SOLAR POWERED WATER TRASH COLLECTOR

Submitted by ;

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INTRODUCTION

A solar-based water trash collector is an eco-friendly device designed to clean water bodies by removing floating debris and pollutants using solar energy. It consists of solar panels that generate electricity to power a trash collection mechanism, such as a conveyor belt or net, which collects waste and stores it in a bin for disposal. The system may also include sensors for navigation or water quality monitoring, enabling autonomous operation. This sustainable solution helps reduce water pollution while relying on renewable energy, making it cost-effective and environmentally beneficial.

PROBLEM STATEMENT

Water pollution caused by floating trash, such as plastic waste, organic debris, and other pollutants, severely affects aquatic ecosystems, water quality, and biodiversity. Manual cleaning of water bodies is labor-intensive, time-consuming, and often ineffective, while conventional cleaning systems rely on fossil fuels, increasing environmental harm. There is a critical need for an efficient, automated, and sustainable solution to address this issue.

PROBLEM SOLUTION

The proposed solution is a solar-based water trash collector, an automated system powered by renewable solar energy to clean floating debris from water bodies. It uses solar panels to generate electricity, driving a trash collection mechanism that collects waste from the water surface. The collected waste is stored in a bin for proper disposal. With features like sensors for navigation and autonomous operation, the system is efficient, cost-effective, and eco-friendly. This innovative approach reduces manual effort,

minimizes environmental impact, and contributes to cleaner water bodies.

COMPONENTS REQUIRED

1. Microcontroller Unit (MCU):

ATmega328P (U1)

2. Motor Driver:

L298N Motor Driver (U5)

3. Voltage Regulators:

AMS1117-5.0 (U3)

4. Diodes:

1N4007 (D2, D4, D6, D8, D10)

Zener Diode (D1)

5. Capacitors:

10 µF (C4)

470 µF (C7)

100 nF (C2)

22 pF (C1, C8)

6. Resistors:

330 Ω (R5)

7. LED:

LED-0603 (LED2)

8. Crystal Oscillator Circuit:

16 MHz Crystal (XTAL1, XTAL2)

9. Connectors:

Input Berg Connector (J1)

Motor Driver Berg Connectors (J3, U6)

Bluetooth Berg (H2)

Relay Berg for Pulley (H1)

ICSP Pins (J2)

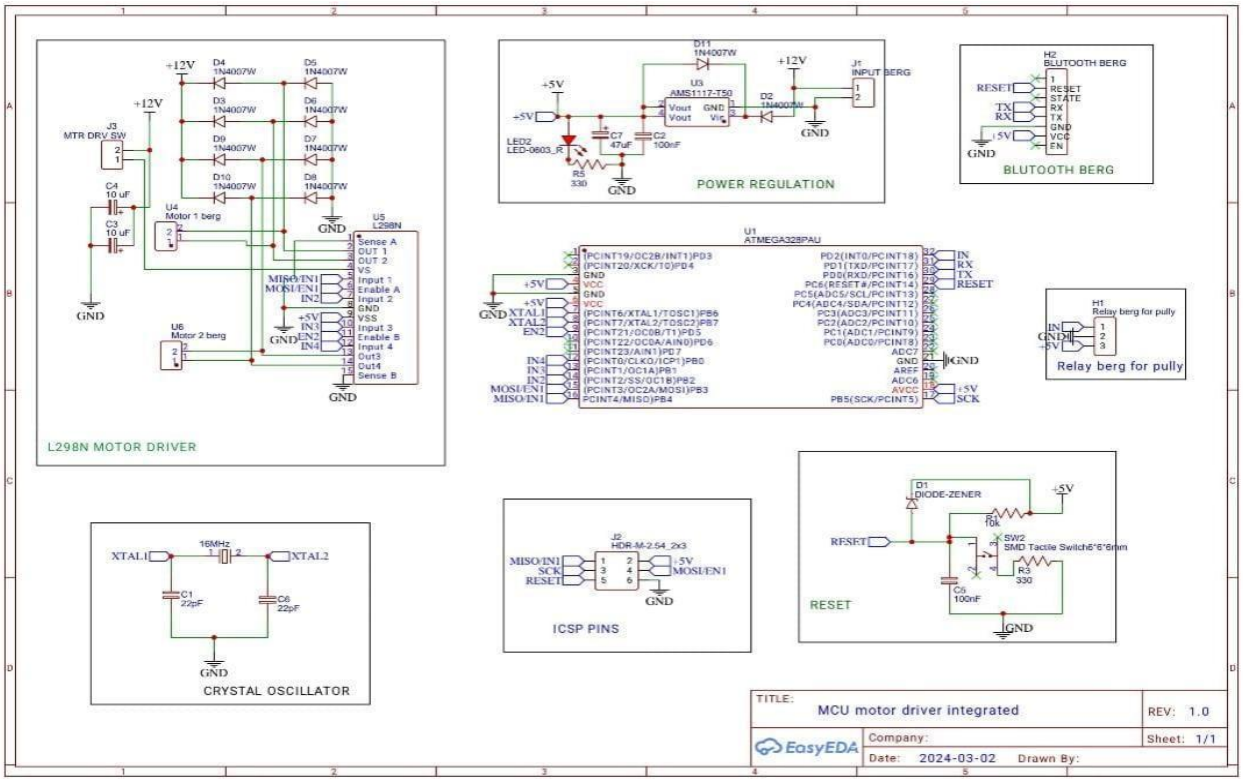
10. Switch:

