

A Review on Solar Panel Cleaning Robot using IoT

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Abstract: Sun power is a standout amongst the most productive yet clean wellsprings of vitality we approach. There are no expanded fuel expenses or conditions, no connections to toxins, and it's both dependable and reasonable. Obviously, keeping in mind the end goal to bridle sun oriented power you require access to particular innovation. This tech depends on either little scale sun oriented photovoltaic (PV) systems but in main problem of photovoltaic (PV) system soil and dust particles accumulating on photovoltaic (PV) panels reduce the solar energy getting the cells, thereby falling overall power performance. We are solving the problem of this cleaning the PV panels is a problem of great practical engineering interest in solar PV power generation cleaning the photovoltaic (PV) panels is a problem of great practical interest in solar PV power creation. We are solve this problem discuss the methods for dust removal system using the Internet of things IoT. We are developing the simple and useful dust cleaning device and developed novel architecture of dust cleaning system for PV panel using IoT. The main motive for this system is developed system for dust cleaning for PV system using IoT and maintaining the clean PV panel efficiency.

Keywords: Solar panel, cleaning, efficiency, PV, IoT

Literature Review:

V. Bhuvanewari et al. (2014) described The Internet of Things (IoT) is the most promising area which penetrates the advantages of Wireless Sensor and Actuator Networks (WSAN) and Pervasive Computing domains. Different applications of IoT have been developed and researchers of IoT well identified the opportunities, problems, challenges and the technology standards used in IoT such as Radio-Frequency Identification (RFID) tags, sensors, actuators, mobile phones, etc. This paper is of two fold; the first fold covers the different applications that adopted smart technologies so far. The second fold of this paper presents the overview of the sensors and its standards.

Kelebaone Tsamaase et al. (2017) presented the development of an automated dust detection and cleaning system which could be used to clean photovoltaic (PV) modules. Dust accumulation is one of the factors which negatively impact of the PV module output because it obstructs solar radiation to incident on the module surface hence reducing the overall performance of the system. The system was designed by writing a C program and compiled with Arduino IDE to read voltage and sense current from the PV and calculate power output. The circuit was built with proteus 8 professional. Simulation results show that the system was able to detector power loss due to dust accumulation on module surface and as a results the motor drive for the cleaning mechanism responded accordingly to operate cleaning mechanism. The work is still ongoing whereby a prototype will be built to demonstrate the practicality of the system.

Swanand S. Wable et al. (2017) proposed the Solar Panels Farms are generally situated in dirt and dust areas which are mostly in case of tropical countries. The performance of solar panels depends on various factors, the power generated by farm can decreased if there is dust and dirt on

panels and this is the main factor for reduction. One can generally assume a reduction of about 40% - 50%, if the panels are not clean properly for 1-2 months. So to overcome this problem and to increase the efficiency of power production cleaning of module on regular basis is necessary. To clean the dust, an automatic cleaning robot is developed, which will clean the panels on regular interval of time. The mechanism is based on control circuit, DC motor; microfiber (bristles) to clean the panels. The paper provides you with the idea how the robot will work and its effect on the energy production by solar farms. It will also to help to understand the problem arise due to not cleaning of solar cells.

Manju B. et al. (2018) described 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 fuel wood 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.

Subhasri.G et al. (2018) presented a sunlight based framework is the device for orienting solar photovoltaic modules and solar thermal collectors toward the sun.

Thinking about the state of the art of the innovation, successful strategy, robust control philosophy and the potential added benefit of different research work which can be employed on an extensive scale in maintainable manner. Presently we are entering in a new period of processing innovation i.e. Internet of things (IoT). IoT is a sort of “universal global neural network” in the cloud which associates various things. The IoT is a intelligently connected devices and framework contain brilliant machine connecting and communicate with different machines, environments, objects and infrastructures and the radio frequency identification (RFID) and sensor network technologies will rise to meet this new challenge. Furthermore the investigation gives the different related works on iot empowered solar panel monitoring modules for the proficient way of gain power from the solar radiation.

