

A Review on Self Cleaning and Tracking of Photovoltaic Panel

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Abstract: Solar panels are used to convert the energy from sunlight to electrical energy. The different impacts on the solar panel which influences the productivity of the solar panel are Sun movement and dirt which generate the fundamental impact on solar panel. Because of those impacts, less yield generated by solar panel so to increase the effectiveness of the solar panel is by utilizing tracking and cleaning technique. There is a framework which is mix of tracking and cleaning. In this cutting-edge world, power is likewise added to the most fundamental requirements in everybody's day to day existence. With the expanding request of power, destruction of the natural resources is done and will be used for energy generation. To adjust the shortage of natural resources unconventional fuels are used for power generation and are used by the most part of world. Among all the unconventional fuel sources, power created by solar panel energy is broadly utilized. The abundance of this type of energy is more all around the earth. A framework which tracks sun as well as automatic washing of solar panel with automated instructions is required. The instrument requires a LDR for following the sun and for cleaning wiper module is required. Regarding every day energy production, the sun tracking - cum cleaning plan gives more energy output when contrasted with the fixed PV module. Without this framework this cleaning work is done by man force which is good for small scale but for large scale like power plant it is very difficult. Then led display is required to display the result of the framework.

Keywords: Solar Panel, Photovoltaic Panel, Efficiency, Power, Solar Power, Arduino, Solar Tacking

I. INTRODUCTION

Solar panels are used to convert the energy from sunlight to electrical energy. There are different impacts on the solar panel which influences the productivity of the solar panel. Sun movement and dirt are fundamental impact on solar panel. Because of those impacts, we get less yield and along these lines the primary point of this task is to increase the effectiveness of the solar panel by utilizing tracking and cleaning technique. This gives a thought regarding the mix of tracking and cleaning in a framework. In this cutting -edge world, power is likewise added to the most fundamental requirements in everybody's day to day existence. With the expanding request of power, destruction of the natural resources is done and will be used for energy generation. To adjust this shortage of natural resources an unconventional fuel is used for power generation and are used by the most part of world. Among all the unconventional fuel sources, power created by solar panel energy is broadly utilized. Since there is very abundance of this type of energy all around the earth. A framework tracking sun as well as automatic washing of solar panel naturally. This instrument required a LDR for following the sun. While cleaning the solar panel, a component comprises of sliding wiper has been created. Regarding every day energy production, the sun tracking - cum cleaning plan gives more energy output when contrasted with the fixed PV module. Without this framework this cleaning work is done by man force which is good for small scale but for large scale like power plant it is very difficult. conditions, for example, cleaned solar panel without moving in direction of sun, dusty solar panel without moving in the direction of sun, dusty solar panel and moving in direction of sun and cleaned solar panel and moving in direction of sun, dusty solar panel without moving in direction of sun, dusty solar panel and moving in direction of sun and cleaned board with following.

To expand the measure of radiation that is gathered by a solar panel, the tracker ought to move according to the sun or source for the duration of the whole day. At a point when a solar panel introduced in heat and humidity are ecological conditions around the equator, critical measure of residue will get kept on solar panel. The cleaning of solar panel is needed in heat and humidity which adds to the expense for the activity and support of the solar panel. The residue chose board, if not cleared will influence the exhibition of solar panel module because of concealing on the front surface. It is seen that there is decrease in energy output by the solar panel when dust is on it and this could be as much as half, when the solar panel are not cleaned for over 30 days. The efficiency of solar panel is lower even if the solar panel is tracking the sun because of the deposition of dust on the solar panel. This can be solved by simple method by using a cleaning module with single tracking of solar panel is used for increasing efficiency. For displaying the energy produced and at a rate it is discharging a frame work of led display microcontroller are used.

