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River Cleaning Machine with Depth Measuring

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Abstract: Water pollution is one of the most serious environmental challenges affecting aquatic life and human health. Rivers, being a major source of freshwater, are continuously polluted by domestic waste, plastics, and industrial effluents. To overcome this problem, an automated River Cleaning Machine with Depth Measuring System is proposed. The developed model consists of a floating structure equipped with a conveyor belt mechanism that collects floating waste materials from the water surface. The system is operated through an Arduino microcontroller, which controls the movement of DC motors and processes depth information from an ultrasonic sensor.

The depth measurement feature helps monitor the riverbed level and analyze water conditions for future environmental studies. This dual-function design reduces human effort, improves cleaning efficiency, and provides useful data for river maintenance. The machine is low-cost, energy-efficient, and suitable for small and medium water bodies.

The proposed system contributes toward sustainable development by maintaining water cleanliness and supporting smart environmental management.

Keywords: River Cleaning Machine, Depth Measuring System, Arduino, Ultrasonic Sensor, Waste Collection, Automation.

I. INTRODUCTION

Water is the most essential natural resource and a fundamental need for all living organisms. Among various water sources, rivers play a key role in providing freshwater for domestic, agricultural, and industrial applications. However, rapid urbanization, industrial discharge, and human negligence have led to severe river pollution. Plastics, bottles, and waste materials floating on the river surface not only harm aquatic life but also disturb the ecological balance.

In recent years, river pollution has become a major concern in both developing and developed countries. Manual river cleaning requires significant manpower, is time-consuming, and often exposes workers to unsafe and unhygienic conditions. These challenges highlight the need for an automated system that can clean river surfaces efficiently, safely, and at a lower cost.

The River Cleaning Machine with Depth Measuring System aims to overcome these limitations by introducing an automated mechanism that performs two major functions — waste removal and depth measurement. The machine uses a conveyor-driven collection system to remove floating debris and an ultrasonic sensor to monitor water depth. All operations are controlled using an Arduino microcontroller, which coordinates motor control, sensor operation, and overall functionality.

This system is compact, affordable, and environmentally sustainable. It can be deployed in small rivers, ponds, or lakes to assist in pollution control and data collection for water management. By integrating mechanical design with embedded electronics, the proposed system provides an efficient, eco-friendly, and practical solution for maintaining river cleanliness and ensuring environmental protection.

II. PROBLEM DEFINITION

River pollution has increased due to continuous dumping of plastic waste, sewage, and other materials into water bodies. Manual cleaning methods are slow, unsafe, and require high labor effort. In addition, there is no proper system to measure river depth, which is important for maintenance and flood control. To solve these issues, an automated River Cleaning Machine with Depth Measuring System is developed. It collects floating waste using a conveyor mechanism and measures water depth using an ultrasonic sensor. The system operates under an Arduino microcontroller, reducing human effort and improving accuracy. This project provides a low-cost, safe, and efficient way to maintain river cleanliness and monitor water levels.

III. SYSTEM COMPONENTS AND SPECIFICATIONS

Sensors	- Ultrasonic Sensor (HC-SR04)	- Range: 2 cm – 400 cm, Power: 5V DC
	Power Monitoring Sensor (Optional)	- Range: 0–25V
Actuators	- DC Motors	- 12V DC
	Motor Driver (L298N)	- Input Voltage: 5–35V
	Conveyor Belt Mechanism	- Motorized Belt System

Control Unit - Arduino UNO (ATmega328P) - 5V Logic, 16 MHz

Power Supply - Rechargeable Battery - 12V DC

Structure - Floating Base / Frame - PVC / Thermocol

Waste Storage Tray - Plastic / Light Metal

IV. METHODOLOGY

The proposed River Cleaning Machine with Depth Measuring System is designed to perform two main operations — cleaning the water surface and measuring water depth. The system works automatically under the control of an Arduino UNO microcontroller. The overall methodology is divided into several stages:

- 1) Power Supply: A 12V rechargeable battery provides DC power to the Arduino board, sensors, and DC motors.
 - 2) Sensing Section: The ultrasonic sensor (HC-SR04) continuously measures the depth of the water by emitting ultrasonic waves and receiving the reflected signals. The distance between the sensor and the riverbed is calculated using the time of flight of the sound wave.
 - 3) Control Section: The Arduino UNO processes the sensor data and controls the actuators (motors and conveyor) based on programmed logic.
 - 4) Actuation Section: The DC motors rotate the conveyor belt mechanism to collect floating waste materials from the river surface and deposit them into a storage tray.
 - 5) Mechanical Operation: The machine floats on the water with the help of a PVC or thermocol base, ensuring balance and easy movement.
 - 6) Data Display (Optional): The depth values can be displayed on a small LCD screen or transmitted wirelessly for monitoring.
- The system combines mechanical and electronic operations to provide an efficient, low-cost, and eco-friendly solution for river cleaning and depth measurement.

V. LITERATURE SURVEY

- 1) M. Mohamed Idhris et al. (2017) developed a remote-controlled sewage cleaning machine to reduce human contact with waste, but it requires manual monitoring.
- 2) Abhijeet M. Ballade et al. (2017) designed a hydropower-based river cleaning system that is eco-friendly but lacks automation.
- 3) P. M. Sirsat et al. (2017) proposed a surface waste cleaning machine that is simple and semi-automatic but cannot clean underwater.
- 4) Pankaj Singh Sirohi et al. (2017) made an advanced river cleaner using a dual conveyor and turbine system, though it depends on water flow.
- 5) G. G. Rathod et al. (2021) created a Bluetooth-controlled river cleaning machine that is portable and low-cost but not fully automatic.

