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# Design and Development of Remotely Operated Boat for River Surface Cleaning

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**ABSTRACT:**Water pollution refers to the contamination of water bodies, such as rivers, lakes, oceans, groundwater, and even drinking water sources, by harmful substances. These substances can be either physical, solid particles in nature and have adverse effects on the environment and human health. Some common sources and causes of water pollution include Industrial Discharges, human activities and agricultural. The dumped plastic bottles, tins, water cans and other wastes pollute the water bodies. These result in water pollution, which harms not just humans, but the whole ecosystem. Water bodies have a huge aquatic ecosystem within them. Any high concentration of suspended solids can cause numerous issues for aquatic life. Hence, the "Wireless River Cleaning Boat" project aims to develop an innovative and autonomous system for cleaning rivers and water bodies using a remotely controlled. This project addresses the growing environmental concern of water pollution and the need for efficient and cost-effective solutions to tackle it.

**KEYWORDS:** Arduino UNO Board, Motor driver, DC Motors, PVC Pipes, Bluetooth Module, Conveyor belt, Waste collector bin, Mobile Application (Arduino Controller).

## I. INTRODUCTION

Water occupies about 71 percentage of the earth's surface and provides humans with a number of benefits. Water is indeed the backbone of human civilization. From the beginning of human history, rivers and lakes have been supportive of our livelihoods. Even today, we are still dependent on the water bodies for our growth in every aspect. Waste collection boats have been widely used for the purpose of cleaning up water bodies. So, as a solution to this problem, smaller sized garbage collection boats have been designed to collect garbage and floating solids in narrow and small areas such as streams and drainage systems. Water is the most important resource for living organisms. Therefore, clean water is a basic need. But the water in the lake or river is polluted by man, most of the waste is dumped into the lake and river. The wastes are thrown into the water so it pollutes the lakes and rivers, because of this we cannot use this water for daily use.

This project focuses more on "Wireless River Cleaning Boat". In India water pollution is increasing day by day so this is often becoming a significant issue for rivers, ponds etc. This mainly consists of impurities like wastewater debris, plastics, garbage on floating water surfaces. These impurities mainly affect the health of people and also affect the life of aquatic animals. Normally this project is based on renewable energy sources, so there's reduction in use of non-renewable energy sources like oil, petroleum, electricity and all types of mineral sources. So by this non renewable energy sources are saved. So this project helps to reduce the water pollution on floating bodies.

The "Wireless River Cleaning Boat" is a novel and innovative solution designed to address the growing concern of water pollution in rivers and water bodies. This project presents a cost-effective and ecofriendly approach to river cleaning by utilizing a remotely operated boat that is controlled via Bluetooth technology. The core functionality of this system is centered on its ability to be controlled wirelessly using a mobile device through Bluetooth connectivity. Users can remotely navigate the boat within the water body, enabling precise targeting of polluted areas. The cleaning mechanism consists of waste collecting tray and waste storing net. The collected waste is securely stored on the boat for later disposal, ensuring the efficient and responsible management of river cleanup efforts.

## II. RELATED WORK

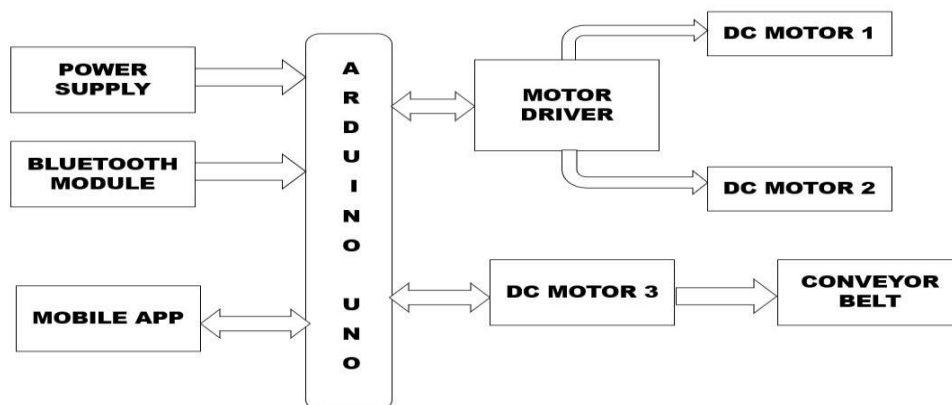
Water pollution, stemming from industrial discharges, agricultural runoff, and human activities, poses a severe threat to ecosystems and human health. Dumped plastic bottles, tins, and other waste exacerbate this issue, endangering aquatic life and compromising water quality. In response to these challenges, the "Wireless River Cleaning Boat" project has developed an autonomous system for cleaning rivers and water bodies using remotely controlled boats. Targeting suspended solids and other pollutants, this innovative solution has been implemented to mitigate the adverse impacts of water pollution on both the environment and human well-being. Through its focus on efficiency and cost-effectiveness, the project has successfully addressed pressing environmental challenges posed by water pollution, contributing to sustainable river management practices.

Furthermore, the project has contributed to the advancement of knowledge in the field through publications, presentations, and outreach activities, disseminating findings and insights to stakeholders and researchers worldwide. Through its multidisciplinary approach and innovative solutions, the "Wireless River Cleaning Boat" project represents a significant step forward in addressing the complex challenges of water pollution and promoting environmental sustainability.

