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Aquatic Waste Management System

Kiran Boby[1], Akhil U S[2], Sravan M[3], P B Mohamed Ajmel[4]

Assistant Professor, Dept. of EEE, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India[1]

UG Student, Dept. of EEE, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India[2]

UG Student, Dept. of EEE, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India[3]

UG Student, Dept. of EEE, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India[4]

ABSTRACT: Clean water is vital to our health, communities, and economy. People depend on cleanwater for their health. Our communities are impacted by water contamination. Themacroscopic waste present in the water bodies are currently creating a high mode of threat to the use of this water for the people living in the corresponding areas. Abundant dumping of waste in to the water could affect the aquatic life in a threatening way. Presently there are a few methods existing for the purification of aquatic environment. But most of it is limited to micro-purification, chlorination and oxygenation of the water life. Most of the methods used to remove macroscopic waste are manual or machines which are manually operated. This method put forward a fully automated system to monitor and remove all the waste from the water bodies. A robot is designed to sense the waste using ultrasonic sensors and programmed to remove the macroscopic waste present in water.

KEYWORDS: HC-sr 04 Ultrasonic ranging module, Gear motor, Arduino UNO, Robotic arm.

I. INTRODUCTION

The condition of the lakes and ponds in majority of the developing countries are abysmal. A lot of money and efforts are being spent by the government and private firms on cleaning and maintaining them at regular intervals.The macroscopic waste present in the water bodies are currently creating a high mode of threat to the use of this water for the people living in the corresponding areas. Abundant dumping of waste in to the water could affect the aquatic life in a threatening way. Non organic waste present in it can result in blockage of water ow and the decaying of organic waste could result in catastrophic destruction of aquatic life in that area due to difference in oxygen, COD and BOD level rise or depletion. This problem can be avoided by using a fully automated system to monitor and remove all those waste from the water bodies. This work aims at developing an automatic robot, which can perform various tasks required for the cleaning and maintenance of lakes, ponds and fisheries. This may save a lot of human effort and provide a sustainable solution to the pervasive problem.

For the purpose of navigation and trash cleaning on the ground, many well-designed algorithms have been developed earlier for both single robotic systems as well as for swarms. However, because of the difference in the dynamic environment, propulsion system, and the difficulty to accurately determine the current position based on relative velocity and acceleration, these algorithms cannot be directly used on aquatic surfaces. Also, the navigation algorithms developed earlier for autonomous aquatic robots have not been designed with cleaning as an integral part of them.

Thus, there is a need for developing a new algorithm for the navigation of these robots and optimizing the effort in waste removal. This paper addresses the issue and presents a viable solution. An automatic system which uses IR sensors for the detection of waste and collection is introduced. Ultrasonic sensors are used for sensing obstructions while traversing in the water. A robotic arm driven by servomotors is used for the collection of waste.

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II.AUTOMATIC POND CLEANING ROBOT

A boat shaped body is adopted as the vehicular structure so that it satisfies all the hydrostatic, sea-keeping and basic solidness criteria. With the end goal of expulsion of waste, a robotic arm driven by servomotors is used and waste is collected in an area secured with a net. Gathered waste buoys on the water surface, so the robot does not have to bolster its weight. The robotic arm is placed below the water level so it can collect the floating waste easily.

An obstruction sensor is used to sense if there is any obstruction. If the sensor detects any obstruction the propulsion is stopped and the robot changes its direction. The propulsion motors are kept inside the hulls to prevent it from making contact with water.

III. KEY FEATURES OF THE SYSTEM

The main key features of the system are an automatic obstruction sensor and a robotic arm which collects the waste. HC sr-04 ultrasonic module is used for obstruction sensing. When the sensor detects any obstruction the robot stops its propulsion and turns to direction where there is least obstruction. The robotic arm is driven by a servo motor. It operates when the IR sensor placed in front of the robot detects a floating waste the servomotor operates and collects the waste. The robot can be toggled between manual and automatic mode.

IV. SYSTEM SETUP

The four essential issues for outlining the amphibian robots are: cost effective arrangement alongside robustness, adequacy and toughness. Because of the way of the cleaning work, the vehicle structure is outlined to such an extent that it can give high steadiness, incredible mobility and can undoubtedly gather all the waste streaming in the middle. A boat moulded body works best for this case and satisfies all the hydrostatic, sea-keeping and basic solidness criteria. With the end goal of expulsion and gathering of surface waste, a robotic arm driven by servomotors has been used to collect the waste in an area secured with a net. This configuration gives a basic and successful waste expulsion and suits a lot of waste inside a little space. In addition, as the gathered waste buoys on the water surface, the robot does not have to bolster its weight. The lower area of the robotic arm is set beneath the water level to effectively take out the floating waste easily.

A. BLOCK DIAGRAM

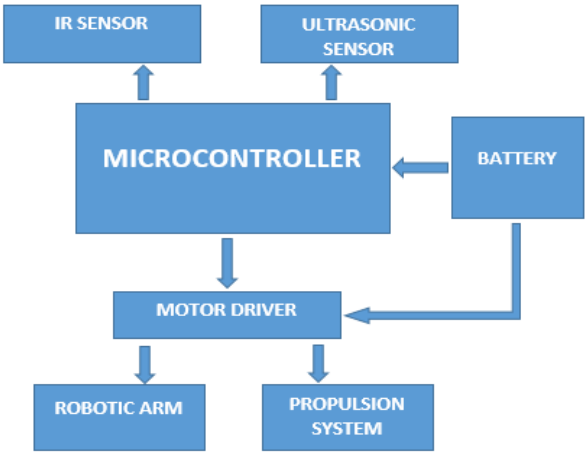

Fig 1 Block Diagram

Block diagram of the system is shown in figure1. IR sensors are for the detection of waste. When waste is detected by the IR sensor it sends signal to the microcontroller. The microcontroller then sends the necessary commands to drive