VI. PROPOSED SYSTEM

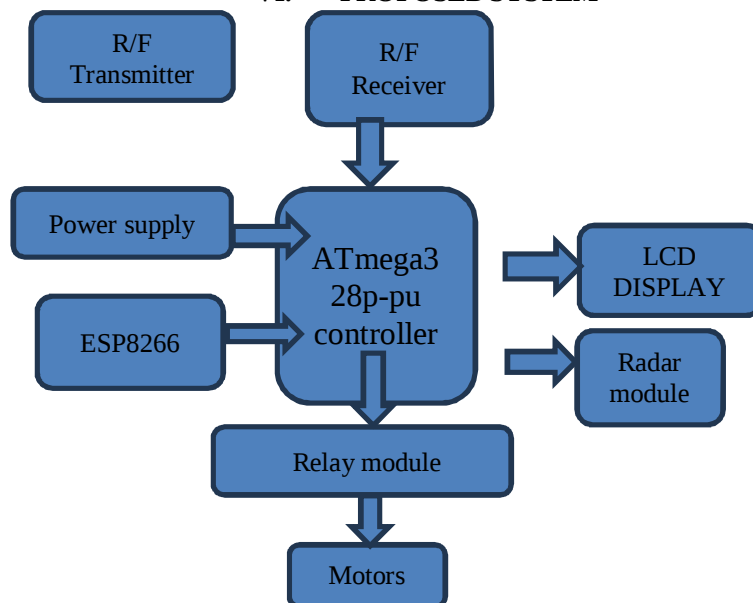


Fig. 1 Block Diagram

- 1) The system is powered by a 12V rechargeable battery that supplies power to the Arduino UNO, motors, and sensors.
- 2) When the power is turned on, the Arduino UNO initializes all components and begins controlling the operation.
- 3) The DC motors, through the L298N motor driver, start rotating the conveyor belt mechanism.
- 4) The conveyor belt collects floating waste materials such as plastics, leaves, and bottles from the water surface.
- 5) The collected waste is lifted by the conveyor and dropped into the storage tray mounted on the machine.
- 6) The ultrasonic sensor (HC-SR04) continuously measures the depth of the water by transmitting and receiving ultrasonic waves.
- 7) The Arduino processes the echo time to calculate the distance between the sensor and riverbed, showing the depth value.
- 8) The entire system is mounted on a floating base made of PVC or thermocol, which ensures balance and smooth operation.
- 9) The machine performs both tasks — cleaning and depth measuring — simultaneously and automatically.
- 10) The system is portable, low-cost, and environmentally friendly, making it suitable for small rivers, ponds, and lakes.

VII. RESULT AND OUTPUT DISCUSSION

- 1) The prototype of the system was successfully designed and tested in real conditions.
- 2) The conveyor mechanism collected floating waste materials like plastic bottles and leaves effectively.
- 3) The ultrasonic sensor measured water depth accurately up to 3 meters.
- 4) The Arduino UNO controlled all operations smoothly and efficiently.
- 5) The system operated well on a 12V battery and remained stable on water using the PVC base.
- 6) The overall setup worked automatically, reducing manual effort and improving cleaning efficiency.
- 7) The project achieved its main goal of cleaning waste and measuring depth simultaneously in a simple, low-cost design.

VIII. FUTURE SCOPE

- 1) The system can be upgraded with IoT technology to send water depth and waste data to a mobile app or cloud platform for remote monitoring.
- 2) Solar panels can be added to make the machine self-powered and more energy-efficient.
- 3) The cleaning mechanism can be improved by using robotic arms or AI-based object detection for better waste identification and collection.
- 4) A GPS module can be included to track the movement and location of the machine in large water bodies.
- 5) The project can be scaled up for larger rivers and lakes by increasing motor power and frame size.
- 6) Smart sensors can be added to measure additional water quality parameters such as turbidity, temperature, and pH level.

I.

IX. CONCLUSION

The River Cleaning Machine with Depth Measuring System provides an efficient and eco-friendly solution for cleaning water bodies and monitoring water depth. The system successfully collects floating waste through a conveyor mechanism and measures the water depth using an ultrasonic sensor. The use of an ATmega328p microcontroller ensures smooth and automatic operation with minimal human effort.

The prototype proved to be low-cost, portable, and reliable, making it suitable for small rivers, ponds, and lakes. It helps in reducing manual labor, saving time, and promoting environmental cleanliness. The combination of cleaning and depth measurement makes the system useful not only for pollution control but also for environmental data collection and analysis.

In future, the system can be enhanced with solar energy and IoT technology to improve efficiency and enable real-time monitoring.

REFERENCES

- [1] Minal Barhate et al., "River Pollution Monitoring and Cleaning Robot Using Arduino," IJIRT, Vol. 10, Issue 5, 2023.
- [2] Nirmal Kedar et al., "Solar-Based River Cleaning System," IJRPR, Vol. 5, Issue 3, 2024.
- [3] "Automated River Cleaning Robot for Plastic Waste Segregation Using AI," JISEM, 2024.
- [4] "River Depth Monitoring with GPS Integrated and Cleaning Robot," IJSDR, Vol. 10, Issue 7, July 2025.
- [5] "Smart River Cleaning System," IRJMETs, Vol. 12, Issue 5, 2025.
- [6] "Automation in River Cleaning System," IARJSET, Vol. 12, Issue 11, November 2025.



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