

AN AUTOMATIC SINGLE AXIS TRACKING AND CLEANING MECHANISM FOR SOLAR PHOTOVOLTAIC SYSTEM

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Abstract: Solar energy is an important source attaining centre stage means of expanding renewable energy. Solar energy is converted into electricity without using battery storage system. The demand for the production of electricity is fulfilled by solar energy. This paper illuminates to find an automated detection for cleaning the PV cells. The cleaning mechanism can be successful by a stepper motor which is tuned to the wiper brush. Dust accumulation is one of the factors which negatively impact the solar panel; it reduces the panel efficiency. It continuously cleans the solar panel which senses the dust particles on the solar panel and it is automatically cleaned of the dust particles in the solar panel. The automatic solar panel consists of four LDR sensors, solar panel and ATmega328 controller and DC servo motor are fixed in solar panel. The sensor synchronization for tracking the sun requires DC gear motor with the gear box mechanism. During the day time the solar panel must face the sun and the sun rays are emitted from the sun; they are tracked by DC motor which is joined with the imitated solar panel. It helps to rotate the panel proportional to sun and the maximum sunlight will fall in solar panel at a particular time. The incident ray from the sun will be blocked and the dust accumulation on the surface module. Electrical parameters of solar panel are very responsive to accumulated dust density. The main processor solar tracker are the most appropriate and the technology is used to increase the efficiency of solar panel and the system controls the two relays DC geared motor driver and a microcontroller. LDR light detector acts as a sensor is used to trace the coordinate of the sunlight on both east and west directions. The tracking movement of the solar panel is achieved by teaming a DC servo motor. With the solar panel such that face the panel is always perpendicular to the sun that tracking movement is achieved by coupling a servo motor to the solar panel such that the panel maintains its faces always perpendicular to the sun. It receives the maximum solar irradiance or by electrically tracking the maximum power point under changing conditions.

Index Terms: solar panel, microcontroller ATmega328, LDR sensor, DC servo motor, DC gear motor

I. INTRODUCTION

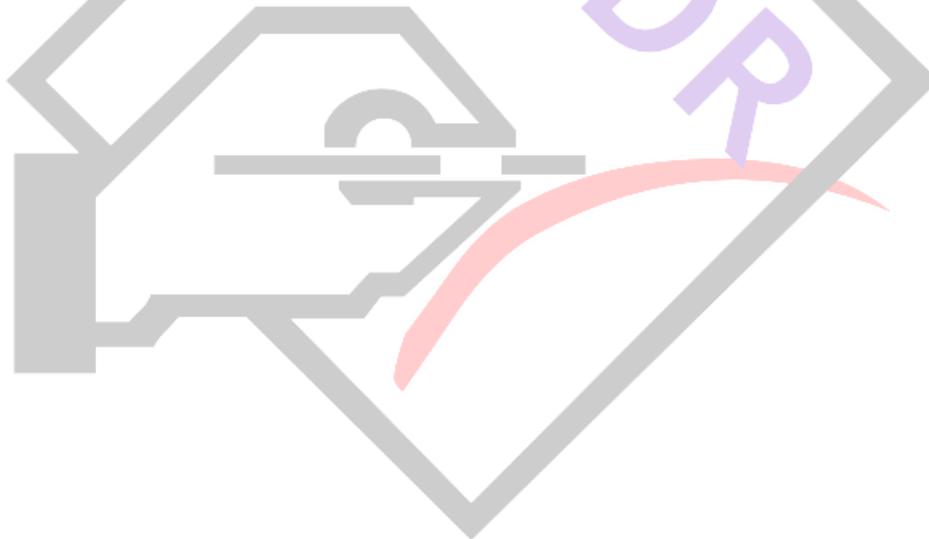
The word photovoltaic methods photograph light and volt is begun from Greek-stage, and the photograph voltaic load are comprised of texture known as semiconductor. The for the most part utilized semiconductor is silicon. Every voltaic-chamber can create by putting the PV cells in sequential and parallel. Programmed photovoltaic board cleaning and following framework is utilized to control and set the snapshots of the sun powered board and it will follow the greatest force position. The PV board cleaning innovation will improve the execution by means of putting off soil and debasements from the outside of the board. This technique incorporates both mechanical and electric areas. The gadget that utilized by P-N intersection specifically convert daylight to electric power the gadget utilized is sun based PV-cells. While this, plate wind up messy as result the cleaning framework will lessen it. The execution of the PV board is diminished residue to the residue aggregation, shadow, snowfall, winged animal dropping residue and earth. Electrical part contains programming which works and controls the circuit of oneself cleaning innovation. The yield of the board is estimated when cleaning and effectiveness is determined with the help of voltage and contemporary charts. Sunlight based vitality is a growing sustainable wellspring of vitality. it is a non regular source, we have created sun oriented boards with the goal that we can satisfy our power require. Sunlight based tracker is a computerized sun oriented board that really pursues the sun to expand the power. The sunlight based tracker can be utilized for a few application, for example, sun powered cells, sun oriented day like lightning framework. The sun based tracker is exceptionally helpful for gadget that needs more daylight for high productivity. The board is working at the best effectiveness to get the most extreme proficiency for the sun powered board. Sun following framework exceptionally intended for private utilized for minimal effort sun powered cell. LDR or light ward resistor has been picked as the sensor on the grounds that, LDR is for the most part utilized for following framework. LDR is touchy to the light. The obstruction of LDR will diminishes with expanding occurrence light power. For the controller Atmega238 had been picked. The programming will give the beat to the driver move to the engine. For the driver, bi-directional DC engine control utilizing transfer has been utilized. The engine controller had been picked in light of the fact that it can control the engine to pivot clockwise course. LM7805 is utilized to change over the info voltage from the wellspring of 5v yield. The sun oriented board is made to turn in every one of the headings confronting the daylight. The fundamental thought of the task is to build the effectiveness of the heavenly bodies. The pivot of the DC engines through the ideal point is accomplished by utilizing topwin6 compiler. This framework utilizes DC engine to control the point of revolution of the boards. Sunlight based vitality is quickly progressing and more vitality is delivered by following the sun based board to stay adjusted to the sun at a correct point to the beams of light. This paper portrays in detail the plan and development of a model for sun powered following framework with two degrees of opportunity, which identifies the daylight utilizing photograph sensors. This is modified to identify the daylight through the photograph sensors and after that activate the engine to position the sun

