SOLAR POWERED FLOATING WASTE COLLECTOR

Shraddha Haveli, Neha Pokharkar, Pranita Waghmare, GayatriBokade(Ambadkar)

Electronics and Tele-Communication, PCET's Nutan Maharashtra Institute Of Engineering &Technology, Talegaon, Pune, India

ABSTRACT

For last two decades water pollution in India has increased tremendously due to which almost all urbanwater bodies are suffering. One of the prime causes of this pollution is floating waste over the water. This work emphasis on design and analysis of the Floating waste water trash collector using solar power. The system is designed for the ponds, lakes and other water bodies which are dumped with litters of garbage and loaded with toxic materials, pollutants, marine debris, etc. The designed machine will help to clean water bodies and make water suitable for usage.The machine is basically a boat which will float over various corners where there is high probability of presence of waste. The boad provide cleaning the light and floating wastes present over the surface of the water with 180 degree rotation while moving ahead. A provision of solar power as a main power source is made, to avail the advantage of renewable energy source. The designed boat reduces water pollution required to maintain a balanced marine ecosystem with reduced human efforts.

Keywords- *Floating wastes, boat, Solar power, Water body cleaning.*

INTRODUCTION:

Water is very essential for human beings and other living beings to survive. There is a huge amount of water present on the earth however a large amount of that is not suitable for usage. With the rapid increase in population, the scenario of cleanliness and hygiene especially with respect to waste management has degraded tremendously over the years and is still at risk [1]. The dumping and overflow of garbage near rivers and other water bodies pollutes the water. The condition of water in major rivers has deteriorated to a greater extent. Floating Wastes in the water body consists of plastic wastes like plastic carry bags, plastic bottles, etc. And other wastes like nirmalya , kitchen wastes, etc., that are dumped in the water bodies at a tremendous rate. The waste water accumulation gives rise to various disease causing carriers and germs like malaria, typhoid, cholera, diarrhea etc. which affects humans health. The plastic and polythene waste does not decompose and keeps floating on thewater bodies which in turn pollute the water. The problem is increasing day by day. In the current scenario, high cost, huge waste collector systems are used currently on sea water, however there isneed of design of low cost waste collector system for general application for smaller water bodies.The proposed work has objectives

1. To clean surface of water bodies.
2. To design a boat which will rotate 180^0 at its location directions.
3. To use wireless technology for operation.
4. To use renewable energy source for operation of boat.

LITERATURE REVIEW:

Vinay et. el.,[1] in their venture have manufactured the remotely worked waterway cleaning machine. The prime objective of this project is to collect all the wastes which are found floating on water bodies and to minimize labor work. Author used a hardware prototype and by using a microcontroller for controlling all partsof a machine via a Smartphone with wi-fi or Bluetooth.

Malavika et. el.,[2], in their paper "Solar Operated Water Trash Collector" proposed a prototype to introducethe use of non-conventional energy source (solar) to run the garbage collection equipment. This system takesthe waste by belt conveyor mechanism and throws it in a chamber situated at the back. Water wheel is boltedon shaft which is placed on base frame. The purpose of water wheel is to move the machine forward or backward on water. Motor is used to rotate the water wheel with the help of chain drive mechanism. This motor also powers the waste collecting conveyor. Finally, the floating waste is collected by the bin which is placed inside the boat.

Madhavi et. el.,[3] in their paper the prototype used entirely solar operated mechanism for river cleaning and can auto collect solid waste and floating garbage from water surface and collect in floating bin.it can be scaledup to any size and operate remotely.

Abhijeet et. el.,[4] in their project "Design and Fabrication of river cleaning system" a prototype is designed to lift the waste debris from the water surface and dispose them in the tray. It consist arrangement of the conveyor. As the conveyor is move, it collects the water debris, waste garbage &plastics from water bodies inupward direction and place it in tray.

PROPOSED SYSTEM

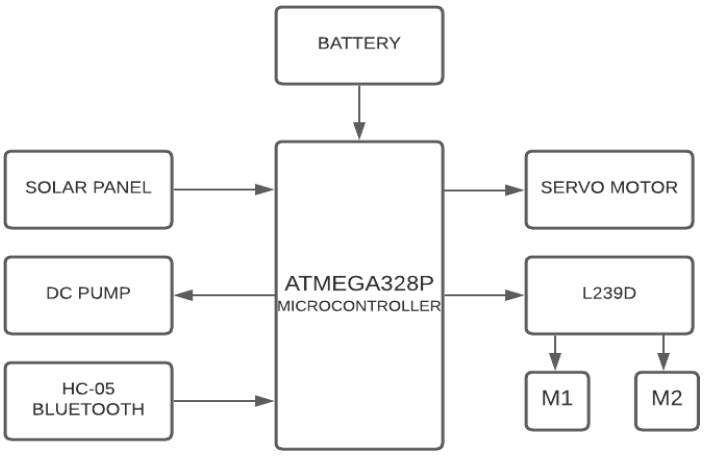

Fig.1 Block Diagram

The proposed system uses DC pumps and servo motors for floating over water. A net model is fittedin the canter for waste collection. Bluetooth module for wireless transmission is used.

