

Design and Development of RF-modually automated water floating garbage cleaning machine

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ABSTRACT: This project is focused on development of water floating garbage cleaning machine or river waste cleaning machine; a machine which is capable of removing waste debris from water efficiently and effectively. For the existence of life on earth water is the basic need and only about 3% of Earth's water is fresh for drinking. Of that, only about 1.2 percent is often used as drinking water; remaining is in the form of glaciers, ice caps, or deep inside the ground. The drinkable water which we drink comes from rivers and waterfalls. If we move our eyes towards existing situation of our rivers and water bodies which supply drinking water, they are serving as dumping yards for waste debris, solid and liquid wastes, which includes plastic bags, bottles, plastic wrappings of food, beverage cans, so many toxic materials, pollutants, etc. Due to this pollution in water is increasing rapidly, which is dangerous for humans as well as aquatic animals. The motive of this project is to clean this type of garbage from the water bodies like rivers and lake by, "water floating garbage cleaning machine." This machine will work on the chain drive mechanism which is operated by RF module remote control arrangement having components like conveyor belt attached with fins, motor, battery or solar panels, propellers, floating pipes, collecting tray, etc. assembled together. As motor runs conveyor belt will also run, which will collect the garbage floating on water and further transfer it to the collecting tray. With less human intervention reducing time and man power for cleaning water bodies is our alternating aim.

KEYWORDS:RF module, conveyer belt, propeller, solar panel, collecting tray

I. INTRODUCTION

Over 71% of Earth's surface is covered with water; water is the most precious resource for the humans as well for the animals. The population of earth continues to grow; the pressure over the planet's water resources is rapidly increasing. In

current scenario, our oceans, rivers, and other inland waters are being "squeezed" by human activities so their quality is reduced. The proof: tons of trash in our rivers and creeks, making it look and smell like a dumpsite by which quality of water is going too poor; by the effect of which animals as well as humans are getting affected with the new types of fevers and diseases. Waste water garbage is defined as the flow of used water come from homes, business industries, commercial activities and institution, etc.

Our project can be used in that places where there is waste debris in the water body which are need to be removed. Our project is consisting of motor driven conveyer mechanism; which is efficient for collecting and removing the floating solid wastages from water bodies. This will reduce the water pollution and also the uncertain death of aquatic animals. It consists of Belt drive mechanism which lifts the floating solid, plastics food wrappings and other solid wastages objects from the water surface. The use of this project will be made in rivers, ponds, lakes and other water bodies for to clean the surface water debris from bodies. Some machines have been developed to clear and remove the waste on the surface of the water bodies but in our project/model we will use the different and more efficient garbage cleaning machine as compare to other developed garbage cleaning machine. Impurities in drainage water can be like empty bottles, polythene bags, food wrapping papers, etc. It's an Industrial, commercial and residential working wastes battery used Water Cleaning Mechanism Which Can auto collect floating garbage and solid waste from the water surface and collect it into its floating plastic made collecting tray or dustbin. In which we can use here Solar panel for continuously charging of our battery and which will improve our machine performance and efficiency with reduced human efforts.

II. LITERATURE REVIEW

1] “They worked looking at the current situation of national sacred rivers which are dump with thousands liters of waste and loaded with pollutants, toxic chemicals, debris etc. which are multiplying water pollution in the form of waste debris and putting the life of aquatic animal in danger. They worked on a machine which will lift the waste surface debris from the lakes and water reservoirs, whose final result will be in fall of water pollution and fall of aquatic animal’s death. Their other aim was to reduce the man power and time consumption for cleaning the river. In their project (Design and Fabrication of River Cleaning Machine) they have stored the energy in the battery and used the energy for river cleaning with the help of a motor and chain drive arrangement.”[1]

