Group 7 – Automated Water Surface Trash Collector

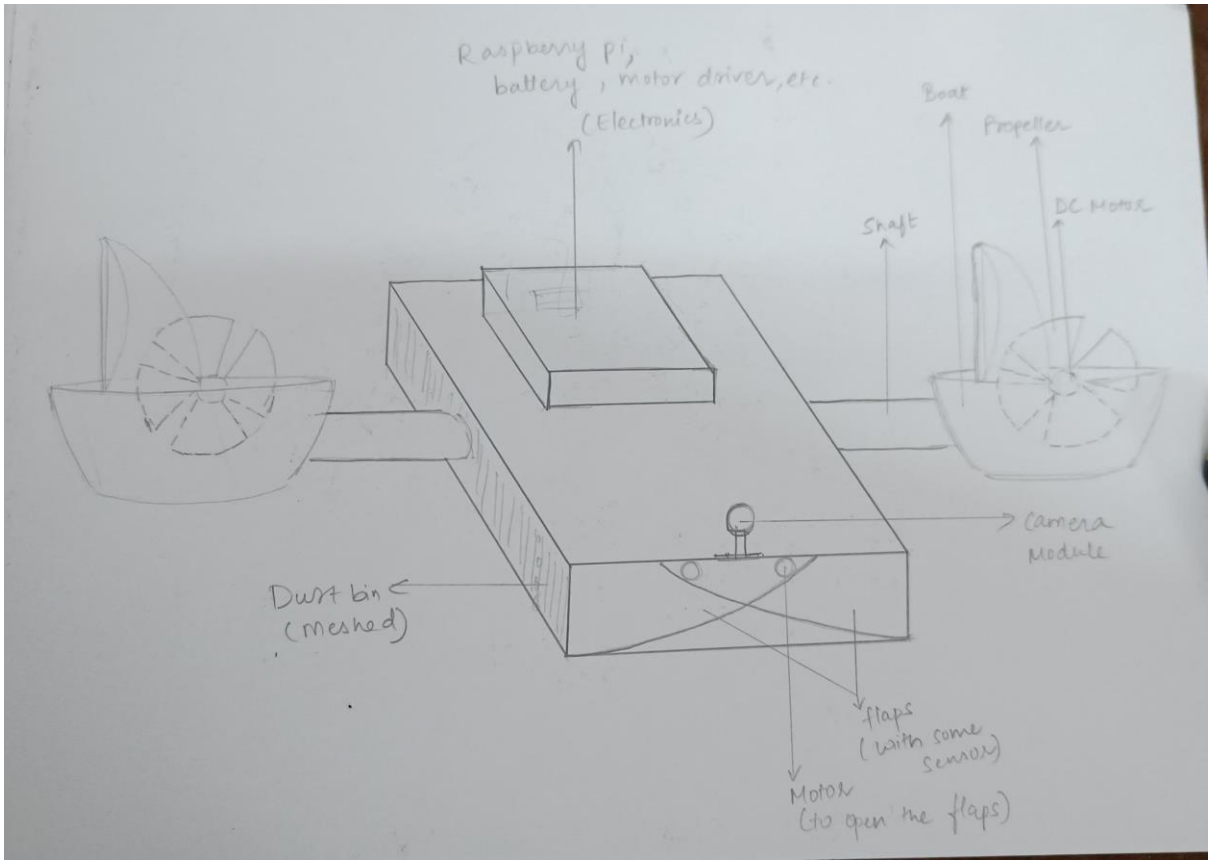
Project Proposal

Problem Statement:

Water pollution is a critical environmental issue that threatens life on Earth. Every day, countless species face extinction due to the harmful effects of polluted water bodies. In India, where rivers are revered and considered sacred, the pollution of these waterways with trash and debris is especially disheartening. This situation represents a profound environmental and cultural tragedy.

In an effort to combat this immense challenge, we aim to address a specific aspect of water pollution through technological innovation. Our project involves the development of an autonomous water trash collector designed to detect and collect floating debris. This device will be deployed in rivers or lakes, where it will operate independently to help reduce pollution levels and contribute to the restoration of these vital ecosystems.

Rough Sketch:



Mechatronic Architecture:

Central Body and Trash Collection Mechanism:

The central structure of the system is a mesh dustbin with dimensions of 3 feet by 4 feet, open on the forward side. The mesh functions as a porous container, allowing water to drain out while capturing larger trash objects. To prevent the collected trash from escaping, a non-porous flap/lid is hinged on the forward side of the dustbin. This lid can be opened or closed as needed, controlled by a servomotor.

Propulsion System:

The dustbin is connected to two boats via metal shafts on either side. Each boat is equipped with a submerged propeller that provides thrust for forward and backward motion, as well as turning, which facilitates the overall movement of the structure. The DC motors driving the propellers are controlled by a motor driver module, which regulates both speed and direction.

Control and Processing:

A Raspberry Pi microcontroller serves as the central processing unit, managing the entire system. It is powered by a rechargeable Li-ion battery. The Raspberry Pi controls the DC motors through the motor driver module and processes real-time data from the camera module, which is mounted above the forward-facing opening of the dustbin. The camera captures images and uses computer vision techniques to detect and identify trash.

Circuit Protection:

Fuses are used to protect the system from short-circuiting and overloading. Further, the entire circuit is to be made waterproof with shields and covers placed strategically to avoid any contact with water. The waterproofing also prevents unnecessary corrosion.

Additional Components:

Servomotor: The servomotor is responsible for operating the lid of the dustbin, allowing it to open and close as needed to prevent trash from escaping.

WiFi Module: This module provides the capability for remote control and monitoring, allowing the user to manually adjust the boat’s movement if necessary.

GPS Module: The GPS module is included to provide location data, which can be used for autonomous navigation or to track the boat's position.