powered board where it can get most extreme daylight. The equipment part involves microcontroller ATmega328, HMC5883L sensor, engine driver, LDR dust sensor, servo engine and so on. Microcontroller ATmega328 is a heart of the circuit. The product part comprises of a program for the microcontroller is composed utilizing low level computing construct and microcontroller preparing programming.

II. LITERATURE REVIEW

A solar cell is a device which converts light energy into electric energy through photovoltaic effect. Solar cells are the building block of photovoltaic modules known as solar panel. In solar tracking system, the module's surface tracks the position of the sun automatically as the days runs by [1]. The position of the sun varies as the sun moves across the sky. For a solar powered equipment to work best, it must be placed near the sun and the solar tracker can increase the efficiency of that equipment at any fixed position. Based on sophistication, costs and performance [2]. One common type of tracker is the heliostat, a movable mirror that reflects the position of the sun to a fixed location. A solar trackers accuracy depends on the application. Concentrators, especially in solar cell application in solar cell applications, require a high degree of accuracy to make sure that the concentrated sunlight is directed exactly to the powered device, which is close to the focal point of the reflector or lens [3]. Without tracking, concentrator system will not work at all, therefore single-axis tracking is mandatory [4]. Non-concentrating applications required less accuracy, and many are likely to work without any tracking. However, tracking with great effect can both the amount of total output power produced during critical system demand periods (usually late afternoon in hot climate) [5]. Researches have been done to improve the energy production of solar panels. The researches have been done to improve the energy production of solar panels [6]. These researches include; double-sided panels, conversion stages improvement [7], building panels integration geometrically [8] and so on. Maximum energy is produced by a solar PV panel when it is positioned at the right angle of sun. for this reason, several researches developed different types of solar panel tracking system [9] and . Therefore, the primary purpose of this work is to develop a solar panel tracker based on arduino advances so as to enhance the energy production of solar panel [10].