WORKING:

The main purpose of this "Solar powered floating waste collector" project is to collect and clean the floating waste that gets accumulated on the surface of lakes and rivers thus keeping the water clean hence minimizing pollution. This prototype is controlled by Bluetooth. The phone is connected to a prototype via bluetooth to give directions to the machine via Bluetooth app. Solar panels are installed on the prototype to charge the battery using renewable source sunlight. Then the battery supplies current to the microcontroller to which all other components are connected. DC pump is used to pull up the floating waste and is collected in a wire gauge net. DC motors are used for direction control and for better steering control servo motor is used. Net is used to collect garbage over water

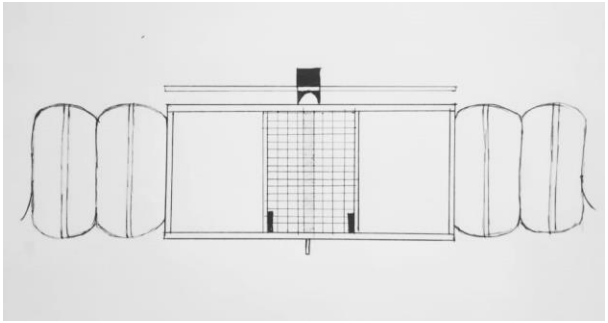

Fig.2 Pictorial representation of proposed cleaning system

HARDWARE REQUIRED:

- Solar Panel (12V, 5W)
- DC Motor (45 rpm)
- Servo Motor(5V)
- DC pump (12V)
- Microcontroller (Atmega 328P)
- HC05 Bluetooth
- L293D Motor Driver
- Relay

A) Solar panel (12 V, 5W):

Solar panel has a number of Photovoltaic Cells. These cells are used to generate heat or electricity through Photovoltaic effect. Generated electricity is used for charging batteries and generated output is given to DCregulators.

Fig.3 Solar Panel

B) DC motor (45 rpm):

Two PMDC motors are used here. These motors are used to control the direction of trash collector machine.

Fig.4 DC Motor

C) Servo Motor (5V):

In this floating waste collector use of Servo Motor is made for better steering control. Servo motor has threearms and high output power. At the same time it is tiny and lightweight. Servo rotates 90 degrees in each direction that means approximately it rotates 180 degrees. To control Servo Motor servo code or library is used.

Fig.5 Servo Motor

D) DC pump (12V):

In this prototype, a DC pumps to move over water is used . This uses direct current from battery or solar powerand generally operates on 6, 12, 24 or 32 volts. Solar operated DC pumps have solar cells which generates direct current when disclosed to sun rays.

Fig.6 DC pump

E) Microcontroller (Atmega 328P):

This microcontroller has 14 digital I/O pins from which 6 are analog inputs and 6 are used as PWM output.It has quartz crystal of 16 MHz. It has a power jack, reset button and ICSP header. It also has a USB connection.

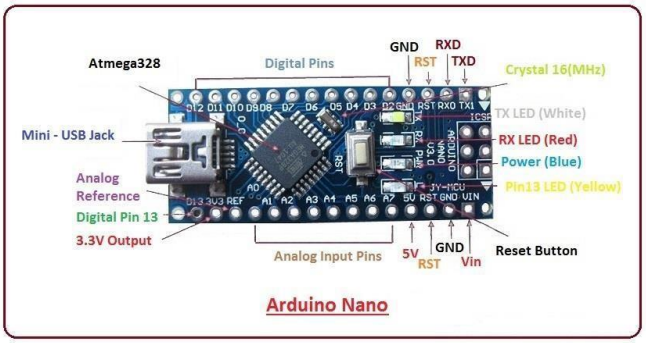

Fig.7 Microcontroller

F) HC-05 Bluetooth Module:

This Bluetooth module is used for full duplex wireless communication. With any device or micro-controller having Bluetooth functionality can use HC-05 module for communication. The module has a baud rate of 9600and it can communicate with the help USART hence it is easy to interact with any micro-controller that has USART. With the help of command mode default values of the module can be configured.

