003)

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2023

DECLARATION OF OWNERSHIP AND COPYRIGHT

TAJUK : PIXEL MICROPLASTIC CLEANER

SESI : SESI 2 2022/2023

1. VISHAN A/L SUPPAYA
2. THAESNAAVAN A/L SIVAKUMAR
3. MUHAMMAD SHA HAQIMI BIN MOHD SHARIF

adalah pelajar tahun akhir Diploma Kejuruteraan Mekanikal, Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah, yang beralamat di Shah Alam 40150 Selangor.

2. Kami mengakui bahawa PIXEL dan harta intelek yang ada didalamnya adalah hasil karya/ reka cipta asli kami tanpa mengambil atau meniru mana-mana harta intelek daripada pihak lain.

Diperbuat dan dengan sebenar- sebenarnya diakui oleh yang tersebut :

a) VISHAN A/L SUPPAYA
(NO KAD PENGENALAN : 02061014379)

vishan

…….

b) THAESNAAVAN A/L SIVAKUMAR
(NO KAD PENGENALAN :O21230101361)

thaes

……

c) MUHAMMAD SHA HAQIMI BIN MOHD SHARIF
(NO KAD PENGENALAN : 000920140605)

sha haqimi

……

Di hadapan saya AMALINA KAMILAH BINTI IBRAHIM

……..

(680720-08-5690)

AMALINA KAMILAH BINTI IBRAHIM sebagai penyelia projek pada sesi 2 2022/2023

ACKNOWLEDGMENT

We would like to thank the Polytechnic Sultan Salahuddin Abdul Aziz Shah for giving us the opportunity to produce this proposal by providing facilities such as a library to enable us to obtain reference material related to our subject under the Project 1 subject.

On this occasion, we would also like to express our sincere appreciation and gratitude to our lecturer, Pn Amalina Kamilah Binti Ibrahim for providing us with the guidance and the perfect explanation from the beginning of the our project until the project was completed. Again, thank you to you for giving us the confidence to make this project success.

Moreover, thank you to the team members for working together to make this proposal success. Without your support and encouragement we would not have been able to perform this task as perfectly as our other friends. In addition, many thanks also to our colleagues who worked hard to produce this work and also exchanged ideas to help us complete the course work. Finally, we hope that the work we do will increase our knowledge base and make us more cooperative and responsible.

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ABSTRACT

Marine pollution has always been a growing problem and concern in our society in the last century.Trash and litter left on the beaches can endanger the life of marine life and coastal animal such as turtle and bird,this sort of action could lead to limitation of our ability to use the beach for recreation and economic purposes.On top of that,aggravating the problem, the progressive breakdown of large plastic debris, due to weathering produce a rather smaller,non-visible pieces of plastic known as microplastic which are defined as plastic particle smaller than 5mm.Extensive evidence has been recorded,demonstrating the effect of ingestion of plastic and microplastic by wide variety of organisms with various type of consequences for wildlife and human. Many action such as employ manual labor,volunteer work and deploying large machine have been made to overcome this predicament.Although these operation required a lot of expenses and time consuming.Therefore to efficiently reduce the pollution,Pixel a mechanized,autonomous sand filler robot are developed.Pixel is capable of traverse on sandy terrain,pick up and fillering out the trash inside the sand.The inventor used a conveyor to scoop the sand and disposed it to the filtering part as its traverse around the coastal area using a controller device.Medium and small sized trash such as bottle cap,microplastic and broken glass are properly collected without the need of manual labor.We believe that our project is the perfect solution to overcome the microplastic pollution at the beach.To summarize we have successfully designed and produce a beach cleaner that fit the objective of our project.

Keyword*:* *Beach cleaner,Microplastic,Robot,Sustainable,Ecofriendly,Pollution .*

CHAPTER 1 INTRODUCTION

1.1 Introduction

Sustainability is the idea that there are finite resources on earth and that we must use them carefully to preserve the environment. Future generations will suffer significantly if we do not embrace sustainable behaviours.Coastal area and beach pollution are a severe problem and has contributed hazards toward wildlife, mainly marine life.Trash and litter, such as plastics and bottle, may flow with the ocean waves or current and become the source of pollutants to the nearby beaches and coastal area.Tanjung Aru is one of the famous beaches in Kota Kinabalu because of its fantastic scenery, especially during sunsets. Unfortunately, nowadays, it might consider as polluted due to seasonal floated plastics bags (Lee, 2019). According to Mobilik et al. (2016), 86% of total marine debris, mostly plastic bottles, food wrappers, plastic fragments, and plastics cups, was commonly found. Researchers observed that in Tanjong Aru itself, debris was found more significant during southwest monsoon (July to September) then followed in Northeast Monsoon (December) and lowest litter during intermediate monsoon (May) shows the influences of location and weather (Mobilik et al., 2017).Another public attraction beach in Kota Kinabalu is Tanjung Lipat.The problems increased, especially during the rainy season, whereby sea currents and tides play significant roles in worsening plastic debris at shores (Fauziah et al., 2015). On top of that,aggravating the problem, the progressive breakdown of large plastic debris, due to weathering produce a rather smaller,non-visible pieces of plastic known as microplastic which are defined as plastic particle smaller than 5mm.Based on the research that had been done for the past decades,these small plastic known as microplastic has shown negative impact on the marine life and food chain.

