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Automated Water Body Cleaning Mechanism

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Abstract*: It is generally seen that even now when we have many alternatives of dumping and recycling waste, a large percentage of waste still getting disposed in water bodies. This debris affects the aquatic wildlife and vegetation, the water is used by people, which is how humans also are affected by this depleting quality of water. Hence, it is must to collect this waste and make them properly disposed or recycled. As human driven cleaning is inconsistent and lags in efficiency, introducing a versatile solution to the problem, AUTOMATED WATER BODY CLEANING MECHANISM
Keywords: Water cleaning device, Automatic robot, IoT device for water bodies.

I. INTRODUCTION

Lakes, Ponds and every stagnant water body plays a vital role for the people and wildlife as well as for the vegetation of nearby area. These water bodies are resourceful to multiple activities taking place. A lake in a rural area is the only source of water for the people to utilize. In cities lakes are the source to water supply all around the city. Hence the quality of water must be inspected and ensured to be at its finest. It is therefore necessary to clean these water bodies. Since many years this cleaning is done by the people. But there are some drawbacks in human governed cleaning. Firstly, they cannot work 24x7, secondly, it's difficult for them to clean parts which are farther from the shore. Efficiency varies and seasonal effects are also seen. Plus, they are exposed to the debris which may be harmful for their skin and respiratory system. These problems are removed by this mechanism which is completely automatic and efficient in working. Automated water body cleaning mechanism detects the floating waste through the sensors in three directions and moves towards the waste and collects the waste in the storage bin through conveyor. Whole mechanism is powered by solar energy.

II. PROBLEM STATEMENT

To design a fully automated water body cleaning mechanism which collects floating waste efficiently.

III.OBJECTIVE

To overcome the difficulty in cleaning a water body efficiently, within the safety standards of human, irrespective of time duration and seasonal effects.

IV.METHODOLOGY

The three sensors at the front will detect the floating waste in left, right and straight direction. Right fan will stop if right sensor detects waste, similarly for the left side condition. When front sensor detects, both fans will run. Once reached, the garbage is picked up by the conveyor and dumps it into the waste collecting container at the back of the boat. When the container fills up to the brim, a message is sent to the control room and the controller will bring back the boat to the shore by remote control for dumping.

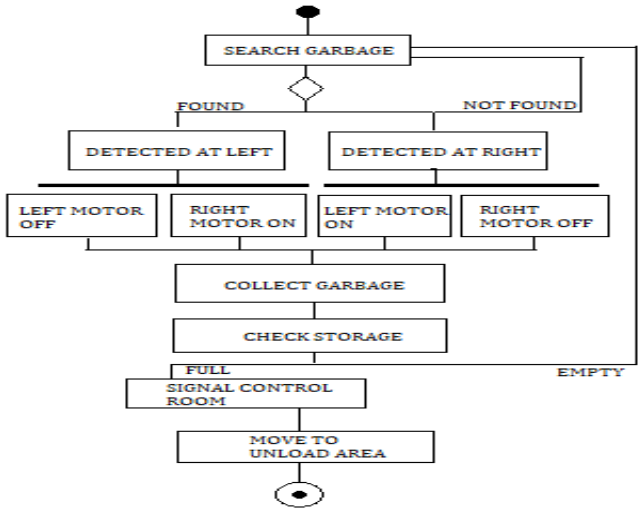

Fig. 1 An activity diagram explaining the working of the automated waterbody cleaning device.

V. CONSTRUCTION AND WORKING

A. Construction

The boat consists of the following parts:

1) *Frame*: The frame is made by Galvanized Iron and flex pipe, with four upward erected members for solar panel mounting. And two front members for front mounting of conveyor.
2) *Conveyor:* Front mounting of conveyor is at the height of 9cm from base. Rear mounting of conveyor is on the two vertically erect rear members at the height 70cm from base.
3) *Propellers*: The propellers are positioned at 5cm height from base on both the sides of the boat.
4) *Storage bin*: The storage bin is hinged to the frame at the back of the boat.
5) *Wiring box:* Waterproof wiring box is positioned under conveyor covered by a safety lid.

B. Specifications

1) *Static*

a) Waste bin – 30cm x 55cm x 15cm = 24750cm^3
b) Room volume – 90cm x 55cm x 15cm = 74250cm^3
c) Rear conveyor mounting height = 70cm
d) Front conveyor mounting height = 5cm
e) Horizontal distance between rollers = 80cm
f) Solar panel height = 60cm
g) Front taper dimension – 17cm x 6cm

2) *Dynamic*

a) 10N 300RPM motors for fans – 2 units
b) 10N 100RPM motor for conveyor – 1 unit
c) Ultrasonic sensors – 3 units
d) Solar panel – 1 unit

C. Working

The objective of the machine is to detect the floating waste and collect it in the bin all by itself. The working is explained in following points:

1) In initial condition, the boat will move in the forward direction, the motion to the boat is given by the rotating fans on both sides of both. While the sensors continue to detect the floating objects on the water surface.
2) The three sensors are positioned to detect the floating waste on the left, right and in the forward direction. When the sensor on the right side detects the object, right fan stops, giving the boat rightward motion and the waste is collected through the conveyor. When left sensor detects, left fan stops and the boat moves leftward. When front sensor detects, boat continues to move forward. In case of waste detection by all three sensors, boat will move forward.
3) Collection of waste and dumping in the bin is done by conveyor. Waste comes on the conveyor due to the motion of the boat and the conveyor takes the waste and leaves it in the bin.
4) Conveyor and fans are powered by 12V battery. Sensing and navigation is done by Arduino Uno powered by 9V battery. In case of battery discharge, batteries will charge itself by the solar panel placed as the roof of the boat.

