

SOLAR POWERED WATER SURFACE GARBAGE COLLECTING BOAT

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Abstract:

As is well known, India's population is growing, and as a result, so is the amount of pollution. The majority of pollution is caused by the rubbish that humans produce. The majority of trash is dumped or just thrown into a lake, river, or other body of water. Garbage poured into water bodies, such as rivers, lakes, and other water resources, causes the water to become contaminated, rendering it useless and preventing us from using it for daily purposes. This is a serious issue in a lot of Indian cities. By gathering the trash that is floating on the water's surface, our project, "Solar powered water surface cleaning boat," is very beneficial in the fight against water pollution. This project saves labor because it operates automatically. This project is also incredibly effective because it uses solar energy instead of an external power source. The energy that the solar plate collects is used to charge a 12-volt battery, which will then use that energy to power the entire boat.

Keywords: PMDC motor, conveyer belt, water impurities, garbage collector, wireless communication, solar energy, Battery.

I. INTRODUCTION

A. Aim

By sustainably and effectively collecting trash from water bodies, a Solar Powered Water Surface Garbage Collecting Boat seeks to address the issue of water surface pollution.

The goal of this project is to create and implement a solar-powered, robotic trash boat that is IOT enabled for cleaning rivers, lakes, and oceans. The purpose of this garbage boat is to gather rubbish and debris from the water's surface.

All living things require clean water as a basic necessity, yet it can become polluted for various causes, including sewage waste, industrial waste, and rubbish waste. Due to stagnant rubbish, the lakes in many Indian communities are not used for any daily purposes. This is the driving force behind the creation and execution of this project.

Through a charging circuit, solar energy is used to charge the battery, which is then used to power the robot.

Using a WEB mobile application, the boat movement, conveyor belt, and headlight can all be controlled via a web browser while watching the video. The ultrasonic sensor on this robot allows it to identify and avoid obstacles while traveling across the water's surface. The IR sensor will notice when the garbage can is full. The boat will automatically turn on the camera module's RED LED and siren when an IR sensor transmits this information.

This system will be more advanced since it will use a moving belt with teeth to collect rubbish on the water's surface to collect the floating waste. Arduino UNO serves as the project's primary controlling mechanism. This operation was completed by loading a C language program onto the Arduino.

B. Objective

- Create a garbage-collecting boat powered by IOT.
- A trash detection system using IR sensors.
- Red LEDs and buzzers for alerts.
- An obstacle detection and avoidance system based on ultrasonic sensors.
- Using a conveyor belt arrangement to gather the trash.

II. LITERATURE SURVEY

As is well known, India's population is growing, and as a result, so is the pollution. The majority of pollution is caused by human-produced waste. The majority of trash is dumped or just thrown into a lake, river, or other body of water. The waste that is dumped into bodies of water, such as lakes, rivers, and other water resources, causes the water to become contaminated, making it useless for human consumption. This is a serious issue in a lot of Indian cities. By gathering the trash that is floating on the water's surface, our project, "Solar powered water surface cleaning boat," is very beneficial in the fight against water pollution. This project saves labor because it operates automatically. This project is also incredibly effective because it uses solar energy instead of an external power source. [1]

Today's significant garbage dilemma is a result of the world's rapid economic development, population increase, corrosive corruption, bad urban planning, and dysfunctional politics. The current tried-and-true trash collection techniques have so far been shown to be unsuccessful. And the world of today is considering clever solutions to the rubbish collection issue. In this paper, a garbage collector robot with an Arduino microcontroller is shown. The robot is constructed on a 50x40 centimeter metal platform that is powered by a 12V, 7.5Ah battery. The Arduino is programmed to control the robot's movement. The robot is intended to gather trash from beaches, concrete walkways, parks, schools, and other public areas. On muddy surfaces, the robot cannot be operated. The robot is designed such that when it is turned on, it will follow the program's instructions for movement. Depending on the circumstances set out in the program, the robot moves forward after hitting the obstacle before picking up the trash. [2]

The goal of this project is to create the AGATOR rotor robot model as an automatic garbage collector to effectively and efficiently combat waste build up in rivers with no flow. The implementation process uses design and construction. This approach entails identifying needs, analyzing the precise components needed, engineering software and hardware, producing them, and testing them. The test results are gathered using the AGATOR's specifications, which comprise the IC ATmega16 with a 5 V and 1,1 mA current, the IC Driver with a 12 V and 1,2 A current, and the Limit switch as the controller. Actuator robots, sensor systems, robot control systems, and Mechanical robots all function as support devices for robots. The garbage can is driven by a maximum load of 5 kilograms. [3]