Most coastal municipalities worldwide have taken priority action ensuring their beach clean by either using a manual cleaning approach or using a mechanical beach cleaning machine. Manual cleaning has its advantages such as inexpensive waste treatment required, low energy cost, and less waste (Belpaeme et al. 2005). On the other hand, the mechanical beach is preferable due to broad area coverage, cost-effective and faster removal of the beach wastes. However, according to Belpaeme et al. (2005), it, unfortunately, takes away most of the organic material beneficial for the coastal ecosystem's natural functions. The critics of mechanical beach cleaning are that besides human litter, the machine also removes beach wrack, including algae and plants (Dugan et al., 2003). Reviewed by TRANSACTIONS ON SCIENCE AND TECHNOLOGY Bolong et al., 2021. Transactions on Science and Technology. 8(3-2), 281 - 289 282 UMS Colloquium on Fundamental Research and Applications 2020 (UMS Co-FA2020) Zielnski et al. (2019), beach sustainability recommendations due to this dilemma are to compromised conservation and tourism, prioritized based on the beach type, and reduce beach littering by beach users with training and environmental education.Taking note on downside of both approaches we have have design an autonomous mobile battery powered beach cleaner machine that are efficient in filtering microplastic,traverse on any sandy terrains and eco-friendly.

1.2 Project Background

Pixel is a Battery powered microplastic cleaner that are focused on filtering and removing any microplastic and small trash that are mixed with the sand of coastal area and beaches. This clean up will be done at the sea shore so that we can save marine animals. A lot of marine animals depend on the beach ecosystem. However, the naked eye can’t see many of them as they are millimeters small or buried in the sand.This PIXEL runs with the power of motor system and moves by using ARDUINO programming. Inaddition to a conveyor systems to collect sand that are mixed with microplastic and filter out the microplastic through the filter compartment.

1.3 Problem Statement

I. Excessive microplastic dirt at the seashore as there is no microplastic cleaning machine which cause the marine animals dead
II. Cleaning machine has to be moved manually which required a lot man power and labor cost

1.4 Project Objectives

The abundance of microplastics in the waters and the possible physical and toxicological dangers they bring to species make them a reason for concern.Microplastics have been discovered in species of all sizes, from tiny invertebrates to huge mammals, and they can be consumed by a wide variety of animals. Laboratory studies have shown there is potential for this to lead to harmful effects and it is estimated that unless we change our ways there, within this century, will be wide scale and potentially irreversible effects in the natural environment. While there are still many unanswered questions about the amounts of microplastic debris that might be accumulating and the types of harm they could present, there is a growing consensus we should urgently take action to reduce the flow of plastic into the environment.In order to overcome this predicament we have designed a suitable machine that capable of removing the microplastic efficienctly to save the marine

1.5 Project Questions

Beaches are an essential part of humans’ lives. In addition to the range of recreational activities, they can also play a role in mitigating climate change. Beaches protect residents living near the ocean by serving as a buffer against the high winds and waves of powerful storms and help drive economic activity important to nearby communities. They also provide permanent habitats for various plants and animals. A lot of marine animals depend on the beach ecosystem. However, the naked eye can’t see many of them as they are millimeters small or buried in the sand. These are organisms that play an essential role in seawater filtration and nutrient recycling

1.6 Project Scope

To avoid pollution occurs. To avoid microplastic entering human blood due to food chain. To keep the beaches unpolluted for the younger generation and upcoming generation and to save marine animals from eating and choking from plastics and to maintain a well-balanced ecosystem .

1.7 Project Importance

Plastic pollution has a negative impact on tens of thousands of marine species globally, including sea turtles, seabirds, and marine mammals. Beach clean-ups are therefore essential to reduce the issue posed by ocean trash and the threat that plastic pollution poses to marine life.

1.8 Operation Definition

This machine is based on a four-wheel drive vehicle and the chassis consists of a chain sprocket setup for picking up the sand that are mixed with the microplastic and a filter compartment at the is used tu separate the microplastic and use vibration from a motor to speed up the filtering process.The hook for plastic bag is attached for deposition of said microplastic.An app is used to control the movement of the machine with the aid Arduino Programming.

1.9 Summary

The existence of microplastic in the coastal and beach area caused negative impact on the marine life.The small sized nature of microplastic has constantly affected marine and coastal animal like bird upon digestion.Tons of initiative have been taken to reduce the existence of microplastic in the beach and coastal area.However some of these approach required a lot of manual labor,cost,health issue and environmental issue.Upon discussion we have produced a working machine that are specialize in removal any excess microplastic from the beach and coastal area.Pixel,the battery powered microplastic cleaner focused on collecting and separating the microplastic from the sand while traverse the area controlled by an app.By using this machine we can efficiently remove the microplastic from the coastal area and beach to the marine life.

CHAPTER 2 Literature Review

2.1 Introduction

BCMs come in a variety of designs nowadays, ranging from the basic but less expensive to the complex but more expensive. To take into account both environmental and financial benefits, the idea of combining mechanised beach cleaning with manual cleaning should be taken into consideration.

To build a useful cleaning machine that is also eco-friendly, comparisons of the many beach cleaner machine on the market must be investigated. Simple design and the capacity to create devices that can collect trash from the beach are advantageous The geographic compatibility of the beach type, such as the public beaches in Kota Kinabalu, has an impact on the design and effectiveness of garbage collection. However, the cost of beach cleaners today is fairly high and not currently affordable, depending on the beach.

The pervasive issue of microplastic pollution has garnered significant attention in recent years due to its detrimental effects on ecosystems and human health. Microplastics, defined as plastic particles smaller than 5 millimeters in size, have become ubiquitous in various environmental compartments, including freshwater bodies, oceans, and even terrestrial ecosystems. Their presence poses a significant threat to aquatic and terrestrial organisms, as they can be ingested or accumulate in tissues, leading to a range of adverse effects.

Efforts to mitigate microplastic pollution have led to the development of innovative technologies, including microplastic cleaning machines, aimed at removing and mitigating the release of microplastics into the environment. These machines utilize various mechanisms and strategies to capture, separate, and dispose of microplastic particles efficiently. Understanding the advancements and challenges associated with microplastic cleaning machines is crucial for improving their effectiveness and guiding future research and development.

This literature review aims to critically analyze the existing body of research on microplastic cleaning machines. It will explore the current state of the art, discuss the different types of cleaning machines, evaluate their efficiency and limitations, and highlight the challenges faced in their implementation. By synthesizing the available information, this review will provide a comprehensive overview of the progress made in this field and identify areas that require further investigation.

