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ROBOTICS APPLICATION DEVELOPMENT- COURSE WORK

Trash Collector Robot for River

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Abstract

The main issue for the Water pollution by plastics, polythene and other floating trash. Normal cleaning methods are more costly, time-wasting, and those are not safe. So, we developed a Trash Collector Robot for this big problem. We have designed it with DC motors, ultrasonic sensors, servo motors, and a collecting mechanism to gather floating trash efficiently. This system provides an automated, affordable, and safe solution for small-scale water bodies while reducing human effort and health risks.

Acknowledgment

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Introduction

Floating trash, water hyacinth, plastic, and polythene have become a major problem in increasing water pollution today.

In the Pollution reduces water purity, blocks the sunlight/oxygen, harms to aquatic animals, increase flood risks, and big threatens to community health.

Normly,traditional cleanup methods are highly costly, very slow, labor-intensive, and unsafe.

The River Trash Collector Robot provides an automated, affordable, and safe way to remove floating trash safely.

It has Built with Arduino Mega, DC motors, Waterproof ultrasonic sensors, and a waste-collection system, it is ideal for small-scale water bodies like canals, ponds, and lakes.

Problem Identification

- **Floating trashes :** plastics (plastic bottles, plastic bags, wrappers) and other solid waste obstruct water flow and reduce the water quality.
- **Invasive Aquatic Vegetation:** Plants such as water hyacinth grow very Fastly, those are covering large surface areas, depleting oxygen levels of water, and big threat to native aquatic species.
- **Waterway Blocks:** since the waste and vegetation clog drainage systems help to flood during heavy rainy days.
- **Health Issues:** from the waste laden waters become breeding grounds for mosquitoes and pathogens, increasing the risk of diseases for nearby peoples.
- **Manual Cleaning Limitations:** Traditional cleaning methods are not Heth full, labor-intensive, So costly, and have my difficulties in it.

Purpose

The purpose of this project is to design and create an autonomous Trash Collector Robot that can collect floating waste things, invasive aquatic vegetation, and other pollutants floating on water surfaces. This system will be designed to reduce human risk, reduce costs, and increase the effectiveness of waterway cleaning operations.

Solutions to Problems

Propulsion System: Deep water propulsion by propellers driven by DC motors or wheels for shallow depths.

Obstacle Detection: Ultrasonic sensors to detect obstacles and allow smooth movement.

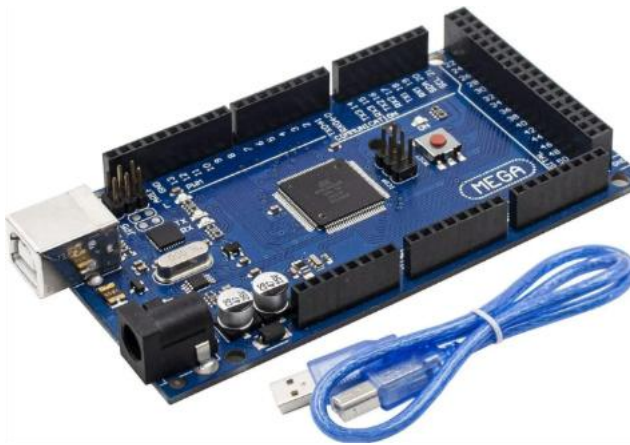
Collection Mechanism: Net or roller installed at the front that can collect floating garbage, plastics, and even small vegetation pieces.

Collection Mechanism: A net or roller installed in the front that can collect floating trash, plastics, and even small patches of vegetation.

