Automatic Solar Panel Cleaning System

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Abstract: **Energy is one of the major issues that the world is facing in India, the supply of energy has been one of the major problems for both urban and rural households. About 60% to 70% of the energy demand of the country is met by fuelwood and agriculture residues. Solar energy is a renewable source of energy, which has a great potential and it is radiated by the sun. Renewable energy is important to replace the using of electric energy generated by petroleum. Solar power has become a source of renewable energy and solar energy application should be enhanced. The solar PV modules are generally employed in dusty environments which are the case tropical countries like India. The dust gets accumulated on the front surface of the module and blocks the incident light from the sun. It reduces the power generation capacity of the module. The power output reduces as much as by 50% if the module is not cleaned for a month. The cleaning system has been designed cleans the module by controlling the Arduino programming. To remove the dust in the PV modules to improving the power efficiency.**

Keywords: **Rolling brush, Arduino board, DC Gear motor, Gear wheels.**

1. Introduction

Here is urgency in improving the efficiency of solar power generation. Current solar panels setups take a major power loss when unwanted obstructions cover the surface of the panels. The obstruction turns the shaded cell into a resistor, causing it to heat up and consume extra power. To address this issue, we have successfully engineered a self-cleaning solar panel. This specific panel detects the obstruction with a Differential Measurement Unit (DMU). It makes the decision from the Microcontroller unit to either clean the panel with the Wiper and Sprayer Mechanism or continue to charge the battery with the Battery Charger. Our mechanism to combat the power loss is unique, self-reliant, and easy to use.

There are many factors that affect PV power efficiency, such as shadow, snow, high temperatures, pollen, bird droppings, sea salt, dust and dirt. The main factor that affects a PV panel's efficiency is dust, which can reduce its efficiency by up to 50%, depending on the environment. To explore the possibility of using a more sustainable power source. The possibility of installing many PV panels into the area brought about the need to consider how to increase long term efficiency by the regular removal of debris from the PV panels. In particular, dust which is made up of pollen, sea salt and dirt particles. This paper investigated the possibility of using the cleaning robots to remove dust, sea salt and pollen from the surfaces of PV panels. The most important part of these systems is the solar panel where the solar energy is converted to electricity for the others. There are many types of the solar panels. In the countries those have dusty environment accumulation of dust on the solar panels leads to reduction of the transmittance of the panel. The effect of the accumulated dust will be reduced with the increasing of tilt angle, since the tilt angle will affect the exposure time to the sunlight also. But the best way to eliminate the effect of the accumulated dust on the solar panels is to clean the panels. Cleaning the solar panels is normally by washing which is tedious and cumbersome and also expensive in terms of the labor involved and time. In practice cleaning of solar panels should be frequently done which makes the process more laborious and expensive.
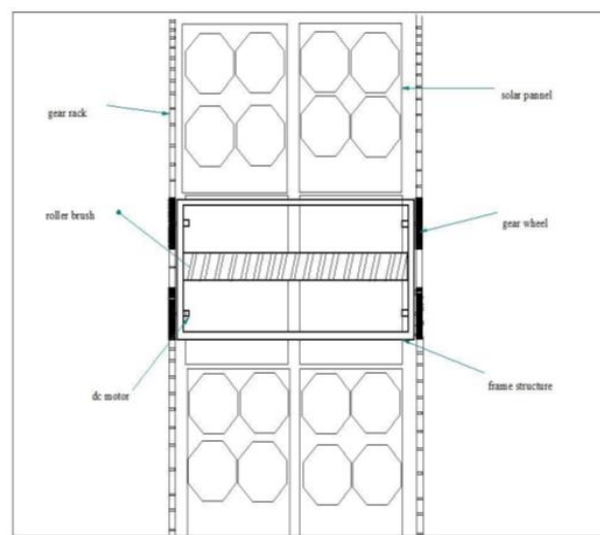

Fig. 1. 2-D Diagram of solar panel cleaner

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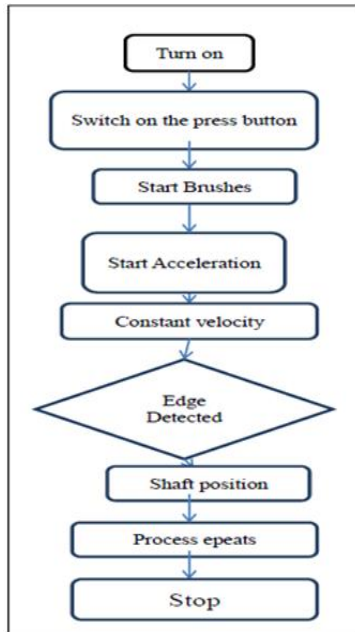
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2. Working principle

Fig. 2. Flow chart of cleaning system

3. Advantages

- Water-less, automatic, daily cleaning
- Maximum power generation with zero soiling losses.
- Uniform cleaning of panel.

4. Conclusion

Existing automated cleaners mainly focus on large arrays and in general are unsuitable for installing on smaller arrays namely residential roofs. For those with limited space this means that a smaller array only needs to be installed, hence our idea serves as a huge advantage for those smaller sites. Our system can be installed for roof top solar panels. The solar panel cleaning system was first designed taking into consideration the design parameters. Our model was tested and the following observations were made. The rack and pinion mechanism work as it was designed to do.

5. Future scope

Dust detector device will be designed which can detect the proportion and type of dust. A film will be put on Solar panel which will protect panel from scratches.

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