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River Cleaner Boat: Autonomous Cleaner for Rivers

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Abstract: ***The innovative River Cleaner Boat Paper aims to address the growing issue of plastic waste, floating debris, and organic matter contaminating river water. The goal of this Paper is to create an automated or semi-automated boat with a conveyor or collecting net to effectively remove waste from the water's surface. The boat aims to operate with minimal impact on the environment because it is powered by renewable energy sources like batteries or solar panels. The primary objective is to promote sustainable water resource management, safeguard aquatic ecosystems, and reduce water pollution. This Paper combines principles of mechanical design, automation, and environmental science, offering a practical solution to one of the most pressing ecological issues facing urban and rural waterways.***
Keywords: Arduino UNO Board, Motor driver, DC Motors, PVC Pipes

I. INTRODUCTION

Rivers are one of the most important natural resources on the planet because they help sustain human livelihoods, agriculture, transportation, and biodiversity. However, numerous rivers have become dumping grounds for sewage, plastic waste, and other pollutants as a result of increasing urbanization, industrialization, and human carelessness. This growing problem not only has an impact on the quality of the water, but it also puts aquatic life in danger and poses significant health risks to the communities that surround it. Traditional river cleaning methods, which rely heavily on manual labor, are often inefficient, hazardous, and difficult to scale. We propose River Cleaner Boat: An Autonomous Cleaner for Rivers with Live Surveillance to address these issues in a sustainable manner. A powered robotic system that can autonomously navigate rivers to collect floating waste and simultaneously transmit live video footage is presented in this paper. The system is made eco-friendly and can run for a long time without using resources that aren't renewable thanks to this paper. The robot's built-in navigation system enables it to operate without constant human intervention, allowing it to work efficiently in varying river conditions.

The River Cleaner Boat's ability to stream live video is one of its most distinctive features. This enables real-time monitoring of river conditions, allowing environmental agencies and researchers to assess pollution levels, monitor cleaning progress, and make data-driven decisions. By providing visual evidence of pollution and the progress made in cleaning efforts, this functionality also serves to raise public awareness. Overall, the River Cleaner Boat represents a step forward in the fusion of clean technology, automation, and environmental responsibility. It offers a practical and intelligent solution to the global challenge of river pollution, helping pave the way for smarter, cleaner, and more sustainable waterways.

II. PROBLEM STATEMENT

Nowadays we face a lot of environmental crisis such as dumping of garbage, waste, e-waste, medical waste etc., in water bodies. This cruel act of human kind has brought great loss and damage to the aquatic ecosystem and to the basic necessity of man which is water. This act has not only created pollution of water but cause various disease to the people living around that particular locality. Most of this plastic pollution is attributed to an increase in tourism, shipping and fishing activities. But according to a recent study, a considerable portion of plastic garbage afloat in the open waters originates on land, and is drained into the seas by rivers. This Paper is not just about how we can rectify impact on environment and the wildlife that live underwater but also it is a small beginning to save and control from aquatic pollution to species, ecosystems, human health, coastal tourism, and contributes to climate change. This Paper aims to bring a cleaner and safer environment to live on through the help of Internet of Things, we have created a device which can remove waste that is floating on the water bodies, where the water body can either be a stagnant one or a floating water body.

The device is created using IOT on a combination of using PIR sensors to indicate the level of garbage collected and to detect garbage floating on the water body. The proposed model "Automated Floating Water Waste Remover" is based on the new technologies which makes the whole process efficient. It is going to be very important and profitable for the whole society. Floating bottles, plastic bags and even toys have become a part of the marine environment in recent times.

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III. LITERATURE SURVEY

Dr. R.H. Rudrani Pofali, Parikh, Suyash Jain, Shubham Patankar, Sudarshan Dhoke, and Rishikesh Telpande (2021) – IRJET, Vol. 8, Issue 3: Using a chain and conveyor system to collect floating waste, the researchers created a solar-powered river water cleaning robot. The robot is intended to support the Swachh Bharat Abhiyan, prevent drain blockages, and reduce manual labor. It uses non-conventional energy and stores solar energy in a battery for operation at night, highlighting its environmental friendliness.

T. Anilkumar, V. K. Abhiram Sampath Kumar, R. Yashwanth Sai Ganesh, U. P. Bhavani Prasad Aditya Raj et al. IJSRET, Volume 2024 10, Issue 5, This Paper focused on a Surface Water Cleaning Robot (SWCR) equipped with an ESP32-CAM for real-time video streaming. The robot can be controlled from a distance and includes servo motors and L298N motor drivers for effective navigation and waste collection. Through real-time monitoring and remote operation, the robot improves environmental monitoring and sustainability efforts.

Suziana Ahmad, Mohd Zaidi Mohd Tumari, Hafizudin Fikri Khairudin, Amirul Syafiq Sadun, Izadora Mustaffa, and others R. PrzegldElektrotechniczny (2024) An IoT-based water surface cleaning robot with live video streaming, ultrasonic sensors, and load sensors to monitor collected waste were presented in the study 100 NR 2. The robot is built on a twin-hull floating platform for stability and utilizes the Blynk IoT platform for remote monitoring and data analysis. The system makes it possible to efficiently collect waste in real time and keep track of waste weight and levels.