III. PROPOSED SYSTEM



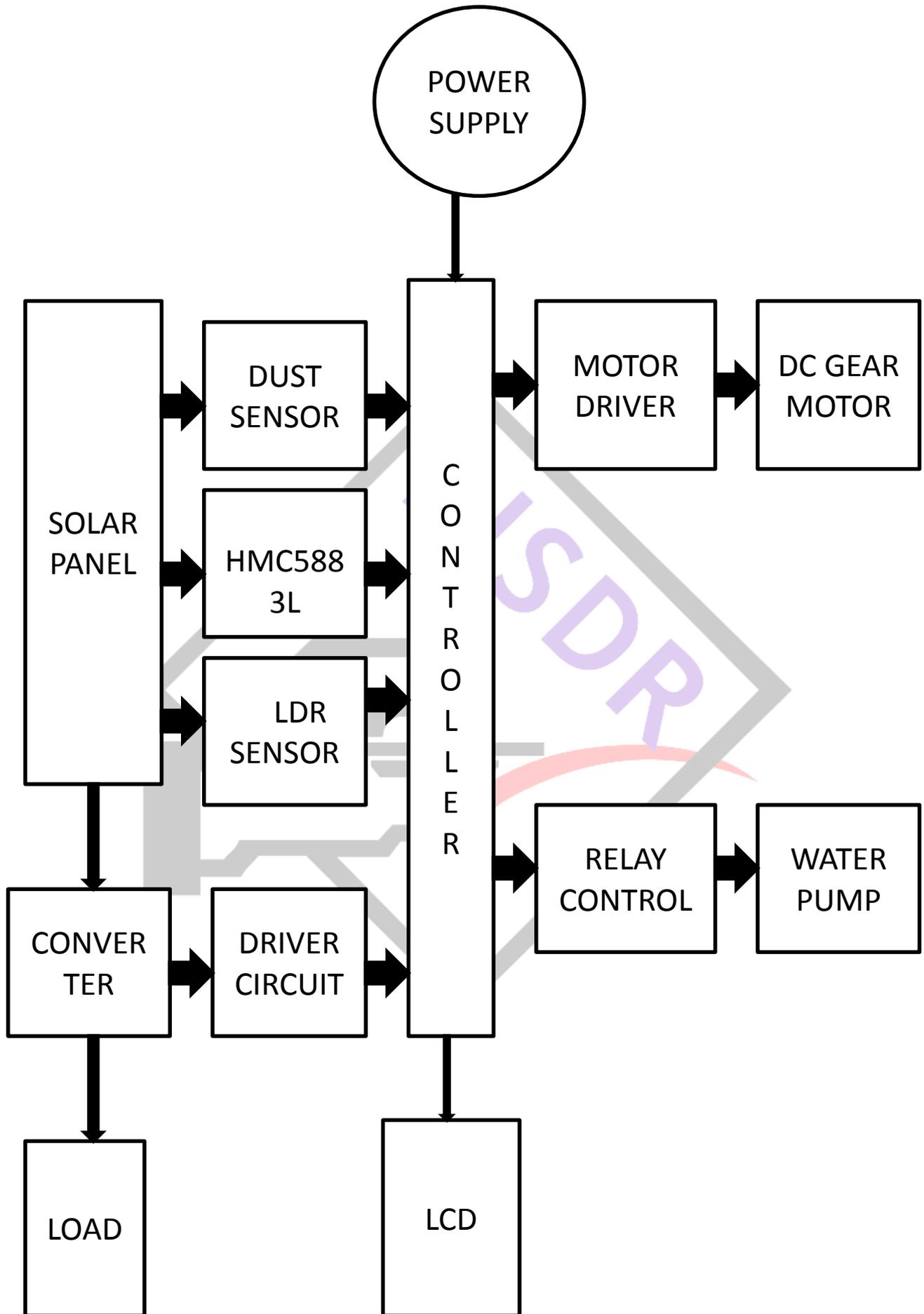


Fig.1. Proposed System

The PV solar cleaning equipment consists of a DC motor, gear system or conveyor belt system, battery, solar panel, rolling bursh. In this, supply is given by the battery is being charged by the sun's energies. Through the solar panel which provides supply to the software system, DC motor. Once the supply is given to the dc motor, gear system starts to operate, thereby moving the rolling bursh and thus cleaning solar panel where the operation is controlled by the software system being supplied by a battery. This project contains a simple preparation of electronic circuit. It contains the basic components which deal with the solar panel, DC motor, DC gear motor or conveyor belt, Microcontroller (Arduino nano) and battery. Solar panel PV panel used as a power source each solar cells produces output of 12V. Solar panel may be ON grid process or OFF grid process. ON grid process where the solar panel output is given to the MPPT converter. In MPPT converter is used to convert the varying output of solar cell into fixed output. The output of MPPT converter is given to inverter where 12DC into 230AC. thus the 230AC is given to net meter and this is connected to the electric board ON grid is possible only on the presence of sunlight. The power is taken from inverter itself and excess power is given to the electric board through Net meter. During night time, power is taken from electric meter through net meter from electric board. OFF grid is same as of ON grid and the only difference is instead of giving the power to net meter it is stored in battery for further use. From solar panel the output given to converter and to driver circuit which is unidirectional. MOSFET is used in converter and switch on and off process of MOSFET is controlled by preprogrammed microcontroller.

