International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Impact Factor: 8.317

Multipurpose Water Surface Cleaning Boat

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ABSTRACT: The Water Surface Cleaning Boat is a novel solution designed to tackle the pressing issue of water pollution in estuaries. Integrating Arduino Uno and Raspberry Pi, alongside essential components like a conveyor belt, ultrasonic sensor, motors, and a Bluetooth module, the RSCB operates efficiently. Equipped with a Pi camera for real-time monitoring, it navigates water bodies, autonomously detecting and collecting debris. The collected waste is neatly deposited into dedicated garbage bags on board. Powered by a rechargeable battery, the RSCB offers a sustainable and ecofriendly approach to river surface cleaning. This project presents a promising endeavour towards environmental conservation, addressing the critical need for effective waste management in aquatic ecosystems.

KEYWORDS: Arduino Uno, Raspberry pi, pi camera, conveyor belt, battery, motor, Bluetooth, collector

I. INTRODUCTION

Rivers are essential natural resources that provide habitats for diverse ecosystems and serve as vital sources of water for communities worldwide. However, these water bodies are increasingly threatened by pollution, with debris and garbage accumulating on their surfaces, particularly near estuaries where rivers meet the sea. This pollution not only damages aquatic ecosystems but also poses significant risks to public health and the environment. In response to this pressing environmental challenge, the development of innovative technologies for river surface cleaning has become imperative. In response to the escalating environmental threat posed by river pollution, particularly near estuaries, this project endeavours to develop an innovative solution: a River Surface Cleaning Boat. The River Surface Cleaning Boat is engineered to autonomously traverse water surfaces, targeting areas prone to accumulating garbage and debris. By integrating a conveyor belt mechanism, the River Surface Cleaning Boat efficiently collects floating waste and deposits it into designated garbage bags or compartments on board. This initiative represents a crucial step towards mitigating the adverse impacts of river pollution, safeguarding both aquatic ecosystems and human health. Key components including conveyer belt systems, motors, and ultrasonic sensors are meticulously integrated into the design to ensure optimal functionality. Moreover, leveraging technologies such as Arduino Uno, Raspberry Pi and Bluetooth controllers enables real-time monitoring and control of the RSCB's operations. Through this project, we aim not only to develop a viable solution for river surface cleaning but also to raise awareness about the urgent need for sustainable environmental practices. By harnessing the power of engineering innovation, we aspire to contribute to the preservation and restoration of our waterways, fostering a cleaner and healthier environment for future generations.

II. LITERATURE SURVEY

Sr. No	Title	Author	Key point
1	IoT Based Water Surface Cleaning and Quality Checking Boat	B. Saran Raj, Dr. L. Murali, B. Vijayaparamesh, J. Sharan Kumar, P. Pragadeesh	Employs data analysis and monitoring through a wireless aquatic system, focusing on catchment management authorities for real-time updates and pollution source tracking.
2	2 Remote Controlled Unmanned River Cleaning Bot	Akash Shahu	Centre on renewable energy utilization for a river cleaning bot to address water pollution, with a key emphasis on energy conservation and surface debris removal.
3	Water Care: Water Surface Cleaning Bot and	Harsh Sankar Naicker, Yash Srivastava, Akshara Pramod,	This paper utilizes a water surface cleaning robot powered by solar energy, incorporating

	Water Body Surveillance System	Niket Paresh Ganatra, Deepakshi Sood, Saumya Singh, Velmathi Guruviah	computer vision and mobile applications to monitor and alert authorities about pollution sources in Indian water bodies.
4	Design and Analysis of River Water Cleaning Machine	Madhavi N.Wagh, Kashinath Munde Research	Research in this paper focuses on automation through motor and chain drive systems for river cleaning, highlighting cost-effective solutions in line with government river cleaning projects.
	A Fully Autonomous Water Surface Cleaning Robot with A Novel Coverage Path Planning Method.	Jinnan Zhu, Yixin Yang, Yuwie Cheng	The SMURF robot is a cutting-edge solution for autonomous water surface cleaning, emphasizing efficiency and adaptability for diverse water bodies
6	Multipurpose Cleaning Robot using IoT and Image Processing	Akshata Gholap, Abhinay Rasal, Aishwarya Pawar, Chailtali Dighe, Prof.S.R.Gagare	This paper presents a smart multipurpose cleaning unit with automation and innovative technologies for window and solar panel cleaning, featuring gesture and line following algorithms.

