AUTOMATIC SOLAR PANEL CLEANING AND SOLARTRACKING SYSTEM

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ABSTRACT:

Solar cell is a device that converts light energy into a electrical energy based on the principal of photovoltaic effect. Dust collection is one of the variables that contrarily effect of the PV module yield since it blocks the sun-based radiation to the occurrence on the module surface thus lessening the general execution of the framework. Sun vitality has huge degree for sunlight-based vitality. While for cleaning the PV modules, a component consists of a sliding brush has been created. In this instrument, the sun-oriented boards make a pivot of 360 degrees in a day, which brings about sliding of cleaning brushes twice over the PV modules. Regarding every day energy, by the cleaning process it gives about 30% more energy yield when contrasted with the level PV (module kept stationary on the ground) and about 15% more vitality yield when contrasted with PV module with single-pivot following. Sunlight-based energy is the best type of energy to satisfy the vitality needs of India and scaffold the vitality request supply hole. Hence, solar panel cleaning and solar tracking is created utilizing light-Dependent resistor (LDR) and DC engines on a mechanical structure with gear course of action. Sun based following (azimuth edge just as frame of mind-point) are executed through Arduino UNO controller dependent on Sun Earth geometry.

KEYWORDS: Solar Tracking, Photovoltaic, Solar Energy, Light dependent resistor.

I. INTRODUCTION

In recent years several factors such as rise in population, increased per capita consumption, fluctuating prices of crude oil and natural gas, improved living standards have led to an increased energy demand. Therefore, there is a need to raise awareness among policy makers to promote renewable energy and the harmful effects of the fossil fuel consumption to generate electricity, solar energy being one of the cleanest energy source is catching a lot of attention worldwide. Although lately, the prices of PV have dropped down sharply to promote the renewable energy, however, the efficiency of PV based power especially in cities is not yet considered economically good enough to be compared against fossil fuel power plants. It is presumed that to meet the ever-increasing demand of energy, the solar energy has emerged as an environmentally friendly power generation choice. With all the advantages discussed above the field still requires more rigorous research that promote the developmentof a PV cell/panel which is more efficient and requires less manufacturing cost. Solar tracking system works on the principle of the path of the sun to capture a maximum power. The productivity of tracking system represents an extraordinary preferred position over static close planetary system. DAST is a structure consists of two rotational axes.These two rotational axes empower the PV cell or board to remain adjusted towards the moving sun to draw the maximum arrays. The most pivotal factor that decides the presentation of the board is sun-oriented irradiance (W/m2). It quantifies the aggregate sum of sun-oriented radiation fall on the outside of the PV board. The solar energy created by the solar board is directly proportional to the total amount of sunlight received by the panel. Dual axis solar tracking makes PV board to confront the sun from first light to sunset, to ensure that greatest conceivable sunlight-based vitality is being created from the board. Along these lines it has an edge of generous increase when contrasted with heavenly bodies with fixed pivot. This system can increase the efficiency by automatically cleaning the solar panel and dual axis solar tracking over a traditional fixed axis solar system.

II.SOLAR PANEL

Sun powered board alludes either to a photovoltaic module, a sun oriented heated water board, or to a lot of sun oriented photovoltaic (PV) modules electrically associated and mounted on a supporting structure. A PV module is a bundled, associated gathering of sunbased cells. Sun powered boards can be utilized as a segment of a bigger photovoltaic framework to produce and supply power in business and private applications. Every module is evaluated by its DC yield power under standard test conditions (STC) and ordinarily runs from 100 to 320 watts.The effectiveness of a module decides the territory of a module given the equivalent appraised yield - a 8% productive 230-watt module will have double the zone of a 16% proficient 230-watt module. There are a couple of sun powered boards accessible that are surpassing 19% effectiveness. Solitary sunlight-based module can create just a restricted measure of intensity; most establishments contain various modules. A photovoltaic framework commonly incorporates a board or a variety of sunlight-

based modules, an inverter, and now and then a battery as well as sun powered tracker and interconnection wiring.

III.CONSTRUCTION OF SOLAR PANEL

Sun based modules utilize light vitality (photons) from the sun to produce power through the photovoltaic impact. Most modules use wafer-based crystalline silicon cells or flimsy film cells dependent on cadmium telluride or silicon. The basic (load conveying) individual from a module can either be the top layer or the back layer. Cells should likewise be shielded from mechanical harm and dampness. Most sun based modules are inflexible, yet semi-adaptable ones are accessible, in view of slender film cells. These early sunlight-based modules were first utilized in space in 1958.

