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Sobot-Solar based Beach Cleaning Robot

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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 Sobot is a solar based beach cleaning robot that collects waste with minimum human intervention. It uses a combination of sensors, such as ultrasonic sensors, IR sensors, cameras, and GPS to detect obstacles and navigate its path respectively. We implement the image detection and processing using the micro controller ESP 32 which has an inbuilt camera module which captures the images. The Sobot operates on the sandy shores, harnessing the power of the sun through integrated solar panels. Our aim is to design and develop an affordable, easily portable and environmental friendly machine that solves the issue of beach pollution.

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

I. INTRODUCTION

Oceans account for 70 percent of the surface of Earth and play a pivotal role in the health of human beings. According to the National Oceanic and Atmospheric Administration (NOAA), billions of pounds of trash and other pollutants enter our oceans every year. This has become an issue not for our country but also for the entire world. Proper disposal of waste is crucial, for maintaining hygiene, cleanliness and overall environmental well being.

To tackle this situation we came up with the idea of Sobot, the beach cleaning robot is a piece of remote controlled equipment designed specifically for cleaning beaches. It has the ability to operate on dry terrain, effectively collecting trash and other forms of waste. The robot uses image processing algorithms to detect various objects on the beach and locate them within the robot's field of view.

In this paper we will explore the design, operation, and potential effects on beach laborers, highlighting its contribution to cleaner and healthier beaches while furthering the goals of environmental conservation and sustainable growth.

II. METHODS AND MATERIAL

Sobot is a four-wheeled skid-steer drive powered by two motors on front wheel, with electrical power provided by a battery pack inside the vehicle using solar panel. The waste detection is done using micro controller ESP32-CAM. The ESP32-CAM has a camera module which captures the image of object. After capturing the image of the object, the frames are transmitted to the cloud via ESP32-CAM. After comparing the captured object with the input database from the cloud, if the object is recognized as plastic bottle, then the wheel motor stops and initiates the arm motor which collects the waste. If the object is not recognized as plastic bottle, the image is ignored and it looks for upcoming images. The storage tank of the robot has a capacity of 10 litres, and after reaching the limit, the IR sensor gives the input to the control station, and the robot moves to the base station and returns back after emptying the tank. The robot uses a mesh like design for waste collection. The robot's design is eco-friendly, and it aims to help clean beaches of waste and junk.

III. RESULTS AND DISCUSSION

The development of a solar-based beach cleaning robot represents a promising step towards addressing the challenge of beach pollution in an environmentally sustainable manner. Through the integration of solar power, the robot offers an eco-friendly solution that reduces reliance on conventional energy sources and minimizes carbon emissions. Moreover, the autonomous operation of the robot enables efficient and systematic cleaning of beaches, effectively removing debris and waste while minimizing human intervention. The use of robotics in beach cleaning not only enhances the effectiveness of clean-up efforts but also serves as a demonstration of technological innovation in environmental conservation. Additionally, the utilization of renewable energy sources aligns with the global trend towards sustainability and contributes to the promotion of clean energy technologies. Overall, the solar-based beach cleaning robot holds great promise in mitigating beach pollution and preserving the natural beauty of coastal ecosystems.

IV. CONCLUSION

In conclusion, the idea of solar-based beach cleaning robot represent has a promising and innovative solution to the challenges of maintaining pristine coastal environments. Sobot offer a sustainable and efficient way to address the issue of beach pollution, combining renewable energy technology, advanced robotics, and environmental conservation. With their ability to autonomously navigate diverse beach terrains, identify and remove debris, and operate under the power of the sun, this robot hold significant potential for local governments, tourist resorts, environmental organizations, and research institutions.

As we look to the future, the continued research and development in this field will further enhance the capabilities and effectiveness of solar-based beach cleaning robots. With a focus on sustainability, efficiency, and ecological impact, these robots represent a compelling example of how cuttingedge technology can address real-world environmental issues, offering hope for a cleaner and healthier coastal environment for generations to come.

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