The River Cleaning Robot Using IoT

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Abstract ***The River Cleaning Robot represents a specifically designed to combat the escalating issue of waterway pollution. As rivers and water bodies worldwide face mounting threats from human- induced contaminants, this autonomous or remotely operated robot offers a promising and efficient solution to restore and maintain their health. Powered by renewable energy sources, such as solar panels or rechargeable batteries, the River Cleaning Robot operates with minimal environmental impact. The River Cleaner Robot operates through a smartphone application utilizing Bluetooth technology, enabling users to remotely control its movements and cleaning functions. Equipped with sensors, the boat can identify and locate pollutants such as plastic waste, debris, and other contaminants in real-time, facilitating targeted and effective cleanup operations. Its intelligent and eco- friendly design, coupled with its ability to operate autonomously in challenging environments, make it an indispensable tool in safeguarding the health and biodiversity of our precious water bodies.***

Keywords: ***Arduino Uno, L298 Motor Driver, DC Gear Motor, Conveyor Belt, Lithium-Ion Battery, Iron Metal Sheet,PVC Pipe.***

1. INTRODUCTION

Underground fault detection is a critical step in discovering faults and flaws in the subsurface electrical distribution network. Faults in underground cables can result in power outages, safety problems, and electrical equipment failure. Underground fault detection is the process of locating and diagnosing defects in underground cables using specialist equipment. This technology detects cable problems using a variety of ways, including acoustic, electromagnetic, and ultrasonic waves.

One of the most prevalent causes of underground cable problems is insulation degradation, which can be caused by age, environmental factors, or mechanical damage. Other prevalent hazards are cable faults caused by excavation and cable joint failures. Detecting subsurface faults might be difficult because the wires are buried and not visible. However, technological advancements have enabled faster and more accurate fault detection. Underground fault detection requires a team of skilled professionals that utilize sophisticated equipment and software to discover and diagnose issues. Once the defect has been identified, the repair process can begin, which may include excavation, cable splicing, or replacement.

Underground faults must be detected and repaired as soon as possible to ensure the reliability of the electrical distribution system. It helps to prevent power outages, reduces safety risks, and extends the life of electrical equipment. To summarize, underground fault detection is an important procedure for discovering and repairing defects in the subsurface electrical distribution system. Locating and diagnosing issues requires specialized equipment, trained people, and advanced technologies. Fault detection and repair can assist maintain a dependable electrical distribution system, avoid power outages, and eliminate safety risks.

The navigation system is fully integrated into the robot's overall control system, allowing for seamless communication between various components. This integration allows for remote monitoring and control of the robot's navigation behavior, as well as the capacity to accept commands and updates from operators or central control centers.

Adaptability and Learning: Some advanced river cleaning robots may use machine learning techniques to improve navigation performance over time. By studying previous navigation data and outcomes, the robot can learn to anticipate obstacles, optimize cleaning routes, and adapt to changing environmental circumstances, increasing its efficiency and efficacy in river cleaning operations.

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2. LITERATURE REVIEW

"Amphibious clean - up robot" published by ICIA in 2017.It has ability to operate both in water as well as on land, facilitating the cleaning of various environments. It is potential complexity of their design and mechanics. Hybrid Mobility: One of the key complexities of an amphibious robot is achieving efficient mobility both in water and on land[1]. Designing a propulsion system that allows seamless transition between these two mediums while maintaining stability, maneuverability, and energy efficiency can be challenging. Engineers may explore options such as paddle wheels, thrusters, or articulated legs to achieve optimal mobility[2]. Waterproofing and Buoyancy Control: Ensuring the robot's electronic components and mechanical systems are adequately waterproofed to withstand immersion in water is crucial. Additionally, managing buoyancy to prevent sinking or floating too high requires careful consideration of the robot's weight distribution, flotation devices, and ballast systems. [3]

