Design of Solar Power Water Trash Collector

[1]Shalini Ajay Singh, [2]Priyanka Sunil Ambre, [3]Prof. Neha Rai,
[4]Prof. Jayesh Rane

*[*1, 2,3,4] Department of Electronics & Telecommunication Engineering
,Pillai HOC College of Engineering and Technology, Rasayani, University of Mumbai*

Abstract
The world today faces major garbage crisis the product from rapid economic growth, overcrowding, poor urban planning, and corrosive corruption. In this presents arduino based totally River Cleaning System. It is the system which floats on the water and the energy is supplied from battery. The important purpose of the project is to reduce the manpower, time intake for cleaning the river. For that cause we designed the automated system for river cleaning. The outcomes of system performance were found that the conveyor belt can collect the garbage from the river for ex. Glass bottles, plastic waste, etc. at the surface of the river. This work emphasis on Design and Analysis of the floating waste collector Machine The system is basically a boat kind of thing which will float to various corners of the water body, cleaning the light and floating wastes present in the water. We are using solar power as a main power source, thus by using alternate source of energy and recycling of water this machine helps in eliminating the floating wastes present in the water.
Keywords: *Solar power, Arduino Uno, Microcontroller, Bluetooth, Renewable source, Conveyer belt, Water pollution,*

I. INTRODUCTION

For constantly growing the water pollution inside the lakes, ponds and all the others water resources that are come inside the human touch and beneficial to the people for lots reasons. This is the important issue for the human society that the water required for each and every motive to the human being must be safe, clean and without pollution. But the lack of the equipment and the coast of the pollution controlling equipment it's more difficult to make rivers garbage and pollution free for this motive the river cleaning a system is designed.

Floating bottles, plastic bags and even toys have become a part of the marine environment in recent times. Pitiful photographs of such plastic debris washed ashore on remote shorelines have frequently made headlines. Most of this plastic pollution is attributed to an increase in tourism, shipping and fishing activities. But according to a recent study, a considerable portion of plastic garbage afloat in the open waters originates on land, and is drained into the seas by rivers. The floating water waste extractor used for the removal of waste debris in water bodies. System consists of mechanism for lifting waste debris from the surface of water bodies. It consists of belt driver mechanism. This is remotely controlled machine. The system is work on solar power during daytime during night time it can operate on battery.

1.1.2 Pollution of Streams by Garbage and Trash

The most common litter in world streams is household trash, including plastic cups, plastic bags and wrapping materials, fast-food wrappers, plastic bottles, and other plastic containers. Plastics can be especially hazardous to wildlife. Depending on their form they can either be ingested, causing internal organ failure, or they can cause a slow strangulation.

Organic waste (e.g., wood wastes) can have chemical and biological impacts on rivers and streams. Among the many impacts are interfering with the establishment of aquatic plants, affecting the reproductive behaviour of fish and other animals, and depleting the water of dissolved oxygen as the wastes decompose. Further, toxic materials can leak or leach out of certain kinds of trash (e.g., pressure-treated lumber, used oil filters, and lead-acid batteries).

1.1.3 Motivation

For constantly growing the water pollution inside the lakes, ponds and all the others water resources that are come inside the human touch and beneficial to the people for lots reasons. This is the important issue

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for the human society that the water required for each and every motive to the human being must be safe, clean and without pollution. But the lack of the equipment's and the coast of the pollution controlling equipments it's milesmore difficult to easy the rivers and make it garbage and pollution free for the motive of the river cleaning robotic is designed. Most developed countries have environmental agencies, nongovernmental organizations, and special interest groups that support and participate in environmental protection activities. Environmental regulations have greatly reduced pollution of streams by sewage and by garbage or rubbish (i.e., wet wastes such as food byproducts). However, such efforts often are lacking in developing nations.

