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# Concept



The main advantages of these systems include increased energy efficiency, reduced labor costs, longer lifespan of solar panels (by preventing excessive wear), and less water consumption (especially in dry regions). By ensuring solar panels remain free from dirt and debris, these systems help maximize energy production and protect the panels from potential damage caused by prolonged di

1. create a system that automatically cleans solarpanels; 2. Make it water-efficient and planet friendly; 3. Ensure it's reliable and needs little maintenance; 4. Help your solar panels last longer and work better.



**Re-Used/Recycled Materials:** 

DC motor ; Cleaner (the foam and the cylinder inside it) Woods to make stand; **Container (for water)** 

Others components

Arduino uno Motor driver Power supply **Breadboard and cables** 

# SUSTAINABLE CAPSTONE PROJECTS (SCAP) FALL 2024-2025

## AUTOMATIC SOLAR PANEL CLEANING SYSTEM

### INTRODUCTION

An automatic solar panel cleaning system is a technology designed to clean solar panels without the need for manual intervention. It addresses one of the major challenges of solar energy systems: maintaining optimal efficiency by removing dirt, dust, and other debris that accumulate on the surface of solar panels. These obstructions can reduce the amount of sunlight reaching the panels, leading to decreased energy output.

Project goa



## **FINAL PRODUCT**

The final project aims to create a solution that optimizes solar panel performance by ensuring they remain free from dirt and debris, thereby maximizing energy production. It involves applying engineering concepts, such as automation, robotics, control systems, and energy efficiency, in a real-world context. The completion of the project will not only provide a valuable functional prototype but also offer insights into the challenges of maintaining large-scale solar energy systems efficiently and sustainably



Working principle

In our case, the working principle of the automatic solar panel cleaning system is:

Once the motor is connected to the battery , it will induce a mechanical work through the DC motor connected on the top of the panel's stand . And , this will generate a motion up and down through a microcontroller that is programmed to make it at x times given.

sustainable.

production.





#### **RESULTS AND DISCUSSION**



Ever noticed how dirty solar panels can get? Well, we've tackled that problem head-on with our Automatic Solar Panel Cleaning System. Solar panels are awesome for generating clean energy, but they can lose efficiency when they're covered in dust and grime. Manual cleaning is a hassle, risky, and can be pretty costly.- Boosted Efficiency: Clean panels mean more energy. Simple as that.- Cost Savings: No more shelling out for manual cleaning crews.- Safety First: Our system keeps people off ladders and roofs.- Eco-Friendly: Uses minimal water and no harsh chemicals.

#### How can the system be improved?

The system's design and functionality can be improved by using more efficient sensors, enhancing the motor control, improving energy usage, and integrating remote monitoring capabilities. By focusing on smarter, more responsive cleaning systems and integrating modern technology (like IoT, machine learning, and solar power), the system can be both more effective and more

#### CONCLUSIONS

The Automatic Solar Panel Cleaning System using Arduino and a DC motor is a significant advancement in the field of renewable energy, offering a solution to enhance the efficiency and longevity of solar panels. By automating the cleaning process, this system minimizes the need for manual labor, reduces the risks of panel damage, and ensures that the panels remain free from dirt and debris, thus maintaining optimal energy

Through the integration of Arduino programming, DC motors, and various sensors (such as light and dirt detection), the system is able to autonomously detect when cleaning is required and perform the task efficiently. The use of **low-power motors** and possible solar panel integration ensures that the system operates in an energy-efficient manner, potentially reducing the overall power consumption.

In terms of **improvements**, the system can be further enhanced by incorporating weather-based controls, remote monitoring via IoT technologies, adjustable motor speeds, and self-diagnosis features for preventive maintenance. Additionally, optimizing the cleaning mechanism and making the system more **weather-resistant** would improve its long-term reliability.

#### REFERENCES

#### - Wikipedia

https://r.search.yahoo.com/\_ylt=AwrhcVVyumZnflcDLH1XNyoA;\_ylu=Y29sbwNiZjEEcG9zAzIEdnRpZ AMEc2VjA3Ny/RV=2/RE=1735995251/RO=10/RU=https%3a%2f%2fsolarquarter.com%2f2022%2f12 %2f03%2fexplained-ultimate-guide-to-cleaning-solar-pvpanels%2f/RK=2/RS=XB8MgIDBZtGFNfTCJK40ARLwVIU-

https://r.search.yahoo.com/\_ylt=AwrhcVVyumZnflcDNX1XNyoA;\_ylu=Y29sbwNiZjEEcG9zAzUEdnRp ZAMEc2VjA3Ny/RV=2/RE=1735995251/RO=10/RU=https%3a%2f%2fnaturesgenerator.com%2fblog s%2fnews%2fhow-to-clean-solar-panels/RK=2/RS=KoCvS3T1Bd618k6OTeyrYV03c3I-