The purpose of this article is to define the technical and financial components of the installation of a freestanding photovoltaic (PV) system in a sailing boat using a boost chopper in order to simplify the power system and reduce costs. This converter's main purpose is to boost a dc load. However, for integration purposes, the converter just needs one inductor to transform

power. Additionally, the PV panel offers a vital defense against direct sunlight and moisture for the boat's occupants. [4]

India's population is growing, and the country values natural cleanliness less and less. There are numerous villages and cities in India that are surrounded by rivers or lakes, yet they are not in use. because humans have already contaminated the water. By taking these into account, the "Solar Operated Water Cleaning Project" has cleaned the water, thus it should be used. To do this, a proposal is presented for a solar-powered boat that will gather trash and clean the water in a river or lake. As well as smart cities, villages will address the current issue of rubbish collection. The goal of this initiative is to purify the water of trash. This project uses solar electricity, and the boat will run automatically as a result, saving manpower. PVC (photovoltaic cell) provides the boat with 12V 7.3AH of power. The trash will be collected by a conveyor belt. This effort makes only a small contribution to the Indian Prime Minister's "Swachh Bharat Abhiyan" initiative to keep India clean. [5]

One such renewable resource is solar energy, which is used by nature during the photosynthesis process (Martsinovich, Natalia 2016). This initiative uses solar energy, a sustainable resource, as a more effective power source to clean the environment, notably swimming pools. Robotic pool skimmers are machines that assist with pool maintenance. Robotic cleaners may do the task without being connected to your pool. A 5V solar panel is attached to a 3.7V DC motor through a battery. For connecting the motor to the shaft, a pulley is needed. The pulley, which is connected to the shaft, converts the shaft's rotating motion into thrust that moves the robot forward. As a result of this prototype's exclusivity to swimming pools, the variety of uses for solar-powered waste collecting is limited. [6]

III. PROPOSED METHOD

Proposed method for a solar-powered water surface garbage collection boat, there are the steps following:

- Design and construction
- Solar Power System
- Propulsion and manoeuvring
- Garbage Collection Mechanism
- Automated Sorting and Disposal
- Monitoring and Control System
- Maintenance and Safety

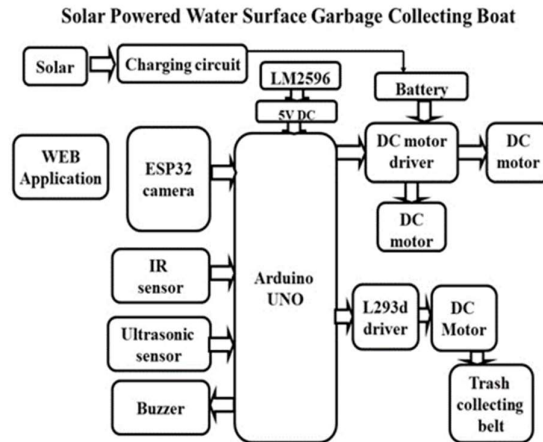


FIG 3.1: Block diagram of Solar Powered Garbage Collecting Boat

The main blocks of this project are:

1. Solar.

Solar energy is the term used to describe the heat and light that the Sun emits that can be captured and transformed into useful types of energy. Solar energy is a sustainable and renewable type of energy that has several advantages, including cost savings, energy independence, and environmental friendliness.

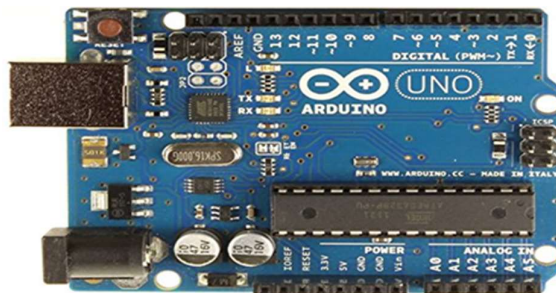
2. Charging circuit.

An electrical system that permits the charging of batteries or other energy storage devices is known as a charging circuit. For a safe and effective battery charge, it offers the essential voltage, current regulation, and control mechanisms.

3. Rechargeable battery.

A rechargeable battery is a type of energy storage that can be charged and discharged repeatedly. It is also referred to as a secondary battery or storage battery. Rechargeable batteries are made for repeated cycles of charging and discharging, making them a more cost- and environmentally-friendly alternative to non-rechargeable batteries, which are created for single usage and then destroyed.

4. Arduino UNO.



The Arduino Uno's microcontroller board is an ATmega328 from the AVR family. There are 14 digital input/output pins, a 16MHz ceramic resonator, and 6 analog pins. It makes use of a USB connector, a power jack, and a reset button. Its program is supported by many libraries, which simplifies development.