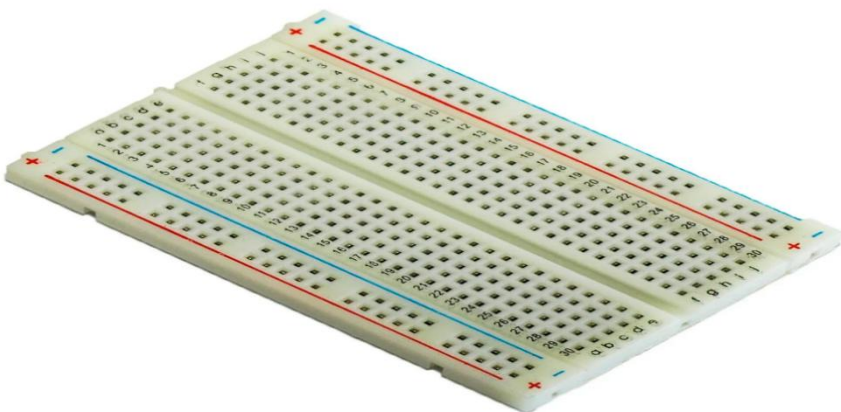
Autonomous Control: Governed by Arduino Uno/Mega to control propulsion, obstacle sensing, and waste pickup independently of real-time human control.

