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ROBOT FOR EFFECTIVE PLASTIC WASTE COLLECTION IN RIVER

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Abstract: Plastic garbage in reservoirs causes significant harm to water quality, aquatic life, and the entire ecosystem. This paper presents a low-cost water waste cleaning robot to collect floating waste in ponds and lakes, composed of commonly available low-cost materials requiring little human labour. This study aims to develop a robot that can collect floating trash in place of humans and evaluate the performance of the proposed system. This automatic system is constructed of floatable material and will float on the water together waste materials. A simple smartphone application is used to control the robot's cage-like framework, resulting in an. extremely user- friendly interface. The waste trapped inside will have to be manually taken out of the bot before a second launch. Successful experiments have been made to collect different types of plastic waste in a small water body. The robot's operating range and battery life are measured to ensure an efficient cleaning process in terms of time. Furthermore, the operator may adjust the robot's speed to make movement simple and precise**.**

Keywords - Eco-friendly robot, floating waste cleaner, remote-controlled bot.

I. Introduction

In response to the urgent need to address the escalating environmental crisis of plastic pollution in oceans, this project presents a cutting-edge robot model specifically designed to tackle the challenge of plastic waste collection. With marine plastic debris reaching alarming levels, there is a critical demand for innovative solutions to mitigate its profound and wide- ranging impact on marine ecosystems. Our proposed robot introduces a novel approach to ocean cleanup by leveraging advanced technology to streamline the collection process. At the heart of our solution is the integration of a conveyor setup within the robot& design, enabling seamless and efficient collection of plastic waste in aquatic environments. This conveyor system enhances the robot ability to navigate through water bodies while effectively gathering plastic debris, thereby maximizing its cleanup capabilities. By utilizing Bluetooth commands, operators can remotely control the robot movements, directing it to targeted locations for precise and targeted cleanup efforts. The autonomy of the robot further enhances its effectiveness in addressing the pervasive issue of oceanic plastic pollution. With the ability to operate independently, the robot can navigate challenging marine environments with agility and adaptability, ensuring comprehensive coverage in its cleanup endeavors. This autonomous system represents a significant advancement in ocean cleanup technologies, offering a promising solution to the global challenge of plastic pollution in oceans. By revolutionizing the approach to ocean cleanup, our robot model aims to contribute significantly to the broader initiative for environmental preservation and the restoration of sustainable marine ecosystems. Through its technologically sophisticated design and efficient waste collection capabilities, the robot underscores our commitment to mitigating the adverse effects of plastic pollution on marine life and habitats. Ultimately, this project represents a crucial step towards achieving a cleaner, healthier, and more sustainable ocean environment for current and future generations.

II. RELATED WORK

- Towards achieving Smart city mission in India, a smart E-dustbin has been designed in IoT based solution was proposed for monitoring the status of the dustbin and e-mail notification is sent to the user.
- Many works in literature have focused on building embedded systems for ensuring safe and clean India mission.
- A metallic waste collection robot was proposed in for automating waste removal in factories
- A mechanical model for drainage system cleaning using propeller, cleaner, belt drives and pan is proposed. The system was tested on rainy days in three different months to evaluate the effectiveness of the developed system. The system performed to a considerable extent in all possible test conditions.
- Development of Clean Environment.

III. OBJECTIVE

- The objective of this robot model is to develop an autonomous and efficient solution for plastic waste collection in oceans.
- By implementing a conveyor setup and utilizing Bluetooth commands for control, the robot aims to streamline the collection process. Accumulate maintenance processes: Integrating IOT data with maintenance systems to automate and minimize the repair workflows.
- The primary goal is to enhance the effectiveness of ocean cleanup efforts by providing a robotic system capable of autonomously navigating through water bodies, targeting and collecting plastic waste.
- This technological innovation seeks to contribute to environmental conservation by mitigating the detrimental impact of plastic pollution on marine ecosystems.

IV. LITERATURE SURVEY

[1] Waste Management Improvement in Cities using IoT Garbage collection is one of the most critical problems faced by Municipal Corporation. While implementing the waste management in cities the biggest challenge is the management of waste in cost optimal way with high performance. The current process of collecting the waste, separating it and transporting the containers everyday which is a complicated process. This paper deals with the concept of waste management and the smart
System for waste management with higher benefits to the society. The proposed system for waste management will use various sensors for sensing the type of waste and separate the waste in different categories and actuator to inform the management to collect the waste container. This system will save money and time compared to the already available process of waste management and also improves the society cleanliness.