VI. CONCLUSION

The project emphasis in the more efficient and versatile method of cleaning water body keeping the safety standards of humans and eliminate manual scavenging of waste. The mechanism is completely solar powered making it an eco-friendly mechanism in working. Simple design and made of easily available materials make it favourable for mass production. The mechanism can be used country-wide and beneficial for rural areas and areas receiving less rainfall.

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CONCLUSIONS

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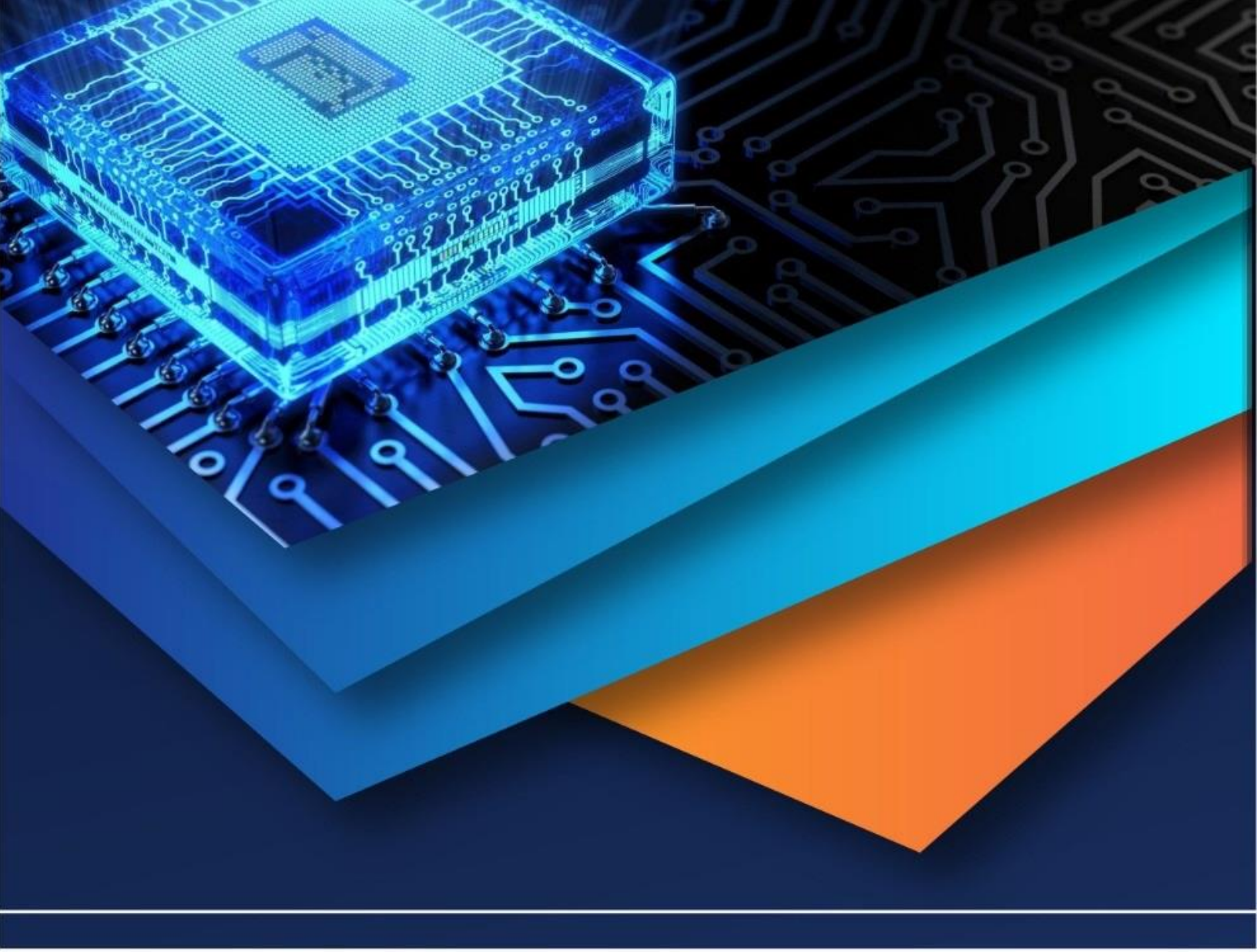

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