Electronic Components

1. Arduino Board



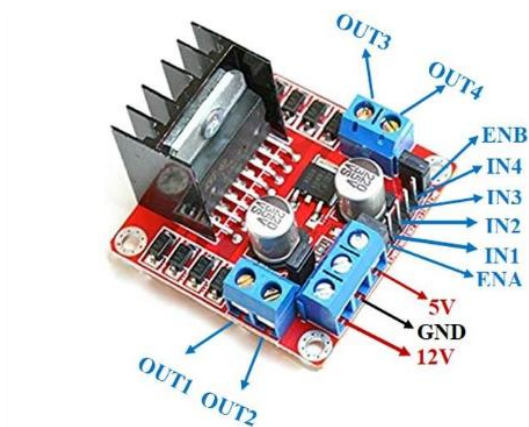
2. Bread board



3. Buck converter



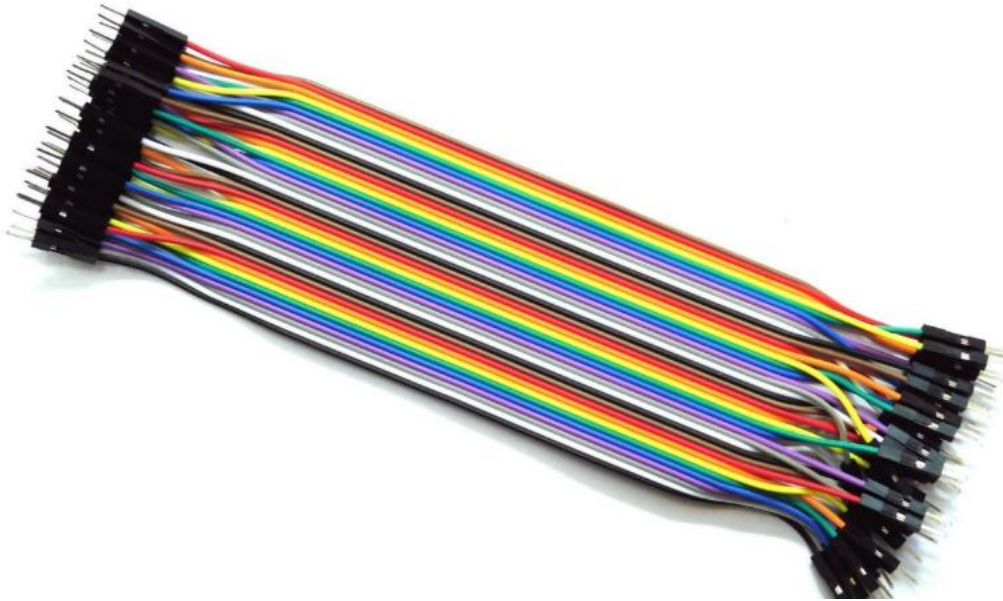
5. L298N motor driver



6. Servo motors



7. Jumper wires



8. Waterproof ultrasonic sensors