The review begins by examining the types of microplastic cleaning machines currently used, including filtration-based systems, electrostatic precipitators, and magnetic separation techniques. Each method will be discussed in terms of its principles, operational parameters, and efficiency in removing microplastics from different environmental matrices.

Next, the review will delve into the advancements and innovations in microplastic cleaning machine technologies. This section will focus on recent developments such as autonomous robotic systems, machine learning algorithms for microplastic detection and classification, and integrated monitoring systems for real-time analysis of microplastic pollution.

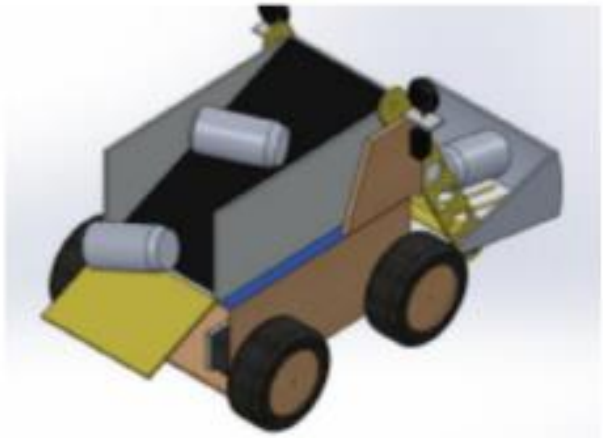
Furthermore, the review will shed light on the challenges and limitations faced by microplastic cleaning machines. These challenges may include issues related to the detection and removal of microplastics of different sizes, the effectiveness of cleaning machines in diverse environmental conditions, and the scalability and cost-effectiveness of large-scale deployment.

To provide a comprehensive perspective, the review will also highlight the gaps and future directions in microplastic cleaning machine research. It will discuss the need for standardized methodologies, improved detection and quantification techniques, and the integration of multiple technologies for enhanced efficiency and versatility.

In conclusion, this literature review will contribute to the understanding of microplastic cleaning machines, their current capabilities, and the challenges associated with their implementation. By synthesizing the available knowledge, it will serve as a valuable resource for researchers, engineers, and policymakers working towards mitigating microplastic pollution and preserving the health of ecosystems

2.2 Past Research

This remote-controlled beach cleaner was made by Nevon Projects to clean up the sand. and trash left behind by visitor.The four-wheel drive vehicle on which this proposal is based uses a chain as its chassis.trash collection mechanism with a plastic bag attached for depositing the collected rubbish. The system is controlled by a microprocessor, and the vehicle is moved by a remote-controlled motor.This simple beach cleaning device cleaned up small plastic bottles and cans, according to the data, but it was inconsistent in picking up other smaller garbage, like plastic bags and bottle caps.



A group of students from the National University of St. Agustin in Arequipa, Peru, studying systems engineering created the HS-GreenFist. This project's main goal is to assist with the

pollution issues that are harming the ecosystem. This robot can move through sand and is made to pick up trash and carry it to another location.To pick up the cans, the robot includes a separate robotic arm. In addition, the robot moves on the same theory as the caterpillar by using four wide tyres. The robot can pick up cans through the sand using the excavator arm's claw, and it also features a small scanning system with a fixed actuator.

The blades of this trash collection system revolve around a shaft that is attached to the motors. The mechanism will only activate when necessary and not for the whole of the vehicle's operation. With some consideration for ground clearance, this collection device is installed on the front side. To perform the rotating mechanism, two motors are installed on the two sides of the shaft and connected to Arduino.

Because of the way the collection mechanism is constructed, it works well in public spaces like gardens, bus stops, and pathways. The mechanism turns and the waste is directed into a collection bin that is situated directly behind the mechanism when the sensor detects fixed obstructions.

2.3 Summary

Due to the functional differences and specific requirements and conditions associated with beach cleaning, not all machines perform equally well or are suited for the project. There are a variety types of coastal debris collectors and waterfront trash. Nevertheless, in this study, customised beach cleaning machines were created and produced despite a variety of installation, local material, and experience capability obstacles, especially in removing the existence of microplastic from the and coastal area.

Microplastics, tiny plastic particles less than 5 millimeters in size, have become a major environmental concern due to their widespread presence in water bodies and their potential negative impacts on ecosystems and human health. To address this issue, researchers have been working on developing innovative solutions, including the design and implementation of microplastic cleaning machines. This summary provides an overview of recent research in this field.

1. Machine Design and Functionality:

Researchers have focused on designing efficient microplastic cleaning machines capable of effectively removing microplastics from various environments. These machines typically utilize a combination of physical and technological methods to capture and separate microplastics. Designs range from floating devices that skim the surface of water bodies to autonomous underwater vehicles equipped with specialized filters.

2. Filtration and Separation Techniques:

A key aspect of microplastic cleaning machines is the development of effective filtration and separation techniques. Various methods have been explored, including mesh filters, sedimentation tanks, and centrifugal separators. Additionally, advanced technologies like electrostatic precipitation, magnetic separation, and ion exchange resins have been investigated for their potential to improve the efficiency and selectivity of microplastic removal.

3. Monitoring and Detection:

Accurate monitoring and detection of microplastics are crucial for evaluating the performance of cleaning machines and assessing the effectiveness of microplastic removal. Researchers have developed spectroscopic techniques, such as Fourier-transform infrared spectroscopy (FTIR) and Raman spectroscopy, to identify and quantify microplastic particles. In combination with machine learning algorithms, these techniques enable real-time monitoring and data analysis, aiding in the optimization of cleaning processes.

4. Environmental Impacts:

While microplastic cleaning machines aim to mitigate the environmental impacts of microplastics, it is essential to assess any potential negative consequences associated with their deployment. Researchers have conducted studies to evaluate the impact of cleaning machines on marine ecosystems, including the effects on non-target organisms and potential alterations in the physical and chemical properties of the water environment. These assessments contribute to the development of environmentally friendly cleaning strategies.