III. METHODOLOGY

A. Block Diagram
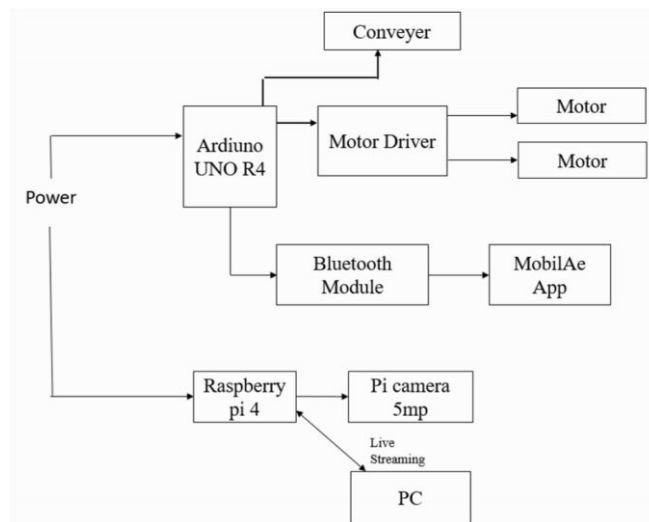
B. Working

The operation begins with the Arduino Uno, the central control unit of the system, receiving inputs from Pi camera. Pi camera provides visual feedback for navigation and monitoring. These inputs are processed by the Arduino Uno to make real-time decisions regarding the boat's movement and operation. The Arduino Uno then sends commands to the motor drivers, which control the motors responsible for propelling the boat through the water. By adjusting the speed and direction of these motors, the boat can navigate efficiently while avoiding collisions and obstacles. Simultaneously, the Arduino Uno activates the conveyor belt mechanism, which is responsible for collecting garbage and debris from the river surface. As the boat moves along the water, the conveyor belt continuously scoops up waste and transports it towards the designated collection area onboard. Additionally, the Arduino Uno is equipped with Bluetooth capability, allowing for remote control and monitoring of the boat's operation from a smartphone or other Bluetooth-enabled device. This feature provides flexibility and convenience for operators, enabling them to adjust settings or intervene, if necessary, even from a distance.

C. Components and Method

Raspberry Pi 4B: Raspberry Pi 4B serves as a central control unit. Equipped with a Pi camera module, it facilitates real time visual feedback. Its 1.2GHz quad-core ARM CortexA53 processor and 1GB RAM ensure efficient performance, while GPIO pins enable interfacing with components like ultrasonic sensors and motor drivers. Additionally, the Raspberry Pi 3B's built-in Bluetooth capabilities facilitate remote control and communication. Overall, it plays a critical role in enhancing the boat's functionality and autonomy in collecting garbage and debris from estuarine environments.

Arduino Uno: The Arduino Uno serves as the central control unit in the river surface cleaning boat project, facilitating coordination between various components such as motors, and communication modules. With its versatile input/output pins and compatibility with a wide range of sensors and actuators, the Arduino Uno enables precise control of the conveyer belt, motor propulsion, and obstacle detection. Its compact size and low power consumption make it an ideal choice for embedded systems like the cleaning boat, ensuring efficient operation throughout the cleaning process.
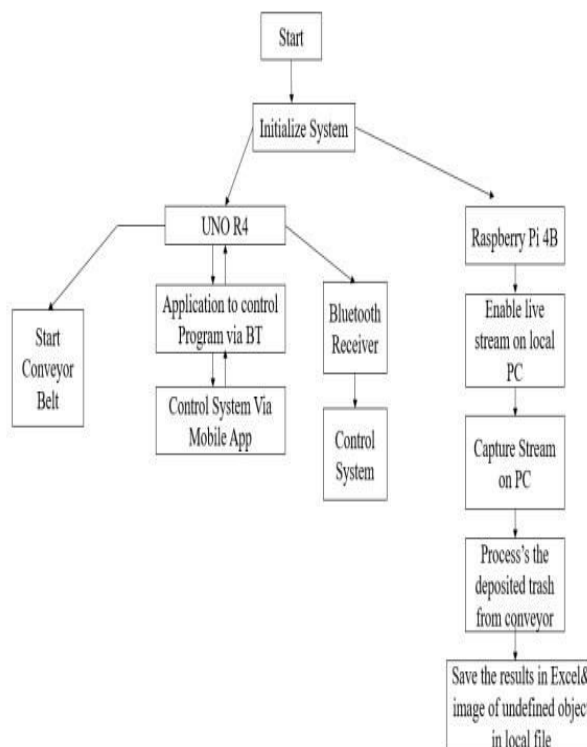
Pi camera: Pi Camera: The Pi camera, integrated with a Raspberry Pi, facilitates real-time monitoring of the river surface cleaning boat, allowing operators to remotely control its movement and assess surrounding conditions.

