

Water Cleaning Boat

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Abstract— Water pollution has been a topic of concern in recent years both in India and worldwide. The floating objects on the water surface many times get clogged in the drainage system and cause choking of the system which results in other harmful effects. Also such floating objects are consumed by the animals residing in the waters as food items and become the cause of their death. Another concern is the security of the water bodies. To deal with this problem we are proposing this water cleaning boat(Ship). This paper presents the design, development and fabrication of water Cleaning boat. This system works on solar energy so it is non-polluting. As the ship is designed to operations in water wireless communication system bluetooth module is used to communicate with the ship for reliable operation. This work can be very useful in improving life style of mankind.

Keywords: Solar Panel, Conveyor, Propeller, Collector, Wireless Communication

I. INTRODUCTION

Cleanliness is the basic need of every society. We need to keep our surroundings clean but we limit ourselves to the areas in our own premises or our neighborhood. A majority of the waste is dumped in the waterbodies like seas, rivers, lakes, ponds etc. Thus causing a high amount of water pollution Our project tries to get rid of this waste and clean the water bodies. Also, our project has the potential to become a great security aid if used wisely. The world currently is facing a lot of problems regarding the degrading condition of the environment we live in. India also has seen the drastic effects of this degradation. One of such problems is the increasing water pollution. In India, water pollution is very common and can be seen everywhere around us. The water pollution can be roughly divided into two types. Type 1-Pollution due to soluble wastes like chemicals, industrial waste, sewage etc Type 2- Pollution due to insoluble of floating waste like plastic, thermocol, flowers, leaves and other garbage. While Type 1 pollution can be treated in specialized water treatment plants, Type 2 pollution has to be cleaned manually and this is very hazardous and risky kind of a job for the life of the people performing it.

The other concern for the countries is the security of their coastline. There are areas where manual patrolling is not possible. Also it is necessary to keep track of the activities happening along the banks of the rivers and around the lakes. This surveillance work has to be done secretly without catching the eye of the people.

The water cleaning boat has been designed to clean such floating materials from water which has to operate manually via Bluetooth module. This can be control using Arduino nano controller, Bluetooth module, ultrasonic sensor, motor drives, etc.

II. LITERATURE REVIEW

This chapter reviews the literature studied for application of various concepts involved in bringing the idea of the

proposed ship into reality. It gives details about the work of other authors.

When the idea of such a device came into our minds, we searched for limit the water pollution due to floating waste. As the issue is related to the environment and the pollution has been responsible for very drastic changes in the environment, we started searching for various environment related journals to find any relevant information.

“Sirichai watanasophon and sarinee onittrakul,” present the article on the “Garbage collection robot on the beach using wireless communication.” This literature helped us in finding ways to tackle the problem regarding communication. Here the user can control a robot via a program developed from visual basic 2005 application based on window XP. The command from user are ent vai Bluetooth.

After searching, “Apoorva S. Chaithanya, Rukuma S. Prabhu, Saiswaroop B. Shetty, Denita D’Souza”, published Autonomous Garbage Collector Robot, Mangaluru helped us in understanding the concepts of autonomous vehicles. After gathering information about the autonomous vehicles, we shifted our focus to such devices operating in water. According to our requirement we were in need of a conveyor belt which would collect the garbage from the water. For more study “Uman khalid,Muhammad Faizan Baloch”, Smart Floor Cleaning Robot (CLEAR)IEEE, proved to be useful in understanding the design, construction and working of boat. For any kind of autonomous unmanned device, navigation is the most important part. The failure in communication and errors in the directions given to the vehicle can cause undesired results. To tackle this problem [1] gave us idea about various aspects of navigation and movements of an water vehicle. Finally for the designing and construction of the control circuit, supply from the solar panel and wireless communication the idea is taken from [1] regarding a solar based autonomous ship proved to be greatly helpful.

III. MECHANICAL DESIGN OF BOAT

Mechanical body consists of six parts i.e., conveyor, pipes, propeller, motor, solar panel, electronic circuitry. Combination all these four parts makes a complete boat.

A. Conveyor

It is a process where the raw materials and products are transport from one manufacturing stage to another. This is design such that they are safe loading, easy to handle, cheap, fast. This belt carries garbage from water bodies to the container. This belt consist of two pulleys which are powered by dc motors. One end of coneyoror belt is fixed on the wooden frame using two small wooden strip and another end is deep in water. This help to collect the garbage from water. Conveyor belt is of length 76.2 cm, width 30.40 cm.

B. Pipes

The base of the boat consist of PVC pipes i.e., Polyvinyl chloride which is synthetic plastic polymer. As this pipes

have less density than water so it can easily float in water. These pipes are air enclosed. Pipes size- diameter 11cm, length 106.68 cm, width 50.8 cm. These pipes do not corrode in water.

C. Propeller

It is a type of fan that transmits power by converting rotational motion into thrust. Propellers are used for the movement of the ship. There are two propellers in the ship, one on either side i.e. one on the left hand side and one on the right hand side. Both the propellers are placed at the back so that the maximum thrust generated by the propellers is utilized. Plastic fans are used. Propellers work by accelerating water backward. The diameter of the propeller is 6cm and run by two DC motors.