II. BLOCK DIAGRAM

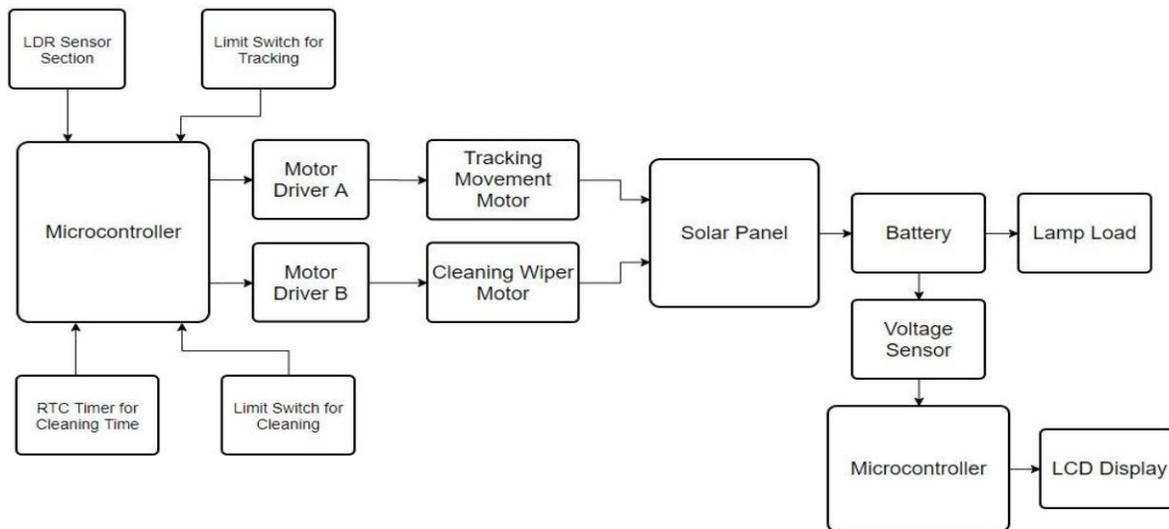


Figure: Block Diagram of cleaning and tracking PV panel

In this usage a programmed framework will be executed to clean the sunlight -based board adequately just as to follow. Various sorts of segments will be utilized to play out the Sun following and Cleaning of PV modules. An LCD will be introduced to notice the proficiency. The primary segments that will be utilized are Micro -regulator, LDR, DC engine, engine driver, Solar board, LCD, RTC module. The control of both the frameworks are performed independently by utilizing Atmega328 microcontroller.

III. LITERATURE REVIEW

M L Throat et al [1] built up an undertaking, that clarifies the examination for sun powered board following and cleaning framework that contains LDR sensors, engines, ultrasonic sensor, microcontroller where the perceptions are seen under residue climate. The entire venture works under proteus programming. The measure of force decreases to 30% if the PV module isn't cleaned for a month or more than that. This framework is executed for a solitary sun-oriented board however the exhibit framework comprises of various sun powered boards in succession. Along these lines, this framework can likewise be actualized for exhibit framework and it is incredibly worthwhile to expand proficiency. This framework should be kept slanted toward development of sun to accomplish more energy for the sun-based board the planned framework is single pivot following by turning hub consequently as an engine heading change. The significant worries of this task is seize however much sun beams as could reasonably be expected over the sun oriented board. Yet, the hindrances of this methodology is that the ultrasonic sensors that are utilized for distance, will get influenced during conditions like downpour. Double hub following has a larger number of favorable circumstances

than single -hub. The downside in Ultrasonic sonic sensor is it won't show the right distance of the item voyaged. In high temperature the supersonic sounds travel quick so the estimation of the distance of item voyaged won't be determined effectively. In blustery season the proposed framework won't work appropriately because of aggravation of downpour water. For more alteration of the model, a residue sensor can be added to give the specifics of the residue present on the outside of the board because of which the sensor can work in like manner and clean consequently for the number of ever times it is required. The turn of the brushes can likewise be added as an ad lobbing element to the model.

