



iDual Axis Solar Sun Tracker

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Abstract

Only solar energy has fast grown in popularity and significance. With the help of the solar tracking technology, we are able to generate an abundance of energy, greatly enhancing the solar panels' productivity. Its effectiveness is due to the solar panel's perpendicular relationship to the sun's beams. Unusually, its installation fee is only marginally higher when less expensive alternatives are also offered. In this work, the design and building of a prototype solar tracking system with a single axis of flexibility are the main topics of discussion. The Arduino microcontroller is the foundation of the primary control circuit. The firmware of this device is set up such that the DC Motor will be told which direction to turn the solar panel in response to the LDR sensor's detection of the sun's rays. The solar array is set up in such a way through this that the most sun rays are possible to receive. The DC motor, which has a strong torque and a modest enough speed compared to the other motors, is the most straightforward and elegant. Despite knowing that it rotates just in one direction, we may programme it to rotate in a different direction under certain conditions. For the first time ever, solar panels made of silicon with a 20% efficiency were produced in 1985. Even though the solar panel's efficiency had increased significantly, perfection remained an unattainable aim. Most of the boxes still hover when the percentage is below 40%. People must either buy numerous panels or single systems with big outputs to try to meet their electricity requirements as a result. The availability of solar cells with better efficiency is provided that they are prohibitively expensive to buy.

Keywords: - Solar Energy, Solar panels, Solar cells and Microcontroller.

I. INTRODUCTION

A double pivot sun powered sun tracker is a framework used to situate a sun powered charger or exhibit towards the sun, boosting how much sun-based energy that can be caught. This sort of sun global positioning framework varies from single-pivot trackers, which just turn around one hub, in that it can follow the sun's development both evenly and in an upward direction. Double hub sun-based sun trackers are utilized in many applications, including private and business sun-oriented energy frameworks, sun based controlled water siphons, and sun oriented fuelled electric vehicles. The utilization of double hub sun powered sun trackers can essentially build the energy result of a sunlight powered charger or cluster, especially where the point of the sun changes fundamentally over the course of the day or consistently. By precisely following the place of the sun and changing the direction of the sun powered charger likewise, double hub trackers can catch more daylight and produce more energy than fixed-slant or single-hub global positioning frameworks. As of late, there has been critical innovative work in the space of double pivot sun powered sun trackers, with an emphasis on working on the precision, productivity, and dependability of these frameworks. Scientists have grown new sensor innovations, control procedures, and assembling methods to streamline the exhibition of sun global positioning frameworks, and are investigating new applications for these frameworks past customary sun powered energy frameworks. In this unique circumstance, this paper gives an outline of the functioning guideline, parts utilized, strategy, and utilizations of double hub sun powered sun trackers. It likewise incorporates a writing review on late examination around here, featuring key



discoveries and future headings for innovative work. By giving an extensive outline of double hub sun powered sun trackers, this paper plans to add to a more profound comprehension of the expected advantages and difficulties related with these frameworks, and to empower further innovative work around here. Present day civilisation capabilities through the vein of clamouring development. Consistently, energy is utilized to the furthest reaches conceivable to satisfy the goals and aspirations of the overall people. Each part of our lives is obliged by numerous layers of deterrent, and thus, energy is transforming into a pivotal part. Subsequently, the energy supply should be boundless or extremely durable to help this gigantic populace. Being developmental in nature, people are seemingly the best formation of nature ever and are continually hustling to envision the reasonable and accessible joys and benefits in any potential scenario in this perilous planet. The experimental network shows which arrangements, in an inconsistency of disparate perspectives, best speed up the requirement of power in a development as different as our own. Our organization's statement of purpose is to propel the honourable reason for energy protection [1].

Taking a gander at the ongoing circumstance, obviously conventional energy sources like coal, oil and gas, fuel, and so on will be very nearly elimination. The requirement for these energy assets has arrived at its top as we battle to satisfy every one of our needs for energy while wasting time and energy with time itself. The whole climate is becoming dirtied because of customary energy use from the burning of petroleum products including coal, oil, and flammable gas. Accordingly, the ongoing venture is planned with parts like LDR modules, DC engines, photovoltaic clusters, and so on that, while useful, wouldn't deliver any contaminations and on second thought act as a repository for energy that is drawn straightforwardly from the Sun. As detailed, no other energy is more ample than sun-oriented energy regarding accessibility and freeness, alongside the way that it tends to be changed over into electrical energy. Assuming history is to be accepted, the primary sunlight powered charger was made in the year 1881. The possibility of the sunlight-based exhibit was subsequently evolved by Peter Ohl during the year 1941, and accordingly, sun powered chargers' suitability has worked on in contrast with prior times.