5. ESP32 Camera.

Popular development boards like the ESP32 Camera pair the ESP32 microcontroller with a camera module to let users add image and video capture functionality to ESP32-based applications. For applications requiring visual data processing and communication through Wi-Fi or Bluetooth, it offers a reasonably priced and small solution.



6. DC motors with l293d motor driver.



To transform electrical energy into mechanical energy, a DC motor typically involves interactions between magnetic fields and current-carrying conductors. The opposite action is carried out by a dynamo, generator, or alternator, which converts mechanical energy into electrical energy.

The L293D and L293 are these quadruple high-current half-H drivers. The L293 is designed to deliver bidirectional drive currents of up to 1 A at voltages between 36 V and 4.5 V. The L293D is designed to generate bidirectional drive currents of up to 600 mA at voltages ranging from 4.5 V to 36 V.

7. Conveyor belt.

A mechanical system called a conveyor belt consists of a continuously moving belt that has been looped around pulleys or drums. It is mostly employed for the efficient and regulated transfer of items, goods, or materials, from one place to another.

8. Buzzer.

An electronic buzzer is a tool that emits sound when an electric current flows through it. It is a typical part that is utilised in a variety of applications, from alarm systems to electronic gadgets that need audio feedback.



9. Head light.

A part of a vehicle's lighting system that provides illumination at the front of the vehicle is a headlight, also referred to as a headlamp. It normally comprises one or more light sources encased in a protective housing and is mounted on the front of the car, above or close to the front bumper.

10. IR sensor.

A device that detects and monitors infrared radiation in the surrounding environment is known as an IR sensor, also known as an infrared sensor or infrared detector.

11. Ultrasonic sensor.

Similar to radar or sonar, which evaluate a target's characteristics by analyzing the echoes of radio or sound waves, ultrasonic sensors operate on the same principles. High-frequency sound waves are produced by ultrasonic sensors, which then analyze the echo they hear back.

IV. RESULT

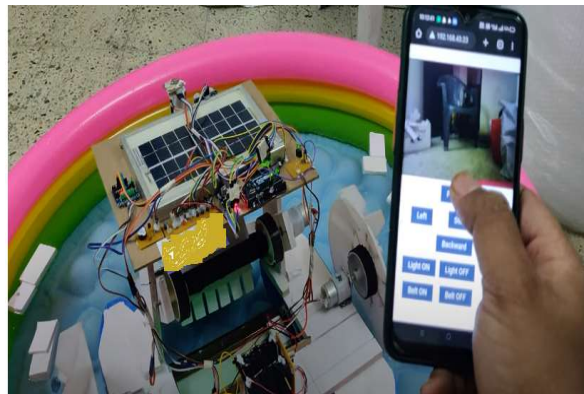


Fig: controlling boat on water surface from web application

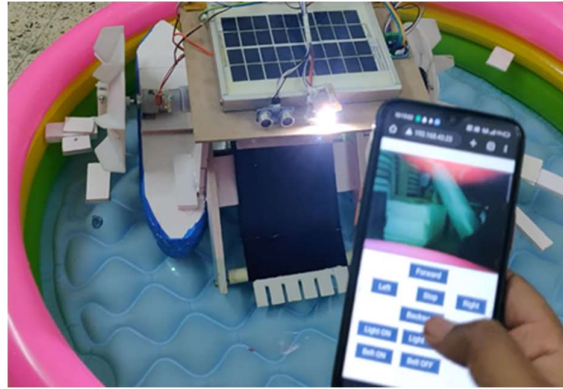


Fig: controlling head light from web application



Fig: collecting the garbage

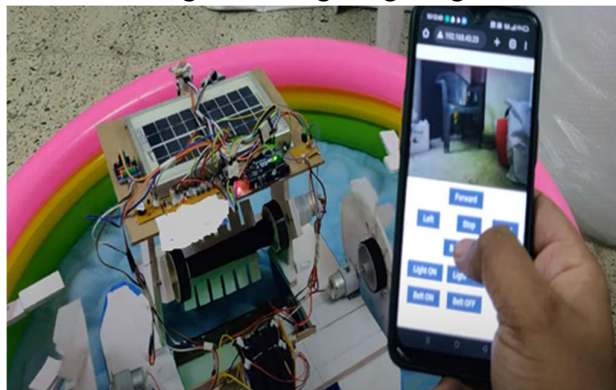


Fig: IOT based solar Powered Water surface garbage collecting boat 🚤

V. CONCLUSION

It was designed with features that integrate with all of the hardware components used. The placement and arrangement of each module have been carefully thought out, allowing the unit to operate as efficiently as possible. Second, the project has been completed with the aid of evolving technology and cutting-edge ICs. The project's design and testing were successful as a result

Future Scope:

We may extend this idea to include water quality and weather forecasting.

We can expand this project to include autonomous systems.

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