Sanket Suhas Koli and coworkers (2025) International Journal of Research Publication and Reviews, Vol. 6, Issue 3, This research introduced a remote-controlled river cleaning robot using ESP32-WROVER, servo motors, anda conveyor mechanism to lift and collect waste. It features IoT connectivity for monitoring via cloud platforms and mobile apps. The robot has solar panels integrated for energy sustainability and is designed to clean rivers like the Ganga. It can be upgraded and improved in the future thanks to its modular design.

Divya Pullivarthi, Shweta Raut, Sakshi Maurya, Poonam Dhole.et al. (2023) proposed a vision-based robotic system capable of multiple object detection, object tracking, lane tracking, and motion detection using the ESP32-CAM module. The robot used convolutional neural networks (CNNs) and YOLO (You Only Look Once) algorithms to analyze real-time video data for autonomous movement and surveillance. The research emphasized deep learning's role in enabling robust object detection and tracking in dynamic environments. The system performed well in detecting a variety of objects, with an average accuracy of over 90%.

Hrishikesh Deshpande, Dnyaneshwari Zite,Sakshi bagul,Dr. Using the ESP32-CAM module, Vineeta Philipet al. (2024) developed a smart surveillance robot that demonstrated its potential for real-time wireless video transmission. The robot featured GPS tracking, motor control, and sensor integration for obstacle detection. A web interface enabled live streaming and remote operation, demonstrating the system's potential for home and workplace surveillance. The paper reviewed multiple similar systems and presented an affordable, scalable design with applications in security monitoring.

MS.A. T. Sujatha Reddy Ch. Gayathri: O. Sharanya. A water boat with an automated conveyor belt system for removing floating waste was introduced by Hanisha et al. (2023) for river surface cleaning. An ESP32-CAM was used for live surveillance on the boat, which was controlled by a Bluetooth-based mobile app and powered by an Arduino UNO. The boat's navigation and waste collection were monitored through a webserver. This semi-autonomous model reduced human effort and improved efficiency in cleaning water bodies, highlighting its usefulness in urban environmental management.

Prof Anas M M, Athira M, Anugraha Suresh, Archana K, Maneesha Shaji et al. (2021) presented a water-cleaning bot with an integrated waste segregation mechanism using image processing. Convolutional Neural Networks (CNNs) were used to classify waste into biodegradable and non-biodegradable categories, and the system processed waste using ESP32 and Raspberry Pi. Using a servo-controlled wiper system, the bot sorting in real time and autonomously navigated water surfaces. The bot addressed both waste collection and categorization, offering a step toward intelligent environmental solutions with an average classification accuracy of 90%.

IV. AIM OF PAPER

The primary objective of the Paper is to reduce the amount of pollution in waterways and reduce the amount of time and labor required to clean the river. Ability to remove waste particles that are floating on the surface of the water. to keep the automation going while working on the cleaning of water bodies. to carry out an efficient and dependable operation while cleaning water bodies. to improve the quality of the water in a body of water, to clean up a portion of a stream or river on behalf of society, to keep track of how much trash is removed from the waterway, and to offer locals ways to make the environment better for people and aquatic animals.

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V. SCOPE OF THE PAPER

1) The main aim of the Paper is to reduce the man power, time consumption for cleaning the river.
2) To reduce the pollution in water bodies. Facility of removing waste particulate floating on water surface.
3) To maintain the automation during working towards cleaning water bodies.
4) To perform the fast & reliable operation during cleaning Water bodies. Improve the water quality of a water bodies.
5) To work for society for clean up a section of a stream or river.
6) To record the amount of garbage removed from the waterway & give solutions to local to provide better environment to aquatic animals and human life.

VI. METHODOLOGY

The River Cleaner Boat is a self-contained robot that cleans rivers and provides real-time video surveillance while removing waste that is floating in the water. It is a solution that is good for the environment and can last for a long time because it runs on batteries that are attached to its structure and power the motors and electronics inside. The robot is constructed on a stable floating platform and is outfitted with a waste collection mechanism, such as a net or conveyor belt, to gather organic and plastic waste from the river's surface.

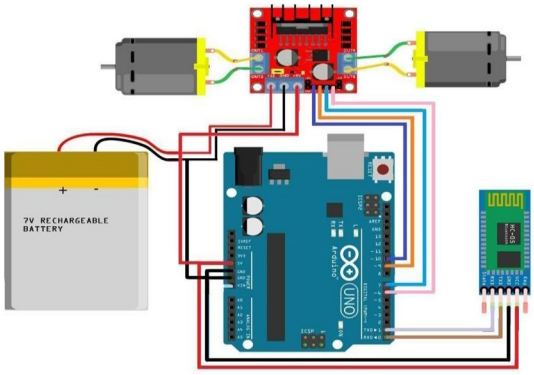


Figure 1 : Circuit Diagra

The robot has a live video streaming system that lets you monitor the river's condition and clean it from a distance. Controlled by a microcontroller, the River Cleaner B oat can operate continuously in various environmental conditions, reducing the need for manual labor, minimizing health risks, and contributing to improved water quality and environmental awareness.
The motor attached behind the device that will rotate the water wheel so that the device move according to the direction where there is floating waste. In autonomous mode the device locomotion and waste pick up is done without human intervention. The device is placed at the centre of the water where floating waste is present Using this ultrasonic sensor configuration the device will be able to distinguish between big objects (walls). The sensors consider large objects to be obstacles and steer clear of them. Other objects are considered as trash and are picked up by the device. An ultrasonic sensor is inserted into the trash can to keep an eye on how much waste is in there. If the bin is full it is notified to the operator.

