



DUAL AXIS SUN TRACKER SOLAR PANEL WITHOUT ARDUINO

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Abstract:

A dual-axis sun tracker solar panel is a special device that can move in two directions to follow the sun as it moves across the sky.

Unlike some trackers that only move in one direction, this one can tilt both up and down and turn from side to side.

Solar energy is a clean and renewable source of power that can be harnessed by using solar panels. However, the efficiency of solar panels depends on the angle of incidence of the sunlight, which changes throughout the day and seasons.

To maximize the power output of solar panels, a dual axis sun tracker system can be used to automatically adjust the orientation of the solar panel to follow the sun in both horizontal and vertical directions.

I. INTRODUCTION:.

- A dual-axis solar power tracker is a mechanism designed to optimize the efficiency of solar panels by automatically orienting them to face the sun throughout the day.
- Unlike single-axis trackers that only follow the sun's movement along one axis (usually east to west), dual-axis trackers can adjust the tilt and azimuth of the solar panels, ensuring optimal alignment with the sun's position in the sky.
- It can track the sun in both horizontal and vertical directions, unlike a single axis tracker that can only track the sun in one direction
- A dual axis sun tracker can increase the power output of a solar panel by up to 40% compared to a fixed panel
- A dual axis sun tracker solar panel is a device that can automatically adjust the orientation of a solar panel to maximize the amount of sunlight it receives.
- it can make up to 25% more energy than a panel that stays in one position all the time

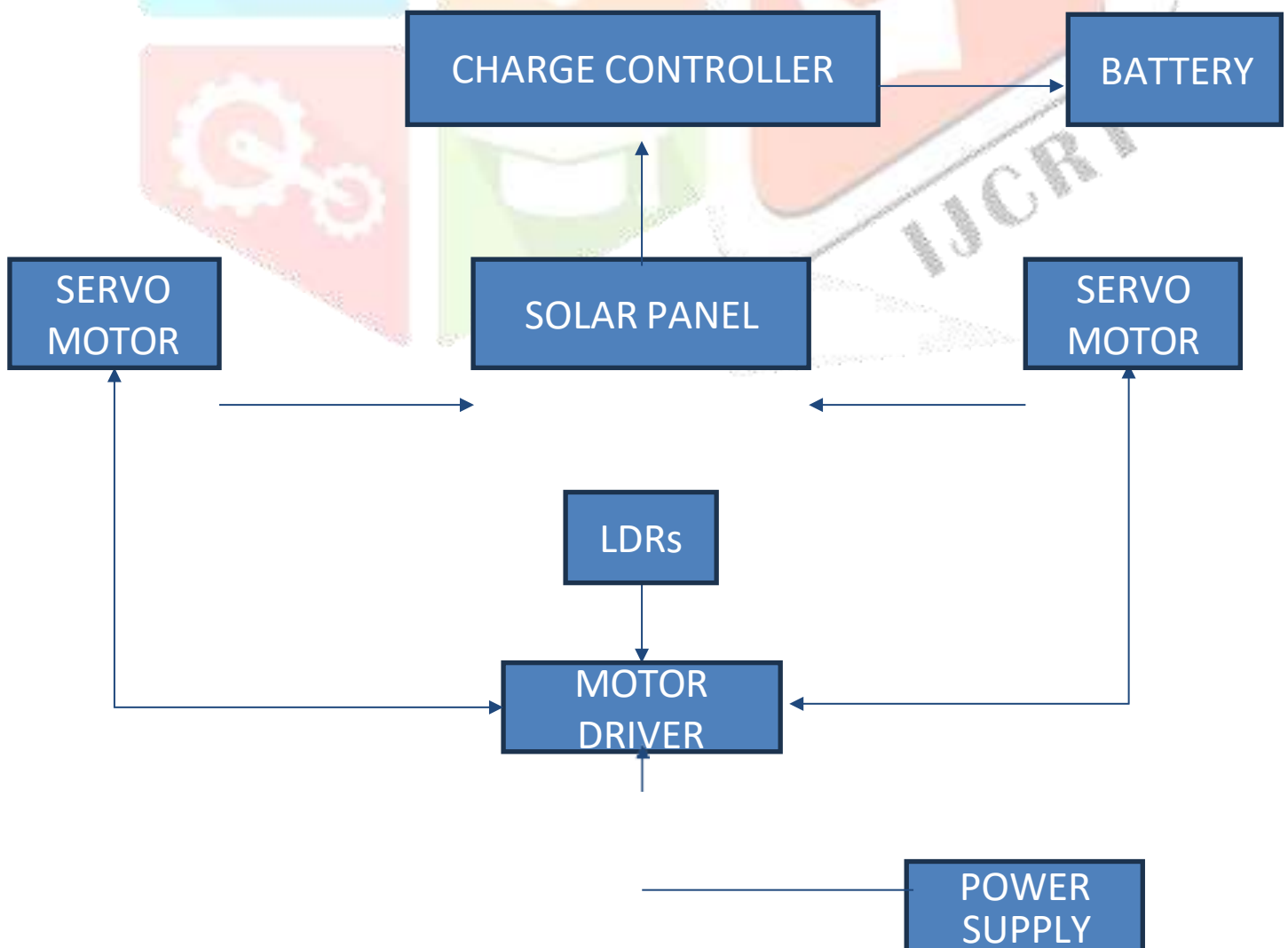
LITERATURE REVIEW

- In our literature review, we delved into several articles to inform the development of our project, particularly focusing on the design of dual-axis sun tracker solar panels without Arduino.
- One standout study in this realm is the research paper titled "Innovative Approach to Dual-Axis Sun Tracking Systems."
- The study suggests new ways to design the parts and electrical system so the solar panel can follow the sun closely.
- The aims of our project to maximize solar energy harvesting efficiency while minimizing complexity and cost.