## III. METHODOLOGY

The methodology for this research project on the design and development of a remotely operated boat for river surface cleaning was executed systematically, following established protocols in engineering and environmental science. A thorough review of existing literature provided essential insights into relevant technologies, environmental concerns, and previous research on remotely operated vehicles and river cleaning methods. Conceptualization and design phases involved meticulous consideration of materials, propulsion systems, cleaning mechanisms, and remotecontrol interfaces, with iterative design processes and feasibility analyses ensuring the viability of the proposed boat design. Subsequent development and fabrication stages saw the integration of chosen components into a functional prototype, guided by collaboration with engineering and environmental experts to meet performance criteria and environmental standards.

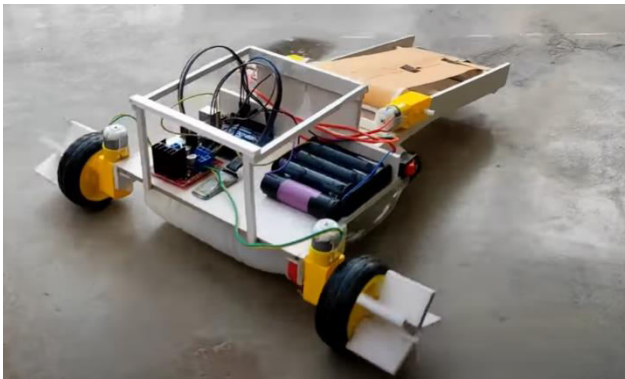
Rigorous testing and evaluation assessed the boat's efficiency, durability, and environmental impact in simulated and real-world river cleaning scenarios, employing quantitative and qualitative methods for data collection and analysis. Documentation of research findings, methodologies, and results followed the conventions of academic writing, providing a structured and coherent account supported by relevant figures, tables, and citations from the literature. This comprehensive approach ensured the validity and reliability of the research outcomes, contributing valuable insights to the field of river pollution mitigation.



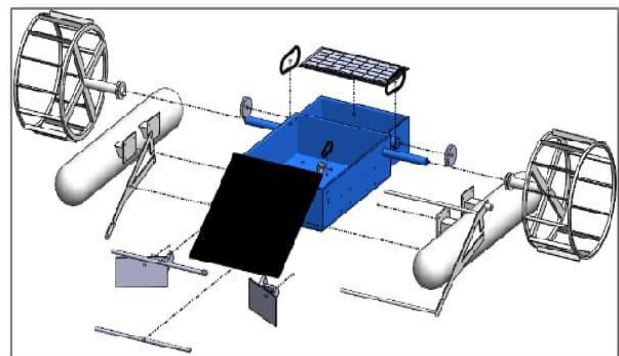
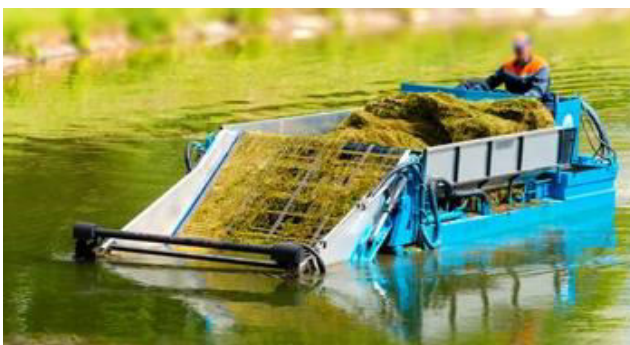
## IV. EXPERIMENTAL RESULTS

The expected results of the automated river cleaning boat project are anticipated to demonstrate significant advancements in river pollution mitigation and environmental conservation. It is expected that the developed automated boat will showcase enhanced efficiency in removing surface debris and pollutants from rivers, contributing to improved water quality and ecosystem health. Through rigorous testing and evaluation, it is anticipated that the automated boat

will exhibit high levels of cleaning accuracy and effectiveness, thereby reducing the need for manual intervention and increasing operational efficiency. Additionally, the integration of autonomous control systems is expected to enable precise navigation and allowing the boat to adapt to varying river conditions and effectively target pollution hotspots. Furthermore, it is expected that the automated boat will demonstrate durability and reliability in long-term operation, thereby providing a sustainable solution for ongoing river cleaning efforts. Overall, the expected results of this project hold promise for significant advancements in automated river cleaning technology, with potential implications for environmental sustainability and public health.



The automated river cleaning boat project are pretty exciting! We anticipate that the boat will be really good at scooping up trash and pollutants from the river surface, making the water cleaner and safer for plants, animals, and people. By using smart technology, like sensors and computer algorithms, the working of battery is for 4 – 5 hours and Bluetooth module range is of 5 -10 meters, the boat can even figure out which pollutants are the most harmful and prioritize cleaning them up. This means less manual work for people and fewer risks to their health. Plus, the data collected from the boat's operations will help us understand pollution patterns better, so we can come up with smarter solutions in the future. Overall, this project has the potential to make a big difference in keeping our rivers clean and healthy for everyone to enjoy.



## V. CONCLUSION

During the course of the project, certain conclusions have been made. The efficiency of the conventional water cleaning mechanism is too low thus, we observed that by replacing the existing method with this automated cleaning mechanism could increase the efficiency with minimal expenses. Since the boat has PVC pipes under it, the air tube piping guider mechanism draws all floating garbage from water towards boat. Cleaning of certain amount of waste with the conventional method that took 20 min is performed using the river boat in 11min. Thus, there is an increase in the efficiency by 88.81 percent. The growing problem of waste disposal in fresh water sources can be stopped not only by putting a stop to the mentality of polluting the environment but also cleaning the already polluted fresh water resources in a more sophisticated way.

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