

Sun Guard The Intelligent Solar Panel Cleaner

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ABSTRACT

Solar energy, which is one of the renewable energy sources, has an important role in meeting the increasing electrical energy demand of our globe. In recent years, many countries have established their energy policies based on solar energy, and researchers have been working on solar panel efficiency, maximum energy extraction from the sun, control, and power electronics. The energy extracting from the sun is converted into electrical energy via solar panels. To extract continuously maximum energy level from the sun reduces installation costs and makes it easier to meet the demanded peak electrical power. Physical conditions such as muddy rain, snow, and dusting place between the solar panel and the sun. This situation results in a reduced electrical power extraction level which can be technically produced with a clean solar panel surface. Therefore, it is also very important to keep the solar panels clean as well as the maximum power point tracking devices. In this study, a solar panel cleaning robot (SPCR) has been designed and tested in real-time.

Keyword: - solar, cleaner, solar cleaner, and project.

1. INTRODUCTION

In recent years, photovoltaic technology has advanced fast for power generation from sunlight. Cleaning methods for solar panels are researched in order to keep solar panel efficient. There are two types of cleaning system available manual and automatic cleaning systems. There is a risk of damaging AR coating of solar panels by manual cleaning and it is a tedious process. Therefore, we need to develop automatic solar panel cleaning system, which does not damage solar panel. Water based cleaning system is expensive, incurs recurring cost, eco-unfriendly. Water based cleaning system leaves residues and causes scratches due to scrubbing of panels. We have used microfiber technology that effectively removes moisture and dust particles without scratching it. It is washable and reusable. These merits make this type of cleaning system competitive in many applications than conventional manual cleaning system. In this paper, I have proposed, microfiber based automatic solar panel cleaning system. The two DC motors are mounted on two sides of solar panel in anti-parallel connection and excited at the same voltage. Motors are connected with the help of track wheels. Aluminium strip with microfiber is connected between two sides of solar panel with the help of track belts. Speed of motor is controlled by program which is set in the Arduino UNO.

2. MATERIAL REQUIRED:-

HARDWARE REQUIREMENTS

- Transformer
- Rectifier
- Regulator
- Arduino UNO
- Switches
- LCD
- Relay
- Relay Driver

SOFTWARE REQUIREMENT

- Arduino IDE
- Proteus
- Eagle

3. WORKING:-

The Sun Guard is an intelligent solar panel cleaner designed to enhance solar panel efficiency. It typically operates using a combination of sensors, robotics, and cleaning mechanisms. Sensors detect dirt or debris on the solar panels, and the cleaning system then activates to remove these contaminants.

The cleaning mechanisms can vary, but they often include brushes, wipers, or even water jets. Some advanced systems may utilize nanotechnology coatings or self-cleaning materials to reduce the need for manual cleaning. The entire process is automated, optimizing energy production by ensuring the panels are clean and free from obstructions. This technology improves the overall performance and lifespan of solar panels, as cleanliness directly impacts their ability to capture sunlight and convert it into electricity.

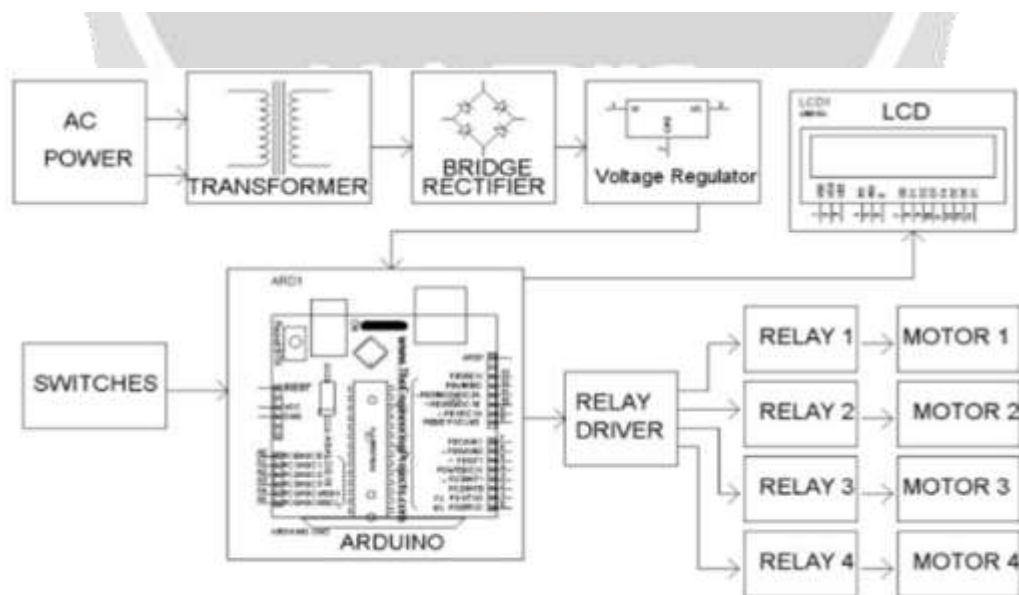


Fig -1: Working block diagram

3.1 ADVANTAGE:

- The first and foremost merit of using this product is there will be no need of human being for reaching to the panels and risking their own lives for the sake of cleaning only.
- The prime benefits via using this system are a person is going to get it in a cheap price.
- The maintenance cost of the product is going to be very less compare to the other available products in the market.
- It will be affordable by the middle class families who own a solar energy generation system.
- It can be controlled with the help of using the application on the mobile phone as well as your laptop or tablet too.
- It can be controlled from anywhere in the world if where the internet connection will be available.
- The owner can keep the track of the energy generation throughout the day from the mobile application itself

3.2 DISADVANTAGE:

- The entire system will be dependent on the arduino chip and the sensors only if one of them will fail the entire system will fail. II. The cleaning wiper or flappers needs to be changed at the regular interval.
- The cost of a high end sensor will be more for the better and accurate result and it will be costly for some of the user

4. CONCLUSIONS

The Solar Panel Cleaning System project aimed to bring a better solution for maintaining solar Efficiency. The main scope was to develop a machine that can clean a solar panel with water mechanism by a proper Control system. This project is a developed prototype to expand on a new and increasing market.

There is a wide scope of using the mobile and other application based system which can be useful for the cleaning the solar panel automatically. The owner can also keep an eye for the dust accumulation on the panel and the energy generation from the panels using the different sensors mounted on it. According to it one can also press the button on the electrical device and clean the solar panel before it reaches t the preset value at which the system should run for the better efficiency.

The outer panel on which the cleaning system is mounted should have the telescopic length so it can be mounting on different sizes of panels up to limited tolerance. The metal used in the making should be light weighted so it can handle very easily at the time of service. Also the system can be made portable so it can mount and unmount on the different panels at different places with the same sizes. There will be a wide range of a applications development in this area.

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