5. Scalability and Deployment:

To address the vast scope of microplastic pollution, researchers are exploring scalable solutions and strategies for large-scale deployment of microplastic cleaning machines. This involves considering factors such as cost-effectiveness, energy efficiency, maintenance requirements, and adaptability to different environmental conditions. Some studies have also investigated the integration of microplastic cleaning machines into existing wastewater treatment plants to enhance their capacity for microplastic removal.

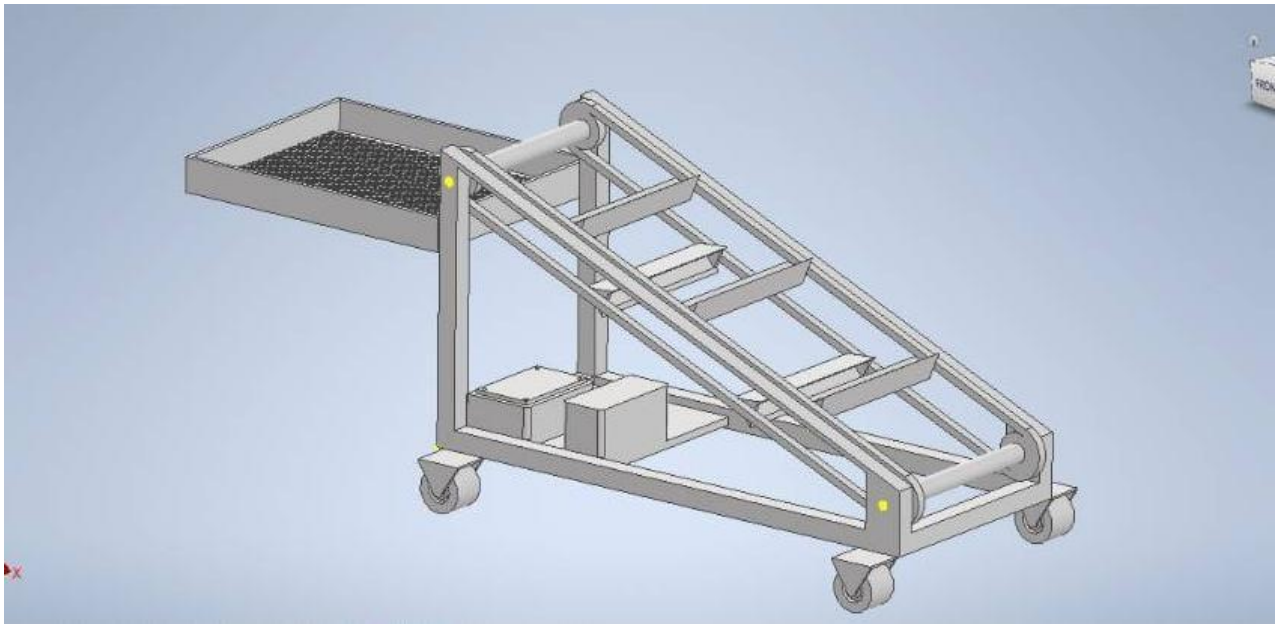
CHAPTER 3 METHODOLOGY

3.1 INTRODUCTION

This chapter will explain the method adopted by this research. This chapter will mention every component involved in conducting this research from population, population frame and sampling techniques used for the interview. Finally, this chapter provides a detail explanation of the selected mode of analysis used and data collection method.