Sujata Shivashimpiger et al [2] thought of a thought of improving proficiency of a sun oriented p hotovoltaic board. The fundamental point of this work is to expand the yield of sun powered board without help from anyone else cleaning and following nearby planetary group. So here oneself – cleaning and following procedures are utilized and the yield of the board for various conditions is noticed. A test arrangement had been planned where the cleaning of the sun -based board is checked and recorded my numerous sensor frameworks and a technique to follow has been actualized. Surprising improvement in the proficiency has been noted. It was noticed if the force rating of the boards were expanded with the current set up the mistake got expanded which means that the mal capacity of the sensor framework. However, this can be limited by fusing the smart fake sensors where the non-straight varieties can be effectively planned. Additionally, it was proposed to build up an Artificial Neural Network based System indicator which will give a guess of information yield power relations which can be considered as the future extent of the work finished. The yield of the sun-based board has been improved by planning the global positioning framework and cleaning framework. The disadvantage of this is that there is no most extreme cut-off control. The force and proficiency was noticed for various conditions where the outcomes were recorded during the stormy seasons between 10am to 7pm. The force got for CPDT (Cleaned Panel with Tracking) is 8.169 while the proficiency is 7.4269%. The force got for DPWT (Dusty Panel with Tracking) is 5.5241 while the proficiency noted is 5.0219%. It was at last seen that the radiation recurrence was expanded to 37% which was the normal of hourly effectiveness esteems.

Mahipal Soni et al [3] thought of an investigation examination of sun oriented following to expand the yield of sun powered boards. To have expanded productivity or more yield power, the sun-oriented boards should consistently be kept opposite way regarding the sunrays. LDR sensors are utilized in this examination to detect the dayli ght falling over the board, where stepper engine helps in turning the sunlight-based board as per the force of light and it is associated with the regulator to the solenoid valve with power supply through the hand -off, microcontroller is utilized in controlling the framework by speaking with the sensor and the engine driver relying upon the development of the sun. A mirror is additionally utilized as a promoter to get greatest proficiency. Here following intends to follow the development of a person or thing. So, in this framework the sun powered global positioning framework tracks the development of the daylight to get the greatest energy from the sun. The yield of the sun-oriented board diminishes half when the temperature climbs from 96c to 84c and in late morning when the sunlight has extraordinary concentration and on account of the mirror supporter the power gets twofold and will influence the sun-based board. Significant downside is that there is just global positioning framework in this paper. At the point when a sunlight-based tracker is utilized with a mirror as supporter it is seen that the normal force of the sun-based tracker to follow the reflection framework is a normal of 30.89%. The expansion in force for attaching including the cooling framework is a normal of 11.39%. The increment in force when both, the following of reflection and cooling framework is a normal of 59.71%. At long last, it is seen in this examination that the productivity of the sun-oriented tracker utilizing a mirror sponsor is 71%.

Vaibhav Dharmik et al [4] meant to plan a programmed global positioning framework which will actually want to find the sun position. It spotlights to review the composition on sun powered photovoltaic module robotized cleaning methods for distinguishing research openings in the mechanized cleaning frameworks. Photograph resistors are utilized as sensors. The implantation comprises of light detecting frameworks, microcontroller, gear engine framework with sun-based board. This specific methodology isn't programmed. Sun oriented Power Tree is the best creative way, which requires less spot to convey energy viably. This specific global positioning framework moves the sun -based board so it is set opposite way to the sun where the most extreme transformation of sun powered energy to electrical energy

happens. It can in like manner use the "Spiralling PHYLLATAXY" to improve the productivity of the plant. At the point when an unmistakable sign has been sent from a cell phone through Bluetooth, the Arduino turns the transfer ON turning the siphon ON alongside it where water will begin to sprinkle box which the residue gets cleaned. These all tasks are performed by Arduino. It is far better than standard sun-situated PV structure in an area point of view and moreover more productivity. These sunlight-based trees could be introduced close by the roads to save power needed for the road load. This again has manual activity to quit utilizing a press key and isn't programmed. The yield energy delivered will be 40% to that of the sun powered boards which don't have global positioning frameworks present in them.