Figure1: Floating waste

1.2   Problem definition
For the last two decades, almost all urban water bodies in India are suffering because of pollution and they are used for disposing untreated local sewages and solid waste. In many cases, those water bodies turned into landfills and get wasted. For example, at the beginning of 1960's Bangalore had 262 lakes, now only 10 hold water. Similarly, in Delhi in2010-11 to check the changes in 3 water bodies in last 10 years the status of 44lakes were gone dry due to rapid urbanization, raise in population, falling water tables. To over come these problems, the government of India has taken initiatives and implemented many schemes. By taking this into consideration, this project "Solar Operated Water Trash Collector" is to remove garbage, debris and solid waste from water bodies and make it clean. The main aim of this concept is to reduce man power and time consumption for cleaning the river. This system will be also helpful for cleaning river lakes and other water bodice. Pollution caused by plastic is unavoidable. It can occur anywhere. Malaysia is one of Asia countries affected by plastic pollution. In one study, plastic waste accounts for 32 percent of all garbage found in the Malaysian rivers. According to a University of Plymouth report, half of at least 700 species of aquatic animals are threatened with extinction as a result of plastic waste. Aquatic lives are exposed to danger as they can be strangled by the plastic waste, suffocate and killed.

1.2.2   Need and Scope of Project
The project can be used for plenty other functions in the destiny. It can be changed to throw existence jackets for the duration of rescue operations. This can be finished by fixing suitable propellers with better motorrpms. We can also replace battery with solar panels and make it completely work on solar energy. Technological advancement is one of the important factors, so that it will lead the future of humanity to prosperity and stability. This Water Cleaning mechanism is no one-of-kind from this fact as this system can similarly boost technologically. In this device we will use advance conveyor device and conveyor material for increasing the efficiency collection of garbage. We can use the solar panel for providing energy to the boat as opposed to battery operation. To modify the size of boat consistent with its waste collecting potential is increases. This project makes only for small lake and by way of performing some amendment in its size and ability it can be used in large lake and river like Ganga.

1.3   Design Methodology
1.3.1   System Design
The garbage collector system needs to be able to float in the water and it also needs to remain floating as its weight increases. The motion of the collector tray will also cause the problem as the weight of the garbage on the collector tray may result in a slight deviation of the center of gravity of the robot. Keeping this in mind, we have decided to implement the shape of a boat/canoe which is bottom heavy, as we have added more mass at the bottom, and has heavy equipment's like motors; battery etc. The base of the boat is made of thermocol, the tub is made with low-density structure type. For the motion of the bot, we have decided to take help of propellers which will be connected to the sides of the robot and are actuated using a 100 rpm geared motor. The collector tray is also actuated using the same motors and all the motors are getting the power of a 9V battery connected in parallel. To control the motion of the robot and that of the collection tray, we need a microcontroller and motor drivers. We are going to use the Arduino Uno as the brain of our system and The main aim of this device is to boost waste debris from the water floor and dispose them in the tray.

1.3.2   System Working
At first set up Bluetooth availability between Android Application and the Bluetooth module. Check whether the gadget is associated. Connect the Bluetooth module(HC-05) to our mobile and then move to app. Whenever associated, give the pre-characterized directions to the smaller scale telephone of the portable handset. At that point the put away the directions on a specified android application which is installed on a mobile. Open the android application and give the instructions which we are given in the arduino program. Than once device get connected we can navigate the boat. After connecting with the help of motor drive we can move the system in forward and backward direction. And then once system is ready to navigate switch on conveyor belt which will be connected with motor and it will help to collect water waste from water surface. Relay is connected to so it can increase current value and increase the overall output power.

1.3.3   Components
- **Arduino Board:** Arduino Uno board is based on the ATmega328P. It consist of 14 digital input/output pins in which 6 can be used as PWM outputs, 6 analog inputs, 16 MHZ quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.
- **L293D Motor Driver Board:** The 293D is used to provide bidirectional drive current up to 600mA and voltage from 5V to 36V.L293D consist the output clamping diodes for protections.
- **HC 05 Bluetooth module:** This Bluetooth module designed for transparent wireless serial connection. This can be used in a Master or Slave configuration; it makes a good solution for wireless communication.
- **DC motor:** In this machine two BO motors are used and these motors are used to control the direction of propeller. Another BO (battery operated) DC motor used to control the conveyor belt and also DC used for navigation system.
- **Battery:** This is a lead acid rechargeable battery. This machine consists of two batteries which gives output such as 2A, 9V for operation of setup.
- **Relay Module:** This module provides the protection to the microcontroller from the higher load current.
- **Solar Panel:** A solar panel consist no. of photovoltaic cells, which can be used to generate electricity through photovoltaic effect. This energy used to charge the batteries. Solar output is given to the DC Regulators. Conveyor Belt: In this machine we used the Conveyor Belt. This is controlled by the arduino uno system with using motor. This collects all floating waste from water surface and discharges it into the dustbin.
- **Blucontrol [android application]:** This android application in installed in mobile phones to control the setup automatically which can be downloaded from the android app market in free of cost.

