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Solar Tracking System

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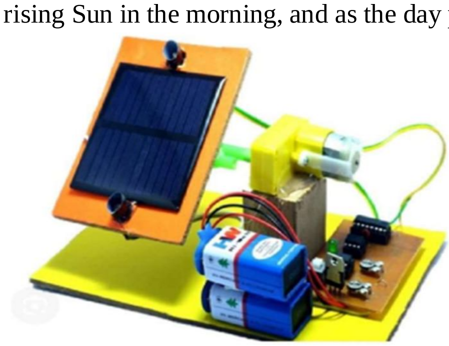
Abstract: The usage of solar panels to convert solar energy into electrical energy has gr own in recent years. The solar panel can be utilized as a huge solar system that is connected to the electrical grids or as a standalone system. The daily energy consumption of our planet is approximately 12 Terawatts, whereas the earth receives 84 Terawatts of power. We are attempting to use solar panels to harness more solar energy. To optimize solar energy conversion to electrical power, solar panels must be oriented perpendicular to the sun. Therefore, it's crucial to track the sun's location and align the solar panel. The purpose of this project is to create an automated system that can determine the sun's lo cation. For optimal energy conversion at all times, the tracking system will adjust the solar panel so that it is perpendicular to the sun. In this system, sensor s made of photoresistors will be employed. The system will include a solar panel, a microcontroller, a gear motor system, and a light detection system.

I. INTRODUCTION

Have you ever observed how a sunflower faces the sun as it travels across the sky? A solar tracking gadget, on the other hand, uses solar panels to accomplish a similar task. It functions similarly to a smart system to assist solar panels in tracking the Sun throughout the day. In this manner, the panels are able to absorb as much sunlight as possible, which increases their efficiency in generating electricity. It's similar to giving solar panels a little extra push to enable them to perform at their peak and provide us with more clean energy. Consider your solar panels as robotic sunchasers. The solar tracking gadget monitors the Sun's path and instructs the panels to follow it. The panels face the rising Sun in the morning, and as the day progresses.



A. Solar Angles and Geometry

At an average distance of 149.6 million kilometers, the earth's orbit Based on sun time, this suggests that at a specific moment (noon), at the same place on around the sun is nearly round. According to Mitchell (1977), the tilt of the earth's axis of rotation with regard to the normal to the plane of its orbit is $\varepsilon = 23.441°$. This may be seen in Figure 1. The ecliptic plane is the name given to the plane of the earth's orbit. The plane that traverses the equator of the earth has an angle of obliquity, or ε, that makes it perpendicular to the plane of the ecliptic. The earth's rotational axis points in a set direction in space based on the conservation of angular momentum. the whole day fixt the solar rays how many solar rays are the conted the energy store.

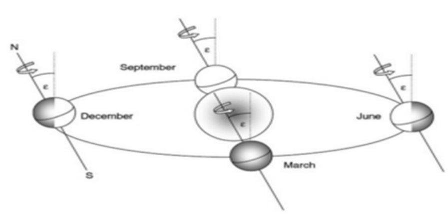


Fig 1. Schematic diagram of earth orbit around sun.

Sun and the viewer's horizontal plane of reference. When the sun sets below the horizon, the altitude angle becomes negative.

B. Azimuth angle of the sun (Ƴs)

It is the angular separation between the south and the groundbased projection of the line of sight to the sun. A position is indicated east of south by a positive solar azimuth angle and west of south by a negative azimuth angle.

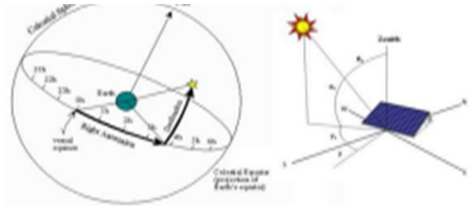


Fig 2. Solar angel

C. The Latitude (w)

It is the angle formed by the radius line joining a point or location. the distance between the line's projection on the equatorial plane to the earth's center. The axis of rotation of the earth passes the The Earth's surface at 90° latitude, or the North Pole, and −90° latude, or the South Pole. Thus, the intersection of a longitude degree and a latitude angle can be used to designate every point on Earth's surface.

II. COMPONENTS OF SOLAR TRACKING SYSTEM

The tracking device, tracking method, control unit, positioning system, drive mechanism, and sensor units constitute the solar tracking system's basic mechanism. The tracking algorithm calculates the angles that are needed to ascertain the solar tracker's position.

III. LITERATURE REVIEW

1) *Evaluate and Select Sources:* Review the abstracts of the articles to determine their relevance to your research question. Select those that provide valuable insights or data related to solat tracking systems.
2) *Read and Summarize the Literature:* Read the selected articles thoroughly and take notes on key findings, methodologies, limitations, and conclusions. Summarize each article in your own words.
3) *Synthesize the Information:* Identify common themes, trends, and gaps in the existing literature. Compare and contrast the findings from different studies.
4) *Write your Literature Review:* Organize your findings into a coherent narrative, following the structure commonly used in academic literature reviews (introduction, methodology, results, discussion, conclusion). Discuss the state of the art in solat tracking systems, highlight areas of consensus or controversy, and propose future research directions.
5) *Cite Your Sources:* Make sure to properly cite all the sources you used in your literature review according to the appropriate citation style (APA, MLA, Chicago, etc.

IV. MATERIAL AND METHOD

Tracking Procedure: Tracking is accomplished first by the sensors. the signal that the microcontroller is receiving. Depending on how many sensors are utilized, the micro-controller gets several inputs from each sensor before sending two signals to the servo-motors so that they can be adjusted in two degrees of freedom. After processing the servo-motors so they can move. Consequently, causes the solar panel to spin along a specified axis in response to commands from the micro-controller, so altering its position. One or more shafts function as a torque transmitter in this way. The solar panel is supported by the shaft as well. When the micro-controller determines that every sensor is getting the same quantity of sunshine, the solar panel's rotation around any axis stops. The electrical energy produced by the solar panel powers the tracking device.

V. BENEFITS

1) *More Energy:* By always facing the Sun ,the panels can grab more sunlight, producing extra energy compared to fixed panels.
2) *Efficiency Boost:* The device helps in optimizing the angle at which panels receive sunlight ,making them work more efficiently.
3) *Extended Power Hours:* Solar panels usually work best during sunny hours. The solar tracker ensures they make the most out of these prime sunlight hours.
4) *Seasonal Adaptation:* In some trackers, panel scan adjust not just daily but also with the changing seasons, ensuring consistent performance

VI. CONCLUSION

Solar systems that track the sun's trajectory throughout the day gather a substantially larger amount of solar energy and provide a significantly higher output power than their conventional fixed position counterparts.

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