Z H Bohar et al [5] proposed a task on sunlight based following robot to ad lib the proficiency of the sun powered board by utilizing light sensors which are utilized to work the engine to follow the light. The paper additionally says about after of sunshine using light sensor by inducing the engine to search for the light to grow the efficiency of the daylight -based board with IR sensor. Arduino and a servo engine are utilized to deal with the circuit. IR sensors are utilized to eliminate the residue particles on the board. Since the productivity of the sun powered is just 22%, the excess daylight which strikes the surface will stay squandered. Effective PV cells were found with proficiency of 42% yet they are in their model mode. By adding the light sensors, it builds the effectiveness of the sun powered cell. In this venture the IR sensor was fastened with the sunlight-based trackers to check if the undertaking could work appropriately. The battery source is 5V greatest to evade the harm to the microcontroller. Here, the LDR distinguishes the daylight and the servo engine will be activated, the speed of these servo engines will thus be changed by the potentiometers. Later when the light sensors are added the servo engine work the sun powered board to move toward the sun. On the off chance that any residue is available on the board, the IR sensor will identify it and animate the cooling fan to clean it and just as cool the framework. The IR sensor can't identify dust in excess of 12 cm on a superficial level. The sensor less sun arranged board needs no recognizing material aside from just necessities the coding to moves the sun-controlled board. In addition, the exhibit of the voltage may teach the master or designer how should be managed increase or lessening the value power required. Using IR sensor doesn't give fitting results as it doesn't work properly in light.

Mohd Helmy et al [6] thought of Battery Monitoring System for electric vehicle on lithium-particle based batteries. This paper depends on the uses of IOT in noticing the exhibition of the battery of an electric vehicle on the web. One of the significant concerns is the presentation debasement which prompts the less inventory of energy. The framework arrangement comprises of 2 sections, observing gadget and the UI. For this actualized framework, first and foremost, the voltage level of the lithium particle is estimated by the voltage sensor and simultaneously the area of the vehicle is recognized by GSM/GPS/GPRS with the assistance of the GPS work. These readings conveyed to the Arduino microcontroller for the preparing. Afterward, this prepared information is shipped off the battery checking UI remotely. After exchange is done, the battery screen shows the refreshed status of the battery. On the off chance that the status of the battery is low, a notice is shipped off that specific individual. A functioning web association needed for the gadget to work online. This online framework can even speak with the battery framework to get the boundaries. This framework will actually want to show data like area, status of the battery. In this investigation, readings of 5 batteries are recorded and they are examined with same batteries that were associated with the voltage sensor which shows the distinctions in exactnesses. Not many chose batteries are fluctuated and again the batteries are changed utilizing new ones, the qualities acquired are not the same as one another. In any case, the exactnesses will in general be comparative of tare 99% or more.

Niraj Agarwal et al [7] planned a Battery Monitoring System for Lead-Acid Battery utilizing MATLAB and Arduino. The framework utilizes ACS712 sensor to record the current and voltage in the framework while LM35 thermistor is utilized recognize the temperature. The information yield is recorded and tried through the microcontroller (Arduino). The beginning of charge These boundaries; temperature, voltage and current are overviewed to decide the condition of charge. General meaning of the State of Charge is proportion of its present thickness (t) to the typical capacitance (Q_n), where the limit of the battery infers the greatest measure of charge to be put away. This plan can be executed in electrical vehicles in view of their reliance on the Lead Acid batteries. Here the mixture strategies are been utilized in light of the fact that they produce great condition of charge contrasted with the individual techniques. These mixture

strategies make utilize various ways to deal with adjust the readings for condition of charge. With the great comprehension of these exhibitions of these batteries on the board, better effectiveness and force can be accomplished. In this paper, the mixture technique utilized, that is reserving keeping assessment to figure the SOC dependent on OCV temperature and an immediate strategy for finding the unique SOC on charge stream. At the point when the information is brought by the sensors, the information is changed over to the boundaries of temperature, current and voltage with the assistance of the necessary calculation. This information has been sent by PLX-Data Acquisition programming to be saved as dominate. This information can be utilized in additional assurance of the SOC.

Nikita N Mutrak et al [8] built up an IOT based Battery Monitoring System. This paper portrays about s system to control the voltage across each battery in giving an extreme manner to plan an ongoing battery for an electrical vehicle. Electrical vehicles presently rely upon batteries for their wellspring of energy. In any case, the exhibition of battery is debasing which prompts the presentation debasement which is one of the significant outcomes. Contemplating everything, a solitary circuit has been actualized. This proposed framework comprises of two areas, one is the checking segment and the other is the UI segment. The framework will comprise of a few segments which have been introduced in different spots of the specific vehicle. The Arduino respects the information, despite the fact that it speaks with the sensor, it can just devour voltage of 5V. In the wake of acquiring the analysis results it is seen that the framework is reasonable to check the debased battery execution and send the warning for to the specific individual. The information will be estimated precisely just as screens the voltage of each and every battery utilized in that specific vehicle. A solitary circuit has been actualized to quantify the voltage of the battery which can later be changed to gauge the voltages, all things considered. This framework will actually want to quantify the voltages of a battery precisely. The use of the battery designs in electrical vehicles can be contemplated and improve the imperfections of batteries which perform not exactly anticipated.

