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Solar Operated Beach Cleaner Robot

Shruti Rajesh Naware , Saloni Vyankappa Dhole , Girish Ravindra Nagarkar , Yash Vivek Meshram, Dr.Amol. D. Sable

Diploma students, Department of Mechanical Engineering, Jayawantrao Sawant Polytechnic, Pune, India

Guide, Department of Mechanical Engineering, Jayawantrao Sawant Polytechnic, Pune, India

ABSTRACT: Beaches are not only popular tourist destinations but are also an asset to the environment. In these days, the pollution on beaches are increasing day by day.The major wastes that are accumulated on the beach shore includes broken glass pieces, medical waste, jellyfish, plastic bottles and bags, rusted metal, etc. These waste ends up in the sea if they are not collected properly and manual collection of this waste will result in health problems for beach workers. The purpose of this project is to design and implement a Solar Floor Cleaner Robot that is low cost, user-friendly, and powered by renewable energy.The conventional floor cleaning machines used in commercial places require electrical energy and are not suitable for areas experiencing power crises. This project aims to provide an alternative solution for these areas by developing a solar-powered, mobile-operated floor cleaning machine.

KEYWORDS: Machine, manual collection, waste collection, sensors, GPS, solar based.

I.INTRODUCTION

With the increasing demand for home automation, the adoption of domestic robots is evolving. The purpose of this project is to design and implement a Vacuum Robot Autonomous that will make cleaning processes more comfortable and efficient, eliminating the need for manual vacuum cleaners. This project aims to develop a vacuum robot prototype that will have several criteria that are user-friendly. Conventional floor cleaning machines are widely used in commercial places such as airports, railway stations, hospitals, bus stands, and malls. However, these machines need electrical energy for their operation and are not user-friendly.

In India, particularly in summer, there is a power crisis, and most floor cleaning machines are not used effectively, particularly in bus stands therefore, there is a need to develop a low-cost, user-friendly floor cleaning machine. In this project, we proposed a solar-powered mobile- operated floor cleaning machine that can be an alternative to conventional floor cleaning machines. The floor cleaning machine will be designed to be energy-efficient and environmentally friendly.

The proposed floor cleaning machine will be designed to use renewable energy, which is abundant in most countries, will have less environmental impact, and will be easy to construct for commercial use. The proposed solar floor cleaner robot project will be implemented using an microcontroller, ultrasonic sensors, solar panels, a 12-volt battery, an L298N motor driver, DC motors, a cleaner motor, and a relay.

II.LITERATURE SURVEY

1.Design and analysis of sustainable beach cleaner [2022] H. Ebrahim, W. Sheikh, A. Saeed. This paper analyzes various beach cleaner projects with the motive of eradicating the limitations they consist of. It also presents a detailed study of the functionality of these beach cleaners along with the motion and stress graphs of the same. The designed machine is a combination of different features adapted from their research. The mechanism of the machine is a simple chain sprocket arrangement wherein the sprocket turns the chain and the rakes attached to the chain lift the trash.[1] This project had limitations such as inconsistency in picking up small debris and will pick up any obstacle in its way. Our prototype is able to collect finer debris due to the presence of mesh. Also, with the help of live surveillance the person handling the system can avoid picking up obstacles other than the debris.

2. Manufacturing of Beach cleaning Machine at UMS prototype design and analysis [2021] N. Bolong, I. Saad, M. Amran Madlan. In this paper, the team has assembled a beach cleaner by integrating both raking and sifting mechanisms. It consists of a sprocket chain arrangement with components like a collector, conveyor, motor, and gears which requires manual handling of the machine. The main objective was to fabricate a simple and budget-friendly

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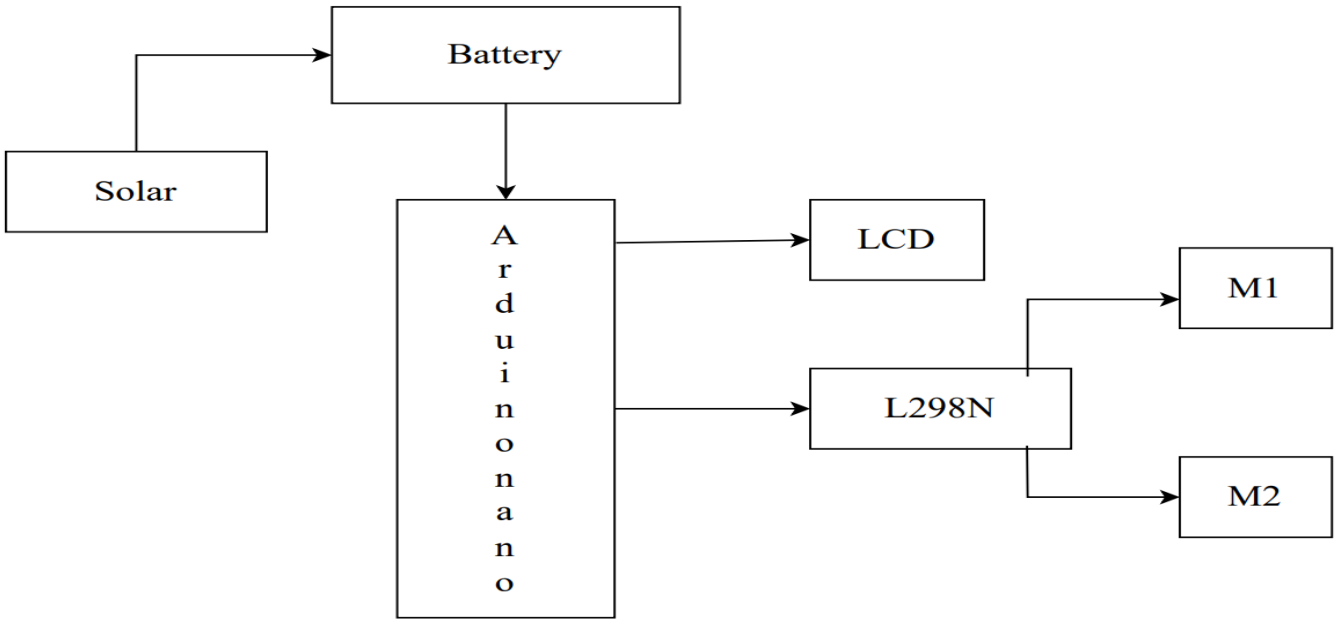
beach cleaning machine feasible for one person to handle. The paper also includes a detailed examination of the operation of the prototype, on-site testing, and user survey.[2] This prototype is operated manually. Keeping in mind the detailed examination and results of the survey presented in this paper we have improved upon the user feasibility by adding additional features like the use of live surveillance and remote automated operation.