METHODOLOGY

- To create a dual-axis sun tracker solar panel without Arduino, first, construct a sturdy base with two axes of rotation horizontal and vertical.
- Next, install light sensors to detect sunlight intensity. Connect these sensors to a comparator circuit, which generates control signals.
- Use motor drivers to control DC motors that adjust the solar panel's position based on these signals. Finally, incorporate limit switches to prevent over-rotation.

BLOCK DIAGRAM:



WORKING:

- A solar panel that converts the sunlight into electrical energy.
- Four light-dependent resistors (LDRs) that sense the light intensity from four directions: east, west, north and south.
- A comparator circuit that compares the voltage signals from the LDRs and generates a logic output for each pair of LDRs: east-west and north-south
- A motor driver IC (such as L293D) that receives the logic signals from the comparator circuit and drives two DC motors that control the horizontal and vertical rotation of the solar panel
- Two DC motors that rotate the solar panel according to the signals from the motor driver IC.
- A power supply that provides the required voltage and current for the circuit. The LDRs detect the light intensity from four directions and produce different voltage signals depending on the amount of light they receive.

OBJECTIVES

- Efficiency Enhancement
- Reduce Environmental Impact
- Compatibility
- Low cost Design
- Reliable Performance

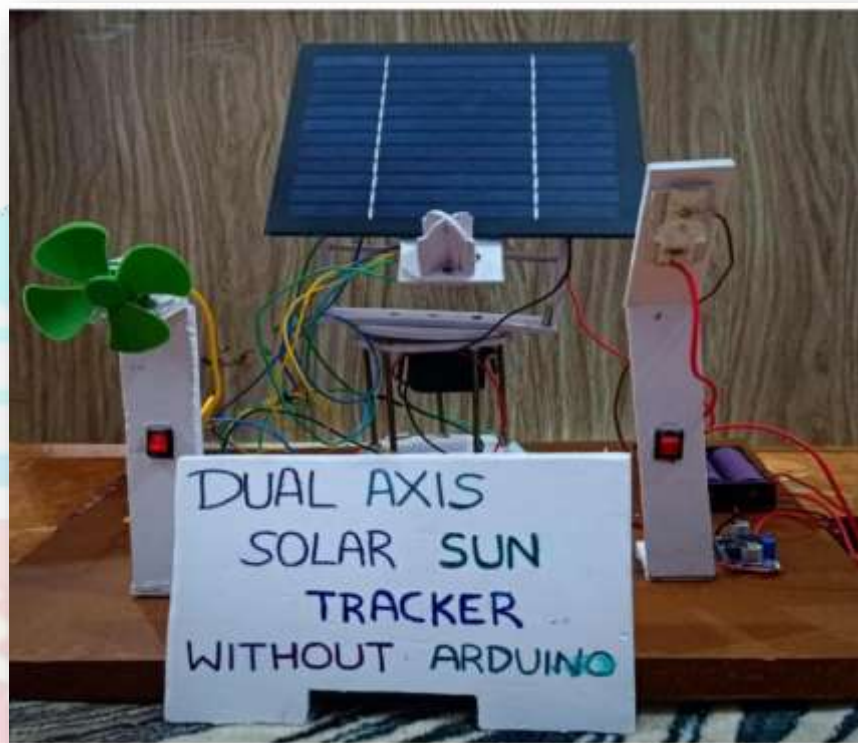
ADVANTAGES

- Higher flexibility and creativity
- Better performance in low solar irradiance areas
- Lower space requirement
- Higher power output
- They can track the sun's position in all directions and produce more energy than fixed or single-axis solar panel
- They do not need a lot of space to accommodate

APPLICATIONS

- Residential Solar Systems
- Agricultural and Farming Operations
- Telecommunications
- Industrial
- Hospitals

RESULTS AND CONCLUSION:



- The paper has presented a novel and a simple control implementation of a Sun tracker that employed a single dual-axis AC motor to follow the Sun and used a stand-alone PV inverter to power the entire system. The proposed one-motor design was simple and self-contained and did not require programming and a computer interface.
- A laboratory prototype has been successfully built and tested to verify the effectiveness of the control implementation. Experiment results indicated that the developed system increased the energy gain up to 28.31% for a partly cloudy day.
- The proposed methodology is an innovation so far. It achieves the following attractive features: (1) a simple and cost-effective control implementation, (2) a stand-alone PV inverter to power the entire system, (3) ability to move the two axes simultaneously within their respective ranges, (4) ability to adjust the tracking accuracy.

REFERENCE

- "Solar Engineering of Thermal Processes" by John A. Duffie and William A. Beckman
- "Photovoltaic Systems Engineering" by Roger Messenger and Jerry Ventre
- "Solar Energy: Principles of Thermal Collection and Storage" by S.P. Sukhatme