[2] Imam Hossain, Dipankar Das, GolamRashed Internet of Things (IoT) provides a platform where devices can be
Connected, sensed and controlled remotely across a network infrastructure. In this paper we propose a smart campus model using IoT technology and its purpose is to achieve the intelligent management and service on campus. After analysing various research studies, we have designed IoT based smart campus model which incorporates campus oriented application services. The designed smart campus model is worked the based on the idea of the three network hierarchy as perception layer, network layer, and application layer. Services will be provided to the end users via mobile application and display monitoring infrastructure by our proposed model. Before deploying such architecture, we have identified the challenges for design smart campus model. We have implemented some of the application services using hardware and software platform. Finally, we tested the viability of our
Proposed smart campus model by experiment.

[3] Waste is becoming a potential contributor to environmental pollution. The perk of waste management is significantly increasing with the growing population. This would have never been an issue if we would have segregated the waste at home, in the first place. This ignorance and indifference has led us to ‘Smart Waste Segregation System The smart waste segregation system is built with an array of sensors. They are inductive proximity, IR and moisture sensors which will segregate the collected wastes into dry and wet waste. In this approach, first waste is sent in the conveyor belt through inductive proximity sensor that detects and segregates metallic waste which can be sent to scrap recasting units. Then the non-metallic

waste is sent through IR sensor that separates plastic waste and finally moves through moisture sensor using which wet waste can be collected which are used for making manure or biogas and remaining miscellaneous waste like medical waste can be disposed or incinerated ethically. Waste management is essential to maintain an ecological balance, and this approach can make it time conservative and efficient.

[4] Smart Waste Detection and Segregation A methodology to estimate the impact of waste management on urban air pollution and health. The analysis is described in the following four steps: (1) collecting data on the waste sector; (2) modelling the emissions arising from waste management; (3) transforming emissions to concentration values and (4) estimating the burdens on health. The assessment has been conducted using the CCAC SWEET tool and WHO Air. The method presented can be used in different locations, depending on data availability, when analysing the impact of and potential changes to waste sector policies. The results of this health impact assessment indicate that, based on the emissions of PM2.5 from the waste sector in Accra, change from the business-as-usual to more sustainable options would reduce air pollutants emissions and avert 120 premature deaths in 2030. Levels of air pollution in Accra are significant and interventions to reduce PM2.5 exposure should be promoted. The detailed analysis of the current situation provides suggestions for waste management policies in terms of impacts on health and ideas to reconsider the waste policies in Accra.

V. RESEARCH METHODOLOGY

The proposed system integrates key components to create an effective robotic solution for oceanic plastic waste collection. A Bluetooth module serves as the communication interface, allowing users to control the robot remotely. The power supply unit ensures continuous operation, powering the entire system. The core control system is managed by an Arduino Uno, which interprets Bluetooth commands and orchestrates the movements of both the conveyor setup and the robot model. The conveyer setup utilizes motor drivers to control two DC motors, facilitating the efficient collection of plastic waste. Robot model incorporates motor drivers for its two DC motors, enabling autonomous navigation. This cohesive integration of components forms a robust and adaptable system that addresses the challenges of oceanic plastic pollution through technological innovation and automation

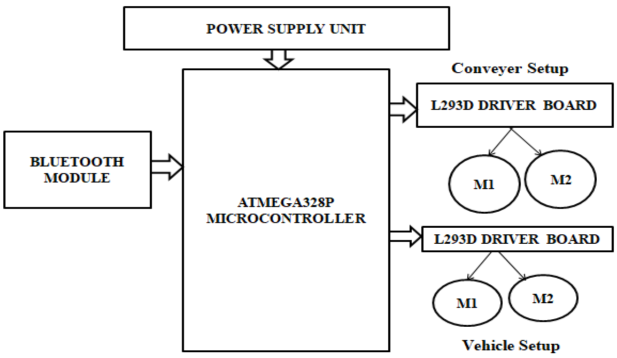
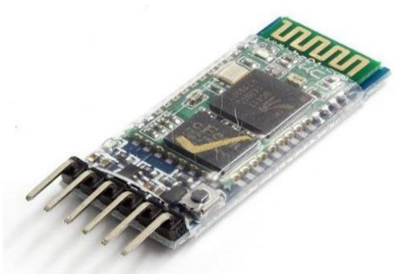


Fig .system architecture

5.1 Bluetooth Module

The Bluetooth module serves as the communication interface, allowing users to control the robot remotely. It enables wireless communication between the user's device and the robot, facilitating commands for navigation and operation.