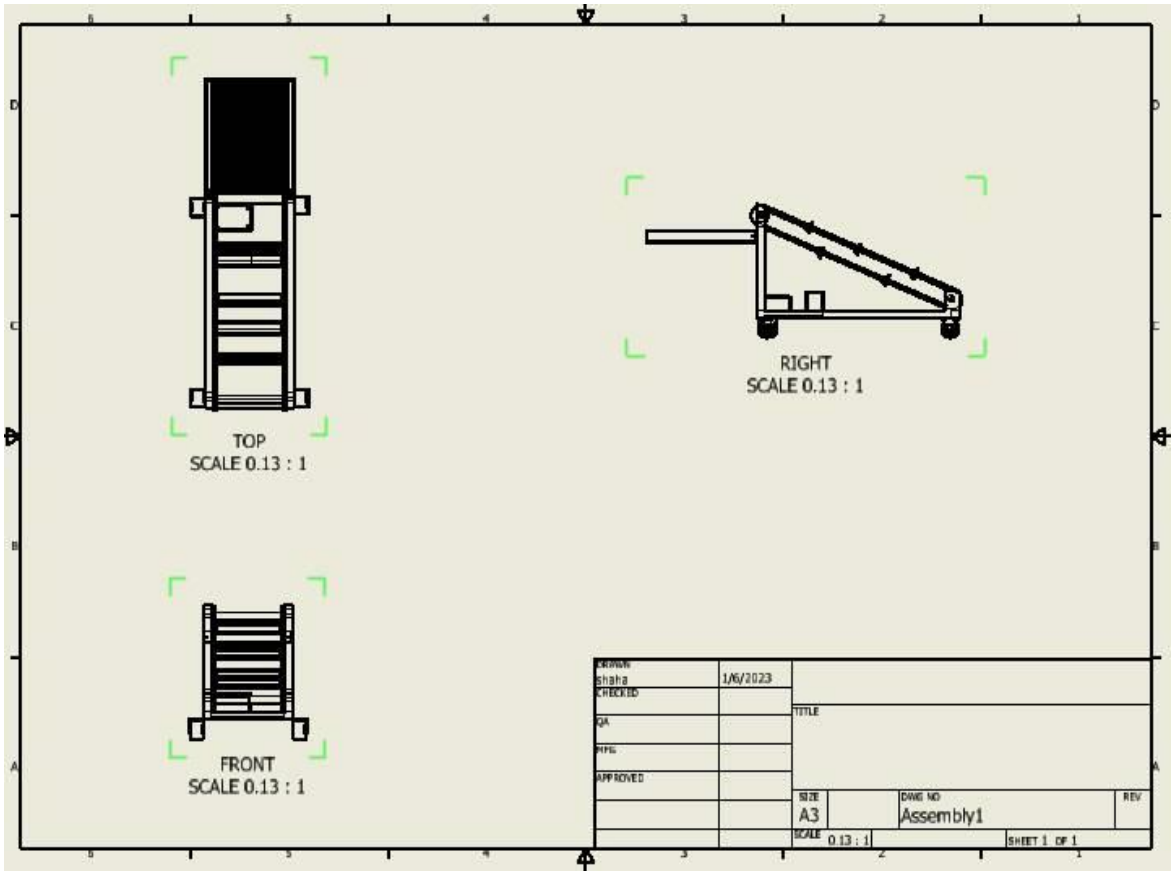
3.2 PROJECT DESIGN

3.2.1 Project Drawing & Description



3D DRAWING

Three-dimensional art is defined as art with all the dimensions of height, width, and depth. Unlike 2D art, it occupies greater physical space and can be viewed and interpreted from all sides and angles. 3D artists use various materials manipulated into objects, characters, and scenes to produce these artworks

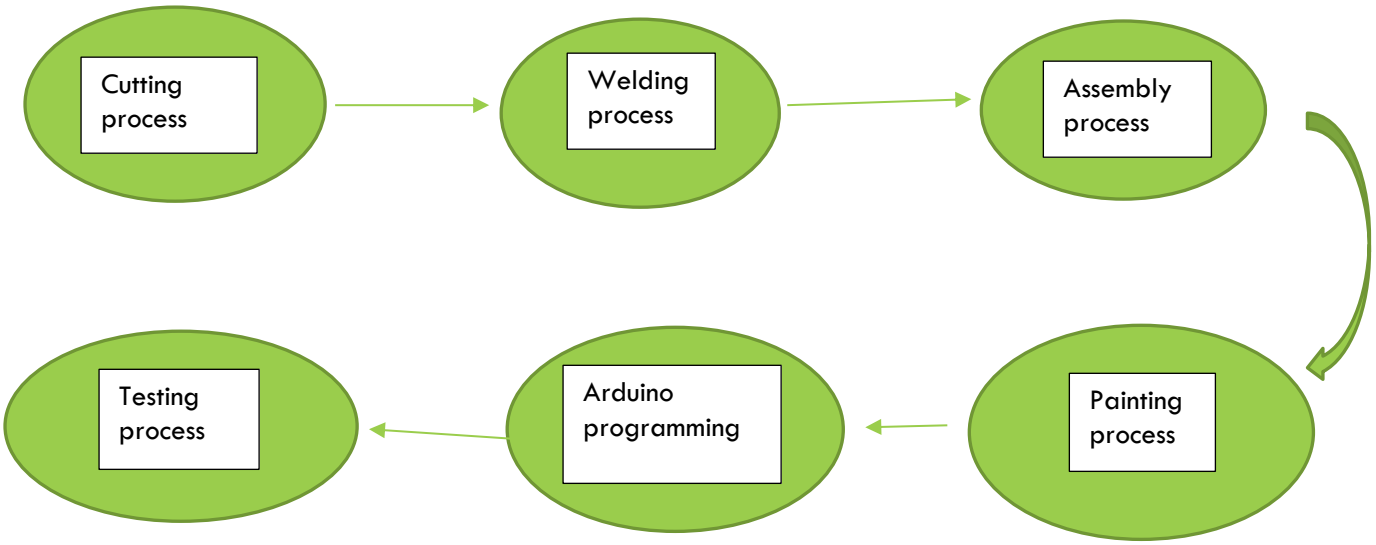


ORTOGRAPHIC DRAWING

An orthographic projection is a way of representing a 3D object by using several 2D views of the object. Orthographic drawings are also known as multi-views. The most commonly used views are top, front, and right side

PROJECT DESCRIPTION

3.2.2 Project Procedures



Cutting process

>process-Cutting is a technique where the operator moves a material (workpiece) such as metal

Welding process

>Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a join as the parts cool

Assembly process

>An assembly process utilizes machines, equipment, or workers to assemble parts and materials in a pre-defined sequence until there is a finished product

Painting process

>Painting process is making the experience of painting more important than the outcome.

Arduino programming

>Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program in Arduino language) for different Arduino boards

Testing process

>process-Testing is the process of evaluating a system or its components with the intent to find whether it satisfies the specified requirements or not.

