

Semi Automated Floating Debris Cleaning Robot

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Abstract: India is one of the biggest countries in the world, where we can see lots of festival celebrations and many attracting tourism places. During the celebrations, many waste materials are being disposed into the water bodies, hence the water gets contaminated. Consuming this contaminated water can harm the life of the aquatic animals and for the humans may cause many diseases which may lead to death. Even in the tourist places like beaches, lakes, sea, rivers, etc. there are many debris materials are being thrown by the people that these materials are too much harmful to the nature. Even this also can cause damages to the marine life system and to the human life. Due to the difficulties facing in today's world for cleaning and protecting the water bodies and the environment clean our team has come with this project which not only collects the waste materials and is easy for waste disposal. The work proposed is design and fabrication of semi-automated floating debris cleaning robot. The main consideration of this project is to reduce the time and power consumption of the workers for cleaning the debris materials which are floating the water or which are lying near the water bodies can endanger the life of aquatic animals.

Index Terms- Pollution, Debris, semi-automated debris cleaning robot.

1.INTRODUCTION

Water is the basic need of all the human beings and all the living things in this world. There is a plenty of water which are not suitable for the human use. The impurities which are present in the water bodies can cause various diseases. Water which are available to use are in the form of lakes, rivers, and rains etc. In recent years, these water bodies are getting polluted due to the waste dumping by the humans. These waste materials include plastic bottles, wrappers, polythene bags, etc. These waste materials will float on the surface of the water bodies. In case of the drainage, these floating wastes obstruct the flow of the water. As there will not be flow of water due to the floating waste. There are lots of troubles due to water contamination. Debris of waste is defined as the used water from houses, factories, commercial places like malls, restaurants and organizations which must be treated by a technically planned and a system of pipes. The major consequence of cleaning the wastes chemical forms the basis of respiratory diseases and it becomes a problem for the workers. A vehicle has been designed for a single person who has difficulty in going places such as differently able or elder people. A person with such difficulties will be able to drive the vehicle without any dependency. Debris is rubble, wreckage, ruins, litter and discarded garbage/refuse/trash, scattered remains of something destroyed or discarded. These add to the pollution and ruin the surroundings of water and water bodies. Being able to clean debris both on land and stagnant water would improve efficiency of the cleaning process and help maintain them. Developing waste collector robots is currently a research and investment matter, so this document presents an efficient solution to the problem of accumulation of garbage on the land and stagnant water. For cleaning the land and stagnant water, some cleaning machine must be used, and our team have come up with cleaning equipment which helps us to clean in less investing hour. The project has been explored the economics of the stagnant water-cleaning trailer in terms of payback period, charging rate to customer, working areas. The most useful and important advantage of our system is that the worker to replace the manual work in cleaning by semi mechanical stagnant water and land cleaner and can access them very easily.