9. load Cell

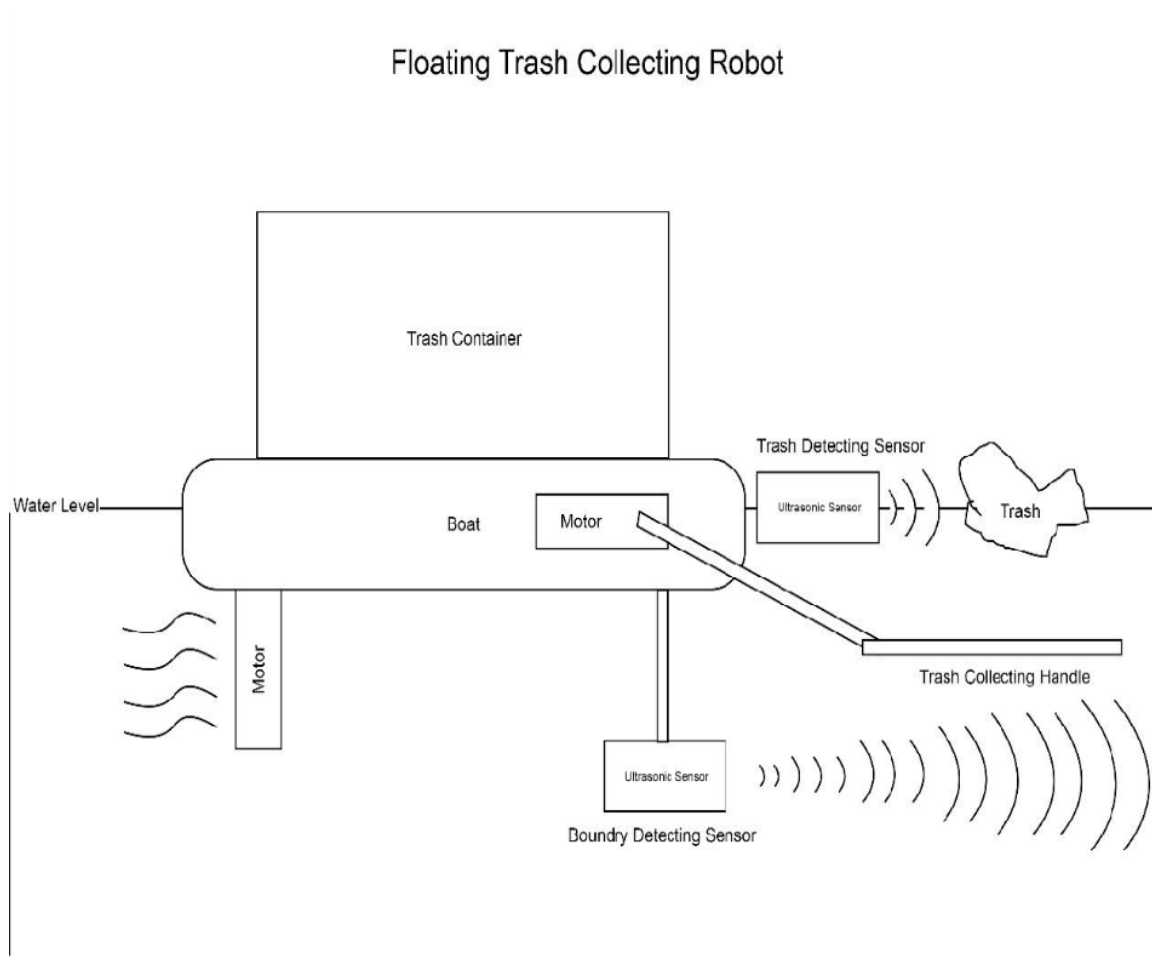


10. Voltage Sensor

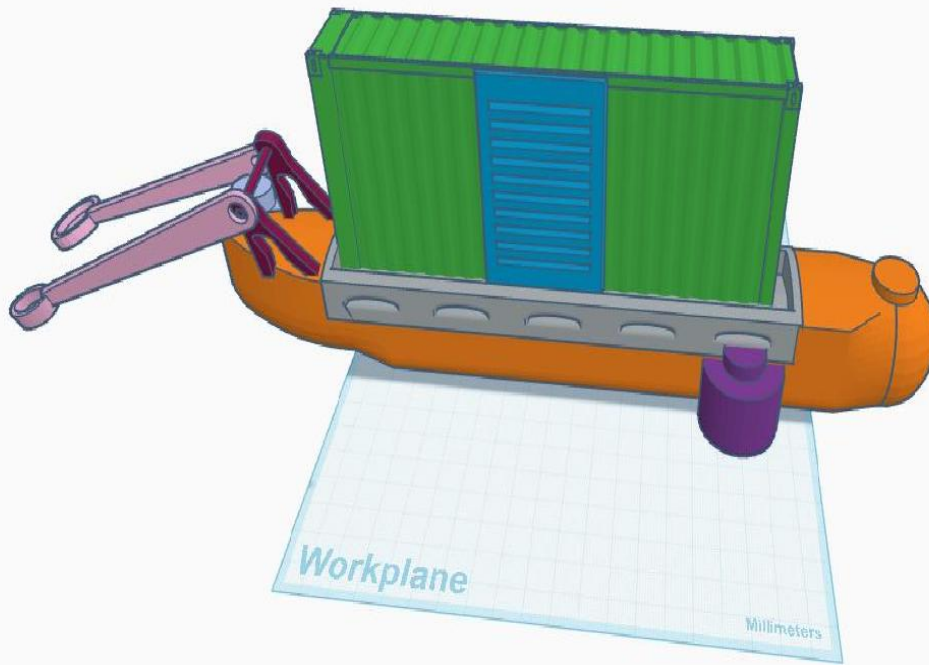


Sketch Designs

Various sketch designs were created to visualize the robot's waste collection handles and mechanical structure.