"Wireless communication-based water surface cleaning robot" published by ICOEI in the year 2020. It involves employing wireless communication technology to remotely control and monitor the robot operation on water surface[4]. The main disadvantage is susceptibility to single interference. In an environment of high radio frequency interference, robot communication will be disrupted. Wireless Communication Technology[5]. The use of wireless communication technology enables operators to remotely control the water surface cleaning robot without the need for physical tethering. This provides flexibility and convenience in controlling the robot's movements and cleaning operations from a distance. Operational Efficiency[6]. By employing wireless communication, the robot can cover larger areas of water surfaces efficiently and effectively. Operators can monitor the robot's progress in real-time, adjust its trajectory as needed, and optimize its cleaning patterns for maximum coverage and pollutant removal.

Integration of Sensors and Actuators: The robot likely integrates various sensors and actuators to facilitate its cleaning operations. Sensors may include cameras for visual monitoring, water quality sensors for pollutant detection, and proximity sensors for obstacle avoidance. Actuators such as brushes, suction pumps, or nets are used for debris collection and removal. [7]

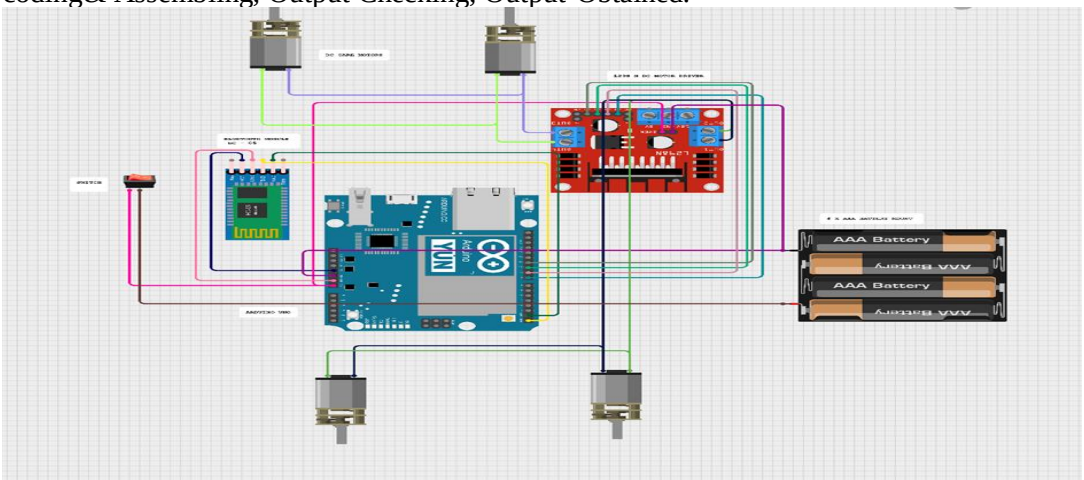
"Bio-Waste cleaning boat" published by IRJET in the month of November 2021. It utilizes a boat equipped with a specialized system to collect bio waste from water bodies. Dependency on the effectiveness of waste detection systems. If these systems are not highly accurate. Purpose and Functionality[8]. The primary objective of the bio-waste cleaning boat is to collect and remove bio waste materials, such as organic debris, algae blooms, or other biological pollutants, from water bodies. The boat is equipped with specialized systems, such as nets, skimmers, or suction pumps, designed to efficiently capture and contain bio waste for proper disposal[9]. Dependency on Waste Detection Systems: The effectiveness of the bio-waste cleaning boat heavily relies on the accuracy and reliability of its waste detection systems. These systems may include sensors, cameras, or imaging technologies capable of detecting and identifying bio waste materials in water. If these detection systems are not highly accurate, the boat may struggle to effectively locate and collect bio waste, leading to incomplete cleaning or inefficient operation. [10]