Electrical associations are made in arrangement to accomplish an ideal yield voltage as well as in parallel to give an ideal flow ability. The directing wires that take the current off the modules may contain silver, copper, or other non-attractive conductive progress metals. The phones must be associated electrically to each other and to the remainder of the framework. Remotely, mainstream earthly use photovoltaic modules use MC3 (more seasoned) or MC4 connectors to encourage simple weatherproof associations with the remainder of the framework. Sidestep diodes might be fused or utilized remotely, if there should be an occurrence of halfway module concealing, to amplify the yield of module segments still lit up. Some ongoing sun based module structures remember fixations for which light is engaged by focal points or mirrors onto a variety of littler cells. This empowers the utilization of cells with a significant expense for every unit

region, (for example, gallium arsenide) in a savvy way.Various sun powered cells in an incorporated gathering, all arranged in one plane, establish a sun powered photovoltaic board or sun powered photovoltaic module. Photovoltaic modules frequently have a sheet of glass on the sun-confronting side, enabling light to pass while ensuring the semiconductor wafers. Sun powered cells are normally associated in arrangement in modules, making an added substance voltage.
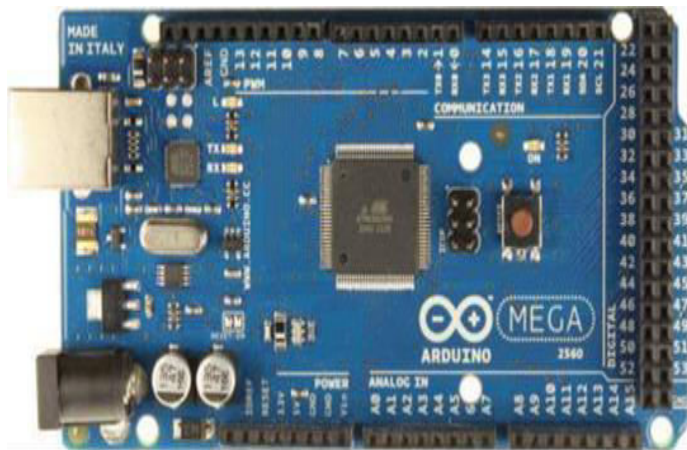
Associating cells in parallel yields a higher current; be that as it may, issues, for example, shadow impacts can close down the more vulnerable (less lit up) parallel string (various arrangement associated cells) causing generous force misfortune and conceivable harm as a result of the invert inclination applied to the shadowed cells by their lit up accomplices. Series of arrangement cells are typically taken care of freely and not associated in parallel, however singular force boxes are frequently provided for every module, and are associated in parallel.
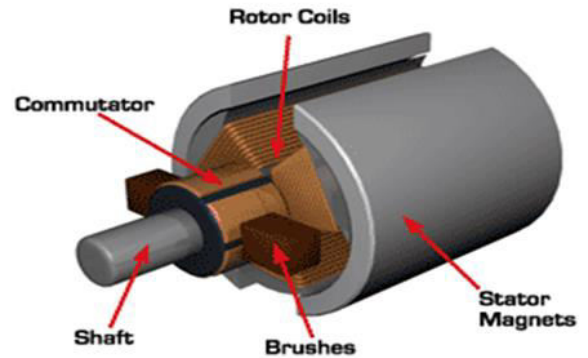
IV.COMPONENTS

(a)Arduino IDE

An Arduino is really a microcontroller-based pack which can be either utilized legitimately by obtaining from the seller or can be made at home utilizing the segments, inferable from its open-source equipment highlight. It is essentially utilized in correspondences and in controlling or working numerous gadgets. It was established by Massimo Banzi and David Cuartielles in 2005. The Arduino Uno is a microcontroller board dependent on the ATmega328. It has 14 computerized input/yield pins (of which 6 can be utilized as PWM yields), 6 simple data sources, a 16-MHz gem oscillator, a USB association, a force jack, an ICSP header, and a reset catch. It contains everything expected to help the microcontroller; just associate it to a PC with a USB link or force it with an air conditioner to-DC connector or battery to begin.