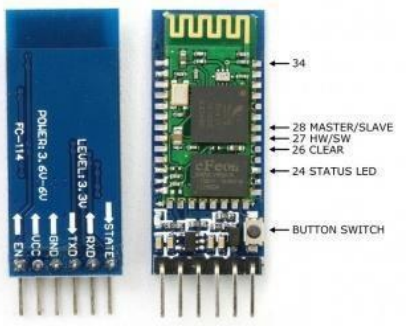

Fig.8 HC-05 Bluetooth Module

G) L293D Motor Driver IC:

This 16 pin Motor Driver IC is typically used to drive motors. A single IC is used for running 2 DC motors concurrently, where direction of both motors can be controlled independently. It can run motors which has operating voltage up to 36v and operating current up to 600mA, and are to be controlled by digital circuits, digital gates or micro-controllers like PIC, ARM, Arduino etc.

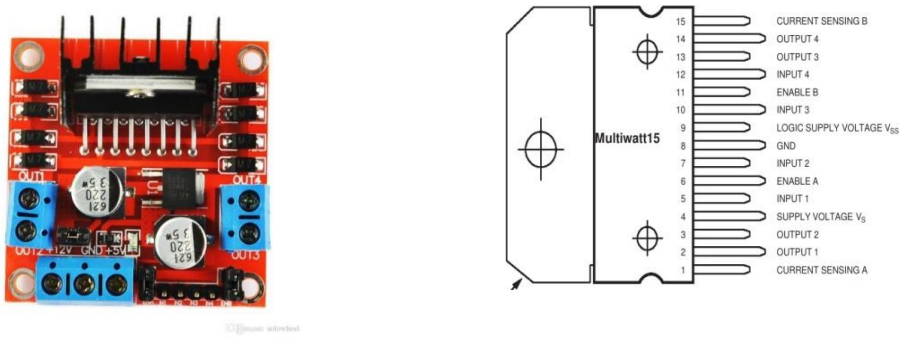

Fig.9 L293D Motor Driver IC

H) Relay:

It is a switch which is operated electrically. It creates magnetic field from current flowing through coil to attract a lever and to switch contacts. These switches have 2 positions and are changeover switches because ofcurrent flowing through a coil can be on or off.

MERITS:

- It is an unconventional river water cleaning method.
- It's initial and maintenance cost is low.
- Skill workers not required to drive the system.
- Environment responsive system.

CONCLUSION:

Along with other floating waste, in these days, the plastic and polythene wastes have a major contribution in the increasing rate of pollution of water. The proposed Solar Powered Floating Waste Collector has designed ina way that it is very much reasonable, easy to operate and helpful for water cleaning. A solar panel mounted onfloating waste collector and a wire gauge net which is designed depending on area of waste collection, makes itsuitable to collect good amount of waste. The proposed floating waste collector has very low maintenance and high efficiency.

FUTURE SCOPE:

By using LORA technology in this boat, it can be used for longer range without human and can get rid offloating waste from beaches also.

ACKNOWLEDGEMENT:

We consider it as an opportunity to articulate a few words of gratitude and our sincere thanks to Nutan Maharashtra Institute of Engineering and Technology for providing all facilities to design this Solar powered Floating waste collector.

REFERENCES:

[1] Mr. Vinay D R , Mr. Bishal Nath, Mr. Avishek Sow, Mr. Ananda P,Mr. Bishal Kumar Sharma, Mr. Nagabhushana N. "Design and Fabrication of Solar Powered Floating Waste Collector" IJESR/ICETEISM-2019/Special Issue/ Article No-47/220-226, ISSN 2277-2685.

[2] S. Malavika, S. Meena, E. Indhumathi, M. Nandhini, S. Srinivasan "Solar Operated Water Trash Collector"IJRESM Volume-3, Issue-4, April-2020, ISSN: 2581-5792.

[3] Madhavi N.Wagh,2Kashinath Munde. "Design and Analysis of River Water Cleaning Machine" IJSDR Volume3, Issue 7, ISSN: 2455-2631.[JULY 2018].

[4] Mr. Abhijeet. M. Ballade, Mr. Vishal. S. Garde, Mr. Akash S, Mr.Pranav. V. Boob and Lahane, "Design & fabrication of river cleaning system", IJMTER Volume 04, Issue 2, [February– 2017] ISSN:2349– 9745.