2] “They explained Cleaning the wastes by utilizing manual procedures would be insufficient as it regularly covers large territory of activities and attached with plausibility to getting affected by different sicknesses from the different type of microorganisms present in the sewage while cleaning with human contact. Their project (Design and Development of River Cleaning Robot Using IOT Technology) features a proposed plan of garbage gathering system important and effective for tidying up waste from rivers, channels and lakes. Their trash gathering system is nicely coordinated to application for getting up a wide differentiation of debris, including gliding water litter, trash logs, disposed tires, plastics and others. For this integrated system they used IOT technology (Internet of Things) that has the ability to monitor and control the total process.”[2]

3] “They specified there main aim as reducing the consumption of time and the man power required for the manual work of cleaning process. In this project they have used the motor, battery and chain drive arrangement for automation; with this they also used special purpose harvesting cutter for cutting the aquatic weed. They have given proper design and calculations for every component of the machine with the material specification and selection procedure. The main components they have used in the project are as follows: cutter, cutter shaft, chain, chain drive, conveyer, conveyor shaft and base frame. With all this they have suggested

proper economical approach for implementation of project in urban areas.”[3]

4] “There model consists of a cage arrangement which they partially submerge it into the water while collecting the water floating garbage. They move their model around this floating debris and trap them into it. They have attached level sensors to their model for identifying the level of garbage filled into the cage. They have also added turbidity and pH sensors to determine the level of pollution in water bodies and used odor sensors for sensing odor and harmful smell of water. They have used RF transmitters and receivers for controlling all the functions of a model. This way they have worked on achieving eco-friendly and less human intervention efficient technology.”[4]

5] “In this paper they discussed the design of a multi-robot system of autonomous aquatic vehicles which can be used for cleaning of garbage from lakes and for maintenance of fisheries. The present method of removing the weeds manually and collecting them with other surface wastes debris is inefficient and all this come up with labor intensive. They aimed at modifying automating the total process, in robots they make use of tactile sensors and wireless communication to work automatically and collectively perform cleaning work such as removing the water floating surface debris, increasing the level of oxygen in water, spraying useful chemicals and supplying food at specific distances along with calculating the quality of water. “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.”[5] By the the help of virtual replication, amplified by present environment testing, they have demonstrated and stated that multi-robot system is an effective for rapid cleaning of rivers and water bodies.”[5]

III. MECHANISMS AND TERMINOLOGIES

❖ Chain drive mechanism:

Chain drive is a way of transmitting mechanical power from one place to another. Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects.

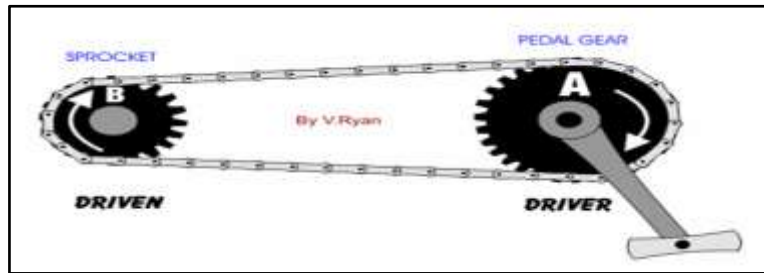


Fig.Chain drive mechanism

❖ **RF Module:**

An RF module (short for radio-frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. Two Channel RF Wireless Relay Module with Remote

Control is a two channel latching relay module. The output of the module is a passive output and it can be controlled by its 2-button RF wireless controller when the module is powered on. The module comes equipped with suitable remote control. It also can drive most of household electrical appliances.