3. PROPOSED METHODOLOGY

- The problem statement for the river cleaning robot revolves around the increasing pollution of water bodies, which poses a significant threat to aquatic life and human health. Manual cleaning of rivers and lakes is time-consuming, expensive, and sometimesdangerous.
- **Pollution of Water Bodies:** Water bodies, including rivers and lakes, are becoming increasingly polluted due to various factors such as industrial waste, plastic debris, and other pollutants. This pollution affects aquatic ecosystems and human well- being.
- **Inefficiency of Manual Cleaning:** Traditional methods of manual cleaning are inefficient and labour intensive. They require human workers to wade into water, collect debris by hand, and dispose of it properly. This process is time-consuming and costly.
- **Safety Concerns:** Manual cleaning poses risks to the safety and health of cleaning personnel. Exposure to contaminated water, sharp objects, and hazardous materials can lead to injuries or health issues.
- **Need for an Autonomous Solution:** There is a need for an autonomous solution that can efficiently clean water bodies without endangering human lives. Such a solution should be able to navigate autonomously, locate areas requiring cleaning, and efficiently removedebris.
- **Technological Approach:** The proposed GPS-guided river cleaning robot is equipped with sensors and GPS technology. It can autonomously navigate waterways, identify debris, and efficiently collect floating and submerged trash. The robot is designed to operate in both shallow and deep waters.

4. ESTIMATIONS AND RESULTS

The way in which design methods are used in the context of the organization, the project, the product, all stakeholders, and all other aspects that influence the development cycle. A model that employs a series of steps to prescribe the development process. An instrument that enables performing a certain process within the overall development process. The Design Methodology includes various types of approach such as Project idea, Planning, Approach, Block Diagram, Circuit Diagram, Hardware Components, Working & Testing, coding& Assembling, Output Checking, Output-Obtained.



In present days, there is rapid increase in water pollution which is a major problem in the world. To reduce this pollution there are a lot of initiations that have been started. We are also taking a small initiation to control this water pollution. In this initiation we worked on a project River cleaning robot. In this robot is mainly operated by Arduino UNO, which acts like a main controlling unit. We operated the robot by giving the code to the Arduino to operate the equipment. In this Circuit firstly, we connect the Arduino UNO with the Bluetooth module by connecting the VCC, GND of Bluetooth module with 5V, GND pin of the Arduino UNO. After connecting the TXD, RXD pin of Bluetooth module to 2nd, 3rd pin of Arduino UNO, we must give connection between Pin motor drive with Soe more Arduino pins i.e.,N1,N2,N3,N4 pins of motor drive to 12th, 11th 10th 9th pins of Arduino respectively. At the same time the motor drive's 5V pin, negative pin relates to Arduino UNO's negative pin, Vin pin. Now we must connect the Switch's positive terminal with battery positive, battery negative pin to motor drive negative pin, then again motor drive's negative pin to Arduino's negative pin. All the connections should be made perfectly. In simple terms we must connect the Arduino UNO with Bluetooth module with the pin mentioned above. As we have given some code to the Arduino it will operate the whole system with the help of the Bluetooth module. We will connect the L298n motor driver with the Arduino to get instructions to move to acquired areas. LN 298 motor drivers will be connected to the motors to make the robots mobility. We will give the rechargeable Batteries As the power source to the circuit. Because of these rechargeable batteries we can charge them easily and one of the main advantages is it will reduce the Electric Wastes i.e., E-wastes, which will make our robot Eco friendly as we are trying to reduce E- wastes. We will also be providing the switch for the power supply. As we are giving control to Arduino by giving code it will operate the moment of motors wheels with the control of motor driver with the help of the Bluetooth module. By controlling the robot with remote through Bluetooth module we clean the water surface by removing the waste with the help of robots. This robot will help with cleaning the areas where we can't even go. These will be a major advantage of the project and an initiation to clean the water surface and make pollutant free to some extent though it is a small, but it is small and good initiation in cleaning the polluted water surfaces.

This work primary motto is to clean the water surface and make waste-free water. To clean the water surface, we are making the river cleaning Robot. This will help us to clean the water surface. The hardware model of the project is shown in fig. 2.