Regardless of whether it is far-fetched, it is absurd as far as the essential energy being taken, which is the reason endeavours have been made through this drive to guarantee that no energy is lost. With the LDR module, the DC motor close to the framework is associated with measuring the strength of the sunrays zeroed in on the upper edge of the sun powered charger will empower it to pivot pair with the Sun's movement to catch and store the absolute most energy. This work is sent off chasing after such objectivity. The Sun produces the most energy ever in this planetary group to produce and move life starting with one cell then onto the next when energy is the premise of all creation. In this response, the "Computerized Sun oriented Global positioning framework" drive tries to utilize the best measure of sun powered energy conceivable and convert it into different types of result. The essential objective of this task is to make this strategy a financially worthwhile subject, one that is easy to access and that, eventually, performs at its ideal. This gadget is a period commendable creation that was made to make the best of its sort in the accompanying of specialized progress, when time is moving at its ideal. At a span, one might say that this venture, which is an improvement of sunlight-based energy, addresses a sustainable wellspring of energy that could never run out. The best ability of the sun oriented just reflects from 10 to 20 percent of the sun powered energy that are utilized monetarily, consequently there is space to actually utilize sun-based cells more. This strategy is a practical and climate elective, making it a significant resource in the realm of contamination. In this clamouring city, when contamination is overwhelming each part of presence, this framework is probably going to cause unsettles. This framework's feasibility relies heavily on how well it capabilities. It might set another norm for mind-body frameworks when contrasted with others. Environmentally friendly power sources certainly stand out of scientists, technologists, financial backers, and leaders overall because of the unavoidable future absence of petroleum product supplies. Hydroelectricity, bioenergy, sunlight based, wind, and geothermal energy, as well as flowing power and wave power, are new types of energy that are acquiring conspicuousness. They are seen as beneficial substitutes for wellsprings of



non-renewable energy sources because of their inexhaustibility. Housetop sun oriented (PV) power is maybe the most generally utilized wellsprings of energy among those classifications. Because of drives in innovative work to expand the effectiveness and diminishing the expense of sunlight-based cells, this innovation is right now being utilized all the more every now and again in homes [2]

Despite the advantages, photovoltaic Sun powered energy is still quite far from uprooting existing regular sources. Expanding the power creation of PV frameworks in places with minimal sunlight-based radiation is as yet a test. In spite of the fact that we actually need producers to foster more refined advances to expand the capacities of PV materials, further developing framework design and module building is a pragmatic method for expanding sunlight-based PV power's effectiveness and make it a more dependable choice for clients. This undertaking was done considering that even-handed to support the progression of such a promising innovation. Expanding time spent in the sun is one of the critical ways of expanding adequacy. By guaranteeing that PV sun powered chargers are constantly lined up with the sun's beams at the legitimate point, global positioning frameworks help with accomplishing this. The objective of this try is to build a downsized model of a light global positioning framework, albeit the plan can be utilized for any sunlight based controlled framework in genuine use. A quantitative assessment of the global positioning framework's presentation in contrast with frameworks with fixed mounting procedures is likewise expected from this review. Two servo engines were utilized to carry out the sun powered project. The engine's snappiness, capacity to support high force, accuracy revolution inside a limited point, and quiet undeniably assumed a part in the choice [4].