Flow chart of working process

First we have to switch on the button in pixel

Then connect the device with bluetooth

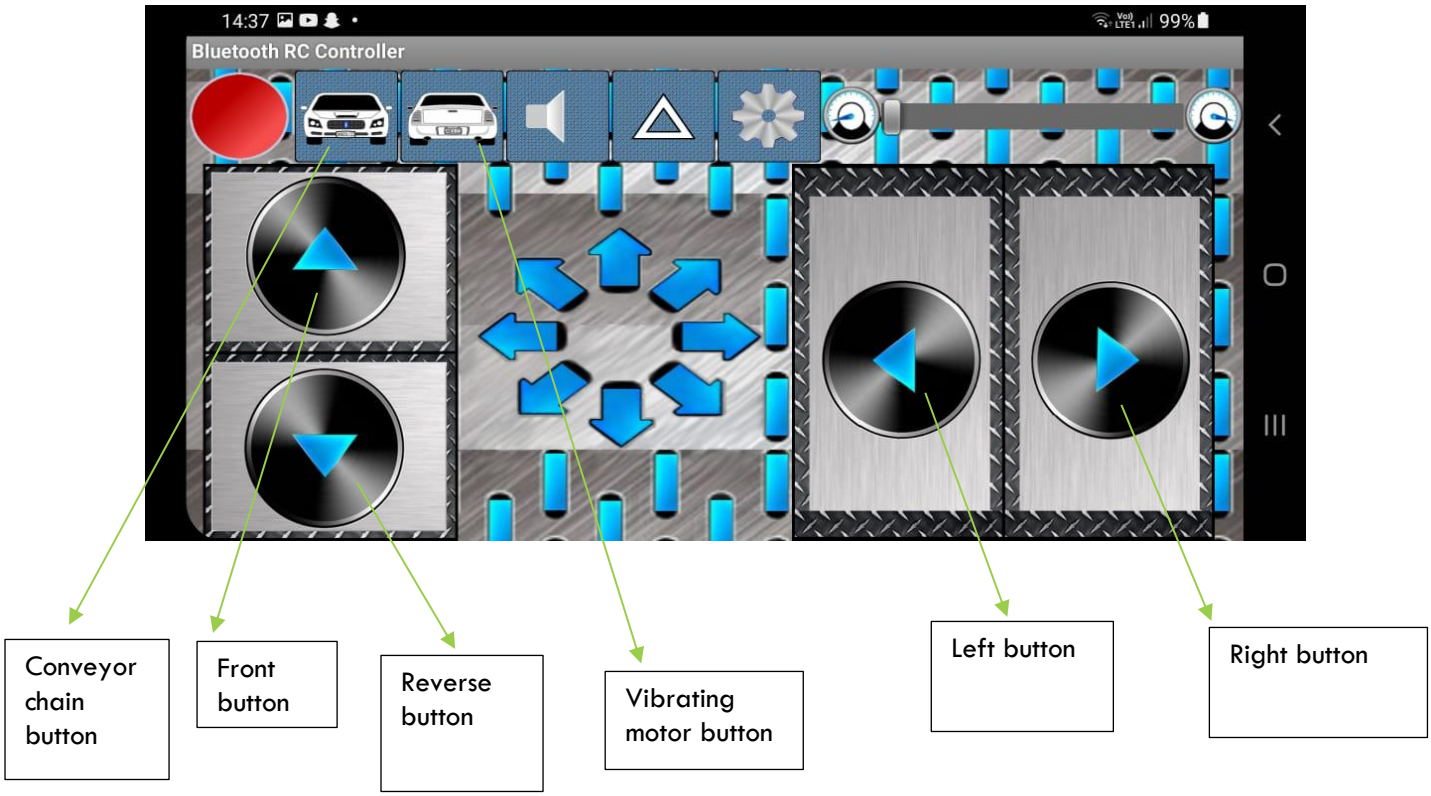
We have to control pixel by using the app in the smartphone

The machine will collect and filter the microplastic at the same time while moving

Once its done we have to collect the filtred microplastic and dispose it and also switch of the button in the pixel to shut down the systems

App used for arduino programming

Bluetooth app that we used in phone to connect to arduino programming



- This is the interior of the app where we used to move left, right, front and back . The top two button which shows the car symbol is a separate button to control the conveyor chain and vibrating motor .

3.2.3 Materials and tools

NO	MATERIALS USED AND ITS FUNCTION
1	**FRONT WHEELS**  • Used this wheel as a free moving wheel so that machine is able to move 360 degree freely without any hesitation • Height of the wheel is 3 inches
2	**REAR WHEELS**  • Has a height of six inches • Rear wheel is powered by power window motor • Ables to move left,right,forward,backward

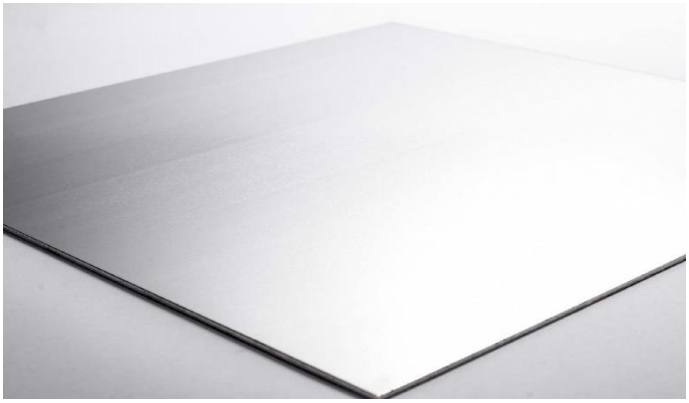
3	**HOLLOW STEEL**  • High Strength-to-Weight Ratio. • Closed Section. • Cost Saving • Sustainable and Adaptable.

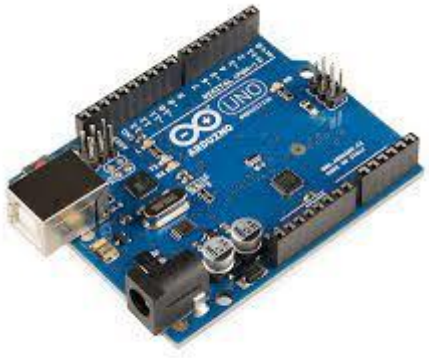
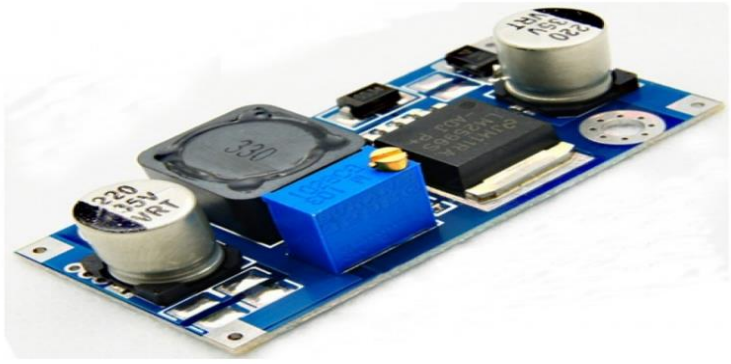
4	**MINI BUCKET**  • This bucket is specially designed to pick microplastic dirt only