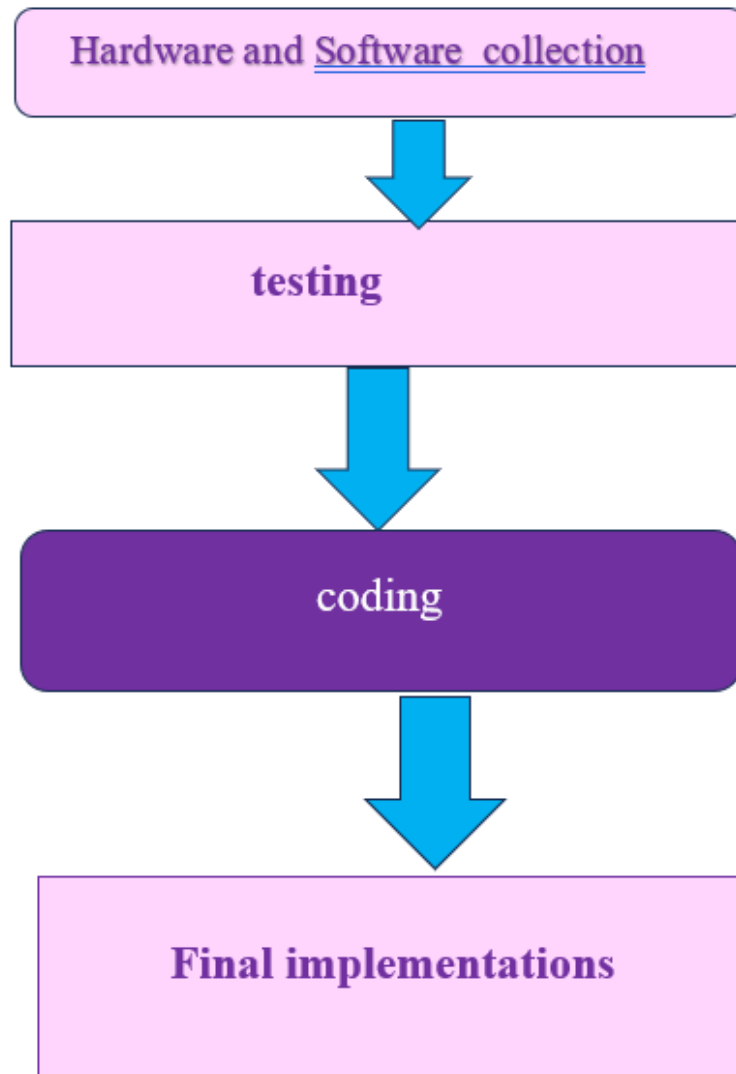
3D Design



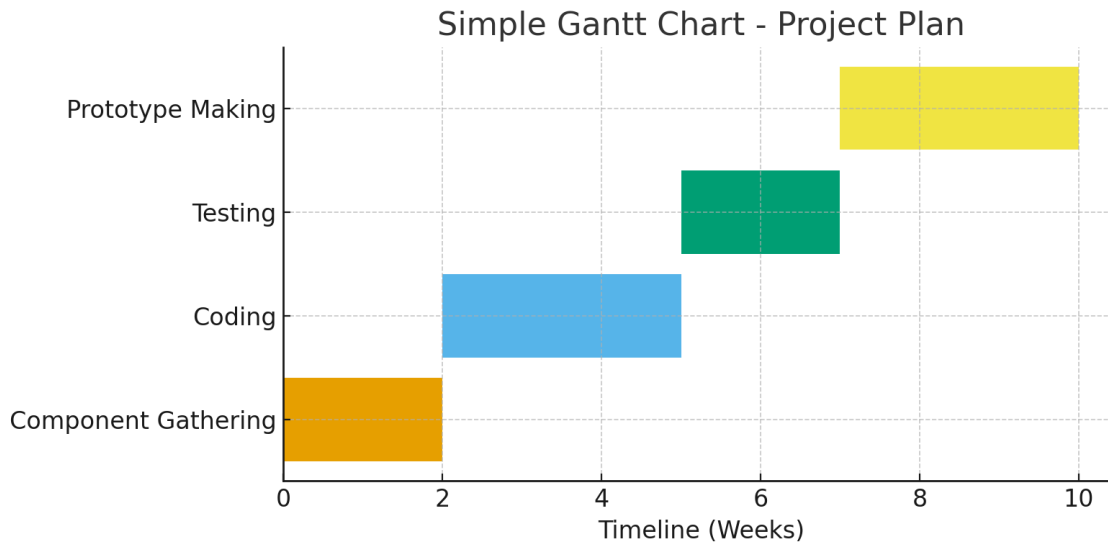
Final Output



Implementation Process



Gant Chart



Faced Difficulties

- **Finding a water resource-** In Sri Lanka, we have too many polluted lakes, canals and rivers. But practically, we cannot test our project with our safe.
- **Float the Boat-**Another Big problem is how to boat is float? Because boat is very heavy and little long.
- **Protect the components from Water-**the Project is want to work in wate.So,we want to protect the components from water, because if water gets into the components,it may cause a power leak.
- **Battery Life & Power Management** – Constant operation of motors and sensors drains power at a high rate, decreasing working time.
- **Clogging of Collection Mechanism** – Nets or rollers can clog if loose or wrapped trash (for instance, ropes or weeds) gets caught up.

Discussion

Trash Collector Robot presents a clean and sustainable method of de-polluting water bodies. Through ultrasonic sensors, DC motors, servo motors, and collection tools, the robot can detect obstacles, avoid collisions, and pick up floating trash effectively. Water currents, biofouling, and low battery life were issues that were encountered but through experimentation and redesign, positive changes were incorporated. The project demonstrates the ability of robotics to conserve.

Future Implementations

1. Adding solar charging to increase operation time and sustainability.
2. Adding GPS for group navigation and tracking.
3. Creating a mobile application for remote control and monitoring.
4. Enhancing the waste collection system to handle bigger sizes of debris.
5. Use of AI algorithms to balance paths and autonomous decision-making.

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