II. LITERATURE REVIEW

Since to the shortage of assets, current culture is compelled to track down ways of obliging the last's assumptions. The rise of progress and the exhaustion of conventional energizes because of human way of behaving have raised worries about practical turn of events. The restricted energy supply and its source driven us to embrace the playful system of using the elective assets allowed upon people. Kind: Flowing, sun based, and so on. The Sun has generally been viewed as an essential wellspring of energy. Contrasted with its opponents, sun powered radiation is an all the more harmless to the ecosystem wellspring of power. The progression of innovation has made it conceivable to foster techniques for involving this energy for its own valuable purposes. Whether it for fuel age, power, nuclear power, or some other explanation. To change over the sun-based energy that the earth has appropriated into power, sunlight based or focusing sun-oriented power (CSP) innovations are utilized. Using a lattice of photovoltaic clusters, a situated system of photovoltaics, a sun-based GPS beacon utilizes this taken sun-oriented energy. Power is created utilizing sun-oriented cells, likewise alluded to as photovoltaic cells. Wodc photovoltaic cells the photovoltaic impact works on a comparable idea to the photoelectronic impact. The qualification is that in photovoltaic, the electrons are not transmitted however slammed into the substance on a superficial level, creating a voltage differential. Silicon gems are utilized to make sun-based cells. It is the rnatedal that is most often utilized in a sunlight-based cell. The sunlight-based charger has been exceptionally powerful and reasonable in its use of silicon. Polymeric silicon can be parted into two structures and used to make sun-based cells. Sun powered cells can likewise be produced using materials like copper indium gallium (di) selenide (CIGS), cadmium telluride (CdTe), and others other than silicon. Silicon is the best material to use in daylight global positioning frameworks since delivering sun powered cells from materials other than silicon is somewhat more costly [3]. Monocrystalline silicon, truly outstanding and most frequently utilized materials, with an effectiveness of approximately 15-20%. The presentation of the cell material abatements by 10-15% at high temperatures. Another form is polycrystalline silicon, which is more affordable than monocrystalline silicon yet has a comparable band hole. The explanation this material is utilized in minimal expense things is that it is less effective regardless of whether it contains a similar band-hole energy. Albeit shapeless silicon cells might work at very high temperatures, their productivity is perceptibly lower



than that of the other silicon types [3]. Contrasted with sun powered cells made of glasslike silicon, these feeble sun-oriented cells are more reasonable [4]. The viability of a sunlight-based cluster likewise relies upon various different components such as Cell temperature, Energy Change Effectiveness Cell temperature [5].

Photovoltaic cells are arranged cumulatively to form solar panels. The PV cells are organised in a solar cell or other PV device with the intention of using photons to excite electrons of the material contained within the solar cells. The average quantity of sunshine that solar panels receive specifically depends on the sun's location [6]. The sun, which is a storehouse of energies, is recognised as the most significant and constant source of radiation emitted from it. The solar panel receives some of this renewable energy source. There are some methods that can be used to use this energy source instead of other non-renewable sources. The alteration of the source of energy is endogenous in light of the numerous ways that it can be used to modify the manner that other resources are conserved [7]. So, in order to utilise solar power for electrical purposes, solar panels are used. To harness the most solar energy possible, they are aligned into several venues. Even while photovoltaic cells can be used to soak up or gather solar energy, their effectiveness is restricted to specific times of day and sunlight that is shining directly on them, i.e., when the sun is at an orthogonal angle to the panel. The amount of solar electricity captured is much smaller at other times of the day since the angle of the sun's rays is varied. The advent of solar tracking devices allowed for the avoidance of such problems and the capture of the most amount of solar energy possible. The goal of a system for tracking the sun is to maintain a 90° angle between the sun's rays and the solitary array. The driving motors and the positioning controller are two of the three separate modules that make up the solar tracking system's mechanism.

Solar board upkeep: Sun powered chargers require next to no support, however they ought to be kept perfect and liberated from flotsam and jetsam to augment the system is answerable for giving exact movements with the goal that it can follow the course of the sun during the day. The gadget's model is intended to be sufficiently strong to endure awful climate. The sun powered global positioning frameworks' component separates itself into the single-hub tracker and double pivot tracker classifications [8].

