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Solar Source Based Cleaning Vehicle for River

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Abstract - *Water pollution has been major cause of environmental concern. Most of the water bodies like rivers, lakes, streams, etc. are highly polluted. Floating waste are a major source of pollution. Machines have been designed to remove the floating waste. This project emphasis on solar source based cleaning vehicle for river of the river waste cleaning machine. The work has done looking at the current situation of our national rivers which are dump with crore liters of sewage and loaded with pollutants, toxic materials and floating solid waste etc. The government of India has taken charge to clean rivers and invest huge capital in many river cleaning projects and many major and medium projects in various cities. By taking this into consideration, this machine we are going to design to clean the river water surface.*

***Key Words*: Solar Panel, Battery, Dc motor, LCD display, Arduino Nano, Bluetooth Module, IR Proximity Sensor.**

1. INTRODUCTION

The Over two thirds of Earth's surface are covered by water less than a third is taken up by land. As Earth's population continues to grow, people are putting over-increasing pressure on the planet's water resources. In current scenario, our oceans, rivers, and other inland waters are being "squeezed" by human activities so their quality is reduced. Poorer water quality means water pollution. Our project can be used in that places where there is waste debris in the water body which are to be removed. Our project is consisting of motor driven conveyer mechanism which collect and remove the floating solid wastages from water bodies. This also reduce the difficulties which we face when collection of wastage take place. A machine will lift the water surface wastage from the water bodies, this will ultimately result in reduction of water pollution and lastly the aquatic animal's death to these problems will be reduced. It consists of Belt drive mechanism which lifts the floating solid waste from the water. 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. Waste water is defined as the flow of used water from homes, business industries, commercial activities and institutions which are subjected to the treatment plants by a carefully designed and engineered network of pipes. Solid waste which floats on the river surface is a cause of serious concern. Disposal of solid waste is the first step towards minimizing surface water pollution. Some machines have been developed to clear the solid waste found on the surface of the water bodies. Impurities in drainage water can be only like empty bottles, polythene bags, papers, etc. It's an Industrial Working Prototype of Entirely Solar Powered Water Cleaning Mechanism Which Can auto collect floating garbage and solid waste from the water surface and collect it into its floating bin. It can be programmed, scaled up to any size and can operate remotely. The system is indigenous and efficient to tack river cleaning cause. It's reduces the human efforts; it's works fast than Man Power

2. LITERATURE REVIEW

[1] "Amphibious Clean-up Robot"

In this paper authors have mentioned that at the both side of the robot they have installed the rotary agglomeration system consists of a left-handed agger and a right-handed agger. A right hand rotating device and a left handed converts rotating the motor output shaft, turn the collector clockwise rotation, the right rotation of the collector rotation of the motor output shaft counterclockwise rotation to promote the right rotation of the collector clockwise rotation, while the robot in the water forward, the water hyacinth, garbage collection to the collection of the mouth to be collected to the collection system. The rotary collection system includes a rotary collector, a rotary collector motor, a rotary collector running track wheel, a storage bin, a collecting motor when the water hyacinth garbage gathered to the collector in the collection of motor driven, the water hyacinth garbage rotation collected into the storage warehouse.

[2] "Design and Fabrication of River Waste Collector"

The authors of this paper have fabricated the mechanical based river waste collector device. In project they have used different types of fins attached

at both the side. Component which is running the project is chain and sprocket assembly and two rims, on the spokes of rims they have fixed curvature cross-section due to which when rims are rotating on the surface of the river it pushes the water in opposite direction and boat moves in forward direction. In this project fins are fixed at one side and another side is moving, on moving side copper wire is fixed and this wires rolls on pulley connected with servo motor. Servo motor is connected with 9-volt battery to pull the fins upward. The solid waste screening or skimming vessel is for collecting waste from flowing water ways by means of using different types of fins. The fins are connected with rod with the help of hook at outside of the boat. The flowing of water from fins collects the floating solid waste between fins all the wastes are transferred into last section by lifting the fins with the help of servo motor. Fins are hanging from one point and another point is connected with metal wire and metal wire is connected with servo motor and the servo motor is connected with 9-volt battery. This boat is run only by manually operator.

