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Smart Solar Tracker using Arduino Nano and LDR Sensors

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Abstract: *As the world transitions toward cleaner and more sustainable energy sources, solar energy has emerged as one of the most promising alternatives to fossil fuels. However, the efficiency of solar panels is significantly influenced by their orientation with respect to the sun. Traditional static panels only perform optimally when the sun is directly overhead, resulting in suboptimal energy collection for the majority of the day. To overcome this limitation, solar tracking systems have been developed to follow the sun's movement and maximize energy absorption.*

This project focuses on designing and implementing a smart solar tracker using an Arduino Nano microcontroller and four digital Light Dependent Resistors (LDRs). The system dynamically adjusts the orientation of a solar panel to follow the sun throughout the day. Four LDRs are strategically positioned to detect sunlight intensity from different directions. Based on these readings, the Arduino controls a servo motor to rotate the panel towards the direction with the highest light intensity. The system ensures that the panel remains optimally aligned with the sun as it moves from east to west.

The project is cost-effective, simple to build, and suitable for both educational purposes and small-scale solar applications. By increasing the exposure of the solar panel to direct sunlight throughout the day, the tracker significantly enhances the overall efficiency of the solar power system. The smart solar tracker offers a practical solution to improving solar panel performance using basic electronic components and microcontroller programming....

Keywords: maximize energy absorption

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