When it comes to small-scale photovoltaic power plants, single axis tracking might be thought of as one of the useful systems or the top solution. Three distinct configurations, such as In agreement shaft setup, South-North axis horizontal installation, and the east-west direction axis horizontal installation, can be used to perform single axis tracking. A simple one axis tracker tracks directional sign. The tracker just tracks one row. Configuration. The various configurations in which only one axis of the Tracker can be used are represented by the approaches that have been preserved above. Each of the approaches that have been retained has a similar operating mechanism [9]. Numerous other single axis tracking trackers are also available, such as the polar matched single axis tracker (PSAT), the tilted single rod tracker (TSAT), the vertical single axis tracking (VSAT), and a horizontal single axis tracker without tilted module (HTSAT). The dual axis tracker's rotational axes are orthogonal to one another. In line with the level of the ground, a single of the two axes is fixed. The other axis is referred to as the secondary axis because this one is designated as the primary axis. Dual axis trackers may move in both the horizontal and vertical cardinal directions. The dual axis trackers has several uses, but the two most popular ones are tip-tilt and azimuthal altitudes dual axis trackers [10].

III. METHODOLOGY

Numerous other single axis tracking trackers are also available, such as An attempt is made to boost the solar module's ability to generate power efficiently by using a solar tracking system. The duration of sun rays falling parallel to the outermost layer of the typical solar module is quite brief since they are fixed, thus the sun's rays hit them at various angles and times. As a result, a considerable portion of solar energy is lost. This lowers the system's efficiency because the maximum efficiency is only achieved when the sun is directly overhead and horizontal to the surface of the solar module. The solar module's efficiency is extremely poor and practically non-existent in the morning and evening. These

variables contribute to the system's very low output issue. The solar tracking technology effectively increases the system's output. With the use of this mechanism, we are able to spin the module so that, throughout the day, the sun's rays fall perfectly perpendicular to the module. As soon as a switch is turned on, power is sent from the switches to the DC motor, which starts the motor. The motor and shaft are connected by a belt, and as the motor starts to turn, the shaft also turns, moving the solar panel in the process. One of the key devices that can regulate the rotational time interval of a panel is the cyclic timer. LDRs serve as light detectors in this project. Before getting into the specifics, we must comprehend how LDRs operate. The light-sensitive gadget is an LDR (Light Dependent Resistor), commonly referred to as a photo resistor. It is widely employed in light and dark detector circuits because of the fact that its resistance drops when light shines on it.

The solar panel is rotated by the servo motor while the two LDRs are positioned on either side of it. In order to continue following the light, the servo motor is going to move the solar cell in the direction of the LDR with the lowest resistance, which is the LDR onto which light is shining. Additionally, if any light is shining on either LDR, the motor will not revolve. The servo will attempt to position the solar panel so that both LDRs have the same resistance, which indicates that a comparable quantity of sunlight will fall on both resistors. If the resistor value of one of the LDRs changes, the servo will spin towards the LDR with the lower resistance.

Solar tracking is a technique that continuously reflects sunlight onto a solar panel throughout the course of the day. The sun's rays will strike the solar cells in two different ways: directly on it and via a reflector that will bounce them off of it. Assuming that the sun rises in the extreme east, the reflector will orient itself so that the incident rays land on the solar cell. The reflected light of the incoming rays will now alter as the earth spins and the sun moves from its original position. As a result, the sensors placed on either end of the solar cells will get some light. The tracking circuit is set up so that when reflection occurs, for example, on a sensor attached to the other side of the panel, the tracker will move in the opposite direction.

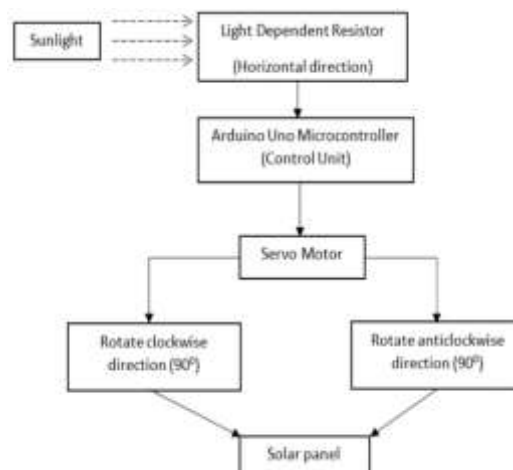


Fig. 1 Block diagram

Similar to this, a circuit will cause the tracker to shift lower if a reflection lands on the sensor linked to the top of the panel. Here, we've attempted to combine two straightforward ideas. One being the typical incidence and reflection theory that our tracker relies on. Secondly, the photovoltaic cells in a solar panel will generate power based on the angle at which the sun's rays hit them. There, two ideas are merged, and as a result, we are able to almost double the output that the panel produces ordinarily. Precisely speaking the tracker is liable for two kinds of rotations, one is on the vertical axis and other is on the horizontal axis. The earlier is for the reflection's right-to-left movement, and the latter is for the reflector's upward-downward movement, which aligns the reflection on the panel.

