

Automatic Cleaning of Solar Panel

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Abstract:- The solar PV modules are generally employed in dusty environments. 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. In order to regularly clean the dust, a automatic cleaning system has been designed, which senses the dust on the solar panel and also cleans the module automatically. This automated system is ARUINO UNO microcontroller which controls the DC gear motor. This mechanism consists of a sensor (LDR). While for cleaning the Modules, a mechanism consists of a sliding brushes has been developed.

Keywords: Solar panel, DC motors, Microcontroller, Sprayer, Wiper

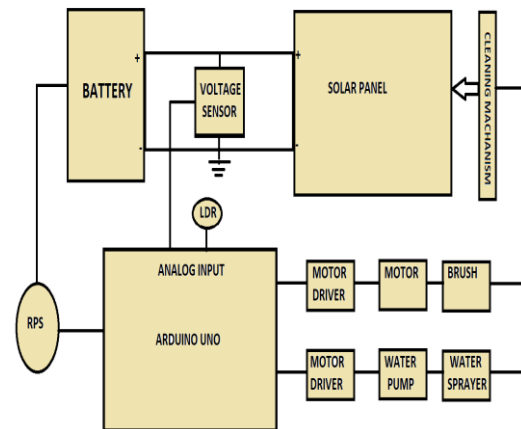


Fig2(a) Block diagram

1. INTRODUCTION

Solar panel production has increased globally in response to the growing demand for solar energy. This has been the result of an increased awareness of the damage to the environment that using fossil fuel sources has had over the years. There are many factors that affects PV power efficiency, such as shadow, snow, high,temperature, dust and dirt. The main factor that affects PVpanel’s efficiency is dust, which can reduce its efficiency by up to 50%, depending on the environment. The best way to eliminate the effect of accumulated dust on the solar panel is to clean the solar panel. Cleaning of solar panel by washing is expensive in terms of labour involved and time.

In case of residential use solar panels are usually placed on the roof to receive the maximum amount of sunlight. As a result of this cleaning these solar panels would result in climbing up on to the roof to clean the panel which can be very hazardous. So automatic cleaning of solar panel has been proposed.

2. METHODOLOGY

An auto cleaning mechanism is proposed to clean the dust accumulated on the surface of the solar panel. In accordance with the dimension of the flat plate panel, the system consist of brushes driven by DC motor through a threaded rod system. The movement of the brushes are controlled by signal generated from a microcontroller in accordance with the dust sensor which produce a rotational motion which is converted into linear motion through rod.

3. COMPONENTS SPECIFICATION

3.1Brushes



Figure 3.1(a) Brush

The brushes are mounted on automated cleaning equipment.Regardless of brush size or speed, brush balance is implemented to ensure complete surface contact.

3.2Arduino UNO



Figure 3.2(a) Arduino UNO

Arduino UNO is a microcontroller board based on the ATmega328P.It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power

jack etc. The role of Arduino here is to control the cleaning mechanism with simple programming.

3.3 Light Dependent Resistor

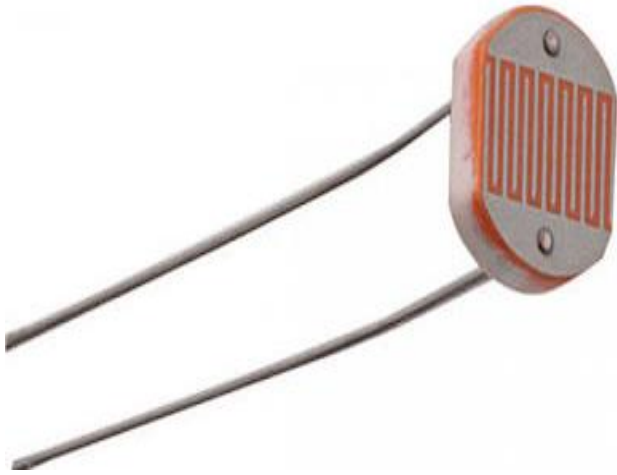


Figure 3.3(a) LDR

A Light Dependent Resistor is a resistor that changes in value according to the light falling on it. LDR is very high resistance, sometimes as high as 10M Ω when they are illuminated with light resistance drops dramatically. It has high resistance in the dark and a low resistance in the light. Here LDR is been used to detect the light from the sun. If there is any interruption the cleaning process will be started.

3.4 Voltage Sensor



Figure3.4(a) Voltage Sensor

Arduino have built in voltage sensors and they support voltages of 0-5V.Voltage sensors allows to measure voltages of 0-25V by presenting a lower voltage to the Arduino for measuring.

3.5 Motors

Motors are used for rotational purpose of the brush which is used for cleaning purpose.

4. WORKING OF SYSTEM

In the automatic cleaning system, when the dust accumulates on the solar panel, Arduino sends a signal to actuate the system. One DC motor is used to move the brush in forward and reverse direction and other DC motor is used to pump the water. This horizontal movement of brush will clean the panel. Two sensors are being used LDR and Voltage sensors. If intensity of sunlight falling on solar panel is high and voltage is low then it will trigger the cleaning system to clean the panel

4. ADVANTAGES

- Low design time
- Low production cost
- System is applicable for both indoor and outdoor
- Less space
- Low power consumption

6. REFERENCES

[1] Mr.Ashish Saini, Abhishek Nagar, "SOLAR PANEL CLEANING SYSTEM", Imperial Journal of Interdisciplinary Research (IJIR) vol-3,Issue-5,2017 ISSN:2454-1362

[2] K.S.Margaret, T. Bathirath, "AUTOMATIC SOLAR PANEL CLEANING ROBOT", International Journal of Emerging Research in Management and Technology ISSN:2278-9359 vol-6,Issue 7,2017

[3] "How to Clean Solar Panel." WINSOL Laboratories .N.p.,n.d.Web,Dec.2012