International Journal of Scientific Research and Engineering Development-– Volume 3 Issue 2, Mar-Apr 2020

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Lake Cleaning Robot

Manisha K. Bhole*, Yash Chavan**, Salman Chougle***, Prasad Rahate****, Nauroz Shaikh*****

*(Professor, Department of Instrumentation Engineering, Bharati Vidhyapeeth College of Engineering,Belpada)
** (B. Tech Scholar, Department of Instrumentation Engineering, Bharati Vidhyapeeth College of Engineering, Belpada)
*** (B. Tech Scholar, Department of Instrumentation Engineering, Bharati Vidhyapeeth College of Engineering, Belpada)
**** (B. Tech Scholar, Department of Instrumentation Engineering, Bharati Vidhyapeeth College of Engineering, Belpada)
***** (B. Tech Scholar, Department of Instrumentation Engineering, Bharati Vidhyapeeth College of Engineering, Belpada)

----------**********----------

Abstract:

Water is a basic need for all living being, it is important to maintain the cleanliness and hygiene of water. Water from lakes and ponds are cleaned by traditional methods. We have to incorporate technology such that cleaning work is done efficiently and effectively.

On seeing the current situation of lakes and rivers, we have designed an intelligent water robot that can clean any floating waste material. Lake Cleaning Robot is an autonomous and mechanical water body cleaning machine that can collect any floating waste material, whether it may be plastic, metal or biodegradable waste. The product is a small unmanned boat which can navigate through a river/lake with help of remote control. Water cleaning boat runs with a motor-powered propeller that uses water thrust to push the boat forward. The waste is collected with the help of a conveyer belt that rotates and pulls any waste object that comes in its way and collects it in the collector basket.

To maintain the cleanliness of India this project gives little contribution towards "Swachh Bharat Abhiyan" scheme by PM of India.

Keywords — **Garbage, conveyer belt, water thrust, propeller, unmanned boat**

----------**********----------

I. INTRODUCTION

The robot helps to collect all the floating waste materials in the collector basket which is then recycled and the robot is brought back in the lake. This process is done with the help of a rotating conveyer belt that pulls the garbage that comes in its path. It is controlled via a mobile phone, connected to the NodeMCU via WiFi connection.

II. LITERATURE SURVEY

In [1] paper it is discussed of the design of a multi-robot system of autonomous aquatic vehicles that can be used for cleaning of lakes and maintenance of fisheries. Aimed at automating the entire process, the robots make use of tactile sensors and wireless communication to traverse autonomously and collectively perform cleaning operations such as removing the surface impurities, pumping oxygen into the water, spraying chemicals and distributing food at appropriate locations along with measuring the water quality. A novel algorithm for navigation and waste removal strategy of the multi-robot aquatic system, inspired by insects such as ants and bees, referred to as 'recruitment algorithm', has been proposed.

In [2] paper it describes the design of a robot for cleaning rubbish floating on the water surface. A pontoon shaped hull works best for the case and fulfils all the hydrostatic, structural stability criteria. For removal and collection of surface waste, a motor-driven collecting-arm system has been designed for collecting the wastes and redeploying it into a rectangular basket on the hull.

In [3] paper, they present an underwater mobile sensor network that is being developed to monitor these waste storage pools. This sensing system will also be used in very old storage pools to build maps of their internal structure which can then be used for waste removal and pool decommissioning. In the paper, they outline the unique challenges of their application scenario which include robot localization in cluttered underwater environments and the effect of location errors on environment mapping. They also list other industrial applications that can benefit from their underwater sensor network.

III. DESIGN AND DEVELOPEMENT

We have used NodeMCU as the controller of the robot. It consists of inbuilt WiFi module. The WiFi module establishes wireless communication between smartphone and the robot.The robot is operated via smartphone. Directions will be given to the boat via an application on a smartphone called "NodeMCU_Car"

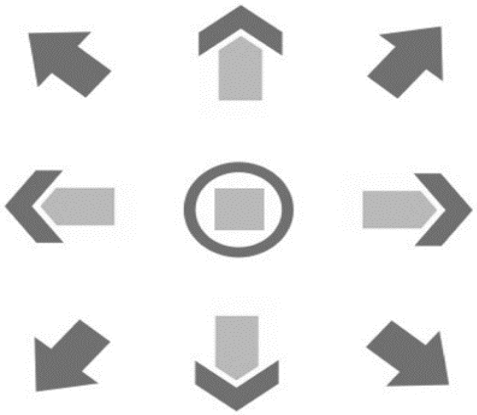

Fig: 1.1 NodeMCU Car (HMI)

It will give directions which will help the boat to navigate throughout the lake. In this we use power supply which is 24V to drive the robot for forward and backward direction and with conveyer belt clockwise and anticlockwise rotation.