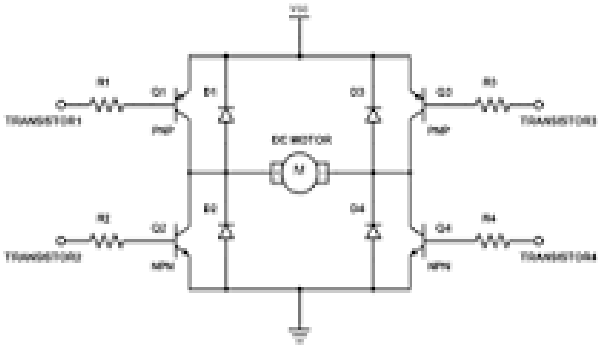
5	**CYCLE CHAIN**  We used this chain because it has : • Durability. ... • Less Friction. ... • Shifting Performance. ... • Noise Reduction.
5	**DC MOTOR**  • Good speed control. DC motors offer highly controllable speed. • High torque. • Seamless operation. • Free from harmonics.

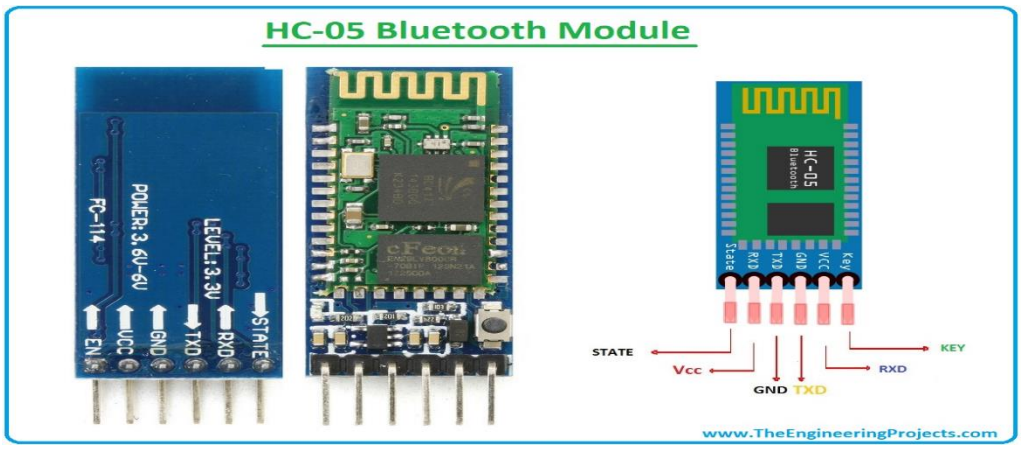
7	**VIBRATING MOTOR**  • We used this vibrating motor to separate microplastic from the sand where it will vibrating under the net and the sand will automatically separate the microplastic dirt from sand.
8	**FILTERING NET**  • To separate microplastic from sand

9	**SPROCKETS**  • 18-Toothed steel sprockets • As the sprocket spins, the teeth grab onto the chain and move other parts that interlock with the chain. This sequential series of operations allows for simple and controlled rotational movement of larger equipment and machinery
10	**LEAD- ACID BATTERY** •  • This battery is a rechargable battery and it has many advantages such as : - Inexpensive and simple to manufacture. - Mature, reliable and well-understood technology - when used correctly, lead-acid is durable and provides dependable service. - The self-discharge is among the lowest of rechargeable battery systems. - Capable of high discharge rates.

11	**NUT AND BOLTS**  • Is used to hold the sprockets • Holds the front and back tyre
12	**ALUMINIUM SHEET**  • Is used to make filter tray. • Light weight and vibration repellent

No	Arduino Parts
1	Arduino Uno Board  Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.
2	Step-down module  A step-down, or buck, converter is a DC/DC power converter that reduces the input voltage and provides a lower output voltage

3	Motor Controller   We use motor drivers to give high power to the motor by using a small voltage signal from a microcontroller or a control system. If the microprocessor transmits a HIGH input to the motor driver, The driver will rotate the motor in one direction keeping the one pin as HIGH and one pin as LOW.

4	Bluetooth module  The HC-05 Bluetooth Module is a simple Bluetooth SPP (Serial Port Protocol) module that allows for the setup of a transparent wireless serial connection. Its communication is via serial communication which makes an easy way to interface with the controller or PC
5	Power window motor  The window motor is a relatively simple component that provides power to a series of gears, which are responsible for pushing the window glass up or pulling it down. They are connected to a switch, which is placed next to the door handle and can be activated by pulling a lever or pressing a rocker or can be controlled by smartphones.

6	Relay module  A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.

Tools used to do this machine and its uses

NO	NAME OF TOOLS
1	MIG-Welding machine  MIG welding (metal inert gas welding) is one of several welding processes that use electricity to melt and join pieces of metal. MIG welding uses lots of electricity to create an electrical arc between an electrode wire and the metal being welded. The arc melts the wire, which is then deposited to create the weld.
2	GRINDING MACHINE 

	A grinding machine, often shortened to grinder, is a power tool (or machine tool) used for grinding. It is a type of machining using an abrasive wheel as the cutting tool. Each grain of abrasive on the wheel's surface cuts a small chip from the workpiece via shear deformation.
3	PILIARS  Used to hold metal parts when welding
4	HAMMER  hammers are used for general carpentry, framing, nail pulling, cabinet making, assembling furniture, upholstering, finishing, riveting, bending or shaping metal, striking masonry drill and steel chisels, and so on. Hammers are designed according to the intended purpose.

5	CORDLESS DRILL  Cordless drills are mostly used for replacing screwdrivers. These tools are used in conjunction with drill bits, which are typically rotating cutting tools used to make holes. Using the relevant bit, cordless drills can also rotate counterclockwise, ideal for removing screws as well as drilling them in.
6	LAPTOP AND ARDUINO APP  The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains 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 connects to the Arduino hardware to upload programs and communicate with them.