Tactile Switch (SW2)

11. Power Sources:

12V DC input for motors and voltage regulation.

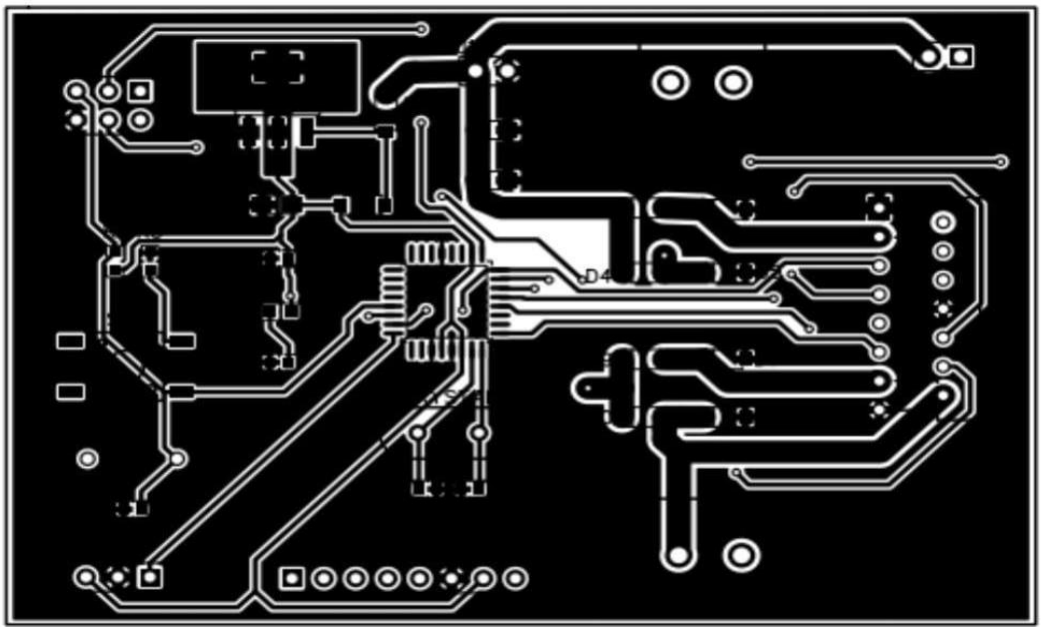
CIRCUIT DIAGRAM



This circuit diagram represents an integrated motor control system powered by an ATmega328P microcontroller (U1). The system includes a power regulation circuit using an AMS1117-5.0 voltage regulator to convert a 12V input to 5V, ensuring stable power for the microcontroller and peripherals. A crystal oscillator with a 16 MHz crystal (XTAL1, XTAL2) and 22 pF capacitors (C1, C8) provides clock signals for the microcontroller. The ICSP (In-Circuit Serial Programming) pins allow programming the microcontroller. Reset functionality is facilitated through a Zener diode (D1), a tactile switch (SW2), and a pull-down resistor (R5). The Bluetooth interface (H2) enables wireless communication.