VII. CONCLUSION

In water bodies, this device detects waste objects like plastic bags and other floating waste. It aids in the purification of water and makes the environment cleaner. It not only creates a clean environment but also cuts down on the amount of labor required to clean any body of water. The purpose of this paper is to address the problem of improper waste disposal in water bodies. Using PIR sensor we can detect floating waste on water bodies and extent of pollution caused by unwanted toxic disposal from the waste which is floating on water.

VIII. FUTURE SCOPE

This device has the potential to be connected to a solar panel in the future, generate power from moving water, and be further investigated in light of environmental conservation and protection. The device can also be connected to analyze water treatment.

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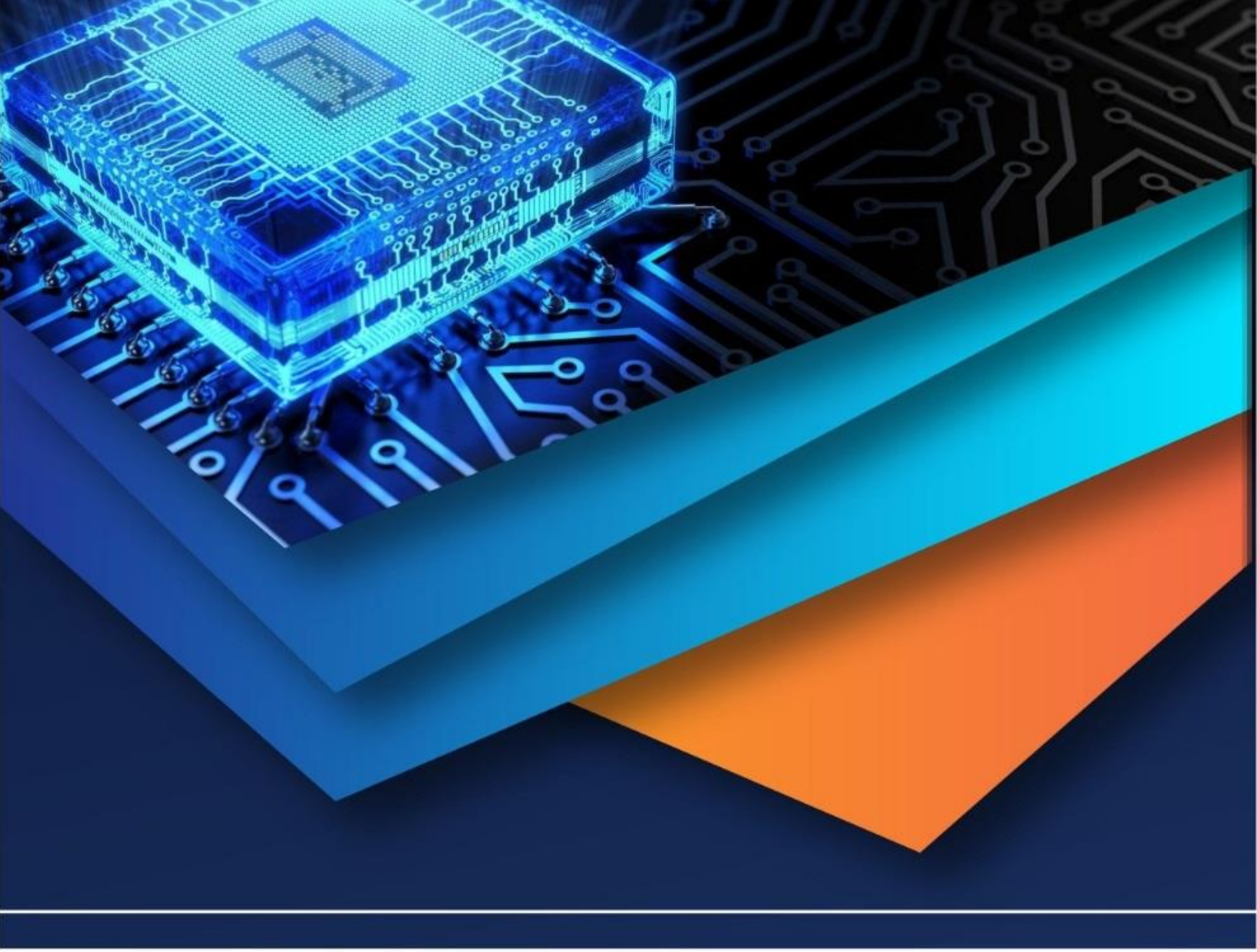
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