Fig. 2. Prototype Model

Working condition of the Prototype: After giving connection to the circuit, we will give the supply to it, and it will start working and the hardware model can be seen in fig.3.

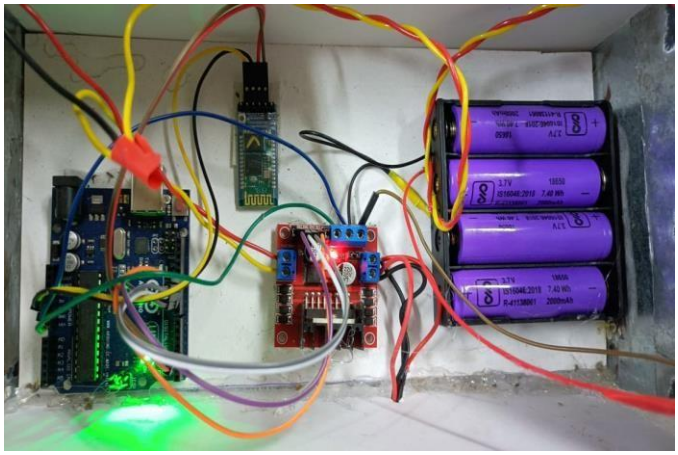


Fig. 3. Working of Prototype

This can be operated by remote as we are giving code to Arduino UNO, and this will make the robot operate from the bank of the river location where we are operating. The remote interface can be shown in fig 4.

Before operating we must pair the robot with the remote, we are controlling, and the interface of the screen can be seen in fig 4 & pairing name is hc-05 and we are labelled it.

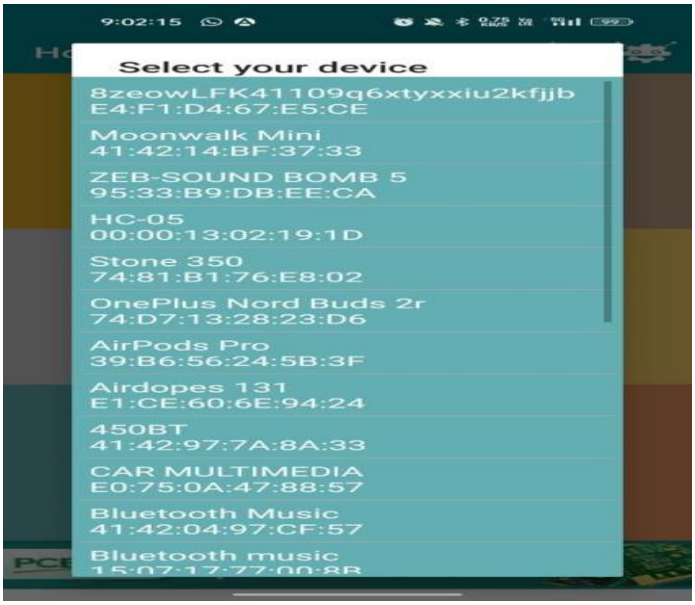


Fig. 4. Device Remote Interface

After we connect the robot with the device we can operate the robot from the bank of the river. We can see how it collects thewaste from the water. This can be seen in fig.5.

Fig. 5. Working & Cleaning Process

5. CONCLUSION

The primary goal of this initiative is to reduce pollution in rivers that are dumped with large amounts of sewage, manufacturing waste, and so on. The technology utilized in a river cleaning robot can vary depending on the design goals, the type of pollutants in the water, and the desired operation environment. The combination of these technologies enables these robots to clean and maintain healthy water bodies in an efficient and effective manner. In this study, we will build a remote-operated river cleaning equipment with the primary goal of reducing the amount of labour and time required to clean the river. We've automated the operation of river garbage cleaning with the help of a motor and conveyor drive system. Creating an Autonomous River Cleaning Robot to Reduce Water Pollution and Protect Aquatic Ecosystems.

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