M Ramesh Kumar et al [9] proposed a Battery Monitoring System dependent on Internet of Things where the battery levels are checked by current and voltage sensors. This proposed framework record s the boundaries and stores them. To execute this framework, a microcontroller and an ADC is utilized. Whatever data the specific battery in the usage is investigated in nonconcurrent transmission which utilizes a convention dependent on C program which he lps in deciding the boundaries. Since the vast majority of the microcontroller don't uphold the voltages more than 2.5V or sometimes 5V a voltage divider is been utilized to venture down the voltage for the ADC to work with. To decide the charge of the battery, the current voltage is required. The vast majority of the vehicles presently utilize un -intruded on force supply with lead-corrosive batteries for their substitute inventory of force. All together save the fuel; these frameworks are considered to screen the battery of these electrical vehicles. This framework additionally endeavours to give estimations on number of back up hours, temperature, dampness charge limit, voltage. At the point when the charge of the battery is getting low, the LED squints and it likewise gets shown on LCD and furthermore attempts to send message to the specific individual utilizing IOT.

Hatem R Alamari et al [10] created 'Experimental Investigation to improve the Energy Efficiency of Solar PV Panels utilizing Hydrophobic SiO₂ Nanomaterial. The principle of this examination is to build the general proficiency of the sun-based PV boards by applying a layer of hydrophobic SiO₂ nanomaterial. The working rule of this hydrophobic covering is that they make boundaries so that water gets collected, and when the board slants, the water moves down the surface. A numerical model had been utilized to record the readings. In light of this acquired i nformation, a PSO (Particle Swarm Optimization) calculation had been created and five optical boundaries which were resolved. A near examination was performed to the three indistinguishable PV boards, initial one was covered with hydrophobic SiO₂ nanomaterial which was viewed as self-cleaning. The coat was eliminated from the subsequent one and was cleaned physically. The third board was left dusty all through the analysis. As per the outcomes got, the board covered with SiO₂ brought about better execution and it indicated increment in proficiency of 15% though the other two demonstrated an increment of 5%. This strategy for covering the PV boards can be utilized in enormous scope as this technique doesn't devour energy for cleaning and no scratches can be caused.

Gaofa He et al [11] evaluated Self-Cleaning Method for Array of Solar cell. The innovation of self-cleaning for a variety of sun-oriented cell can build the effectiveness of power that is delivered and the sun-based cell is ensured.

Various techniques for evacuation of residue like mechanical methods, nano film self-cleaning, electrostatic and characteristic methods. Certain mechanical techniques like brushing, blowing, vibrating and ultrasonic driving are utilized for the evacuation of residue. The sun powered cell exhibit was covered with nanomaterial film of translucent self-cleaning coat which is very hydrophobic material. It incorporates 2 procedures, super-hydrophilicity film and super-hydrophobic film. It additionally incorporates electric strategy for the residue evacuation where the anodes are associated with multi-stage AC voltage, a voyaging electric wave is noticed. Under the right conditions, the particles won't be saved however they continue moving along the surface after the electric field. Different techniques like application for lunar and Martin investigation have been talked about by specialists, the exploration led with respect to self-cleaning for sun powered cell cluster is less. Consolidating the strategies above, electric shade is the best method of residue expulsion for sun-based cell. Utilizing the above delivered technique, best procedure for the expulsion of the residue particles of sun oriented cell exhibit is finished.