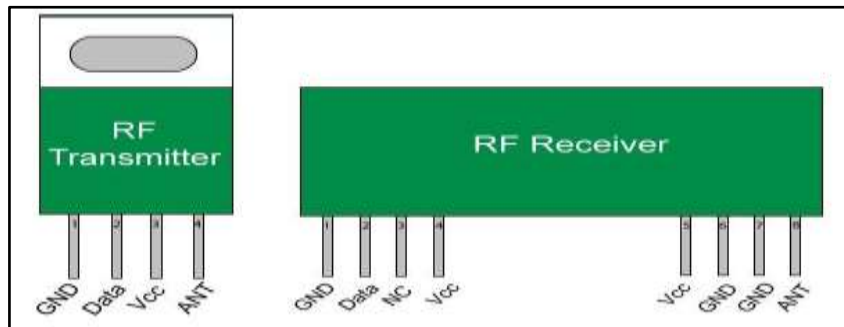


Fig. RF Module Transmitter and Receiver

IV. CAD MODEL AND SPECIFICATIONS

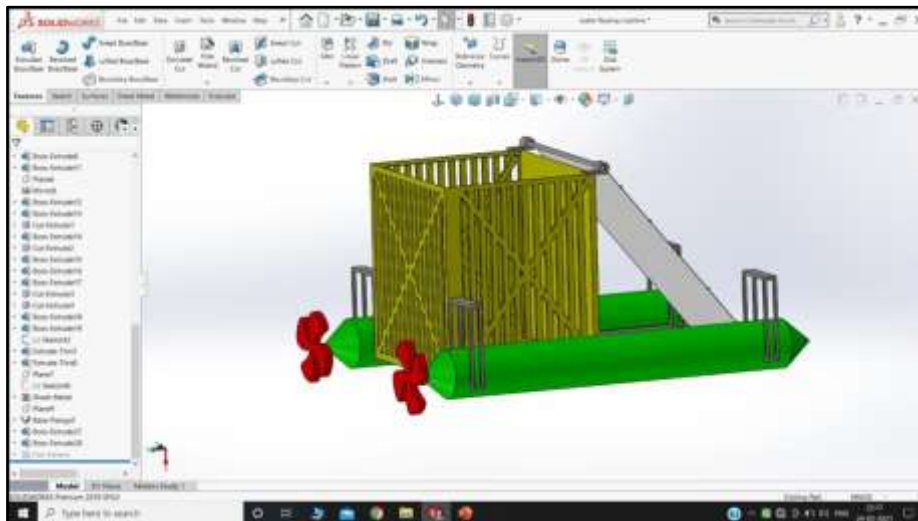


Fig. CAD Model

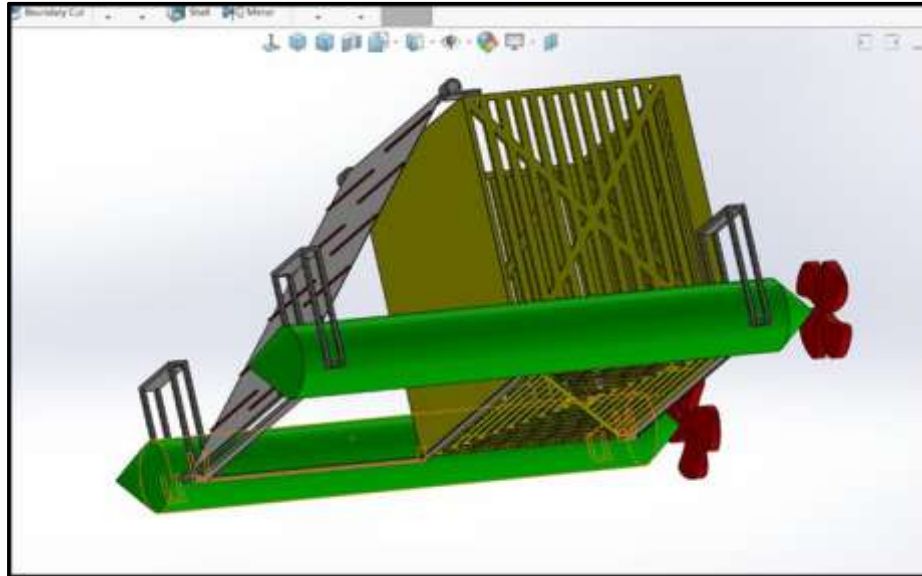


Fig. CAD Model

V. DEVELOPMENT PROCEDURE AND COMPONENTS SPECIFICATION

Following is the development procedure of “Water Floating Garbage Cleaning Machine” with specific components detail-

