Tracking System for Solar Panels

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Problem Statement

Design and implement a self-powered single-axis solar panel tracking system using Light Dependent Resistors (LDRs) to autonomously detect and follow the sun's position, adjusting azimuth or tilt angles to optimize energy capture throughout the day, ensuring efficient operation without an external power source and enabling LDR-based sun tracking technology for increased solar energy generation

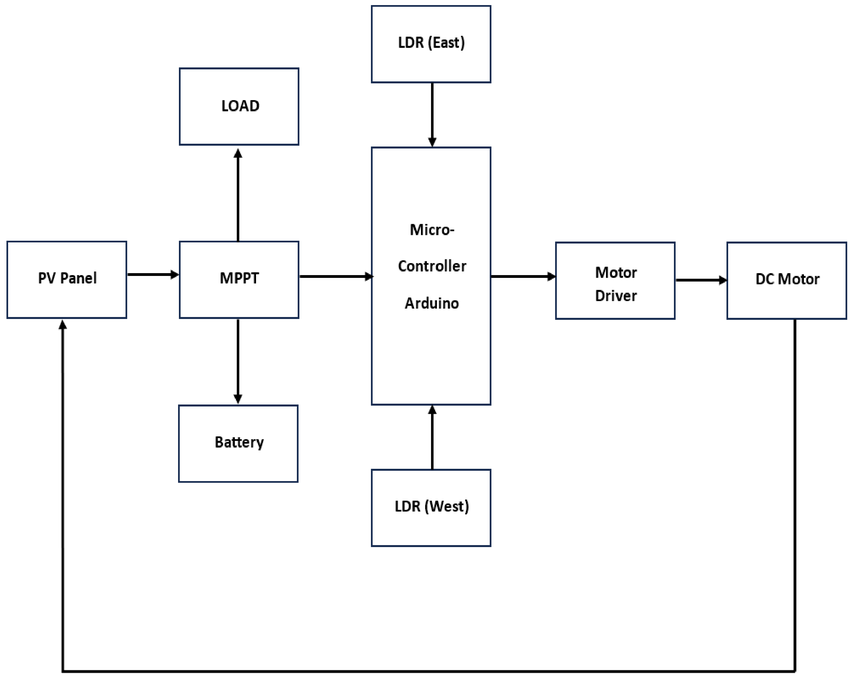
Constraints

- Solar panels should not exceed size (70*70*2.5) Centimeter
- The output power should be at least nominal power of 70 Watts
- The length of the axis tracking should be between 70 cm and 30 cm
- Power should be calculated in under 0.5 second

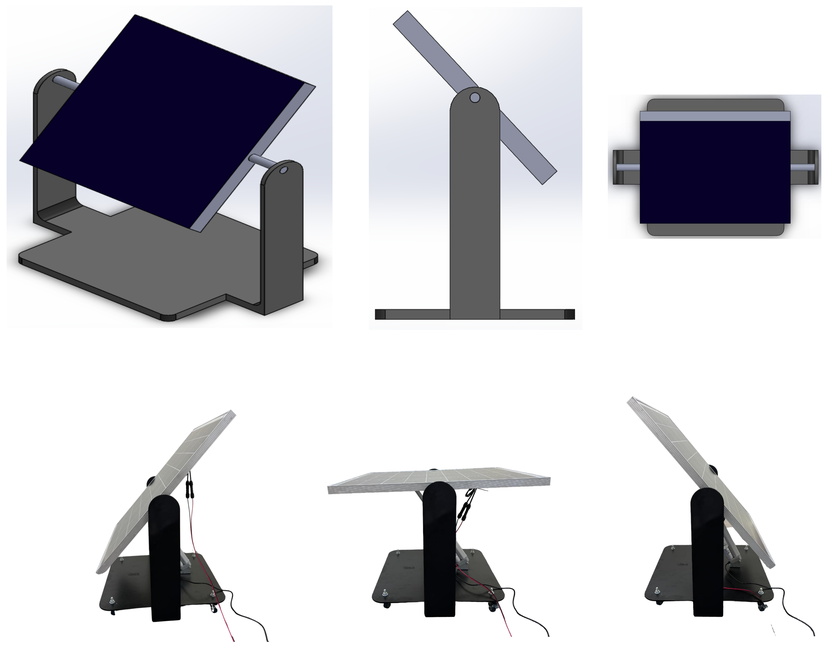
Specifications

- Self-powered
- Utilizes Polycrystalline solar cell material
- Contains one solar panel to provide sufficient energy
- Single Axis Tracking within a range of 120 degrees
- Power consumption should not exceed 30% of captured power

Conceptual Design



Implementation



Testing and Validation

Specification	Does it meet & Why?
self-powered	The system's self-power feature depends on weather conditions. For example, if it is cloudy, the generated power may not be sufficient to run the system.
Utilizes Polycrystalline solar cell material	The purchased solar panel is made of polycrystalline material.
Contains one solar panel to provide sufficient energy	The purchased solar panel has a power rating of 100 Watts, which is sufficient to power the tracking system. The tracking system, in turn, consumes a maximum of 20 Watts.
Single Axis Tracking within a range of 120 degrees	In our prototype's final design, the solar panel is connected to a horizontal rod using an ARDUINO. It is also attached to two vertical rods (90 cm to 100 cm), allowing a 60° rotation on each side.
Power consumption should not exceed 30% of captured power	When the actuator is powered, the total output power decreases to over 80 Watts, meeting the required target.

Conclusion and Future Work

Our single-axis solar tracker has utility-scale potential. Future work involves boosting efficiency through regular solar cell cleaning.

Acknowledgements

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