The Uno varies from every single going before the board in that it doesn't utilize the FTDI USB-to-sequential driver chip. Rather, it includes the Atmega8U2 modified as a USB-to-sequential converter. \ "Uno\" signifies one in Italian and is named to check the up and coming arrival of Arduino 1.0. The Uno and form 1.0 will be the reference variants of Arduino, pushing ahead. The Uno is the most recent in a progression of USB Arduino sheets, and the reference model for the Arduino stage; for an examination with past variants.

(b)DC Motor:

A DC engine is any of a class of electrical machines that changes over direct flow electrical force into mechanical force. The most widely recognized sorts depend on the powers created by attractive fields. A DC motor's speed can be controlled over a wide range, utilizing either a variable stockpile voltage or by changing the quality of current in its field winding. Little DC engines are utilized in apparatuses, toys, and machines. The widespread engine can work on direct current however is a lightweight engine utilized for versatile force apparatuses and machines. Bigger DC engines are utilized in the impetus of electric vehicles, lift, and raises, or in drives for steel moving plants. The appearance of intensity gadgets has made supplanting of DC engines with air conditioning engine conceivable in numerous applications.Basic DC engine has a stationary arrangement of magnets in the stator and an armature with at least one twisting of protected wire folded over a delicate iron center that focuses the attractive field. The commutator permits every armature curl to be stimulated thusly and interfaces the turning loops with the outside force supply through brushes. (Brush less DC engines have hardware that changes the DC current to each curl on and off and have no brushes.).

(c)Light Dependent Resistor (LDR):

A Light Reliant Resistor (LDR) or a photograph resistor is a gadget whose resistivity is a component of the occurrence of electromagnetic radiation. Subsequently, they are light, delicate gadgets. They are additionally called as photograph conductors, photograph conductive cells, or just photocells. They are comprised of semiconductor materials having high obstruction.
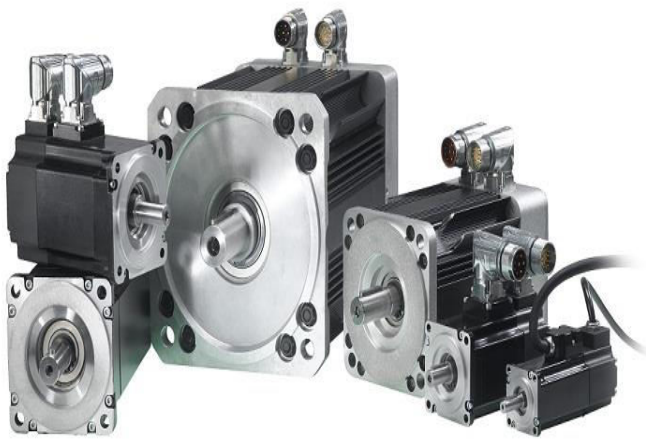

(d)Servo Motor:

Servo Engines are DC Engines (look at how a DC engine functions) with a servo instrument to give an exact rakish movement. Heartbeat width regulation (PWM) system is utilized to set the point of pivot. For the most part RC servo engines have a revolution point of confinement of 900 to 1800 yet servos with high pivot edges are additionally accessible. A servo engine is one of the broadly utilized

variable speed drives in modern generation and procedure robotization and building innovation around the world. Albeit servo engines are not a particular class of engines, they are planned and intended to use moving control applications that require high precision situating, speedy turning around, and uncommon execution.A servo engine is an electrical gadget which can push or turn an item with extraordinary exactness. On the off chance that you need to turn an article at some particular points or separation, at that point you utilize a servo engine. It is simply comprised of basic engine which goes through servo component. On the off chance that engine is utilized DC controlled, at that point it is known as a DC servo engine, and on the off chance that it is air conditioning fueled engine, at that point it is called an air conditioner servo engine. We can get a high torque servo engine in a little and light-weight bundles.
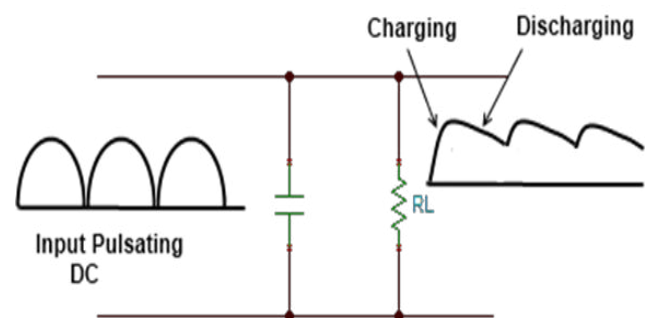

