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AQUA ROVER

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Abstract

Water has been stated as one of the fundamental elements for the existence of life on Earth, and is being contaminated as a sign of human development and negligence towards the ecosystem. In spite of many waste disposal methodologies that have been proposed and brought into practice, the pollution rate is not differentiable. Around 80% of the Indian local body water sources have been reported as tainted due to waste dumping. Every year, around 1.5 million Indian children die from diarrhea. While looking at the water pollutants, plastic has a significant contribution towards this. They pile up, creating a layer on the water surface resisting the light to enter the water; also, the chemicals used in coating the plastic objects turn out to be life threatening for the aquatic lives as well as human lives. A considerable population use these local water body sources for drinking purposes and it adds up to the responsibility for us to keep them hygienic and safe. Many methods for abreaction have been initiated by the Government and other resources. This paper proposes an efficient, cost-effective, simple and habitat-friendly "AQUA ROVER" (prototype) which is a dedicated device to this concern.

Keywords: Sea Bin, Robotic Arm, Prototype

1. Introduction

Most of the living organisms rely on domestic water bodies such as lakes/ponds for their survival. Domestic water bodies have a valuable ecosystem and provide a variety of goods to humans. These water bodies have great significance, especially in India. They enhance the beauty of the landscape, provide shelter and food to many organisms, and help in maintaining the temperature. For the past few decades, water pollution has been a major

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concern in most parts of the world. As the world population increases the migration to urban cities has also increased due to which most of the water bodies have been exploited in many ways. The land has been occupied by humans and due to this the proper infrastructure for garbage disposal is lacking. As a result, the domestic water bodies especially in India are being polluted [1].

Our objective through this project is to build an autonomous trash-collecting robot (small or large waste) that does not harm aquatic animals, safe to use, cost-effective, durable, easy to use, collects a large amount of waste in less time, and collects the most type of waste. This project will be a huge advantage for many Government organizations or non-governmental organizations like WWF, UNDP, UNEP, ADB, and other local organizations to clean the lakes/ponds and converse the water bodies.

2. Proposed System

The "Aqua Rover" can collect waste particles in two methods either using a sea bin or by using a robotic arm. Sensors and a wireless camera are attached to the rover to record and measure the presence of any waste material. With this recording, the robotic arm/ the sea bin can operate to collect the waste. The power supply for Aqua Rover is given by the solar panel or by a lithium-ion battery. The Aqua Rover can be controlled with the help of an RF controller or by a Bluetooth module [4][7].

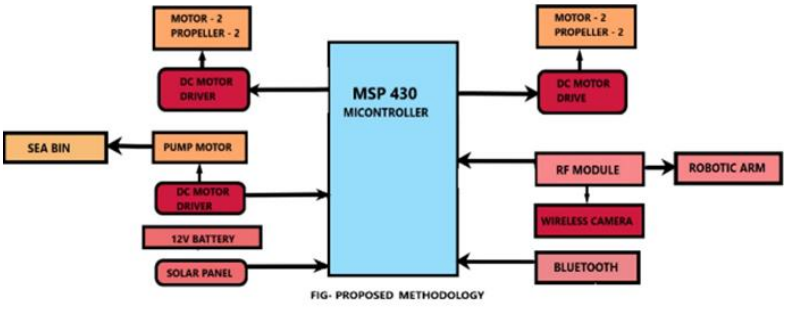

Figure 1. Proposed Methodology

The work of the rover can be explained with two modules:

2.1 Module 1:

RF Controlled Robotic Arm: Aqua Rover has an MSP 430 microcontroller that is interfaced with an RF receiver. These RF receivers are given instructions using an RF remote [8].

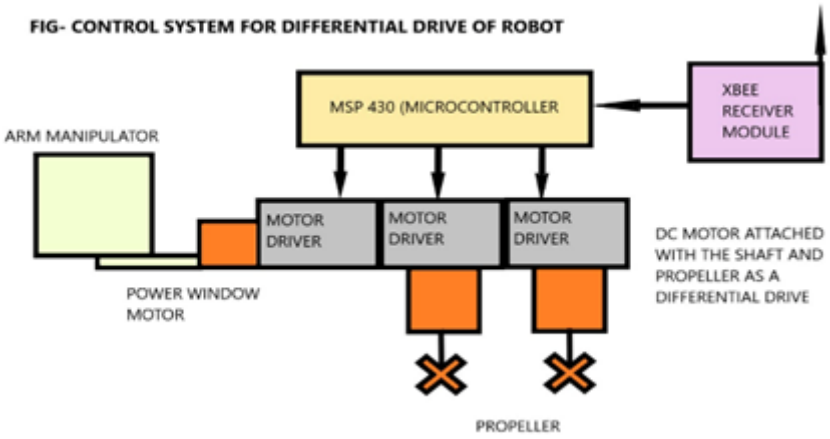

Figure 2. Control System for Differential Drive of Robot

Button Pressed at Transmitter	Moving Direction of Robot
First(1)	Left
Second(2)	Right
First and Second(1&2)	Forward
Third and Fourth(3&4)	Backward
No Button pressed	Stop