[3] "A Floating Waste Scooper Robot on Water Surface"

The floating waste scooper is designed and developed for replacing labor cleaning waste on city canal, pond or pool. The robot is a ship made of two pontoons fixing together leaving free space in the middle for the front scooper, waste container and paddle wheels in this project. They have used green plastic net in the place of rubber belt. Because it is lighter and generates smaller amplitude of surface wave. They have selected the double paddle wheels and rudder for driving speed and direction control mechanism. The paddle wheels are mounted next to each other on the same shaft between the pontoons, whereas the rudder is mounted behind the paddle wheels. The paddle wheels are driven by a 250W, 400RPM. DC brushless motor. In this system the driving speed of robot is adjustable in both forward and backward direction by rotating speed of the paddle wheels. When approaching waste near to the robot at that time they reduce the speed of paddle wheels in order to reduce generated wave that cause waste flowing away. For turning left and right in this robot they have used rudder. By adjusting the angle of rudder with respect to the robot body the direction change. The rudder is driven by stepping motor with gearbox. In this two types of mechanism are used for waste collection one is a flight conveyor and the other is a scooping arm with basket. The flight conveyor is often used in the literature whereas the scooping arm is one DOF robot arm. Both of them can overcome waste surface tension as material is net.

[4] "Design and Fabrication of River Cleaning Machine"

Mohammad Irshad and his team have fabricated the mechanical based river cleaning machine which is a stationary system. This system consisting a bicycle wheel with eight numbers of aluminum buckets attached to its periphery is mounted on a shaft to make a turbine resembling a pelton wheel. When flowing water falls on buckets, the wheel starts rotating. A spur gear called the driver also mounted on the turbine shaft begins to rotate. Due to the meshing of the driver with another spur gear mounted on a parallel shaft, power gets transmitted to the driven gear. The driven gear shaft also carries sprocket 1. Which drives sprockets, 2. Mounted on an intermediate shaft 3. Through a chain. Sprocket A mounted on shaft 3 carries the drive to sprocket B mounted on the main sprocket shaft 4 through a chain. On shaft 4 more sprockets C and D are mounted. Sprocket D drives another sprocket E through a chain. This chain carries meshed buckets meant for picking up the floating waste. This constitutes the inclined conveyor system. Sprockets C drives another sprockets E through a chain. The shaft of sprocket E also carries one bevel pinion. This enables the direction change through 90 degrees. A roller is mounted on the shaft of the second bevel pinon. This roller drives another roller through an endless conveyor belt. This constitutes the horizontal conveyor system. The waste falling from the inclined conveyor is carried away by the horizontal conveyor.

[5] "Detection and Removal of Floating Wastes on Water Bodies"

In this paper authors explained how the wastage on water body is detected and removed. Their whole system works on two voltage levels, 5 and 12 Volt generated by voltage regulator. The Renesas microcontroller controls and co-ordinates the whole system. They have used ultrasonic sensor at certain distance from one another, these sensors detect the floating wastes by 180degree range. They are placed on a pole and along the river. In their project they have used the infrared sensor for the prototype. If floating wastes are detected by the sensors, the signal will be sent to the authority via GSM. By using GPS, the

location will be tracked by the authority. The floating barricades then come into action and remove the waste present. The barricades operate with the help of DC motor. They have also used the flow sensor to know the rate of flow of water.

3. MOTIVATION

Due to less specific weight than water, the dry waste such as plastic waste or bottles will float on the water surface so, it is Observable on the water surface. The problem of water logging increase due to plastic, themocole and metal leads to pest growth and it favors diseases like malaria. This is unsafe for human life and hence the idea of this project emerged. So the solid waste has to be removal from the surface of the river, ponds, etc. Now days the typical waste collecting by human is often done by using scoop net with long handle. However, the operation requires much effort of cleaning team when amount of waste is enormous. Our proposed system is to minimize or overcome the problem faced while using man operated machine and to minimize the increased dumping rate of waste.

4. EXISTING SYSTEM

The most of the existing system is a mechanical based project. It is stationary system, simply kept in the sewage area to collect the wastes passing over it. The chain and sprockets is used for movement, which has fitted to collect the wastes from sewage. The rotation of the chain along with the rims will push the machine forward direction, the floating wastes are collected in different sizes of fins and put off the wastes in the bin that is placed at the backside of the machine.

Nowadays in our country, for cleaning of water surface the diesel or petrol source operated devices are used. But it is operated by man so, the man power is necessary for this type of device and in this the layer of collected waste is to be assumed by the operator which is on vehicle. Because there is no device to measure collected wastage.

5. METHODOLOGY

This paper proposes Solar source based cleaning vehicle for floating waste on river water surface.