IV. AUTOMATIC SOLAR TRACKER WORKING AND HARDWARE DESCRIPTION

It is the one which pursues the sun's development for the duration of the day and gives continuous reflection to the sun oriented board. The sun beams will fall on the sun oriented board in two different ways, which is they will fall specifically on the sun based board and furthermore mirror the occurrence beams on the sun powered board. Assume as the sun time of sun rise the sun is in extraordinary east reflector will adjust itself in some situation by which the episode beams will fall on the sunlight based board. At the point when the earth turns and the sun get moved from its before position the impression of the episode beams will likewise change. In this way accordingly light will fall on the sensors kept on each side of the sun oriented board. The following circuit is designed to the point that when reflection falls on the sensor connected to one side of the board, the tracker will fall move towards the course. Comparable for the situation when the reflection falls on the sensor joined at to the board, circuit will make the tracker to move downwards.

The real piece of this hardware framework is the smaller scale controller. Every one of the tasks are controlled by it. With the assistance of small scale controller, you can adjust the sun based board as indicated by the force of the daylight of the daylight. Another segment is the battery-powered battery which is utilized to store vitality which is gotten from the board. The motivation behind the charge control is to control the charging of the battery. Small scale controller unit gets the status of the battery by the charge control unit. It has two sensors, each made up of LDR. Four LDRs comprise on unit and are set at the four corners of the board. LDR faculties the force of daylight and controller gets the yield. Control unit chooses in which heading the board must be turn to get most extreme daylight. Another unit of the sensor additionally comprises of LDRs and utilized for the control of lightning load. The board can be pivot in the ideal heading by the server engine.

V. AUTOMATIC SOLAR CLEANING TECHNIQUES

There are diverse methods of cleaning gathered residue, model, cleaning procedure which comprises of sliding brushes on PV board surface. Additionally electrostatic cleaning is utilized where the residue is shaken off the PV board when an electrically charged wave breaks over the outside of the PV board. Another system is wet cleaning. One of the wet cleaning models incorporate Heliotex, which is a programmed cleaning framework that washes and flushes sun based board surface. The computerized cleaning framework for PV modules was produced thinking about the kind of residue location or checking system, technique for cleaning and the cleaning instrument. Along these lines, the cleaning programming was displayed to work connected at the hip with the measure of irradiance delivered from the sun and the product activity as outline. The product execution was written in C and transferred to a microcontroller utilizing Arduino and the reproduction was completed. The framework comprises of the DC engine associated with the arduino UNO by means of control circuit of the L293D engine drive. The checking circuit and the light sensor were additionally associated the arduino UNO board. The sensor was utilized to distinguish the nearness of the microcontroller will reaction to this by estimating the yield control from the board on the off chance that it is sunny morning or the yield is "HIGH". The cleaning instrument will be dynamic just when productivity or the yield control is low.

CLEANING MECHANISM

- Sprinklers are regularly utilized in the dry region to keep board clean. It has indistinguishable cleaning impact from precipitation and will clean board at a moderately ease.
- Brushes-Different sort of brushes can be joined to the front of the board so as to brush away any residue, sand, and earth which heap up on the sunlight based board. The cleaning instrument will clean varieties of PV boards by moving a vertical brush on a level plane over the boards.
- Wipers-Wipers are commonly used to evacuate rain, snow, ice and trash from the outside of the boards. Thus in blustery and frigid territories where snow heaps up on sun based boards, wipers can be valuable in expelling all the snow from the outside of the boards.

VI. CIRCUIT OPERATION

In our undertaking we have utilize sun powered board to change over the light vitality into the electric vitality. The sun change its situation for the duration of the day that is the reason we can't ready to use the entire light vitality we have made a following framework in which sun oriented board can be pivot according to the sun changes its position. We have utilize four LDR sensor to detect the light and in the event that the sun change its position, particular LDR sensor sense the light and produce the most extreme yield voltage. Microcontroller get the voltage motion from the any info stick of the controller and looks at the each LDR yield flag to with each LDR sensor yield. At the point when the controller locate the most astounding voltage dimension of any LDR sensor gives the guidance to the engine through the engine driver circuit to turn the sun based board on the single pivot toward the LDR sensor which are creating greatest yield force. By utilizing outer engine and by influencing association in parallel we to can move the sun oriented board toward any path. As by turning the sun oriented board toward the sun we use the most extreme vitality of the daylight.