Figure 3. Navigation Controls

2.2 MODULE 2

SEA BIN MODULE: This module consists of a floating bucket. The inner part consists of a filter bag made with fiberglass matt. The floating bucket is connected to a pump. It pumps in waste along with the water. The waste is collected by the filter bag and the water is passed into the water body [8].

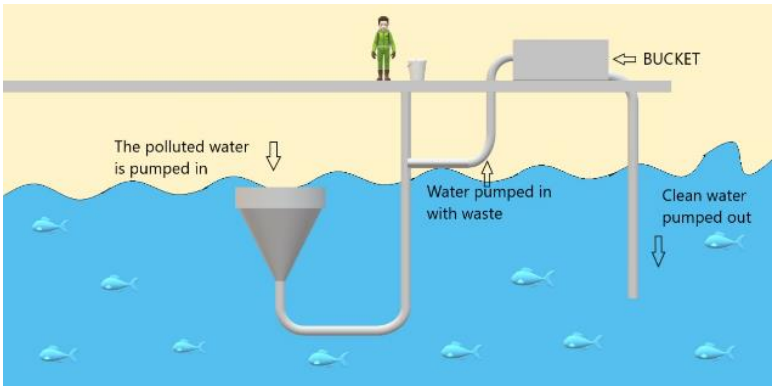

Figure 4. Workflow of SEABIN

3. Working of Aqua Rover

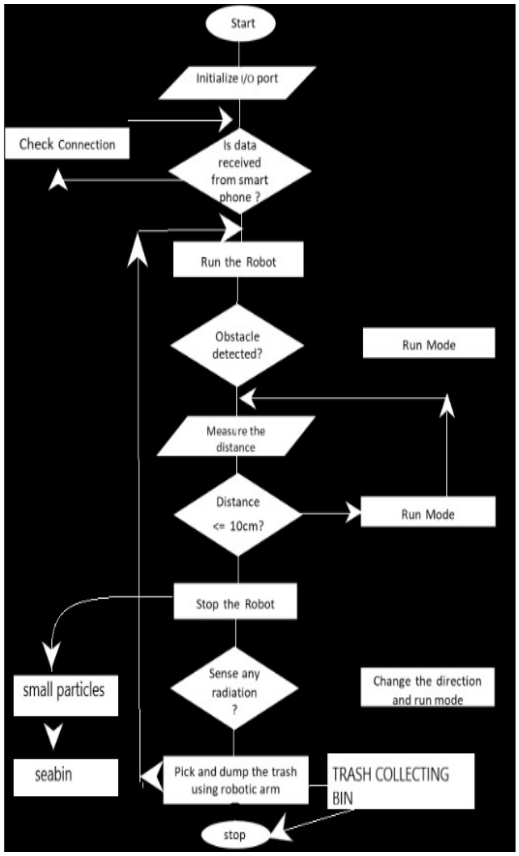

Figure 5. Command Controls of SEABIN

This module is designed in order to filter out considerably smaller particles and toxic films that are formed on the surface. The device pumps in the water through the sea bin which is directed to a filter bag; it filters out the pollutants with a fiberglass Matt. Once the filter process ends the water is directed back to the water body through the outlet pipe. The module is interfaced with ultrasound sensors, IR sensors and PIR sensors that helps in object detection and for the organized operation of both Seabin and Robotic arm. For relatively larger trash, the robotic arm comes into operation and is manually operated by the user. The device is driven by two 3500 rpm DC motors and is powered by solar energy (renewable energy) with Lithium-ion batteries. This module is Wi-Fi-GSM interfaced that enables mobile connectivity.

4. Prototype Design

The Aqua Rover prototype is based on a Basic microcontroller with built-in Wi-Fi that can be powered by a lithium-ion battery. The microcontroller is coupled to the robot arm

and ultrasonic sensor for testing purposes. The sea bin concept can be implemented individually by combining a water pump and filter paper. Both concepts are prototyped separately to demonstrate the basic behavior of Aqua Rover.

