

Solar Based Autonomous Ship for Cleaning Garbage & Surveillance

Arvind Vasudevan¹ Prof. P. P. Jagtap²
^{1,2} Department of Electrical Engineering
^{1,2} GHRCE Nagpur, India

Abstract—Water pollution with floating garbage is getting more and more serious in many countries. The design of an autonomous ship for cleaning the garbage floating on a lake has been proposed. The ship is powered by a solar battery. Circuit for protection of the excessive charge and discharge of the battery system has been used. Ultrasonic sensors have been equipped to detect the distance between the ship and the bank of the lake. The position and the orientation of the ship can be determined by measuring the distance between the ship and the bank at two successive times, which is used for controlling the running direction of the ship to make the ship autonomously run in an annular zone of a short distance away from the bank. The ship has also been equipped with a system to detect the occurrence of obstacles and to bypass the detected obstacles. Two screw propellers have been installed at the two sides of the ship to drive the ship, which makes the ship change its direction nimbly. A photo-resistance has been used to determine if it is in daytime or nighttime. The ship circulates the lake only one time at nighttime to save power energy. Wireless remote control is also available, which makes the ship user friendly. Experiments have demonstrated the applicability of the design.

Keywords: autonomous, garbage, Solar Battery, Ultrasonic, Propellers, Photo-resistance.

I. INTRODUCTION

Water pollution is a serious problem for the entire world. It threatens the health and wellbeing of humans, plants, and animals. As the world became more industrial and smaller due to communications and trade, accidental and purposive hazardous dumping has contributed to the problem of sea pollution. All water pollution is dangerous to the health of living organisms, but sea and river pollution can be especially detrimental to the health of humans and animals. Rivers and seas are used as primary sources of potable water by populations all over the world. Another serious consequence of this pollution is the effect of this pollution on trade in the polluted areas. This paper examines cases which reflect

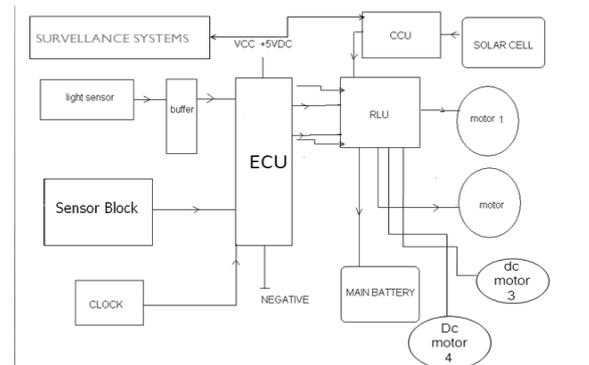
Different causes of sea and river pollution, the seriousness of this pollution, the effect of this pollution on trade, and a possible global solution to this problem. Water pollution can result from several sources, including "waste water that runs through city sewers, waste water produced by industrial processes, water runoff from farmers, urban areas, mining, forestry, and construction, and the dredging and filling of waterways which churns up bottom sediment and other pollutants.

II. THEORY

The cleaning ship is powered by solar battery, which is economic, and can save energy and protect environment. The cleaning ship determines the position and the direction of its own by taking the lake bank as the frame of reference. The ship runs around the lake bank by controlling itself running in a predefined distance away from the lake bank. At the same time, it automatically cleans the floating garbage. The ship can change direction if the equipped ultrasonic sensors have detected obstacles. Circuits for recognizing the daytime and the nighttime are designed too. The ship runs only once at nighttime to save electric energy. The circulating times of cleaning floating garbage at daytime can be determined according to the practical environment. A remote control circuit is designed, which makes manual control of the ship applicable. This is useful in some special circumstances, and thus can increase the practicability of the ship. A mechanism for collecting floating garbage is designed to realize automatic collecting floating garbage.

To realize the functions mentioned above, the designed cleaning ship should be controlled by a microcontroller. It should also have power supply system, obstacles detecting system, ship position and orientation detection system, motion controlling system, circuit for recognizing daytime and nighttime, and remote control system

III. METHODOLOGY



IV. CONSTRUCTIONAL DETAILS

Crystal Oscillator – used for providing operating frequency with the help of two capacitors Generates clock Signal to microcontroller, used for generating clock pulses for 89c51, 8051 from 4MHz to 12Mhz. In the project it generates a clock pulse of about 11.069MHz

Resistor Bands – Used for impedance Matching.

DB9 Connector - The DB9 (originally DE-9) connector is an analog 9-pin plug of the D-Subminiature connector family (D-Sub or Sub-D). The DB9 connector is mainly used for

serial connections, allowing for the asynchronous transmission of data as provided for by standard RS-232 (RS-232C).

IC Max 232 - The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single +5 V supply via on-chip charge pumps and external capacitors. The later MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1 μ F in place of the 1.0 μ F capacitors used with the original device.

Single X-Y Arm - The plates and tilt angle can vary from 0 to 180 degrees which can fulfill any location condition either the solar panel is installed on a ship. If both tilt and the plate angle is 90 degrees, the solar panel is normal to the ground surface. This work assumes that the orientation search by this Solar tracking system is done during the first time calibration; right after a solar panel has been installed. After acquiring the maximum power value from the solar panel, tracking system will only start searching again after power obtained from solar panels fell below some threshold value. Subsequent search would be much faster as the Tracking system would start searching from the best individual.

Inverter Circuit used for converting the DC voltage into a 230V AC voltage. Consist of two FET (Field Effect Transistor) which will work alternately. (ex: if one FET is on, then other FET will be in OFF position and vice versa. Due to the switching function the conversion of voltage takes place. It also consists of a RLC series circuit which is used for switching of 2 FET's. Consist of a step up transformer to increase the DC voltage to a 230V AC voltage.

RLU (Relay Logic Unit) - Fixed thermal unit design eliminates the need for separate thermal units, thus simplifying selection and reducing inventory. Self-powered; no external power source required. Current range adjustability for maximum application flexibility, ease of selection and installation, Phase unbalance protection provides additional degree of motor protection. Permanent tamper guard prevents tampering with the trip current adjustment dial setting.

V. OBJECTIVES

The first objective is the detection of the battery with the help of CCU (Charge Controllable Unit). If the voltage is lower than the threshold value, then the CCU compares the main battery voltage with solar battery voltage which is ever applicable is used to drive the ship, then the ship will work accordingly. In addition detection of obstacles and bypassing of the detected obstacles have been also proposed. However there are some disadvantages. On the other hand the ship advances forward well. On the other hand, in case there is large radius of the bank lake the ship may turn slowly at first, when ship is going to hit the bank. Thus the path may not be smooth.

VI. CONCLUSION

In this project, the structure and working principle of an autonomous ship for cleaning the garbage floating on a lake has been proposed. The ship can both be manually operated and run automatically. By analyzing the distribution characteristic of the garbage floating on a lake, a method for cleaning up floating garbage round the bank of the lake has been brought forward. Two ultrasonic ranging systems are used to obtain the positioning and the orientation of the cleaning ship and for path planning. Proposed work have already performed that the design of the autonomous cleaning ship for cleaning floating garbage on a lake is applicable.



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