Conveyor Belt: The conveyor belt mechanism installed on the boat efficiently collects garbage and debris from the river surface, transporting it to a designated area for disposal, thereby streamlining the cleaning process and maximizing efficiency.

Motor: The motor, controlled by Arduino Uno, propels the river surface cleaning boat, ensuring smooth movement across the water surface and efficient collection of garbage and debris

Bluetooth Module: Integrated with the Raspberry Pi, the Bluetooth module enables wireless communication for remote control and monitoring of the cleaning boat, allowing operators to adjust its trajectory and monitor its performance from a distance, enhancing operational flexibility and control.
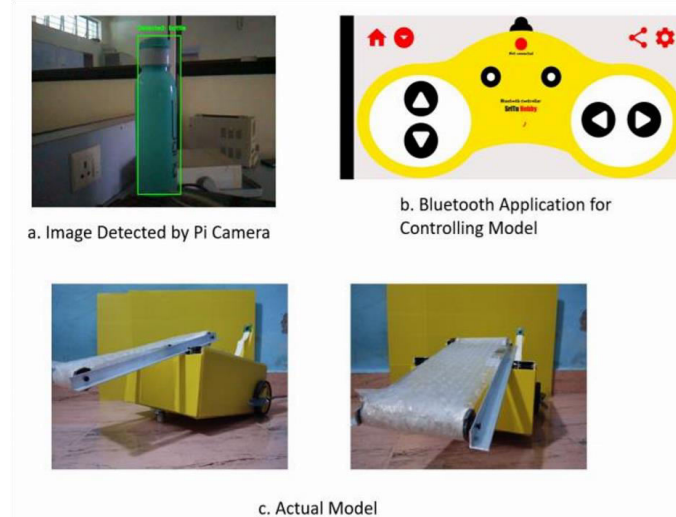
D. System Flow

IV. RESULTS

a. Image Detected by Pi Camera

b. Bluetooth Application for Controlling Model

c. Actual Model

V. CONCLUSION

The development of a river surface cleaning boat equipped with innovative technologies such as Arduino Uno, Raspberry Pi, Pi camera, conveyor belt, ultrasonic sensor, and Bluetooth module represents a significant step towards addressing the pressing issue of water pollution in estuaries. Through meticulous research, design, assembly, and testing, we have successfully created a versatile and efficient solution for garbage and debris collection on water bodies. The integration of these technologies enables autonomous operation, real-time monitoring, and effective waste management, contributing to environmental sustainability and ecosystem preservation. Furthermore, the systematic methodology employed in this project serves as a valuable framework for future endeavors in the field of aquatic pollution mitigation and marine conservation. With continued refinement and deployment in real-world scenarios, this river surface cleaning boat holds immense potential to make a meaningful impact in combating water pollution and fostering cleaner, healthier waterways for generations to come.