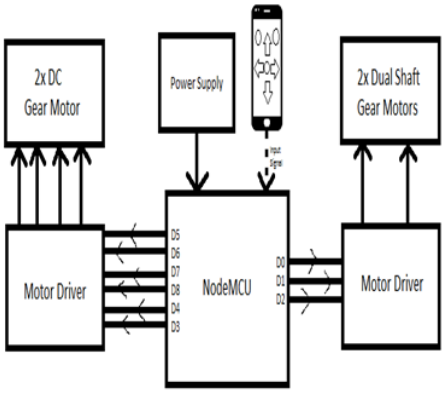

Fig: 1.2 Hardware Arrangement

On turning ON the machine, it will start the conveyer belt and the robot will start to swim forward.

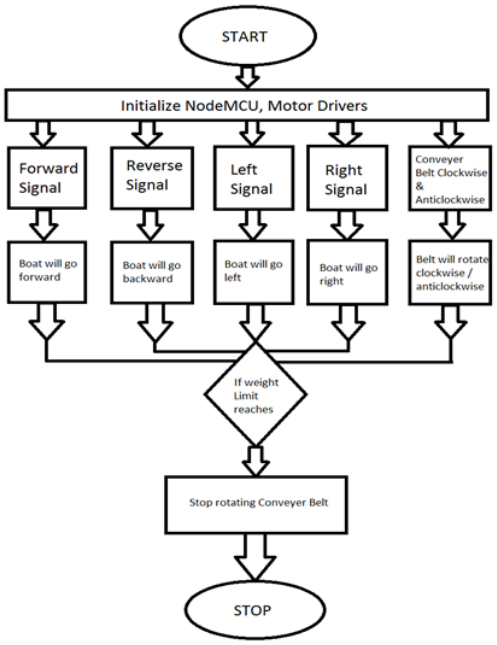

Fig: 1.3 Flowchart

We can give directions using remote control/smart phone and the conveyer belt collects waste in the collector basket.

When the collected waste limit reaches up to the limit it indicates us by a glowing LED which will eventually stop the robot.

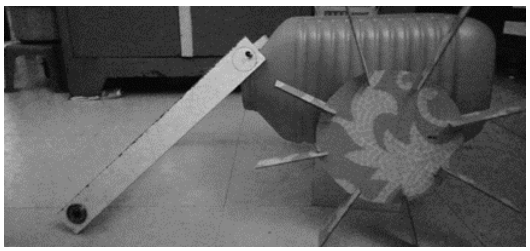

Fig: 1.4 Actual Model

IV. CALCULATIONS

1. Weight Calculations

Total weight of conveyer belt section =pulley wt + conveyer belt wt + motor wt + Waste wt

=50gm + 600gm + 30gm + 50gm

=730gm

Total weight of wheels & waste basket =wheels wt + basket wt

=500gm + 1.2kg=1.7kg

Therefore, the total weight of overall robot will be 2.41kg.

2. Torque Calculations

T = Total weight * specific gravity
=2.41*9.81
=23.64Nm

3. Power Calculations

To calculate the power required for wheels motor,
P =Torque * w
=23.64 * (2 * 3.14 * r) [r = radius of the shaft]
=23.64 *2.512
=59.38watt

Power required for single wheels motor is 59.38watt.

The total power required for wheels motor to drive forward and backward is 118.76watts.

To calculate the power required for conveyer belt mechanism,
P=Torque* w
=23.64 * (2*3.14*r) [r = radius of the shaft]
=23.64 * 3.454
=81.6525watt
Power required for a single conveyer belt motor is 81.6525watt.
The total power required for robot is 281.625watt.

V. RESULT

The lake cleaning robot is tested in the lake. Following are the features of the same-

Specification	Value
Garbage Weight (kg)	1.5 – 2
Robot Weight (kg)	2.41
Runtime (mins)	30
Power Supply (V)	24
Battery Type	Rechargable

CONCLUSION

We have successfully completed the project with the given observations and results. This robot can be used through mobile remote application for minimum 30 minutes. With some additions such as weight sensors, camera, GPS, motion sensors integrated with artificial intelligence this boat can be made completely unmanned. Thus, this is our small contribution towards cleaning the water bodies such as lakes and ponds.

REFERENCES

[1] Pranay Agrawal And Bishakh Bhattacharya, “Aquatic Multi-Robot System for Lake Cleaning”, Department on Mechanical Engineering, Indian Institute of Technology Kanpur.

[2] E Rahmawati, I Sucahyo, A Asnawi, M Faris, M A Taqwim, D Mahendra, “A Water Surface

Cleaning Robot", Universitas Negeri Surabaya, Indonesia, IOP Publishing.

[3] Sarfraz Nawaz, Muzammil Hussain, Simon Watson, Niki Trigoni, Peter N. Green, "An Underwater Robotic Network for Monitoring Nuclear Waste Storage Pools", Oxford University Computing Laboratory Wolfson Building, Parks Road, Oxford.