IV. RESULTS AND DISCUSSION

In the below figure shows the final output of the work. The figure 2 is the when the system is in OFF-mode and the figure 3 is when the system is in ON-mode. Both are operated during the peak afternoon time so as to get the proper output. The Results show the tracking moment of the servomotor orienting the solar panel towards the sun direction so as to get maximum reading in the current output.



Fig. 2 Output 1 OFF Mode



Fig. 3 Output 2 ON Mode

V. CONCLUSION AND FUTURESCOPE

Conclusion

Energy utilization per individual is rising dramatically in the twenty-first 100 years as we advance in innovation, populace, and financial turn of events, yet our energy supplies, like petroleum derivatives, are exhausting rapidly. To meet our energy needs, we should in this manner think about different methodologies, (for example, the utilization of environmentally friendly power sources).

In this article, Double Hub Sun based Trackers, we've made a demo model of a sun-oriented tracker to follow the light source's most splendid point with the goal that the sun powered charger's result voltage is at its most noteworthy there. We at last completed our venture after numerous preliminaries and blunders, and we are glad to have added to society. Presently, this task has a couple of imperfections, very much like each and every other examination. (i) Our board recognizes light inside a detecting zone; beyond this reach, it can't respond. (ii) It computes the vector amount of the light sources and moves the board to that position if various light sources (like diffused light sources) are available on the board.

There were not many assets used to finish this task. The hardware was kept up with easy to use, intelligible, and clear. All in all, double hub sun-based sun trackers are turning out to be progressively famous for the purpose of working on the proficiency of sun-oriented power frameworks in different applications. By following the sun's way both evenly and in an upward direction, these trackers can amplify how much daylight caught by the sun powered chargers, bringing about higher energy yield



and expanded energy productivity. Double hub sun-oriented sun trackers have many applications, including private and business sun-based power frameworks, farming, media communications, military and guard, logical exploration, open air lighting, transportation, fiasco help and crisis reaction, water treatment and desalination, sporting vehicles, and remote detecting and checking. As sun powered innovation keeps on propelling, we can hope to see more creative purposes of double pivot sun-based sun trackers later on, further diminishing our reliance on petroleum derivatives and advancing manageable energy rehearses.

Future scope

The task's objective was achieved with the current time and assets. The venture can be done on a lot greater scale. Future ventures could consider the use of additional compelling sensors, that should be reasonable and power productive. This would bring down costs while expanding proficiency. It would be truly helpful on the off chance that there was a method for facilitating lessen the task's expense. This is because of the way that how reasonable they can be will decide the degree to which these undertakings are embraced. Sunlight based chargers are harmed by concealing when they are working. Because of the way that the phones are commonly associated in series, the concealing of one cell will affect the whole board.

The future extent of double hub sun powered sun trackers is promising, with numerous likely progressions and enhancements for the skyline. A portion of the areas of future improvement include:

1. Artificial knowledge: The incorporation of man-made brainpower (artificial intelligence) into double hub sun-based sun trackers can additionally improve the presentation of sun-oriented power frameworks by anticipating the sun's way and changing the direction of the sunlight powered chargers likewise.
2. Lightweight and minimized plans: With the headways in materials science and designing, the advancement of lightweight and reduced double hub sun-oriented sun trackers is conceivable, making them appropriate for use in applications where weight and size are basic, like robots and little satellites.
3. Integration with energy capacity: Double hub sun-based sun trackers can be incorporated with energy capacity frameworks, like batteries or power modules, to give ceaseless power supply in any event, when the sun isn't sparkling.
4. IoT network: The mix of Web of Things (IoT) innovation into double hub sun-based sun trackers can empower continuous checking of energy creation and execution, considering better control and the board of sun-oriented power frameworks.
5. Mass creation and moderateness: As the interest for environmentally friendly power keeps on developing, the large-scale manufacturing and reasonableness of double hub sun-based sun trackers become progressively vital to make them open to a more extensive scope of clients.

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