REFERENCES

1. B. Saran Raj, Dr. L. Murali, B. Vijayaparamesh, J. Sharan Kumar, & P. Pragadeesh. (2021). IoT Based Water Surface Cleaning and Quality Checking Boat. Journal of Physics: Conference Series, 11.
2. Shahu, A. (2021). Remote Controlled Unmanned River Control Bot. International Journal of Engineering and Technical Research, 572-574.
3. Harsh Sankar Naicker, H. S., Sriwastava, Y., Pramod, A., Ganatra, N. P., Sood, D., Singh, S., & Guruviah, V. (-). Water Care: Water Surface Cleaning Bot and. School of Electronics Engineering, -. Madhavi N.Wagh, & Kashinath Munde. (2018). Design and Analysis of River Water Cleaning. IJSDR, 285-290.
4. Zhu, D. J. (n.d.). SMURF: A Fully Autonomous Water Surface Cleaning Robot. MDPI Akshata Gholap, A. R. (2020). Multipurpose Cleaning Robot using IoT and Image Processing. International Research Journal of Engineering and Technology (IRJET), 1755-1757.
5. Vani H, L. V. (2020). Floating Objects Collection Using Robotic Arm. International Research Journal of Engineering and Technology (IRJET), 3399-3404.
6. Arun Kumar Shanmugam, S. K. (2021). Effective Aquatic Waste Removal through Lake Cleaning Robot for Smart City. International Journal of Innovative Technology and Exploring Engineering, 2831-2835.
7. Gaurav Bagade, V. P. (2020). River Cleaning Ro-boat! IJRTI, 118-120.
8. MS A. Sujatha Reddy, T. G. (2023). River Surface Cleaning Water Boat. International Journal of Creative Research Thoughts (IJCRT), 2320-2882.
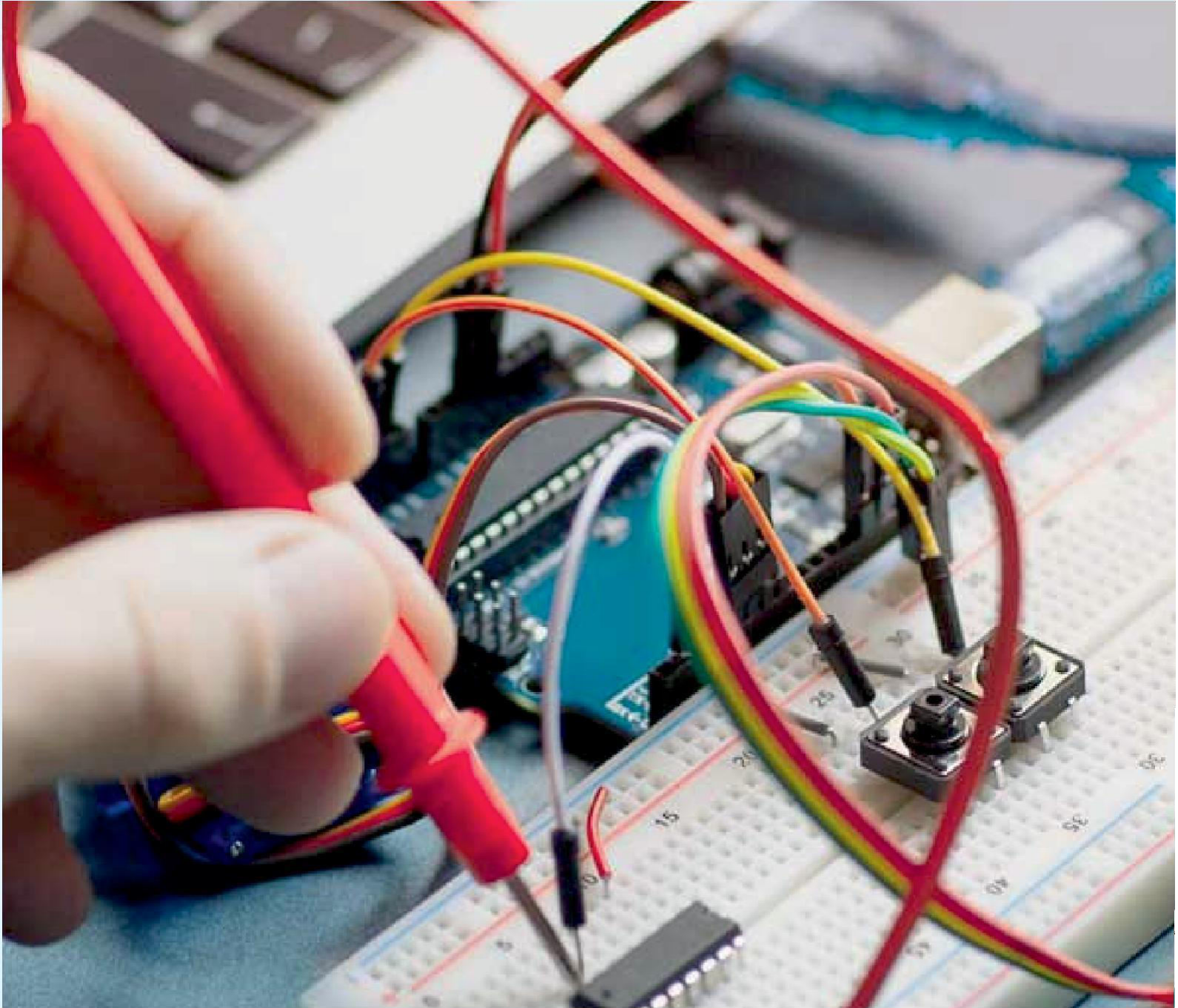
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