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# Automatic Dust Cleaning of Solar Panel with Night Sensing Auto Turn Off Mode

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**ABSTRACT:** A some of the best places to collect solar energy are also some of the dustiest on Earth. Dust from pollution and traffic that fall on the solar panel surface prevents the sunlight from reaching the solar cells. The efficiency of solar panel gets affected in the presence of dust particles. While many factors affect how much electricity your solar panels will produce, dusty solar panels can be one of the biggest, and easiest to fix. Experts have agreed that dusty solar panels do not produce as much power as clean panels. The power output of the panel degrades up to 50% due to the dust accumulation. A solar panel cleaning system is proposed in order to make a solar panel operate at the best power generation state, while the solar panel is used in dusty environment. This project consists of a LDR sensor, wiper unit and sprayer. The LDR sensor is used to detect whether it is a day or night and detect dust. Depending on the solar output the presence of dust on the surface of solar is detected. If the dust is detected the wiper starts to work on the surface along with the water sprayer.

**KEYWORDS:** LDR, Sprayer, Wiper.

### I. INTRODUCTION

Photovoltaic array installations are becoming more prevalent around the world. Each of these solar parks has an expected lifetime of 20-25 years, and it is vital to maximize the power generating potential during daily service. The energy generated by solar photovoltaic modules is related with the sun's available intensity and spectral content, as well as other factors like environmental, climatic, component performance and inherent system. The accumulation of dust particles and debris on the surface of photovoltaic (PV) panels negatively affects the performance. Cleaning dust accumulated panels with commercial detergents can require more time, costly, hazardous to the environment, or even corrode the solar panel frame. Ideally solar panels should be cleaned every few weeks to maintain peak efficiency, which is especially hard to do for large solar panel arrays. There is a need for an automated cleaning solution to this problem which can service large ground based solar array up to an operating park of 22,000 panels (20,000 Square meters).



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## II.SYSTEM MODEL AND WORKING PRINCIPLE

Solar panel consist of glass surface coating photovoltaic material are placed in zigzag pattern to collect maximum sunray's .But the environmental condition will disturb the surface layer and it reduces production of current. In this project we used automatic object able sensor wiper for cleaning of solar plate. In this proposed system when dust or other particles accumulated on solar plate the sensors starts to sense & initiate work. Sensor senses the particles and sends feedback to the wiper and wipers are start and completely clean the plate. We also used this system manually. In this system atmega-328microcontroller is use to control the circuit. Battery is used to store the supply and it is supply is gives to cleaning system. rove the capacity