III. BLOCK DIAGRAM



IV. WORKING

Solar panel:- To store energy,the robot would likely have a rechargeable battery (12V) connected to the solar panel.The panel charges this battery during the day. A 1.3Ah panel will be recharges a 12V battery through you may want a larger battery capacity depending on the robots energy needs. If the beach cleaner robot consumes 1.0A on average the 1.3Ah solar panel could provide enough power for approximately 1-2 hours of operations during peak sunlight, depending on how much energy is stored in the battery.

LCD:- Liquid Crystal Display (LCD) and the Internet of Things (IoT) are related in that LCDs are often used as display devices for IoT devices and systems. For example, LCD screens can be used to display real-time data from IoT sensors or to provide a user interface for controlling IoT devices. A register select (RS) pin that controls where in the LCD's memory you're writing data to A Read/Write (R/W) pin that selects reading mode or writing mode. An Enable pin that enables writing to the registers.8 data pins (D0 -D7).

Arduino Nano:- Power The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source. Memory The ATmega328 has 32 KB, (also with 2 KB used for the boot loader. The ATmega328 has 2 KB of SRAM and 1 KB of EEPROM.

Ultrasonic Sensor:- The ultrasonic sensor operates based on the principle of echolocation, which involves emitting ultrasonic waves and measuring the time it takes for the waves to bounce back after hitting an object. The sensor detects nearby objects, helping the robot gauge how far they are. For instance, the robot can sense if it’s approaching a

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large rock, a piece of driftwood, or other obstacles on the beach. The robot can avoid obstacles by turning or altering its path when the sensor detects an object in its way.+

L298N:- The L298N is a dual H-bridge motor driver IC that can control the direction and speed of DC motors, making it suitable for use in various applications, including robotics and fire-fighting systems. In a fire-fighting system, an L298N driver could be used to control motors for moving a robot or an automated firefighting vehicle, as well as for operating water pumps or other apparatus required to combat fires. The L298N driver controls the motors connected to it; it can drive two DC motors. By sending control signals from the microcontroller to the L298N, you can adjust the direction and speed of the motors, allowing for movement towards a fire or maneuvering around obstacles.

BATTERY:-The solar panels on the robot generate electricity, which is stored in the 12V 1.3Ah battery. The battery provides a stable power supply to the robot's components, such as the motor. The motors of the beach cleaner can draw around 10-20W depending on the type of terrain and cleaning efficiency needed. In combination with other components, the robot would require careful power management to ensure sufficient battery life. A solar-powered beach cleaner equipped with a 12V 1.3Ah battery would be efficient for cleaning small to medium beach areas, given that the robot's energy consumption is optimized and there's enough sunlight for charging.

V.OBJECTIVE

The objectives of a solar-operated beach cleaner robot are generally focused on improving environmental sustainability, enhancing efficiency, and reducing human labor in the beach cleaning process. The use of solar energy as the primary power source minimizes reliance on fossil fuels, thereby reducing greenhouse gas emissions. Solar-powered systems have minimal environmental impact, helping to protect the natural beauty and ecosystem of the beach. The robot is designed to autonomously collect debris, such as plastic waste, seaweed, and litter, which accumulates on the beach. This reduces the need for manual labor and increases the efficiency of cleaning. The robot can function independently, with minimal human supervision, enabling efficient cleaning over extended periods. The solar panels ensure that the robot can recharge during the day and continue working.

VI. ADVANTAGES AND APPLICATION

Advantages

- The machine is environment friendly, because it is totally electrically driven, powered by rechargeable full isolated GEL batteries.
- It reduces human efforts also more comfortable to use, moreover it is silent, robust and accurate.
- By removing litter, unwanted seaweed, Floating waste like bottles, plastic cans, covers any kind of waste unwanted seaweed and other debris from the beach, municipalities and resorts are able to maintain their beaches with fewer invested hours.

Application

- Useful for controlling indoor fires.
- Can provide a low cost fire protection system with limited centralized fire

VII. CONCLUSION

This project has created the robot for garbage collection at the beach. Wireless communication module is used in the project for remote controlling. Raspberry Pi was used for processing all commands. The robot can progress on the sand as per the user's command by wireless
communication medium and collect the garbage. This robot is expected to overcome the excessive garbage spread on the beach which might harm the natural environment.

- However, the robot can still be improved to operate automatically and control from even larger distance. Design of prototype model and waste cleaning robot is proposed which is used at beaches to cleaned it and maintain the surrounding environment clean and hygiene. It is very easy to handle and also its operation is easy.
- Our proposed robot is also used at different places like gardens, different campuses, sports grounds etc. For maintaining its hygiene and for cleaning purpose. At present, we are working on fabrication and mechanical parts development of this project. Progress which is so far is successful and good

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