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the servomotors controlling the robotic arm. The motor rotates 180 degrees to collect the waste in the storage area. Then the servomotor rotates 180 degrees back to its original position. Ultrasonic ranging module is used for sensing obstructions. The robot moves in a straight path until an obstruction is detected by the ultrasonic sensor. When it comes across an obstruction the sensor looks to left and right. It will find the direction with minimum obstruction and sends necessary signals to drive the robot in that direction. The inputs from all the sensors and the wireless receivers are fed into the microcontroller. Microcontroller processes the information and sends the desired commands to motor drivers for propulsion, waste collection and payload deployment. The collected waste floats on the water surface, the robot does not need to support its weight. A 6Vlead-acid battery is used as the supply.

B. CIRCUIT DIAGRAM

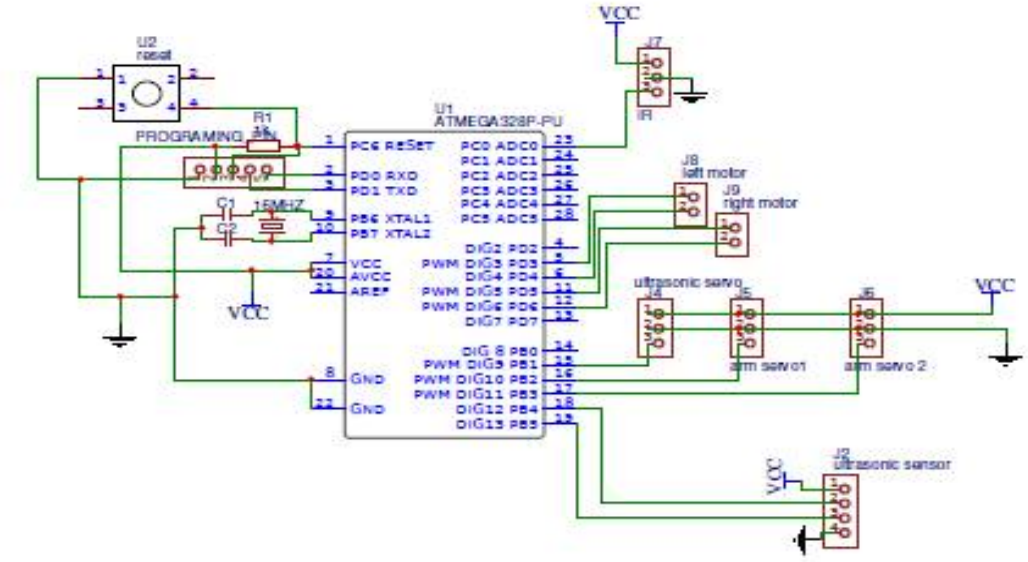

Fig 2 Circuit Diagram

The circuit diagram consists of Arduino UNO, IR sensors, Ultrasonic ranging module, servomotors and gear motors. The system is powered by a 6V lead-acid battery. The microcontroller reads input from the sensors and sends necessary commands to drive the propulsion system and waste removal system. Propulsion system is driven by thegear motors and robotic arm is driven by servomotors.

V.RESULTS AND CONCLUSION

Our communities are greatly impacted by water contamination. At present there are a few methods already present for the purification of aquatic environment. But most of it is limited to micro-purification. Most of the methods used to remove macroscopic waste are manually operated. This paper introduces an automatic robot system to be used for lake cleaning. The system is highly reliable effective and economical at water bodies, reservoirs and any form of aquatic environment. As this method saves us a lot of amount of labor and man-power and also reduce the time consumed to treat the water making the system efficient enough to be implemented considering the cost is negligible considering the application and need of the system. We know that though it is very beneficial but it is also impossible to install such system at each and every place, but it gives certainly a considerable benefit to us, thereby to our nation.

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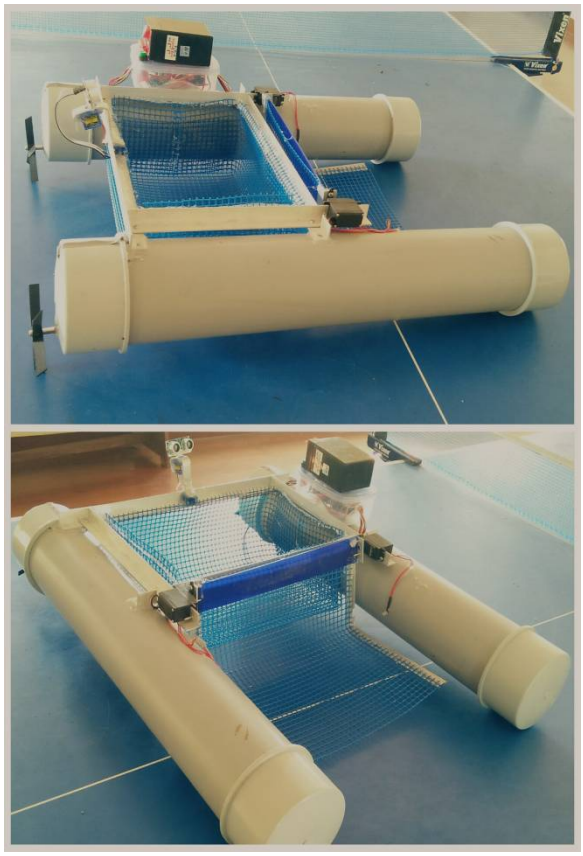

Fig 3 Implemented Prototype

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