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Advanced Solar System

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1. Introduction

The sun's radiation, which generates electricity, is referred to as solar energy. Solar energy is a vast, abundant, inexpensive, and environmentally friendly source of renewable energy. Because of these characteristics, the world is currently researching and discovering the most cost-effective way to harness this energy, and the solar tracking system is the result of that search. Solar panels were developed to generate this energy by absorbing sun rays and converting them into electricity or heat. This report provides an overview of solar PV cells and the materials required to construct them. There's also a discussion of the various types of solar PV systems, solar dirt cleaning and solar tracking systems. But mostly it focuses on the design and performance analysis of various dual axis tracking solar systems that have recently been proposed.

2. Our Future Goals

Mission: Our mission is to support a sustainable future by offering affordable and effective solar energy solutions that absorb the power of the sun's radiation, minimize the adverse impact on the environment, and promote a cleaner world for future generations.

Vision: Our vision is to be the premier supplier of cutting-edge solar energy solutions that accelerate the transition to a more sustainable future and provide communities with clean energy access.

3. How it works?

In this project, we will learn about the robot that cleans solar panels. Our goal is to create a system that detects moisture, temperature, and dust on solar panels. This device will detect dust on the solar panels automatically. It will begin cleaning when it detects dust on it. We use this because if a thick layer of dust forms on the solar panel, the power efficiency will be reduced.

On the other hand, we use this system to detects the sun's rays and moves accordingly, we call it Sunny Bot. If the sun's rays are at a 90-degree angle, for example, it will rotate accordingly. In this system, we would use raspberry pie software to control the panels. Apart from this, when the weather is cloudy the probability of the solar radiation is negligible so the performance of the solar tracker would be 20-30% less compared to the sunny weather.

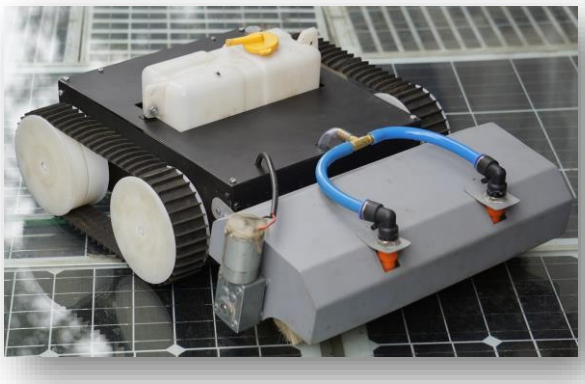

Figure 3.1

The Sunny Bot, as depicted in the illustration, is outfitted with cutting-edge sensors that can find dust and other contaminants on solar panels. Sunny Bot makes sure that the panels can operate with optimum efficiency and provide the best amount of energy for the plant by cleaning them on its own. In addition to enhancing performance, this ground-breaking technology also lowers maintenance costs and lengthens the lifetime of the solar panels.

4. **Application of Machine**

The solar panel cleaning robot cleans the solar plates by sucking up dust. It helps to clean the solar panels to preserve the efficiency of solar power production. We established a limit of 40% in this system, which means that if there is more dust than that, it will send a message to us, and we will have to issue the instruction to clear the dust particles than it starts cleaning the solar plates with brush and water spray, until the solar plates clean till 100%. We have built an automated system, which clean up the dust by itself. This technology is also eco-friendly because it uses electricity generated by the solar panel to clean the plates. This system cleans the dust with 100% accuracy.

The solar tracker is a device that adjusts the angle of the solar panels in relation to the sun. Because the solar panel is kept perpendicular to the sun by the motor, more sunlight reaches it. The panel was rotated in accordance with the requirements. We've attached a circuit board to the solar panel that tracks the sun's position and sends commands to the solar tracker. So, with that command we control the tracker so that it rotates the panels into the direction of the sun.