(e)Flexible thin film module:

Adaptable flimsy film cells and modules are made on a similar generation line by storing the photoactive layer and other essential layers on an adaptable substrate. On the off chance that the substrate is an encasing (for example polyester or polyimide film) at that point solid incorporation can be utilized. The phones are collected into modules by covering them to a straightforward vapid fluoropolymer on the front side (ordinarily ETFE or FEP) and a polymer reasonable for clinging to the last substrate on the opposite side. The main economically accessible (in MW amounts) adaptable module utilizes indistinct silicon triple intersection (from Unipolar)

(f)Filter:

A normal force supply channel circuit can be best comprehended by isolating the circuit into two sections, the repository capacitor and the low-pass channel. Every one of these parts adds to expelling the rest of the air conditioner beats, yet in various ways.
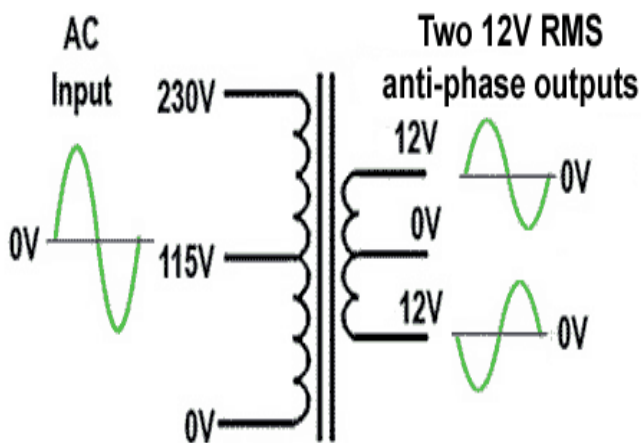
Electrolytic capacitor utilized as a repository capacitor, supposed on the grounds that it goes about as impermanent stockpiling for the force supply yield current. The rectifier diode supplies current to charge a repository capacitor on each cycle of the info wave. The supply capacitor is huge electrolytic, for the most part have a few hundred or even a thousand or more microfarads, particularly in mains recurrence PSUs. This huge estimation of capacitance is required in light of the fact that the store capacitor, when charged, must give enough DC to keep up a consistent PSU yield without the information current; for example during the holes between the positive half cycles when the rectifier isn't directing.

The activity of the store capacitor on a half wave amended sine wave. During each cycle, the rectifier anode air conditioning voltage increments towards Vpk. Sooner or later near Vpk the anode voltage surpasses the cathode voltage, the rectifier conducts and a beat of current streams, charging the supply capacitor to the estimation of Vpk. When the info wave passes Vpk the rectifier anode falls beneath the capacitor voltage, the rectifier becomes turn around one-sided and conduction stops. The heap circuit is currently provided by the supply capacitor alone. Despite the fact that the repository capacitor has an enormous worth, it releases as it supplies the heap, and its voltage falls however not by definitely. Sooner or later during the following cycle of the mains input, the rectifier input voltage transcends the voltage on the somewhat released capacitor and the store is re-charged to the pinnacle esteem Vpk once more.

(g)Step down transformer:

Basic power supply the input power transformer has its primary winding connected to the mains (line) supply. A secondary winding, electro-magnetically coupled but electrically isolated from the primary is used to obtain an AC voltage of suitable amplitude, and after further processing by the PSU, to drive the electronics circuit it is to supply. The transformer stage must be able to supply the current needed. If too small a transformer is used, it is likely that the power supply's ability to maintain full output voltage at full output current will be impaired. With too small a transformer, the losses will increase dramatically as full load is placed on the transformer. As the transformer is likely to be the most costly item in the power supply unit, careful consideration must be given to balancing cost with likely current requirement. There may also be a need for safety devices such as thermal fuses to disconnect the transformer if overheating occurs, and electrical isolation between primary and   secondary windings, for electrical safety.
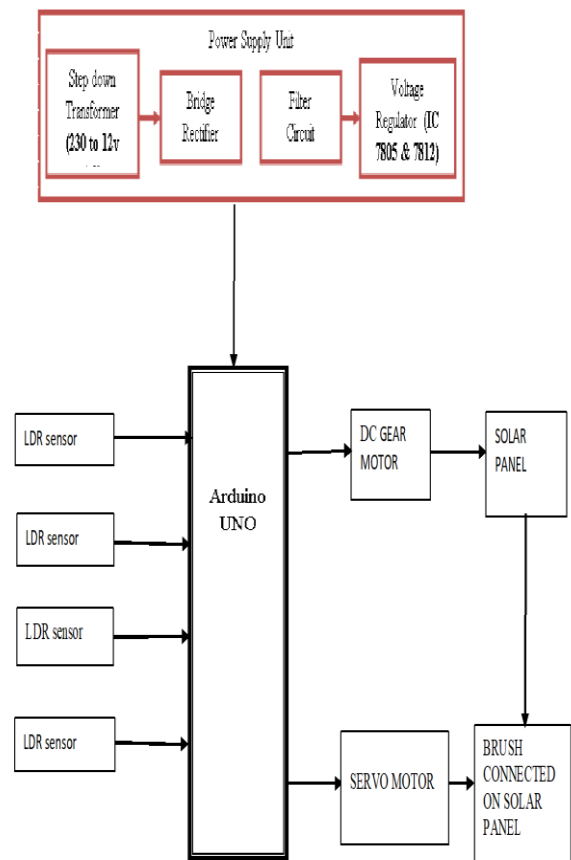

