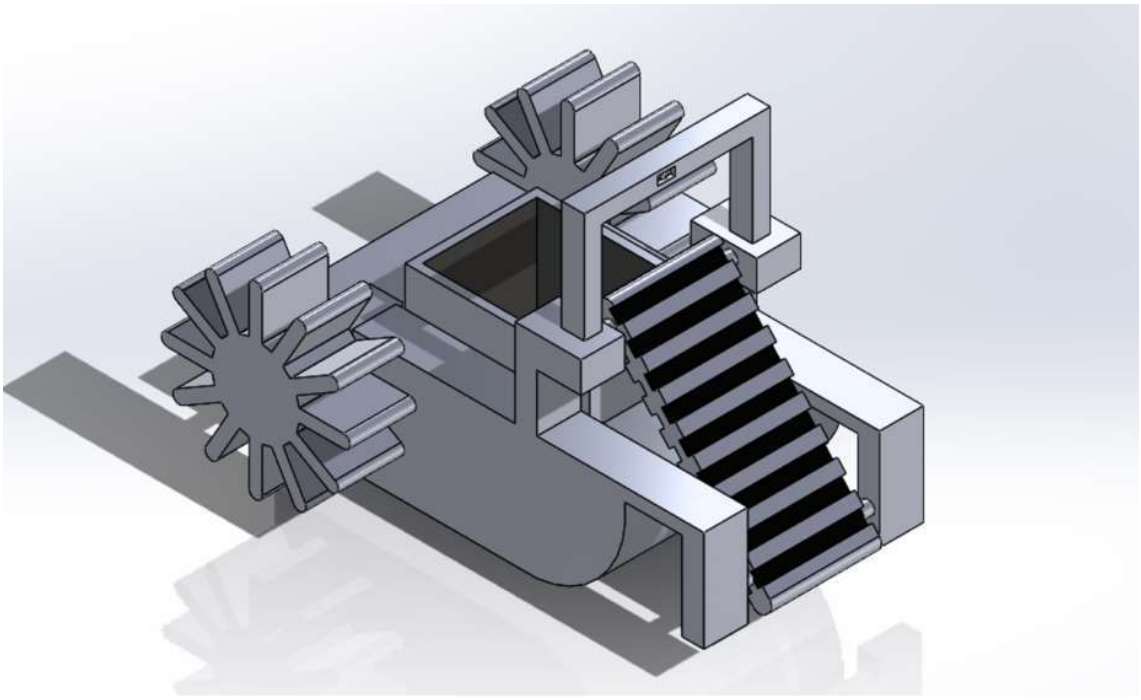
METHODOLOGY

DESIGN AND IMPLEMENTATION:

The system is an unmanned water bot and thus the design needs to be streamlined, water resistant, light weight and durable. The material chosen for the body of the robot is polyvinyl chloride (PVC) board keeping all the aspects in mind. The whole body including the conveyor belt are made of water repellent materials that do not add excess weight to the robot. The trash collector has slots engraved where the excess water that comes from the conveyor arrangement can flow back into the water body and do not add to the weight of the trash in the container. The motors used are high-torque so that the water currents cannot force the motor to rotate.

EXPECTED DESIGN:

NOTE: The brushes and grass cutter are not included in this design, they are attachable modules and can be attached to the robot. These modules are designed separately.

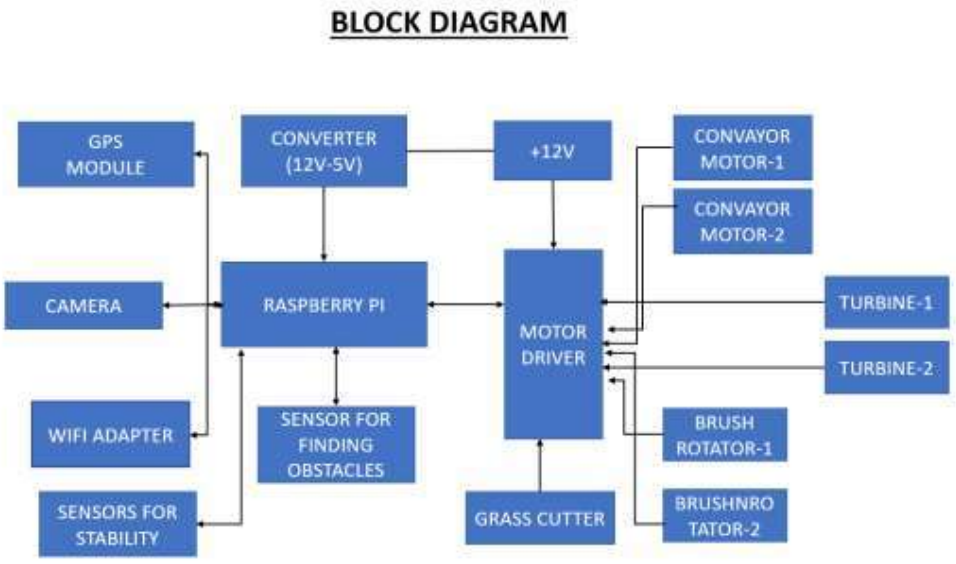


METHODOLOGY

COMPONENTS & USES:

- A Raspberry pi is used as the main controller, which is connected with a gsm module / wifi adapter for internet connectivity.
- The GPS module is connected to the pi for getting the location where the plastics are collected and the data is transferred to the cloud.
- The robot have a camera and an ML model is embedded in pi to identify plastic, other wastes, obstacles, grass, etc.
- Sensors for obstacle avoidance is embedded, sensors like Lidar, ultrasonic range finder, etc, are used to detect the obstacles.
- Sensors for stability of robot in the water, sensors like accelerometer, gyroscope, etc are used.
- Motor driver is used to control and drive the motors used in the robot.
- We are using a 12V DC battery for the power requirement.
- Voltage converter convert 12V to 5V for the Raspberry pi.
- Two stepper motors are used as the conveyor motors.
- Two DC motors are used as the rotor for the brushes.
- Two DC motor is used as the rotor for the turbine.
- A high speed brushless moto is used for the grass cutter.