5.2 Power Supply Unit

The power supply unit ensures continuous operation by providing the necessary electrical power to all components of the system. It powers the motors, control systems, and other electronic components, ensuring uninterrupted functionality during cleanup operations.

5.3 Arduino Uno

In this project, The Arduino Uno serves as the core control system of the robot. It interprets Bluetooth commands received from the user and orchestrates the movements of both the conveyor setup and the robot model accordingly. The Arduino Uno's programmable nature allows for flexible control and coordination of various system components.

5.4 Conveyor Setup

In this project, the conveyor setup utilizes motor drivers to control two DC motors. These motors drive the conveyor belt, facilitating the efficient collection of plastic waste from the ocean surface. The conveyor setup is designed to effectively transfer collected waste onto the robot for storage, ensuring a streamlined cleanup process.

5.5 Robot Model

The robot model incorporates motor drivers for its two DC motors, enabling autonomous navigation through the water. These motors drive propellers or other propulsion mechanisms, allowing the robot to move independently and cover a wide area during cleanup operations. The robot's autonomous capabilities enhance its efficiency and effectiveness in collecting plastic waste.

5.6 L293D –Motor Driver IC

We start with the L293D. L293D is a popular motor driving IC. It is a 16 pin IC. The IC has 8 pins on both the sides. It has 2 enable pins, 1 V_{SS} pin, 1 V_S pin, 4 ground pins, 4 input pins and 4 output pins. Though not required here, but in case you wish to learn how to interface L293D with a microcontroller.

5.7 DC MOTOR

Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

VI.SOFTWARE IMPLEMENTATION

6.1 ARDUINO UNO

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software_library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program argued to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino_boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

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VII. ADVANTAGE

1. The conveyor setup and autonomous robot model enable a systematic and efficient collection of plastic waste, covering a larger area in oceans.

2. The Bluetooth module allows for remote control, enabling users to direct the robot to specific locations, enhancing flexibility and adaptability in cleanup efforts.

VIII. PROCESS:

The proposed system integrates key components to create an effective robotic solution for oceanic plastic waste collection. A Bluetooth module serves as the communication interface, allowing users to control the robot remotely. The power supply unit ensures continuous operation, powering the entire system. The core control system is managed by an Arduino Uno, which interprets Bluetooth commands and orchestrates the movements of both the conveyor setup and the robot model. The conveyer setup utilizes motor drivers to control two DC motors, facilitating the efficient collection of plastic waste. Robot model incorporates motor drivers for its two DC motors, enabling autonomous navigation. This cohesive integration of components forms a robust and adaptable system that addresses the challenges of oceanic plastic pollution through technological innovation and automation.

IX.FUTURE SCOPE

ISIS has wide range of components in its library. It has sources, signal generators, measurement and analysis tools like oscilloscope, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, switches, displays, loads like motors and lamps, discrete components like resistors, capacitors, inductors, transformers, digital and analog Integrated circuits, semi-conductor switches, relays, microcontrollers, processors, sensors etc.

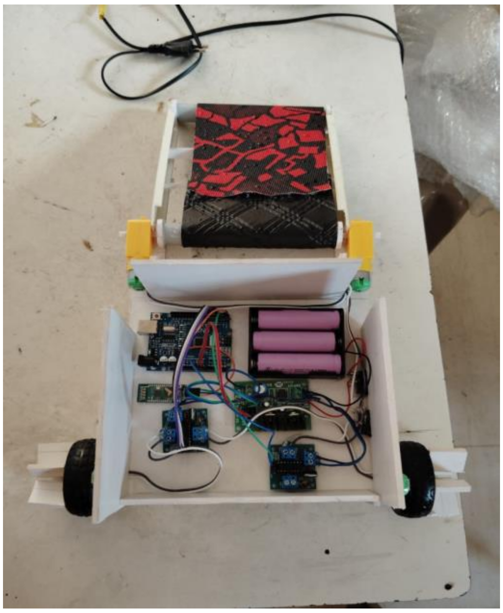
ARES offers PCB designing up to 14 inner layers, with surface mount and through whole packages. It is embedded with the foot prints of different category of components like ICs, transistors, headers, connectors and other discrete components. It offers Auto routing and manual routing options to the PCB Designer. The schematic drawn in the ISIS can be directly transferred ARES.

