

Automatic Solar Tracker

1 Introduction

Green energy has rapidly become a widely sought out alternative for non renewable energy sources throughout the world. Incidentally, there is an increased demand for solar power. Current implementations of solar technology have one major challenge; the generated energy depends on the intensity of the sunlight and angle of incidence, making it difficult to optimally generate electricity under different lighting and positional circumstances. In this project, you are tasked to come up with an analog PID control circuit which can rotate a solar panel to achieve the highest efficiency. The panel should be rotatable along a single axis, dynamically adjusting the angular position by the control circuit to maximize the efficiency.

2 Specification

Design a PID controller which rotates the solar panel along a single axis; the controller should be capable of dynamically adjusting the panel's angular position to achieve highest efficiency.

- Panel Specification (15W maximum power rating, 5V - 12V panel voltage)
- Complete design should be based completely on analog electronics components (transistors and operational amplifiers)
- Single axis design (single motor is sufficient)
- 1 second latency (maximum latency) to track the sunlight and adjust the panel.

3 Additional Notes

- Any change of project specification is negotiable only before the mid review
- All circuits must be simulated using software (e.g., Multisim, LTspice, PLECs, ..., etc.)
- All circuits should be tested on the breadboard and reviewed by the assigned supervisor before moving further

- Circuits must be designed using professional EDA software (e.g., Altium Designer, OrCAD,...,etc.) Schematics should be verified and evaluated by the assigned supervisor
- Design for manufacturability should be considered when designing the PCB
- Complete set of design and manufacturing documents Schematics, Layout, 3D file Gerber files, Assembly files BoM must be generated and properly documented.
- Students are encouraged to procure components from international component distributors (e.g., Mouser, DigiKey, Arrow Electronics, LCSC,...,etc.)
- Students are encouraged to get the PCBs manufactured from international PCB manufacturers (e.g., JLCPCB, PCBway,...,etc.)
- Main functionality of the project must be achieved with basic electronic components such as resistors, capacitors, inductors, diodes, transistors and other analog integrated circuits. Using any other pre-built programmable ICs are prohibited.
- Microcontrollers can be only used for user interface operation.
- Enclosure design must be done using a professional software (e.g., Solid-works) Enclosure and 3D model of the circuit must be assembled and inspected before manufacturing.
- 3D printing, Laser cutting and Sheet metal bending can be used to manufacture the enclosure.
- Student are encouraged to consider the 3D model and PCB co-design (design in parallel by taking their integration into consideration) when designing
- Final implementation of the project need to done in a PCB
- Follow provided “General guidelines”.