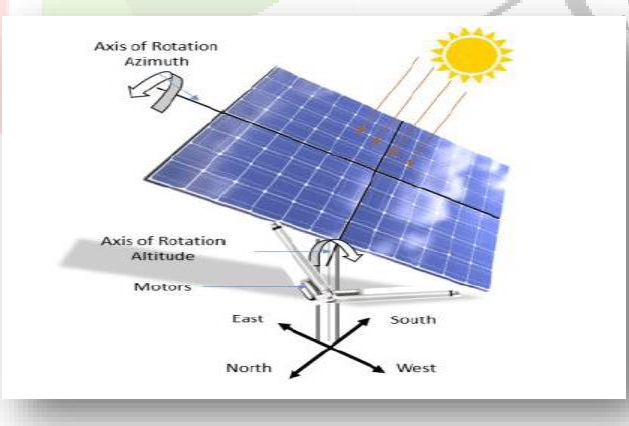

Figure 4.1

The figure indicates the solar tracker turns the panel in the direction of the sun, maximizing sunlight absorption and producing more solar energy for the field.

5. Motivation

So, I've been motivated to build both systems from India, where we have large lands and plants on which we've planted solar panels. I've been witnessing worker accidents when cleaning and rotating plates for a number of years, and many of the plates have been damaged as a result of this cleaning and turning operation. Aside from that, it takes a lot of time. As a result, I became motivated

and resolved to build something that would take less time and cause less harm to the worker and panels. So, for that reason, I have research on this project and accomplish it, as it saves the time and accidents. But this tracker is only applicable to the large field not for the house usage. I feel this system solves the problem world-wide.

6. Technology and Users

Solar panels cleaning robot and Sunny Bot contain a large number of technology components, including:

- Microfiber brush
- Roller belt
- Supporting frame.
- RF remote
- Receiver
- Transmitter
- Pump Motor.
- Robotic Chassis
- Cameras
- Screws and bolts
- Mounts and couplings
- Piping.
- Motor shafts.
- Controller circuitry.
- Rubber tracks.
- Sensors (Camera sensor, dust detection sensor, ultrasonic sensor, high-end sensor)
- Battery
- Internet connection
- Wheel support
- DC motor
- Water Tank.
- Energy storage system.

7. Advantages and Disadvantages

There are couple of advantages and disadvantages of these two systems, we had discussed below:

Advantages:

- Automatic cleaning system.
- Time efficient.
- Clean up solar panel without the use of human operators and electricity.
- Remote and wireless
- Increase durability.
- Eco-friendly robots.
- Generate more electricity.
- No risk of surface damage.

Disadvantages:

High initial cost.

Maintenance required depending on the quality of tracker.

Not applicable on soggy dust.

8. Literature Review

1. Using solar panel cleaning Robot

So, there is a mechanism attached to the solar panel that detects dust. The panel's limit has been set, and if the dust particles exceed it, the system sends a notification to the user, who then gives the command to clean the dust. This is how the system operates.

2. Using solar Tracker

So, basically, this tracker aligns the solar panel with the sun's angle, allowing more sunlight to strike the panel and generate more electricity. A circuit is installed on the solar panel that sends commands to the solar tracker, causing the tracker to spin the panel in the direction where it receives the most sunshine.

9. Action Plan

WHAT	TIME	EXPECTED OUTCOME
Research	3 Weeks	Got Required Information
Materials	15 days	In Process
Circuit Diagram	10 days	In Progress
Analysis	3 days	In progress Analyzed
Prototype making	3 weeks	Working
Testing	2 days	
Modification	2 days	Modification as per feedback
Final	1 day	

Table 9.1

10. Conclusion

This report discusses the design and performance analysis of various dual-axis solar tracking systems, as well as a robot that cleans solar panels called Sunny Bot. The solar tracking system adjusts the angle of solar panels to maximize the absorption of sunlight, while Sunny Bot detects dust and automatically cleans solar panels. The goal is to bring more advance technology in this field. At the same time, we have made it in such a way that it is cost effective. The report also includes the mission and vision of the company, as well as the motivation behind building these systems. The main Moto is the technology and users of the systems are also discussed, as well as their advantages and disadvantages.

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