V. METHODOLOGY

This framework consists of LDR sensors are fixed in the upper piece of the sun powered board. It detects the light power. The force appraisals are shown in LCD show. On the off chance that the light force is low, this data will be gone through the MPPT. The Arduino controls the stepper engine. The Arduino is customized by C Language program. The stepper engine moves the sun-based board to tracks the daylight. All things considered, there is no daylight likewise, the data will be gone through the Arduino, it controls the siphon engine, it will splash the water in the outside of the sun-based board, the wiper begins to clean. There are two wipers. It will be constrained by servo engine 1 and 2. Day-night sensor utilized for staying away from the sun powered board following during the evening. At long last, the vitality is put away in the 12V battery. The reason for the voltage controller is to direct the

12V into 5V. This 5V supply is given to the Arduino. The vitality put away battery is associated with the heap. In existing technique there is no trend-setting innovation for estimating the perusing of electric bill in home's, people are put for take readings from home, in such cases nobody is available in the home and earlier month flow perusing will be noted. The wellspring of the undertaking utilized is 5V in light of the fact that to maintain a strategic distance from the Arduino from harm. The LDR will identify the daylight and impel the stepper engine. Regularly, sun-basedboard just retains the light vitality at it places. At that point, after the LDR sensor added to the close sun powered board, the stepper engine which goes about as an actuator at that point moves the sun powered board to follow the daylight. On the off chance that the residue nearness identified on the sun based board impel the wiper engine (servo engine) to evacuate it. The LDR sensor is utilized to recognize dust as an info. Essentially, the Arduino is utilized to program the circuit.

VI. PROPOSED SYSTEM

A model of the programmed two-pivot sun based following framework with another plan of sun-position tracker component and remote supervisory is planned in this paper.

- The sun powered tracker system is made out of Arduino UNO controller, DC engines, gear box, LDR sensor module, edge sensor, timing circuit, and engine driving circuit.
- Arduino UNO sends direction to DC engines to determine height and azimuth edges of the sun based board in which to keep up the board constantly typical to daylight.
- The parameters of the following framework are observed remotely on the boss and control PC program through Bluetooth module. Because of investigations the force produced by the proposed following framework is expanded in the by and large of about 10% ~ 40% more than the fixed-point framework as a rule.

VII.CONCLUSION

Existing computerized cleaners mostly centre around enormous exhibits and all in all are unsatisfactory for introducing on littler clusters in particular private rooftops. For those with restricted space this implies a littler exhibit just should be introduced, consequently our thought fills in as an enormous favourable position for those littler locales. Our framework can be introduced for rooftop top sun-oriented boards. The sun based board cleaning framework was first structured thinking about the plan parameters. Our model was tried and the accompanying perceptions were made. The rack and pinion instrument to fill in as it was intended to do. The direct actuator framework worked pleasantly and had the option to accomplish the necessary structure parameter. The cleaning activity of the brush was acceptable yet it neglected to scour the residue which was clingy in nature. The clingy dust should be expelled utilizing a hard brush or through cleaning activity. Along these lines, as we probably are aware avoidance is superior to anything restoring because of the cleaning activity forestalls the essential gathering surface residue on the sun powered board before it turns out to be too clingy to even consider removing.

VIII. REFERENCES

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