X.APPLICATION

- Ocean Clean-up Operations
- Harbour and Coastal Clean-up

XI. RESULTS AND DISCUSSION

The proposed robotic solution for oceanic plastic waste collection represents a significant advancement in addressing the urgent environmental challenge of marine pollution. By integrating key components such as a Bluetooth module, power supply unit, and Arduino Uno, the system offers a comprehensive and adaptable approach to remote control and operation. The Bluetooth module serves as the communication interface, enabling users to remotely control the robot's movements, thus facilitating targeted clean-up efforts in oceanic environments. Additionally, the power supply unit ensures continuous operation, essential for sustained clean-up activities across vast marine areas. At the heart of the system lies the Arduino Uno, which acts as the core control system, interpreting Bluetooth commands and orchestrating the synchronized movements of both the conveyor setup and the robot model. This centralized control mechanism streamlines the operation of the entire system, enhancing its efficiency and effectiveness in collecting plastic waste from oceans. The conveyer setup, driven by motor drivers controlling two DC motors, enables the efficient gathering of plastic debris, while the robot model, equipped with its own motor drivers, autonomously navigates through marine environments, further enhancing the system's versatility and adaptability. The cohesive integration of components in this robotic solution forms a robust and technologically advanced system capable of addressing the challenges posed by oceanic plastic pollution. By leveraging automation and innovation, this solution offers a promising pathway towards more effective and sustainable clean-up efforts in marine environments, ultimately contributing to the conservation of ocean ecosystems and the protection of marine biodiversity.



XII. CONCLUSION

In this paper, a cost-effective robot has been implemented to collect the floating wastes on the water surfaces. Experimental results show that the designed system stably floats on the water surface, works perfectly, and can accumulate floating waste with ease. All the controls involved in this system are straightforward and can be operated by anyone with just a smartphone in hand. The total system is exceptionally inexpensive (USD 100). In the future, the proposed system can be entirely automatically operated to collect waste by exchanging data amongst other bots connected under one central server, and consequently, Raspberry Pi or Jetson Nano can be utilized. The Bluetooth module can be replaced with a Wi-Fi or RF module to increase the device's operating range.

XIII. REFERENCES

1. Hasan, M. K., Shahryar, A., Jim, K. U.: Water pollution in Bangladesh and its impact on public health. Helicon, 5(8) (2019).

2.Z. Wang and Y. Liu, "Global AsymptoticStabilization Control of a Lake Surface Cleaning Robot,"in Proc. 2009 IEEE Int. Conf. on Information and Automation (2009).

3. Shridhar, K., Vijay, B., Siddarth, and K.: Aqua drone remote controlled unmanned river cleaning BOT. BVB College of Engineering and Technology, Hubballi (2016).

4. Dunbabin, A. Grinham, J. Udy, "An Autonomous Surface Vehicle for Water Quality Monitoring, "Australasian Conf. on Robotics and Automation (2009).

5. Ruangpayoongsak, N., Sumroengrit, J., Leanglum, M.: A floating waste scooper robot on water surface. International Conference on Control, Automation and Systems, pp. 1543–1548. Jeju, Korea (2017).

6. Sumroengrit, J., Ruangpayoongsak, Economic floating waste detection for surface cleaning robots. MATEC Web of Conferences, 95 (2017)

7. KeweiSha, Wei, Wei, Andrew T. Yang, Howie Wang, WeisongShi, "On security challenges and open issues in Internet of Things", Future Generation Computer Systems (2018).

8. Tariku Islam, S. C. Mukhopadhyay, N. K. Suryadevara, "Smart Sensors and Internet of Things: A Postgraduate paper", 2016 IEEE.

9. Yongfeng Cui, Yanking Ma, Zhengyuan Zhao, Ya Li, Wei Liu, Wanneng Shu, "Research on data fusion algorithm and anti-collision algorithm based on internet of things", Future Generation Computer Systems (2018).

10. Keyur K Patel, Sunil M Pate, "Internet of Things-IOT: Definition, Characteristics, Architecture, Enabling Technologies, Application & Future Challenges", International Journal of Engineering Science and Computing, May 2016.

11. Oscar Novo, "Block-chain Meets IoT: an Architecture for Scalable Access Management in IoT", JOURNAL OF INTERNET OF THINGS CLASS FILES, VOL. 14, NO. 8, MARCH 2018.