The motor control section Is based on the L298N motor driver (U5), which drives two motors through input signals from the microcontroller. Diodes (D4, D6, D8, D10) are used for flyback protection to safeguard the motor driver from voltage spikes. A relay interface (H1) is provided for additional control, such as operating a pulley mechanism. LED indicators (LED2) are included for power status. This circuit can be utilized in robotic or automation applications, with features like wireless communication and efficient motor control.

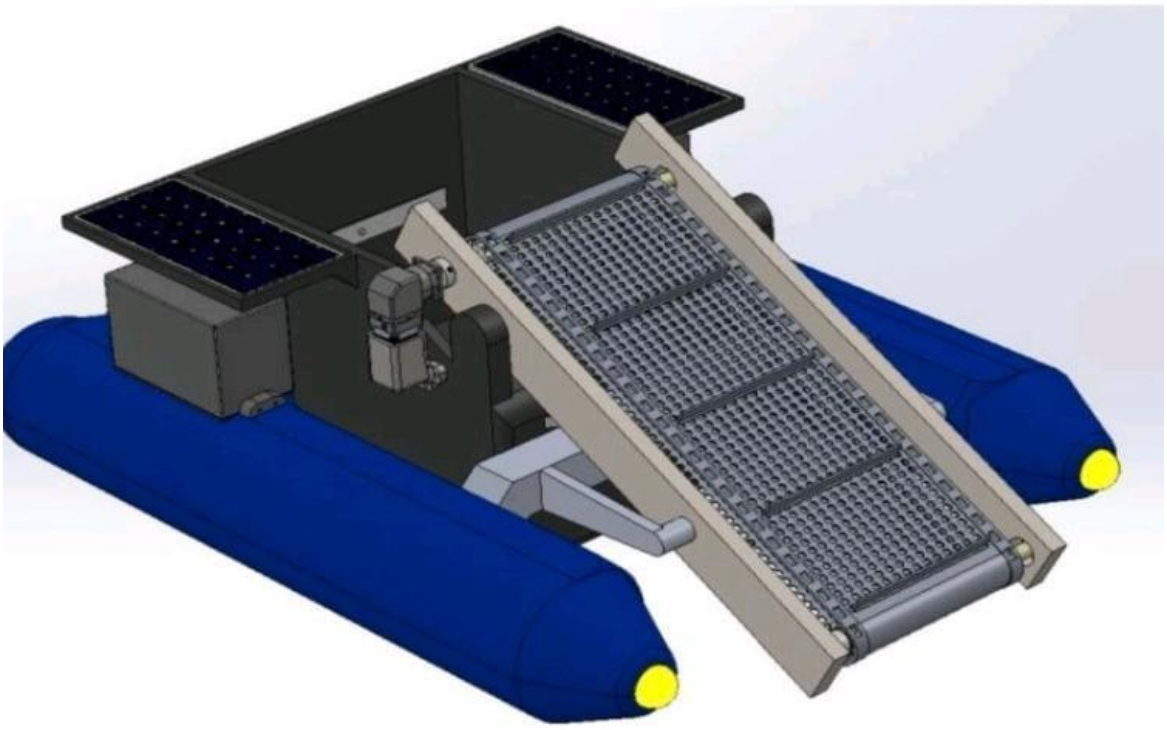
PCB LAYOUT L298 BLUETOOTH



The PCB layout integrates an L298N motor driver and a Bluetooth module, designed for efficient motor control and

wireless communication. The layout features distinct sections for power regulation, motor control, and Bluetooth interfacing, ensuring minimal interference and streamlined connections. Power traces route the 12V input to the motor driver and voltage regulator, while signal traces connect the microcontroller to the L298N driver for precise motor operation. The Bluetooth module is strategically placed to facilitate reliable communication. The design optimizes trace widths for current handling and includes ground planes for electrical stability, ensuring the system's overall efficiency and reliability.

MODEL



CONCLUSION

A solar-powered trash collector presents an innovative and sustainable solution to combat water pollution. By utilizing renewable solar energy, this system offers an environmentally friendly way to clean water bodies without the need for external power sources or fuel. The integration of efficient motors, sensors, and a trash collection mechanism ensures the effective removal of debris, contributing to cleaner water environments. As awareness of environmental issues grows, solar-powered trash collectors could play a key role in maintaining water quality and promoting sustainability, making them a valuable tool in global efforts to preserve aquatic ecosystems.