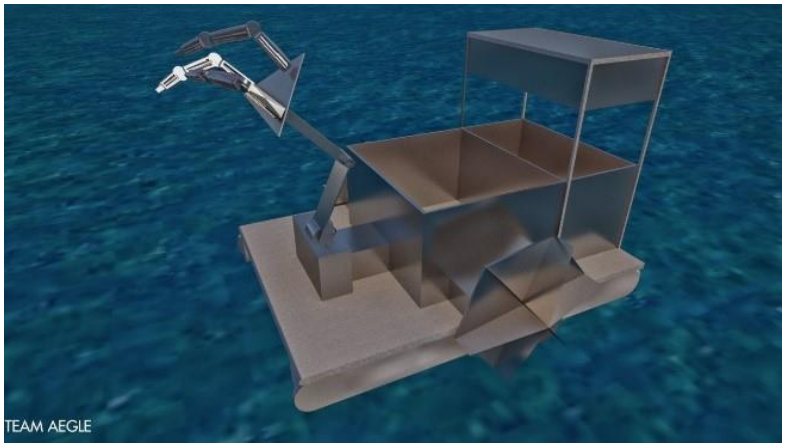

Figure 6. Proposed Model of Aqua Rover

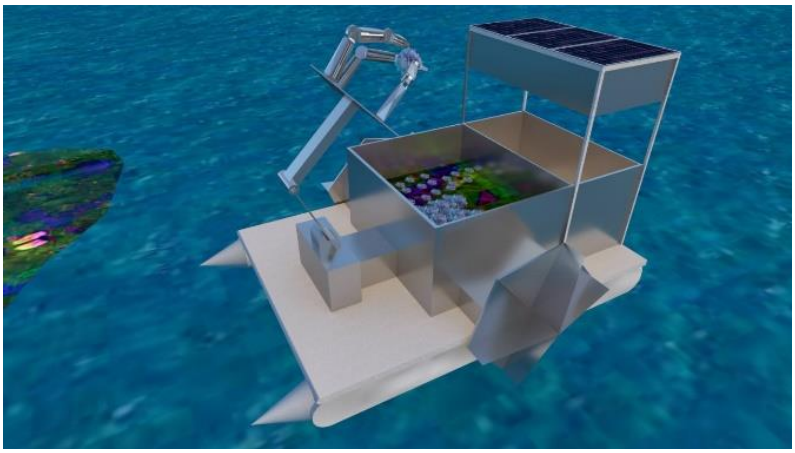

Figure 7. Aqua Rover Collecting Waste

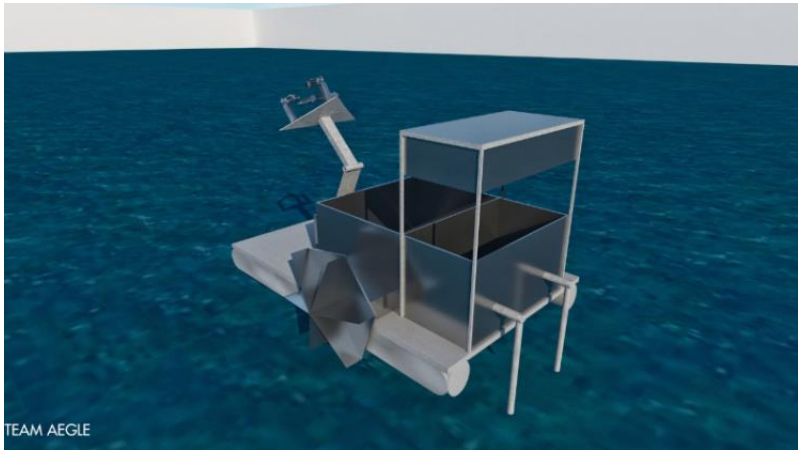

Figure 8. Rear View of Aqua Rover

5. Conclusion and Future Scope

Industrial wastes have been dumped in many water bodies. To save water resources, an autonomous multitasking garbage collector that can collect up to 67kg of garbage has been developed. The net weight of the prototype is 10 kgs. The production cost of the prototype is Rs.10000. The two basic concepts used in the design of Aqua-Rover are the sea tank and the robot arm (with RF module). Solar energy (renewable energy) is converted into electrical energy, which is Aqua rover's main source of energy. The prototype is built with a variety of sensors that represent the highest accuracy. The product can be manufactured within 30 days. The prototype has been developed using a new technology that is easy to use and accessible to everyone.

In the future, the waste collected by the prototype can be recycled and used as a source of energy. Moreover, the prototype can be used in the sea/ocean for collecting the waste by upgrading the camera and connecting a transmitter and a receiver.

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