1.3.4   Proposed Method
In this project the main aim of this machine is to lift waste debris from the water surface and dispose them in the tray. It consist arrangement of conveyor which is place on shaft of motor. Due rotation of motor conveyor rotated. As the conveyor is move, it collect water debris, waste garbage and plastics from water bodies. As the machine is placed in the water the waste debris in water will get lifted and it moves in upward direction. As the waste debris reaches the upper extreme position it will get dropped in the tray. Hence this will result in cleaning of water surfaces and safe collection of waste debris from water.
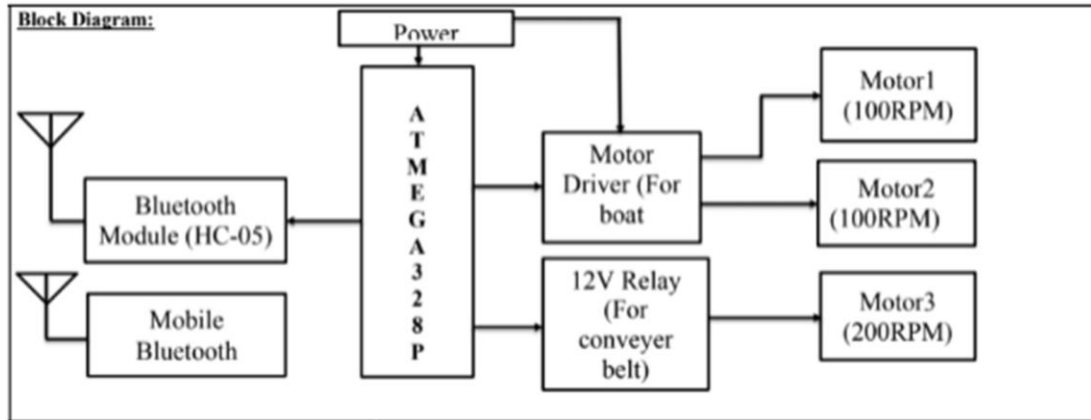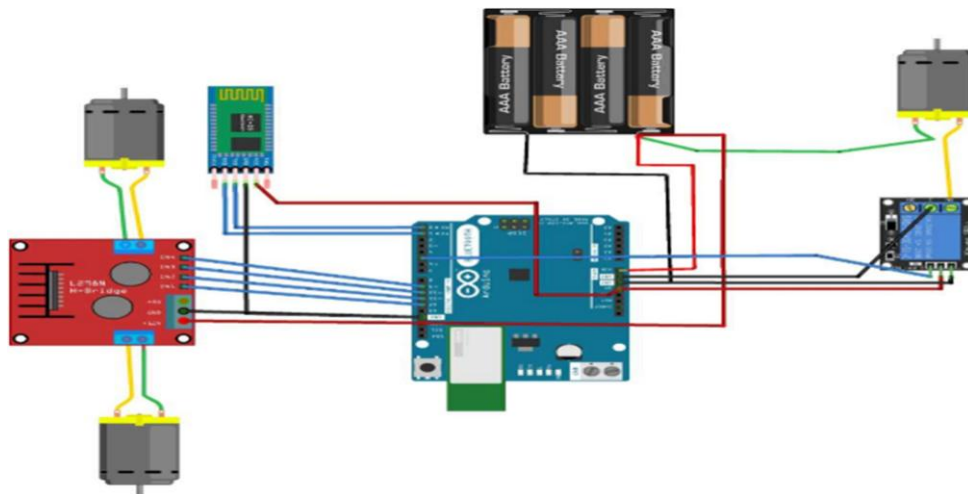
Figure2: Block diagram