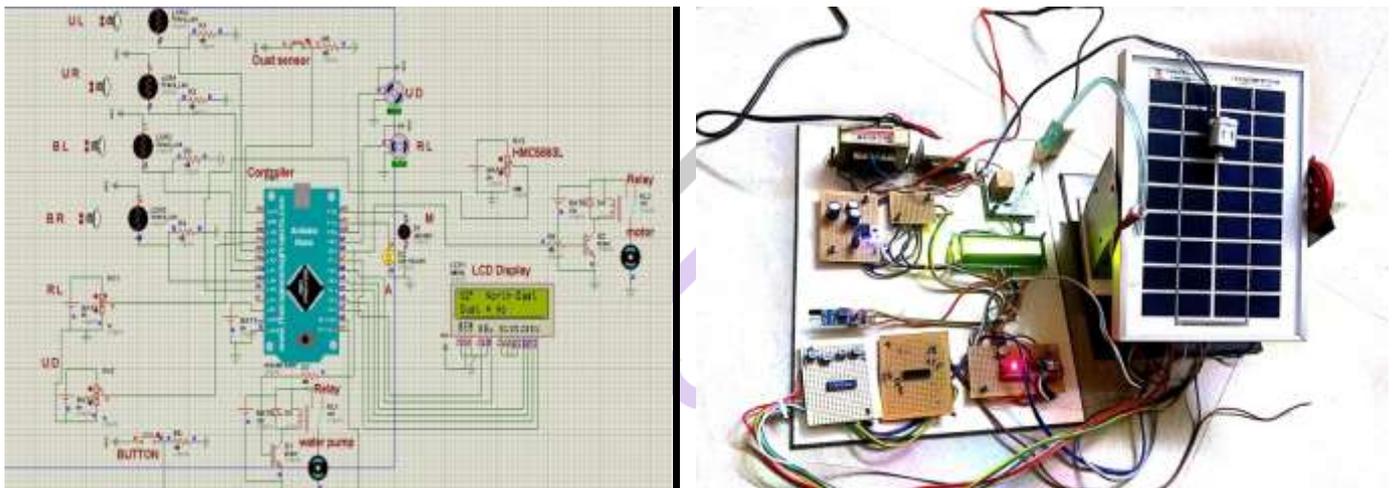


Fig.2. Circuit and Hardware

VII. RESULT AND DISCUSSION

The framework is concentrating on the controller structure. The built framework has been tried and a few information from equipment estimation have been gathered and talked about. Regular sun powered board has been utilized and reason just to demonstrate the structured framework can work in like manner. In this way the encompassing impact, for example climate condition are not truly considering amid equipment testing.

VIII. FUTURE SCOPE

- This execution has an extraordinary future degree that wellspring of vitality is accessible in free expense.
- In the present world the general population needs more prominent measure of vitality it very well may be fulfilled by our proposed thought in a progressively powerful and productive way.
- By utilizing microcontroller we can execute the shrewd framework in future. The traditional vitality isn't adequate for use so there is a need of utilization non-ordinary vitality source.
- Concentrated sun based board can be utilized in future since they can enhance proficiency of PV boards radically and create the higher measure of power.
- With rising usage of photovoltaic exhibits, another strategy for cleaning and investigation is important.
- This framework can follow and pursue the force to the sun so as to inspire most extreme yield to get greatest yield paying little heed to engine speed.

IX. CONCLUSION

Sun oriented following and cleaning framework was effectively created. This framework can follow and pursue the daylight power so as to gather most extreme yield. The planned framework is centers around structuring controller part and the principle concern is to configuration fitting circuits and the circuits assume to have the capacity to control DC adapt engine turning course without thinking about engine speed. The examination of the execution is completely founded on the measure of intensity created on the dusty board and a cleaned board. Cleaning can wipe out the dusty particles superficially however the successful cleaning on wet cleaning. No outer power supply is required for the cleaning the expense is affordable and having huge number of sunlight based board. Our proposed framework is only a refresh of programmed sunlight based trackers with cleaning framework. The paper advances the utilization of sun based board is progressively practical and proficient way. The cleaning instrument is finished by the DC servo engine that is modified and stimulated by the microcontroller. Along these lines any sort of DC adapted engine can be utilized this

framework paying little heed to engine speed controller unit as long as the speed. The developed framework model can be connected in neighborhood for elective power age particularly for non basic and low power apparatuses.

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