

Automatic Hydro Tech Cleaning Rover

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Abstract— This project aims at dealing with the ecological problems with modern methods. This research paper presents a way to deal with the surface water pollution with the help of AHTCR (Automated Hydro Tech Cleaning Rover). The surface water pollution has been a severe problem in various parts of the world specially in India where rivers are treated as gods by many religious groups this problem is really concerning. The AHTCR focuses on cleaning the surface of the water reservoirs by collecting the floating debris of the water surface by a porous conveyer belt that just collects the waste and filters the excess water that enters with the debris by the net. This project is controlled by ESP controller and blynk software making it easier to be controlled. The conveyer belts speed will be moderate and it will slowly collect the trash from the water body. The propellers can be controlled individually, grants the boat the ability to turn 360 degrees clockwise or anticlockwise even in a small area.

Index Terms- BO Motor, Blynk, ESP Controller (Wi-Fi Module), Motor Driver, Relay.

I. INTRODUCTION

In today's world, it is observed that water bodies in India are suffering from pollution due to presence of garbage on water surface. It has an adverse effect on water quality, aquatic system and also human beings. It has an adverse effect on various aspects including marine trash, microplastics, damage to different ecosystems, economic damage.

There are various solutions which can be implemented to avoid pollution. One can create Waste management system, take up some cleanup initiatives, technological innovations. By implementing above given solutions, effects of trash present on water surface can be managed and it can lead to a cleaner environment.

These are some major issues which needs to be addressed and this is where AHTCR will be helpful. AHTCR stands for "Automatic Hydro Tech Cleaning

Rover". The main objective of the project is to engineer a specialized boat which is capable of collecting the floating debris present on the water bodies. This project signifies the commitment to a cleaner and healthier environment also ensuring it without harming the aquatic life. AHTCR is the boat which not only cleans the water bodies but also maintains the sustainability of the environment without creating any carbon emission.

The AHTCR prototype that is created in this project is just a demo model that can be implemented on a small scale. The large scale model of AHTCR can be used to combat the reservoirs surface pollution at a huge rate. It will help to restore the aquatic ecosystems and it will also help to protect the public health who depend upon direct consumption of river water.

II. LITERATURE REVIEW

The machine consists driver mechanism. The conveyor belt that is powered by a battery continuously rotates in a backward direction to collect the floating debris with the help of dc motor. dc motors used to run the boat which is controlled by using mobile app, Arduino Bluetooth controller. ESP 32 camera on it provides visible path with the help of webservice.[1]

The proposed boat has DC motors for motion of boat and conveyer belt. Encoder-decoder pair of RF-Module is used to control actions. Non-slip PVC conveyer belt drops light waste into bin. [2]

The project lifts up debris from the water surface by using a collecting plate placed between two chain drives which are rotated continuously by a motor. It also consists of two propellers which drives the floating towards the collecting plate. This rover is controlled by Bluetooth module. [3]

The river water cleaning boat structure consists of Arduino board, Bluetooth Model, Battery, Solar Panel, Bluetooth control Android app, DC Motors, and Conveyor Belt. Bluetooth Module is used for wireless communication. The batteries used are rechargeable with the help of solar power. The motors control the conveyor belt and the motion of boat. [4]

ESP Controller (Wi-Fi Module)	Connection of motor driver and communication between AHTCR and Blynk
Motor driver	Direction of Propellers
Relay	Switching On/off of the conveyor belt depending upon the signal

The proposed machine cut-shorts aquatic weeds with an underwater spinning blade. These pieces of weed are conveyed into a bin by a belt. Submersive propellers facilitate locomotion. [5]

Conveyor belt made of rough material drops waste into a box. Conveyor belt will have slow speed and a slope so that water can be drained as much as possible. Many problems were faced during the making of AHTCR. Firstly, the electronic components firstly used were flawed. (Node MCU, motor driver). The solution for this was the components were exchanged and checked again. Secondly, the soldering done to connect the circuit was not enough to hold the jumper wires. The solution for this was to use strong wires and ensure connectivity. Third problem was the components selection had many problems like base was needed to be light and durable also should be able to float.

The proposed model makes use of 2 sensors. Based on the data collected by sensors, boat and robotic arm are used to collect the garbage floating on water. With help of Ultrasonic Sensor, if any object is detected at near distance then the boat will initially identify whether it is trash or any living organism using Passive Infrared Sensor (PIR) and accordingly perform action. i.e. It will collect if it is trash and stop if it is a living organism[6]

The solution brought was to use sun-board sheet as it floats and is hard and durable. Fifth problem was the conveyer was needed to be porous to drain out water. The solution found by taking a net with big pores that drained water well and didn't clog due to dirt particles.