Figure3: Circuit diagram

II. RESULT AND DISCUSSION

2.1 Software implication

Arduino IDE - Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Figure 3: Arduino IDE Software Implementation

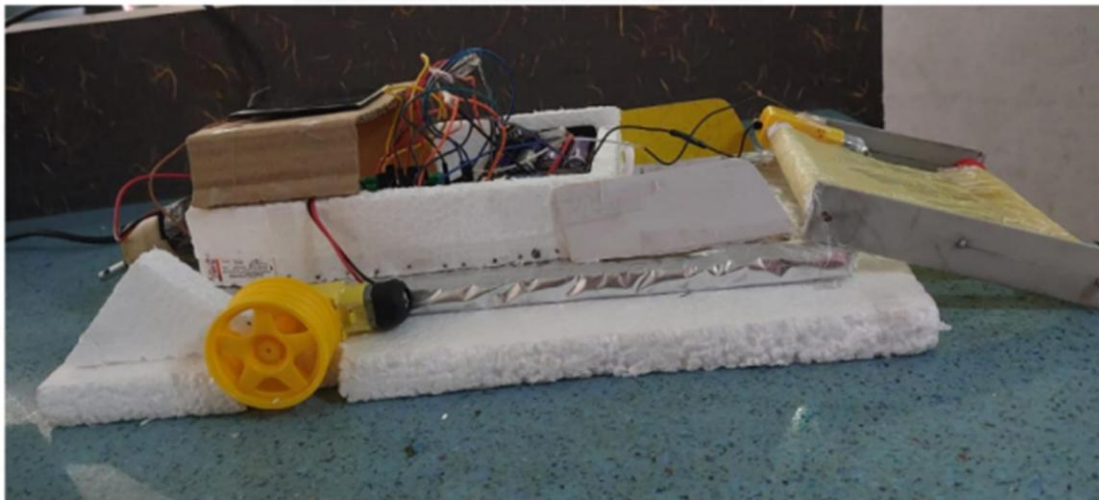**2.2   Hardware Implementation**

Figure 4: Hardware Implementation

3.1   Application
- Useful to reduce the water pollution in river.
- It is applicable to reduce water debris, impurities, and all types of impurities which are
- floating on water surface in swimming pool.
- It is useful to reduce sewage waste.
- It is useful in fishery plant to collect dead fishes.
- It can be useful to save aquatic life.

III. Conclusion

In modern days the plastic and polythene wastes have a major contribution in the increasing rate of pollution of water. The plastic waste does not decompose and keeps floating on the water bodies which in turn pollute the water. The work states about the designing and fabrication of a floating waste collector. The various problems like degradation of the marine ecosystem, breeding of disease-causing germs, fall in the farm production rate, business and transport using waterways etc. that the humans and animals are facing due to the pollution of water are the main reasons behind the development of this machine. This machine is designed and fabricated with the aim to provide a lightweight, portable, automated machine with smart controlling which will collect all the floating wastes by recycling of water and without any human physical intervention with low energy consumption and totally power by solar energy. The development of the machine is done on the basis of analysis and research on various works regarding to the

work that has been done earlier, the mechanism, materials used, advantages and disadvantages along with the future works have been deeply analyzed and taken into count for further improvement. The machine consists of a bath tub with two wheel that are attached to it for better floating, solar panel mounted on top powering the batteries, motors and pump, rotary mechanism used in propellers for movement of machine driven by the motors. A funnel with a filter is used for the collection of wastes and for its separation later. The whole system is controlled by a arduino Uno microcontroller board with two single channel relay switches using the integer data type and switch looping statement for the required coding done on the microcontroller. This work has an impact on the reduction of wastes in water and in the life of the workers cleaning the wastes manually by providing them comfort and ease of working using a smart monitoring system that saves time and energy along with maintaining good health and hygiene. The system has lots of advantages along with modernization and many of plans for future which can be developed and implemented later on. Thus, it provides a healthy and disease-free environment for the humans and animals to live in.

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