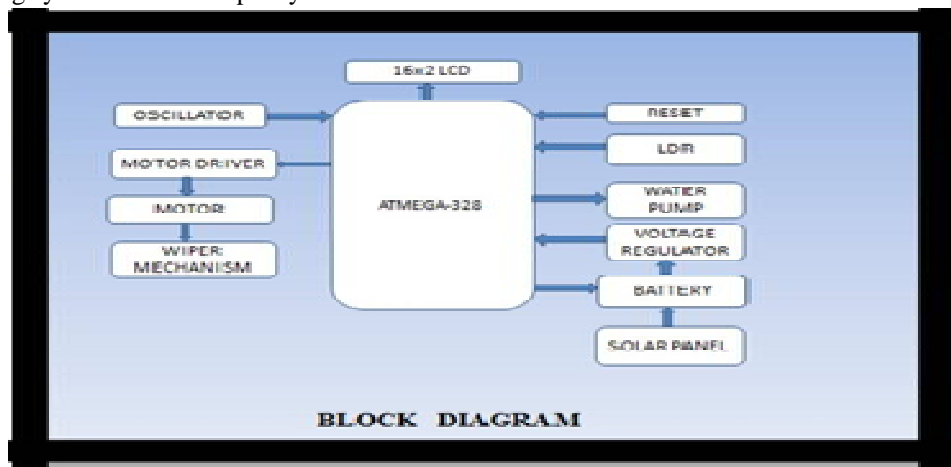


Fig. 1 Block diagram of proposed system

This project is Atmega328 microcontroller. In this system, we use an LDR, which identifies the present condition of atmosphere that is day or night. The output from LDR and solar panel is fed to the Atmega328 microcontroller through voltage divider and analogue to digital converter. Voltage divider is a passive linear circuit that produces an output voltage that is a fraction of its input voltage and ADC converts an input analogue voltage to a digital number proportional to the magnitude of the voltage. This project includes a washing system. Where water was provided by water storage tanks, and a dedicated water pump included to convey the water at suitable pressure. This system also contain a wiper mechanism with suitably designed wipers, whose action acquire the surface of the panels during sweep cycle of the wiper. In wiper system, a motor motivates the wiper to move across the panel. The motor is powered by electricity from power storage device(Battery), which itself is charged by the electricity generated by panel during daytime.

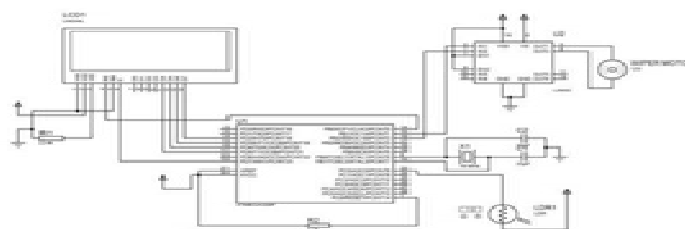


Fig. 2 Circuit diagram of proposed system



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### III. HARDWARE IMPLEMENTATION

The circuit diagram consists of ATMEGA 32 microcontroller, LDR, Solar panel, LCD, Motor driver circuit, AVR is a 40 pin IC. Here to interface LCD with AVR, an 8 bit data bus is required. 16X2 LCD can interface with AVR microcontroller by using two modes, 4-bit mode or 8-bit mode. In this circuit we will use 8-bit mode for interfacing. In 8-bit mode we send command to LCD by using eight data lines (D0-D7) for sending command and data. These data lines can be connected to any port of Atmega328. LDR and Solar Panel is connected at port A, the ADC is configured in free running mode and is left adjusted so only ADCH register is read. The output is at Port C where 8 leads are connected. If the light falling on LDR is more no. of led glowing are less. and vice-versa. The value of ADCH is show on the LCD. L293 is a most popular and less expensive built-in H-bridge in a small integrated circuit used for low current motors. H-bridge is a motor driving unit used to control the direction of two motors at a time either clockwise or anticlockwise direction. It is a 16 pin IC in which pins out1 and out2 connected to the motor. Connect the IN1, IN2, and EN1 pins of L293 with PD0, PD1, and PD2 pins of Atmega32. Connect the VS and VS pins 12V and GND pins of L293 with ground. Limit switch is use to limit the rotation of motor and wiper.



Fig. 3 Constructed project

### IV. FUTURE SCOPE

The solar panel cleaning system design proposed in here is for the solar panel . Use of this design would be favorable with the other panels for small variations in the dimensions but, for very small panels like 40W or 50W, the system will require modifications to make its use economically viable. For small panels, the use of a single driving mechanism and DC motor will be done for a group of 4 to 5 panels. The wipers of these panels would be linked together by the linkages in series, and would be driven by a single modified Geneva mechanism and a DC motor to reduce the cost of the system. The cleaning system could be driven automatically at fixed time intervals or on the basis of drop of the output of the PV system to a present value. Thus, in this way the operation of the cleaning system could be optimized.



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## V.CONCLUSION

This project highlights the effect of dust, dirt, pollution, sea salt, and bird droppings on the PV systems efficiency. However, the development of the cleaning system can solve those problems. The overall performance of the PV system of the Automatic dust cleaner will overcome its demerits & will bring revolution in today's condition where each & every country is facing the challenge of energy crises. During night there is also presence of dust but, LDR turn off the dust clean process and save energy in the absence of solar rays.

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