Tushar Pokharkar et al. (2018) presented the solar PV modules are generally employed in tropical countries like India. Dust and dirt particles accumulating on PV panels decreases the solar energy reaching the cells, thereby reducing their overall power output. The power output reduces as much as by 50% if the module is not cleaned for a month. Hence, cleaning the PV panels is a problem of great practical engineering interest in solar PV power generation. In this paper, the problem is reviewed and methods for dust removal are discussed. In order to regularly clean the dust, an automatic cleaning system has been designed, which senses the dust on the solar panel and also cleans the module automatically. This automatic system helps in maintaining the overall output of the solar firm. For cleaning the PV modules, a mechanism consists of a sliding brushes has been developed. In terms of daily energy generation, the presented automatic-cleaning scheme provides about 30% more energy output when compared to the dust accumulated PV module.

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Gargi Ashtaputre et al. (2019) proposed the efficiency of Solar PV panel is greatly affected due to the accumulation of dust, dirt and sea salt on panel. This paper aims at developing a low-cost automatic robot which will smartly clean the panel. The project is divided into two parts: Cleaning System and Monitoring System. Cleaning task is

completed according to the data received from monitoring system. Wireless technology has been implemented in order to collect all the data from individual panel. The power output of each panel is monitored thoroughly and depending on the information collected at each node, the cleaning action is triggered. This system is also able to detect breakage of panel. The system can be operated remotely and user can access all the information on field from any part of the world.

Milan Vaghani et al. (2019) presented transparency in cleaning system by using the most newly invented technology, which provide a better performance, integrity, consistency, cost-effective and scalable solution for the removal of dust and speck. The presented cleaning system provides about 32% more energy output compared to the dust accumulated solar panel. This system is control by application from whole world. Also this system reduces manpower for cleaning of solar panel. This is automatic solar panel cleaning system.

Sharvari Nikesh Ghate et al. (2019) proposed energy demands are increasing sharply, therefore the need to conserve energy and utilize available energy efficiently is very important. There are many forms of renewable energy available, with the increasing demands there is a need to exploit renewable sources of energy. Solar is one of them and it is a time-dependent and intermittent energy source. Thus, it is important to store available energy and use later on when the need is greatest. While storing solar energy which will drive us towards the goal of universal energy access, there is one major drawback. This paper aims to eradicate that drawback by designing and installing an automatic solar panel cleaning system. Dust accumulation on PV modules is the area of growing concern for the reliability of solar panels. So developing such a mechanism that will maintain the efficiency of PV modules connected in arrays as in solar farms spread over a large area and also for the rooftop assemblies at low cost is the main concern. This paper includes the study of effects of change in efficiency of PV modules due to the accumulation of different dust particles found in different regions, factors governing for the decrease in efficiency accounts a lot due to soiling and developing an automated mechanism for cleaning. Labor-based cleaning methods for PV modules are expensive and uses a large amount of water. This prototype includes DC motors controlled by a drive unit that moves a cleaning head horizontally with or without using a spraying system. This results in an increase in efficiency of overall PV modules, the amount of renewable energy harnessed is more, less water usage and less water usage.

Conclusion: This paper highlights the effect of dust, dirt, pollen, sea salt, and bird droppings on the PV systems' efficiency. Dust has a major impact on the efficiency and performance of the solar panels. The reduction in the peak power generation can be up to 10 to 30%. Power reduction was observed due to dust accumulation on the panels and this can be improved by using robotic cleaning method. It

has increased Power generation capacity of the solar panels. Easy maintenance, low cost and less power usage are few advantages of this process. Finally, the reduction in the peak power generation can also be overcome by using this cleaning system. Internet of Things is a new revolution of the Internet & it is a key research topic for researcher in embedded, computer science & information technology area due to its very diverse area of application & heterogeneous mixture of various communications and embedded technology in its architecture. All their aims to add a new dimension to this process by enabling communications with and among smart objects, thus leading to the vision of “anytime, anywhere, any media, anything” communications.

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