ROBOTICS

REPORT

TEAM NIGHT'S WATCH

PROBLEM STATEMENT (ROBOTICS AND DRONES)

We are trying to address the problem of river pollution, specifically the accumulation of waste such as plastic, debris, and other harmful pollutants in rivers. This pollution poses significant threats to aquatic ecosystems, wildlife, and even human communities that rely on rivers for clean water. Current methods for cleaning rivers are often inefficient, expensive, and require substantial human labor.

ABSTRACT

The proposed solution is an autonomous water body-cleaning robot that collects floating debris using smart IoT-based technology and real-time monitoring. The robot navigates the water surface, collects waste in specialized self-sealing bags, and records its location for easy retrieval. It utilizes dual-motor control for flexible movement, a camera for visual detection of waste, and LoRa for communication and IoT tracking

How it Addresses the Problem

•Autonomous Operation

•Efficient Waste Collection •Precise Navigation and Monitoring

Innovation and Uniqueness of the Solution

•Self-Sealing Floating Bags

•GPS-Based Waste Bag Tracking

•IoT-Enabled Real-Time Monitoring

EXPERIMENTAL PROCEDURE (PROTOTYPE)

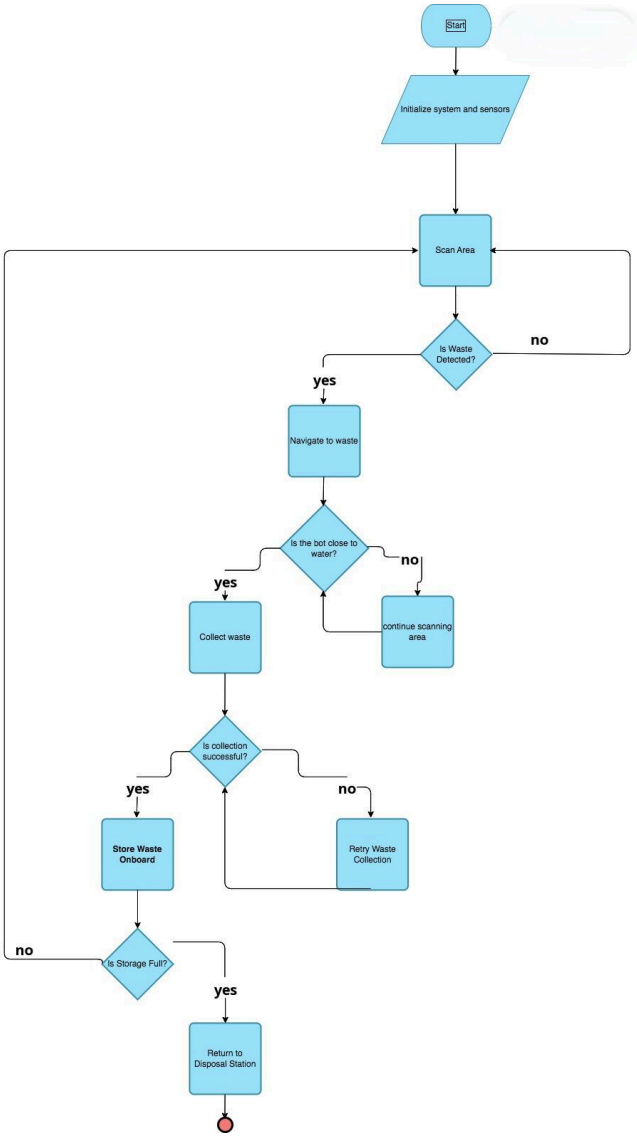
The water surface cleaning robot is equipped with **ESP32 microcontrollers** and utilizes the **ESP-NOW protocol** for efficient, low-power communication between the robot and dock. A **YOLO-based detection model** is used to identify and locate waste (such as plastic), with the robot autonomously navigating toward the waste based on linear and angular acceleration data provided by the model.

Once near the waste, a **conveyor belt system** transports it into floating, interconnected bags that the robot tows. These bags are designed to prevent aquatic organisms from

entering and are sealed when they reach a threshold weight. The sealed bags remain buoyant with the help of **attached buoys** and can be retrieved via a rope system connected to the dock.

To avoid rope tangling, a **pathfinding algorithm** optimizes the robot's movements while conserving battery life. The entire operation is monitored and controlled through a **mobile app**, allowing users to track the robot's location, waste collection status, and other critical parameters, with the option for manual control when needed.

WORKFLOW



BUSINESS MODEL

Customer Segments (Primary customers)

- **Government bodies: Municipalities and environmental departments responsible for maintaining public water bodies.**
- **Environmental Agencies: Nonprofits and organizations focused on reducing water pollution.**
- **Private Companies: Businesses that own or manage private lakes or ponds (e.g., resorts, estates).**
- **Industrial Plants: Factories that discharge treated water into nearby water bodies.**

Revenue Streams

- **Direct Sales: Sell the water bots to government and private organizations for direct use.**
- **Service Subscription: Provide a subscription service for real-time monitoring and maintenance of the bot and the water quality sensors.**
- **Maintenance and Support Contracts: Recurring revenue from providing maintenance, repairs, and software updates.**

Profitability and Scalability

- **Initial Profitability: The business would initially rely on direct sales to governments and agencies, which would generate large, one-time payments.**
- **Scalability: Once a few units are sold and installed, recurring revenue would come from monitoring and maintenance subscriptions. As the number of bots deployed increases, economies of scale would reduce costs.**

- **Expansion: As the product gains traction, it could be expanded to international markets and further diversified into cleaning additional types of water bodies or adding new functionalities like oil spill cleanups.**

REFERENCE

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https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1745433#:~:text=and%20Climate%20Change-,Government%20notifies%20the%20Plastic%20Waste%20Management%20Amendment%20Rules%2C%202021%2C%20prohibiting,from%20the%2031st%20December%2C%202022.

Work:

http://aqumulate.unaux.com/#

https://github.com/punithan1arjunan/pitchathonnightswatch

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