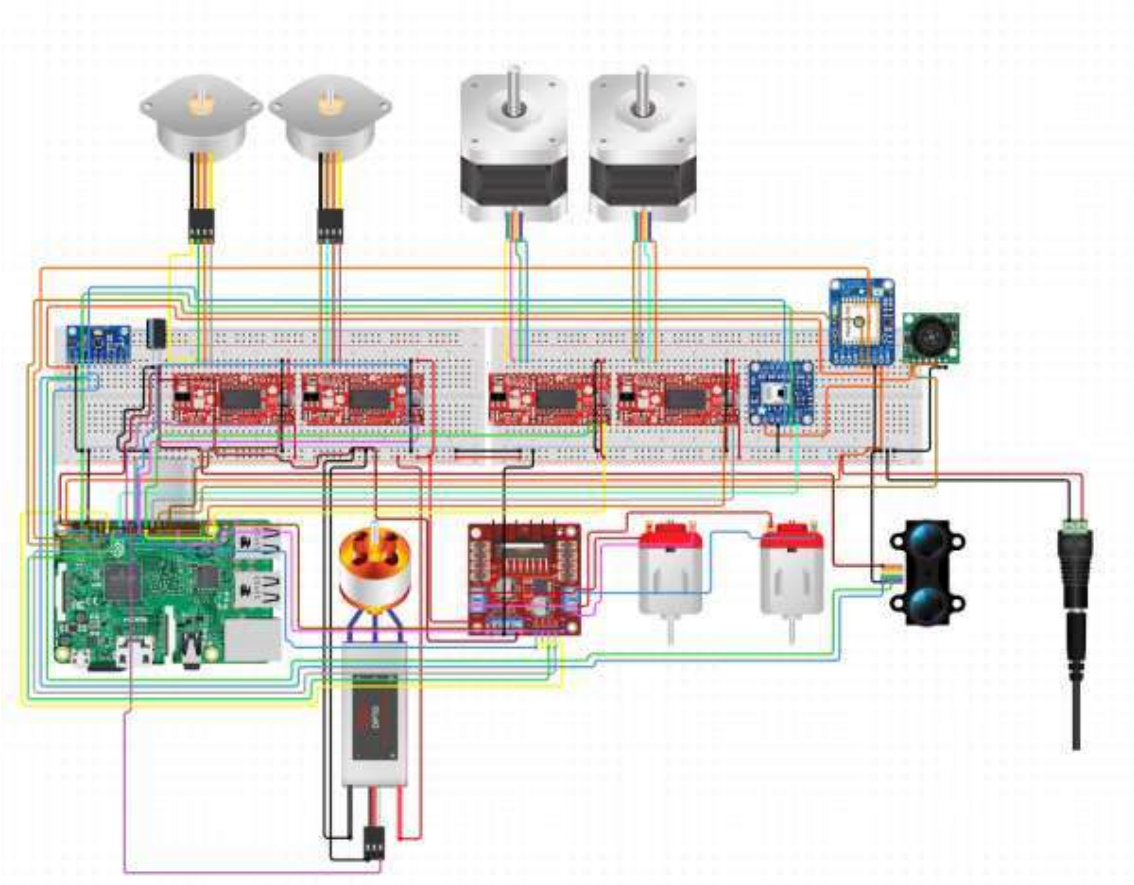
BLOCK DIAGRAM / FLOW DIAGRAM:



METHODOLOGY

CIRCUIT DIAGRAM:

NOTE: The actual component used may vary based on specification, since unavailability of desired component in circuit design software, similar components has been used for completing the circuit.



METHODOLOGY

WORKING / STEP:

- The robot can be controlled from anywhere using IoT, the data is transferred to the cloud live.
- The robot can be controlled using a mobile application or the robot can autonomously operate.
- Once the robot is on the water and initiated, the camera will look for wastes and move slowly.
- Sensors are embedded to determine the stability of the robot in the water.
- If waste is identified by the ML model implemented, the robot will move near to the waste.
- Once the robot reach near the waste, the conveyor, the brushes are activated and the waste is collected.
- The conveyor will carry the waste and displace it in the container.
- The camera could also detect aquatic animals like fishes, and the operation will be temporarily paused, not to harm them.
- The location were plastic is collected, is captured using the GPS module and the data is stored in the cloud.
- The robot will continue its process until the area is clear or the container is full.
- In the case of removing water plants which are harmful for the aquatic life, the grass is identified by the camera through the ML model.
- The grass cutter is initiated and the grass is collected through the conveyor.
- The collected grass is trashed and transferred for further processing.

COMPONENTS USED & ESTIMATED PRICES:

SL NO	COMPONENT	QUANTITY	AMOUNT (in Rs)
1	Raspberry pie	1	18000
2	Camera module	1	5000
3	Motor drive	1	1500
4	+12v Battery	1	3000
5	Voltage regulator	1	500
6	GPS module	1	2000
7	Wifi adapter	1	1000
8	Lidar sensor	1	20000
9	High torque motor for conveyor	2	5000x2=10000
10	Turbine motor	2	5000x2=10000
11	Turbine	2	2000x2=4000
12	Brush motor	2	5000x2=10000
13	Brush	2	1000x2=2000
14	Grass cutter	1	10000
15	Body	1	25000
		TOTAL	**1,22,000**