D. Motor

Permanent magnet DC motors are used for this ship. The motors are selected according to their requirements. Permanent magnet DC motor (PMDC), provides magnetic field instead of stator winding, which provides reduction in speed which gives constant speed for rotation. There are 4 motors in total.

1) Motor for Propeller

These motors are so selected that they produce enough forward thrust. These motors are having low torque and high speed. Two motors are used for two propellers of either side. Ratings - 1000rpm, 600mA.

2) Motor for Conveyor

This motor has to perform the operation of rotation of pulley and pull the belt filled with the garbage. Therefore it also has to be a low speed-high torque motor. Two motors are used for one pulley, these motors are coupled for constant speed of rotation.

Rating - 30rpm, 600mA

E. Solar Panel

Solar panel is used for charging the battery. Sunrays incident on the panel and it gets converted into electricity. In this process, the light energy is changed into electrical energy. Solar panel acts as a primary power source for the boat. The selection of this panel is done according to the power requirement of the boat. The solar panel is fixed on the wooden frame using two small wooden strips. This is to provide support to the solar panel and also to sustain the weight of the solar panel. The specifications of the solar panel are as follows.

Open circuit voltage (V_{oc}) – 21.6V

Short circuit current (I_{sc}) – 0.95A

Maximum power voltage (V_{mp}) – 17.4V

Maximum power current (I_{mp}) – 0.88A

Dimension – 220*360*20mm

IV. ELECTRONIC CIRCUITRY

A. Motor Controller

Motor controllers commonly known as H-Bridge, are used for driving motors in both directions i.e., clockwise and counter-clockwise. Current rating is 15A. And the controller contains two parts

- 1) Energized relay through the Arduino controller, drive motor.
- 2) Controlling the speed of motor.

The L298 is an integrated monolithic circuit in a 15-lead Multiwatt and PowerSO20 packages. This device is used in boat to control the PMDC motors. This motor drive is small in size and easy to use and is easily available in market. It is cheap and reliable. It is mainly used with electronic components.

B. Arduino Nano

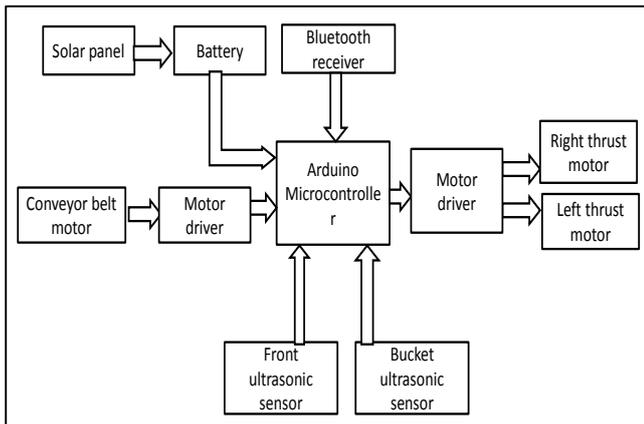
The Arduino Nano is a small breadboard based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). It has the same function as others but in the same package. It has Mini-B USB cable instead of a standard one. It has only lack of DC power jack. It can be powered by the Mini-B USB connection, 6-20V unregulated (pin 30), or 5V regulated (pin 27) external power supply. It has 16KB memory for storing code. The Arduino Nano has so many facilities for communicating with other devices and computer. It can be programmed by Arduino software (C++, Java). Arduino Nano can be directly connected to computer and can be easily programmed using C++ or Java language. It is cheap and can be used easily. It is used in water cleaning boat to command other electronic devices like Bluetooth module, sensors, motor drive.

C. Bluetooth Module

Bluetooth module is a microchip highly integrated module. HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module. The range of the module is 15m-20m. It is controlled by our mobile phone with the help of specific applications i.e. Bluetooth controller HC-05, version 2.08 module are an easy to use Bluetooth module. It is easily available in market i.e., HC-04, HC-06. The cost of this module is less and efficient as compared to others. The Bluetooth module is used to control the boat by giving the command through mobile. The boat will start its operation (such as conveyor, propeller etc.). HC-05 is small in size and is very efficient.

D. Sensors

Sensor is a device or module which is used to detect any change in environment or any obstacle. It is always used with other electronic devices like Arduino, Bluetooth module. Ultrasonic sensors are used in this boat. The modules include ultrasonic transmitters, receiver and control circuit. Ultrasonic ranging module HC-SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. Ultrasonic sensors include transmitter and receiver. Transmitter converts electrical signal into sound and receiver converts sound into electrical signal. Two sensors are used, one is used for detecting the obstacles and garbage, another is used for sensing the level of garbage container.



V. CONCLUSION

The ship can prove to be a helping hand in controlling the increasing problem of water pollution. It can greatly reduce the problems caused by floating waste. Also it can be effectively used for the surveillance purpose and can be used as a good security equipment.

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