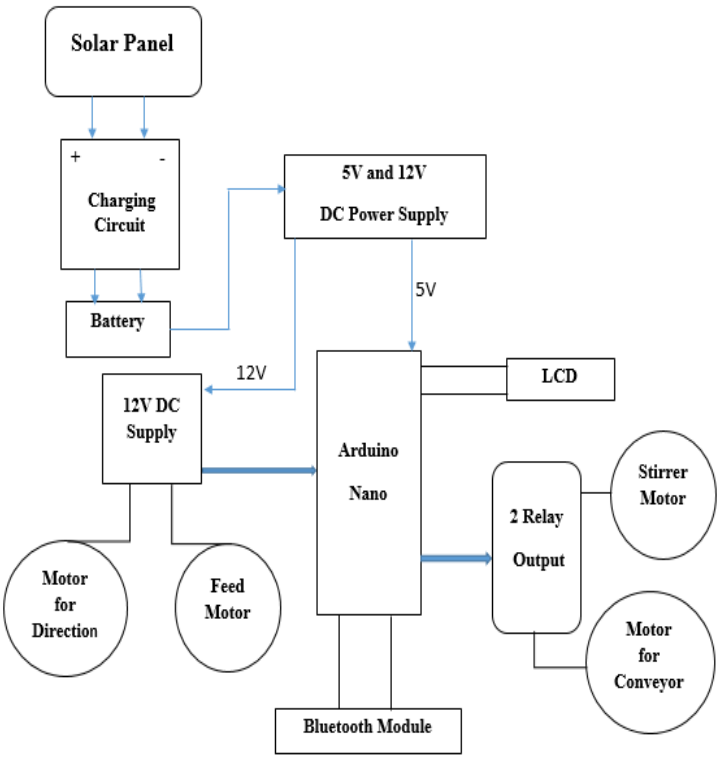

Fig. 1 Block Diagram

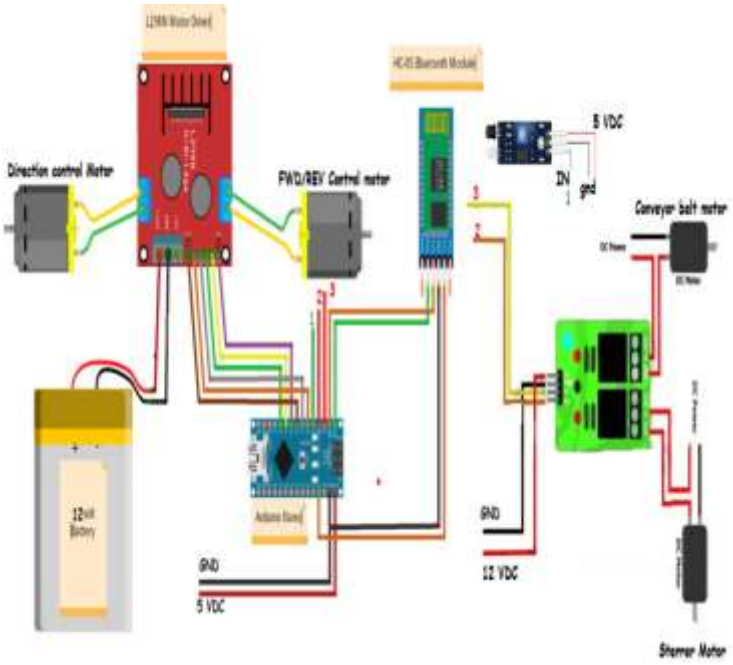

Fig. 2 Hardware Implementation

The main aim of our project is to lift the waste debris from the water surface and dispose them in tray. The present inventions for river cleaning machine mostly using petrol or diesel operated machines. In our project the main source we have used the solar power. That's why we have given the name of project is to "Solar Source Based Cleaning Vehicle for River". We have used

five motors in our project. All of them are DC gear motor. First motor we have used is for conveyor to lift wastage from river and the speed of the conveyor motor is 30 RPM and operated at 12 volts second motor which is used for the forward motion to move vehicle in forward direction. The third motor which is used for the change direction of the vehicle and it is mounted at the backward end of our vehicle. The fourth and fifth both the motor are used for the collect more waste near to the conveyor belt lower end which is in contact with the water. These all five motors are operated at 12 volts DC.

In our vehicle we have used Arduino Nano for all the control operation. The Arduino Nano is a heart of our vehicle. All the speed of the motor is control by Arduino Nano by the Bluetooth module. Because for the remote operation we have installed the Bluetooth module so from our mobile we can control the vehicle. The Arduino is operated by 5-volt DC but our battery output is 12 volts so for Arduino Nano supply we have used IC 7805. The IC 7805 is connected to the output of diode bridge circuit at the end of IC 7805 gives the 5-volt DC output for the Arduino Nano.