2.LITERATURE REVIEW

The beach litter collection is a concern for bang sane beach, one of the popular tourist attractions. In order to solve this problem, a beach cleaning trailer was designed and fabricated with emphasis on the use of local materials and local production [1]. The design trailer prototype was carried out using a three-dimensional solid modeling computer program and explored the economics of the beach-cleaning trailer in terms of payback period, charging rate to customer, working areas [2]. The surface trash from the water body is lifted by the machine, it will cause in the decrease of water contamination and the aquatic plants and other living things death due to these harms will be decreased [3]. When designing the collection mechanism, the biggest concerns were manufacturability, and durability. Furthermore, design had to allow the beach cleaner to pick up a wide range of trash: items as small as a bottle cap or as large as a two-liter bottle [4]. For cleaning the beach, some cleaning machine must be used so this cleaning equipment which helps us to clean the beaches in less investing hours. Public does not like to wait for long waiting hours just to get good surrounding [5]. A robot adapted to a low budget. In the current context of environment protection and care, waste collector robots loom large, because they locate, collect and dispose garbage in a controlled, autonomous and fast way [6]. The research has not been carried out on beach cleaning machines because they are not widely used and the alternatives available in the market are quite less. The service machines for the purpose cleaning pools and households are being developed continuously but a cleaning machine for the beaches are not given much of an importance. The model developed comprises of a shovel with holes which picks the rags and leaves the sand behind [7]. Even though these models exist they are quite complicated to use and requires a technically sound person to operate them [7]. There are huge variety of other possible projects that might have the same structure of the beach cleaner. The structural framework of the propulsion control system of the surface robot is designed based on the principle of PWM speed control [8]. The plenty of water available on earth but not suitable for human use due to impurities present in water that can cause hazardous diseases. Greater depth the automated drains have common mechanisms such as chain and sprockets which is powered by Arduino. The boats are pedal powered, and batteries power the motor. Based on load batteries work [9]. The machine is innovation and easy, less costly and designed with very much economical and helpful to river and pond cleaning. Automation achieved through computer, hydraulics, pneumatics, robotics [10]. The current situation of national rivers which are dump with litters of sewage and loaded with pollutants, toxic materials, debris, cleaning machine used belt drive mechanism to lifts the debris from the water RF transmitter and receiver are to control the machine [11]. A robot cleaning overcome all sorts of water garbage problems and promotes blockage free drains. Cleaning robot consists of chain and sprockets, lifter, and the collecting bin to achieve semiautomatic control of river wastewater treatment [12]. the stages and results of development of an intelligent device park cleaner a prototype named Garbot 5.0. Garbot 5.0 utilizes a combination of robot interaction with external device [13]. The various machines are used in that place where removal of waste debris in the water body RF transmitter and receiver, microcontroller are used to development of the prototype [14]. The great impact towards the environment weather if it is on the seaside or the desert the robot able to reduction and collection of litter such as plastics and glasses and the solar panel is a great source of power and can be used as an alternative of using a rechargeable battery [15]. it is important to maintain cleanliness and hygiene of water and to monitor the pH of a water body an alteration in normal pH in a water body. The cleaning machine consists of bucket coupled with motor relay and IR sensor which are used for collecting the surface waste present in the water bodies [16]. The system is successfully able to clean the floating solid waste over the river surface more effectively. The prototype works conventionally used mechanism of using conveyors but modification of air tube piping guider mechanism for improving its efficiency [17].

3.METHODOLOGY

- System consists of chain drive which acts as a conveyor to carry the waste particles from the water garbage system.
- It is operated by the motor which runs the chain drive.
- It also consists of wastage tank which is used to store the water garbage waste particles.
- The carrier is connected to the middle of the chain drive which carries the waste particles and settled down in the storage tank.