7	SPRAY PAINT  Using spray paint allows you to cover surfaces quickly and more evenly than traditional paint, and can be an effective way to touch up or apply a new coat of paint for many different kinds of DIY projects

3.3 Summary

This chapter clearly tells us about the project design and description . Moreover it, shows the process that pixel has gone through to be created and the working process of pixel . It shows the materials and tools that has been used to create pixel . Also it tells and explain what programming we used to do the movement of pixel and app that will be connected through our mobile phone.

CHAPTER 4 FINDINGS AND DISCUSSION

4.1 Introduction

Battery powered microplastic cleaner means it is to clean up all the small particles which is made from plastic . This clean up will be done at the sea shore so that we can save marine

animals. A lot of marine animals depend on the beach ecosystem. However, the naked eye cannot see many of them as they are millimeters small or buried in the sand. This PIXEL runs with the power of motor system and moves by using ARDUINO programming.

4.2 Testing

We have tested our pixel microplastic cleaner at the seashore and this proves that it solves the problem statement and hence it achieves the main objective of our machine which is :

a) Remove mircoplastic dirt from the sea shore where it can save marine animals by solving this issue they will not consume mircoplastic and pollute the food chain.

b) Decrease the amount of manpower needed to do the cleaning as the machine can be moved using our mobile phone through bluetooth connection.

4.3 Summary

Therefore, this pixel resulted in a success where it achieves the objectives and solves the problem statement. So this machine will help the coastal area or beaches to be kept clean by using less manpower and efficient cleaning

CHAPTER 5 CONCLUSION AND SUGGESTIONS

5.1 Introduction

We have designed a machine to oppose the microplastic pollution . Our machine is able to traverse on the beach , collect trash found in the vicinity and transport it to a dumpster .The microplastic machine is an efficient modern day machine.

5.2 Conclusion

We have designed a machine to oppose the microplastic pollution. Our machine is able to traverse on the beach, collect trash found in the vicinity and transport it to a dumpster. They use Arduino programming to move the machine which is connected through an mobile app. It has two powered motors for the tyre and one lead acid battery which powers the microplastic cleaning machine . The microplastic machine is an efficient modern-day machine but the use of computers and a complex operating mechanism makes this machine little hard to use but as far beach cleaning and remote operation are concerned this project resulted in success.

5.3 Suggestion

According to our project research, we as a team suggested to have more chain and buckets to be added to the project so that the efficiency of running a microplastic cleaning machine at the seashore will be more effective as the project we created is a prototype . This prototype explains and understands the responsibility party the drawback of microplastic at the seashore.

5.4 Project Limitation

The limitations of a microplastic cleaner project can vary depending on various factors, including the specific type of plastic cleaner being used and the environmental conditions of the beach. However, here are limitations that may be associated with microplastic cleaner project:

a) Only efficient in cleaning small debris: They are primarily designed to collect smaller items like plastic bottles, cigarette butts, and other small litter. As a result, larger debris may require manual removal or alternative methods.

b) Limited effectiveness on wet or compacted sand: Microplastic cleaner may encounter difficulties in effectively cleaning wet or compacted sand. Wet sand can become heavy and clumpy, making it harder for the machine to pick up debris efficiently. Compacted sand may also be challenging to clean, as the machine's brushes or rakes may struggle to penetrate the surface effectively.

c) Energy consumption and environmental impact: Our microplastic cleaning rely on battery powered , which can contribute to air and noise While efforts have been made to develop more eco-friendly alternatives, such as electric or solar-powered microplastic cleaner, they may have limitations in terms of power and efficiency.

5.5 Summary

It's important to note that technological advancements and ongoing research are continuously addressing some of these limitations and project suggestion. Manufacturers are working on improving the efficiency, mobility, and environmental impact of beach cleaners to enhance their overall effectiveness. Additionally, combining plastic cleaning efforts with educational programs and public awareness campaigns can help prevent littering and reduce the amount of debris that needs to be cleaned in the first place.

References

- Beach cleaner. MY Clean Beach. https://mycleanbeach.org/
- Equipment. Clean Sand. https://www.cleansands.com/
- What is microplastic. National Ocean Service. https://oceanservice.noaa.gov/facts/microplastics.html#:~:text=Most%20plastics%20in%20the%20ocean,through%20waterways%20into%20the%20ocean.

Appendix

a) GANTT CHART

GANTT CHART

SESION : II:2022/2023
DEPARTMENT : MECHANICAL ENGINEERING
CODE/COURSE : DJJ50193 PROJECT 2

	WEEK/ PROJECT ACTIVITY	STATUS	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14
1	Project briefing, iSOLMS briefing	P														
		A														
3	IOT workshop	P														
		A														
4	Data collection and analysis workshop	P														
		A														
	project requirement															
	project plan															
	project scope and limitation															
	project methodology															
		A														
6	Project Development	P														
	project development details															
	project techniques and tools															
		A														
7	validity and reliability measurement	P														
	project results and analysis															
		A														
8	Project report writing and review by supervisor	P														
		A														
9	Proceeding Paper review by supervisor	P														
		A														
10	Project Inventory Form submission	P														
		A														
11	Poster review by supervisor	P														
		A														
12	Mechanical Innovation, Challenge and Exhibition (MICE) SESSION II:2022/2023	P														
		A														
13	Logbook and report submission	P														
		A														
14	PITEC 4 PSA (Project Exhibition and Presentation)	P														
		A														

Planning
Actual

Project Costing

Materials	Price
Front Wheels (2x)	20
Rear Wheels (2x)	30
Hollow Steel 8 feet	150
Mini Bucket (7x)	50
Cycle Chain (2x)	20
DC Motor (2x)	30
Vibrating Motor (1x)	25
Filtering Net	5
Sprocket	15.30
Lead Acid Battery	55
Nut and Bolts	75
Aluminium Sheet	8

Total Costing : RM 483.30