When the collected wastage level will increase above the desired limit the IR proximity sensor will sense and gives the signal to the Arduino Nano and automatically the conveyor motor will Stop. Our vehicle is easily control by the phone. By the use of our vehicle the required human effort to clean water surface will be very less.

6. COMPONENT DETAIL

6.1 Arduino Nano

Arduino Nano which is small, compact and breadboard-friendly board based on the ATmega328. It has more or less the same functionality, lacks only DC power jack, and works with Mini-b USB cable.

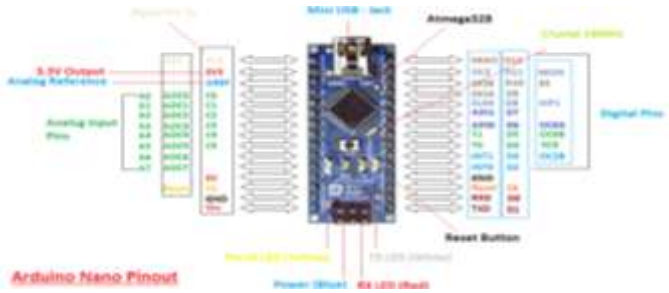

Fig. 3 Arduino Nano

6.2 Solar Panel

Solar panels are those devices which are used to absorb the irradiation and convert them into electricity. These cells are arranged in a grid like pattern on the surface of solar panels. Thus it may also be described as a set of photovoltaic modules, mounted on structure supporting it. A photovoltaic module is a packaged and connected assembly of 6x10 solar cells.

Fig. 4 Solar Panel

6.3 Battery

A sealed lead acid battery or gel cell is a lead acid battery that has sulfuric acid electrolyte coagulated so it cannot spill out. They are expensive than normal lead acid batteries, but they are also safer. They use different chemicals than dry cells, so they are rechargeable.

Fig. 5 Battery

6.4 DC Gear Motor

A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. The most important parameters in regards to gear

motors are speed, torque and efficiency. Here we are using 5 DC gear motor.

6.5 LCD Display

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16x2 LCD display is a very basic module commonly used in circuits. The 16x2 translate to a display 16 characters per line in 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

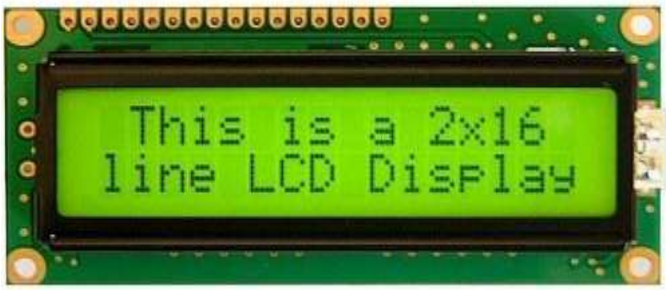

Fig. 6 LCD Display

6.6 Bluetooth Module

HC-05 module is an easy to use Bluetooth SSO (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth module can be used in a master or slave configuration, making it great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulation with complete 2.4GHz radio transceiver and baseband.

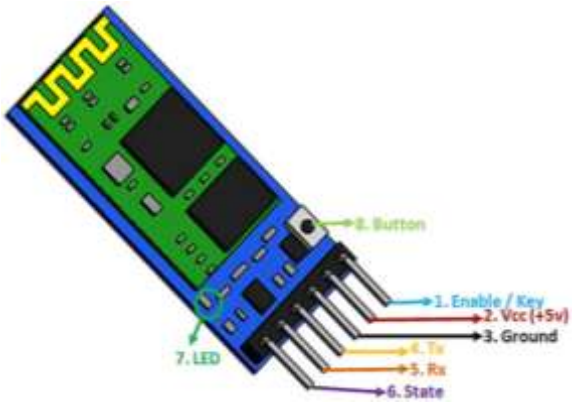

Fig. 7 Bluetooth module

7. CONCLUSION

This project design and analysis of river water cleaning machine is fabricated on the basis of literature and research on different journal and paper relevantly available and fabricated in accordance so it can provide flexibility in operation. On the basis of it design and estimating cost and availability it is very cheap and very useful for the society. The project carried out by us made an impressing task in the environmental purpose and it is very useful for the small scale works.

8. FUTURE SCOPE

We are going to design this demo machine into large scale for actual practice in big rivers or lake.

- The vehicle can be designed for major rivers like Narmada, Tapi, Ganga, etc. by increasing the capacity of the machine
- The machine can be designed for deep cleaning.
- We can use device like camera, buzzer along with sensors for further development.

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