A Syafiq et al [12] made many development approaches with respect to self-cleaning of photovoltaic boards. This article gives a layout of various cleaning strategies for PV. Oneself cleaning strategies are of 2 kinds; Active technique and Passive strategy. These techniques incorporate electrostatic strategies and mechanical which uses ability to play out oneself cleaning component. In splash spouts, cleaning robots, wiper on PV board, power is needed for mechanical development age. As to powerful mechanical strategies, the blowing of air from the cooling framework gives numerous advantages when contrasted with different techniques. Covering methods: too hydrophobic covering and too hydrophilic covering don't assimilate ability to produce development on PV board during interaction of self-cleaning. Overly hydrophobic covering surface convey hostile to consumption, no water streak on surfaces because of less energy surfaces. It has more energy surfaces and can extended all through far film layer surface while the Super hydrophilic surface cleans dust as per the band hole energy of materials during the response of photocatalysis. The fundamental perception said that the arranged sun powered board (level slant) can catch about half more than the slant modules during stormy conditions. One principal issue is that it doesn't work great in dull districts.

Suneetha Racharla et al [13]. This methodology discusses different kinds of sun global positioning frameworks that have been produced for twenty years. In any case, each time there is alter in the course of the sun, this is one of the principal downsides as it decreases the force in watts conveyed by sunlight-based board. It is additionally said that this sun based global positioning framework is the best elective approach to build the proficiency. Contingent upon their turn modes, the sun global positioning frameworks can be arranged as Single Axis and Dual Axis and dependent on the actuator, they are delegated Active Tracker and Passive Tracker. Their standards have likewise been talked about here. The yield created is relied upon the cosine point of occurrence which the point between the sun beams and the even surface. It's in a roundabout way corresponding to the yield power. The finishes of this audit says that the azimuth and height double pivot global positioning framework is better productive when contrasted with the remainder of global positioning frameworks. However, in the view purpose of adaptability and cost, in examination with double hub global positioning framework, the earlier one is more achievable. The subtleties of this paper will be invaluable in future for choice of a precise tracker as for accessible space, locale and cost.

Sebastijan Seme et al [14] developed a sun based photovoltaic Tracking Systems for power age. It likewise creates a total survey on the global positioning frameworks just as the most recent investigations with respect to done in recent years. This particular paper progresses a state of workmanship and composing review in PV worldwide situating systems for electrical energy creation and besides gives a framework of its latest examinations. The double pivot and single hub PV global positioning framework with proper control systems, when appeared differently in relation to a fixed Photovoltaic structure, electrical energy can increase from 22% to 56%. The chip and sensor-based control structures blends include most used control method as by and large capable. Electrical drives are used by dynamic global positioning frameworks to move hub, that could acclimatize colossal proportion of electrical energy in light of silly control systems. Electric engines that are utilized in photovoltaic following applications are intended to withstand different climate conditions like high temperatures, and solid breezes as they have been presented to these climate conditions. Because of extra sensor gadgets, sensor-based PV global positioning frameworks are more costly.

Timothy Laseinde et al [15] set forth a multi-hub sun powered global positioning framework that is of ease and programmed for development in execution utilizing Arduino board in vertical help sun oriented boards. The best force point following calculation was made in this endeavour which was done using different numerous pivot servo -motor input following structure, that helped in addition of capability of sun -controlled board display. Supply of power from power systems to LEDs is moreover overseen in this investigation. The adequacy of power delivered by the sun -based board has improved by 23.95%. Its kept in point that it is imperative to quantify the productivity of followed sunlight based board and the fixed board. The productivity is acquired by contrasting the force created by the tracker and the force produced by the fixed sun-oriented board. Numerically, it is reasoned that the productivity is the proportion of yield capacity to the info power. The conclusion of this examination says that following the sun at a serious level of precision is vital to improve the sun oriented light ingestion. Utilizing Arduino board helped in decrease of framework development cost without being reliant on exorbitant, muddled space burning-through exclusive foundations. Alluding and contemplating the above papers, this venture was advanced.

IV. CONCLUSION

Through this project, we come to the conclusion that there is still a lot of scope of energy production with the help of tracking and cleaning of solar panels with better design and with increase in the number of solar panels it is possible to implement this project on a large scale. There are various effects on solar panels that effect the efficiency of the panels. Due to these effects, we get less output power from the panel. This project has been developed to increase the efficiency of solar panel by using the automatic tracking and cleaning method with the help of microcontrollers and different sensors for making it an automatic system. This can solve the problem of energy crisis to a great extent.

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