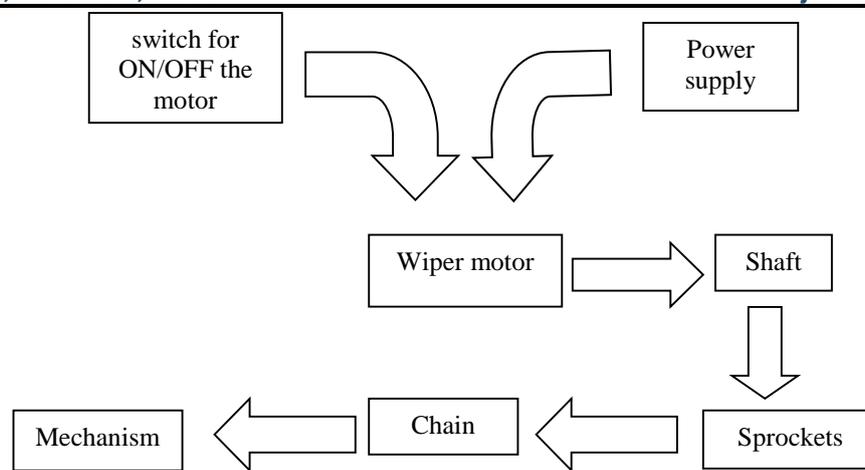


Fig-1. Working Flow Chart

4. WORKING PRINCIPLE

The beach cleaner works based on rotation of the chain and sprocket set. A low-speed high torque motor is attached to the upper shaft that drives the sprockets. The lifter mechanism consists of a chain sprocket arrangement coupled to the motor to drive the cleaning mechanism. The torque developed in the motor aids the claws in picking the rags from the sand. In addition to the torque, centrifugal force also acts on the chain. Due to the centrifugal force the chain will move away from the point of rotation that aids in smooth movement of chain over the sprockets. The device is place across a beach and sea so that only beach sand can get through the lower basement. Floating waste like bottles, plastic cans, covers any kind of waste etc. Is lifted by lifters which are connected to the chain. The chain revolves with the sprocket wheel which is driven by the motor. The energy provided to the motor is electrical energy. When motor runs the chain starts to circulate making the lifter to lift. The wastage material is lifted by lifter teeth and stored in collecting box. Once the collecting box is full, the waste materials are removed from the box. It is mainly used to leveling the beach surface. The material which we are going to use is M/S Mid-Grade which is easily available in market with less cost compared to others. The two rollers are connected apart from each other through belt drive on which perforated buckets are mounted through riveting joint. As system is allowed into drainage, the roller starts rotating the buckets will move inside the drainage which will goes up to material inside the drainage block. The bucket will pick up the wastage material and floating material from drain block. The bucket allow water to flow out as being perforated and only waste part will be collected into the storage collector behind the belt drive.

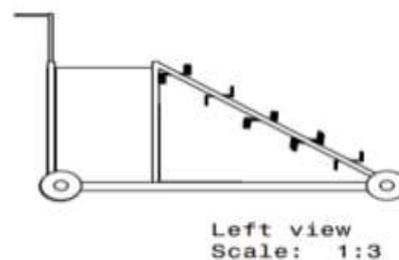
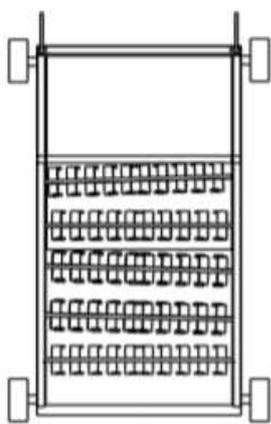
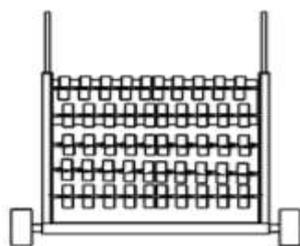


Fig 2. Left view of the model



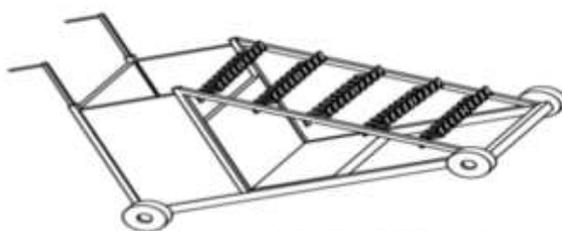
Top view
Scale: 1:3

Fig 3. Top view of the model



Front view
Scale: 1:3

Fig 4 Front view of the model



Isometric view
Scale: 1:3

Fig 5 Isometric view of the model

5.EXPERIMENTAL SETUP

In conclusion, the prototype was designed and fabricated, by implementing components such as raspberry pi and arduino uno, some level of automation was achieved and so we were able to create a prototype that was semi-automated. with the help of a water tube and propellor system, the prototype designed was able to achieve movement on water surface. the prototype was able to be amphibian in nature. thus, we were able to achieve a prototype cleaner that was able to operate on land as well as the water surface. the cleaner

will help in reducing pollution and removing debris wherever required, be it on land and water and thus drastically reducing the debris which then helps in the improvement of the environment.



Fig.6 Cad model of drain cleaning machine



Fig7. Model Front view



Fig-8. 3D Model of Proposed System

6. FURTHER IMPROVEMENTS

At present the cleaner can remove and collect debris on land and the surface of the water. Further improvement can be done to improve the autonomous level of the prototype and therefore reduce the human interaction and improve the efficiency of the cleaner. Further it can be also made to be submergible to clean in shallow water wherever possible to improve the rate of debris and pollution present in the water bodies.

7.CONCLUSION

This project is fabricated based on literature and research on different journal and paper relevantly available and fabricated in accordance so it can provide flexibility in operation. In the treatment system of Water or sand wastewater control by the motor, roller chain and sprocket, lifter and the collecting bin to achieve semi-automatic control of waste in sand or water treatment. This innovation is easy and less costly and has lot of room to grow more economical. This project “Remote Operated “Semi automated floating debris Cleaning Machine” is designed with the hope that it is very much economical and helpful to lake, pond or stagnant water cleaning. Based on it design and estimating cost and availability it is very cheap and very useful for the society.

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