III. METHODOLOGY AND DESIGN

AHTCR is structured with a sun-board sheet to its base, a conveyor belt, a trash container, plastic bottles to support the buoyancy of AHTCR and the circuit box. AHTCR is powered by a 12V Li-ion battery, motor driver, and relay used for the needful connections of motors.

The 12V Li-ion Battery is selected due to its feature of rechargeability. It is a 2800mAh (milli Ampere per hour) battery with the ability to provide sufficient current ranging from 40 to 180 mA current to each motor.

For wireless communication, it uses ESP8266 Node MCU. The conveyor belt is porous to drain off the excess water. Two BO motors are used for the functioning of the conveyor belt. Two BO motors are used along with propellers for the motion of AHTCR.ESP8266 is used along with the Blynk app for communication.

Torque Calculation for motors:
 Weight of rover =310g
 Rpm=300(Rotations per min)
 Torque = 0.35kgcm
 Power= Torque × Angular velocity
 $P=2\pi \times T/60$
 Power =11W

Fig.01 Components names, purpose and their rating

Name	Purpose and Rating
BO Motor	Rotation of conveyor belt and propellers
Blynk	Wireless communication between mobile and ESP8266

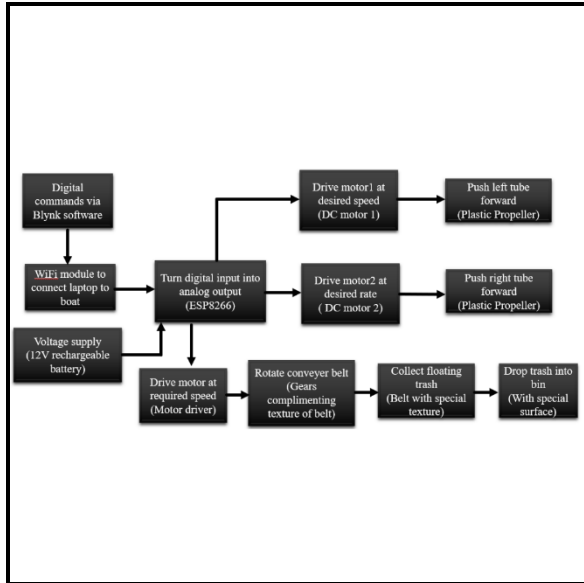


Fig.02 System Block Diagram of AHTCR

Simulations/Experiments/Testing

The project monitored and tested the motors speed for the conveyer belt and propellers. For smooth functioning the project checked their suitable speeds for collecting the floating trash and to move the boat forward. The project was also monitored for the clockwise and anticlockwise rotations for the motors to maintain proper functioning of the conveyer belt and for the forward movement of the boat. Testing of different materials for the conveyer belt in this project different materials were tested for the conveyer belt. This project primarily focused on a belt that would remove or filter water from the floating waste so the weight of the waste would be reduced. The problems faced during this testing was the clogging of the net due to dirt particles in the end the net used in this project has large pores so it won't be clogged by dirt particles. Testing of Wi-Fi module (ESP/BLYNK). In the execution of this project the esp module and blynk plays a really important role in its controlling. Hence their through testing was done the module takes sometime like 3-4 seconds to give response after connection or starting the system. Sometimes the module shuts itself off by its own. The motors for propellers can be controlled individually but the motors on conveyer work together. Materials tested for base. This project was completely performed on hit and trial basis. The right components for the project were selected through various experiments. A rigid but floatable body base to make the boat float. Instead of

going for the normal streamlined boat shape the project chose a board shape to maintain stability for the boat. The body the conveyer the base and all the layout of the boat were solely chosen after experimenting with different materials.

CONCLUSION

The pollution caused by surface garbage on water bodies cannot be left unnoticed. It affects human life in various ways it can lead to many harmful diseases like diarrhea, typhoid fever, E.Coli infection. It will add to the toxicity of the water and will also affect the ph and turbidity of the water which in turn can make the water unfit for human consumption. It also affects the aquatic life and will also affect the whole aquatic.

This project prototype is made using basic components and sustainable resources. This model has rechargeable batteries and a conveyor that drains water so that these don't need to be replaced again and again which will be a good step for the preservation of the nature. Both the propellers can be controlled individually so it can have nearly 360 degree turns and gain more control over the boat. The blynk allows the model to be controlled from a distance and that in turn helps in automation of the rover.

Considering that, rigorous efforts have been put on for accomplishing this project. AHTCR is built in such a way that it offers the cost-effective as well as environment friendly way to achieve the objective of the project

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