- **Base Frame:** The first step in development or fabrication of machine is Base Frame manufacturing which consist of different section and joints i.e. L-Section(for holding PVC pipe), T-Section (to support pulley by using bearing and shaft). The machines which we used for these operations are hand cutting machine, grinding machine and electric arc welding machine.
- **PVC Pipe for Floating Mechanism:** With the help of PVC hollow pipe machine is capable of floating on water. Pipes are filled with compressed air to withstand the weight of machine according to different conditions.
- **Conveyor Belt Mechanism and Shafts:** There is conveyor belt attached at the top of the assembly with the help of two connecting shafts with inclined slope from pulley end to bottom end. Shaft-1 is attached at the pulley end connected to chin drive and shaft-2 is attached at the bottom end for supporting conveyor belt.
- **Mechanism for Transmitting Power:** chain drive transmits the torque from motor to the Shaft-1 which is attached to the conveyor belt at pulley end.
- **Driving Source and Power Source:**The main driving source of our project is electric motor having specifications as 12V voltage and 7.6A current carrying capacity. We are using electric battery as a power source for the motor.
- **Gear Mechanism:** gear is also attached to the motor shaft and pulley shaft for helping chain drive.
- **Collecting Mechanism:**for collecting mechanism we are using the square shape tank which will be placed at the rare end of the machine. As the conveyor belt will move it will transfer water floating garbage from river to the tank.
- **Propeller Mechanism:**for giving direction to the machine we are using propeller which is connected to the shafts of base frame, it will give forward and backward motion to the machine.

SR. NO.	COMPONENTS	MATERIAL USED	DIMENSIONS (mm)
1	Base Frame	Mild Steel	L=1220, W=480
2	Hollow Pipe	Mild Steel	D1=2000, D2=180
3	Waste Collector/Box	Plastic	

4	Hollow Shaft	Iron	D1 =20mm, D1 =18mm
5	Propeller	Plastic	
6	Bearings	Steel	B=.7500, OD Ball=1.6250
7	Conveyor Belt	Chrome Steel	L=1700mm, W=400mm
8	Batteries	Lithium-ion Battery	12v 7.5-amp ups battery
9	RF Model	Thin film magnetic material	-
10	Signal Transmission Device	Outer plastic sheath	-
11	Remote	Acrylonitrile butadiene-styrene	-
12	DC Motor		DC Motor- RPM=50
13	Chain & Sprocket	Alloy Steel	No. of Links =108

VI. WORKING

As the motor will start running the shaft of motor will transfer the torque from motor to pulley shaft. Then pulley shaft will give rotation to the conveyor belt. As the conveyor belt will rotate it will lift the water floating garbage with the help of fins attached to it and transfer it to the collecting tank which is connected at the rare end of machine. RF-Module will operate the machine with the help of remote controller arrangement. Remote controller will transfer the transmitting signals and receiver end i.e. machine will receive the receiving signals.

VII. RESULT AND CONCLUSION

This paper has proposed the Design and development of RF-module automated water floating garbage cleaning machine. During all the phases of design to fabrication it has accomplished objectives like minimizing manual stress, less human intervention, environmental friendly, reliable, stability, cost efficient and economical. According to future facilities and conditions the certain future scopes which are possible are as follows-

- Deep cleaning of rivers and water bodies can be possible and also garbage carrying capacity can be increased.
- The assortment system for different category of waste is also possible.
- By increasing the fineness of conveyor and the material used in conveyor the efficiency of water floating garbage collector can be increased.

- And there is still gap for automation techniques like sensor technology, AI (Artificial Intelligence) technology, IOT (Internet of Things) technology, etc. which having potential of total automation. This way we can conclude that the objective of our project is successfully accomplished.

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