Automated Solar Tracking System

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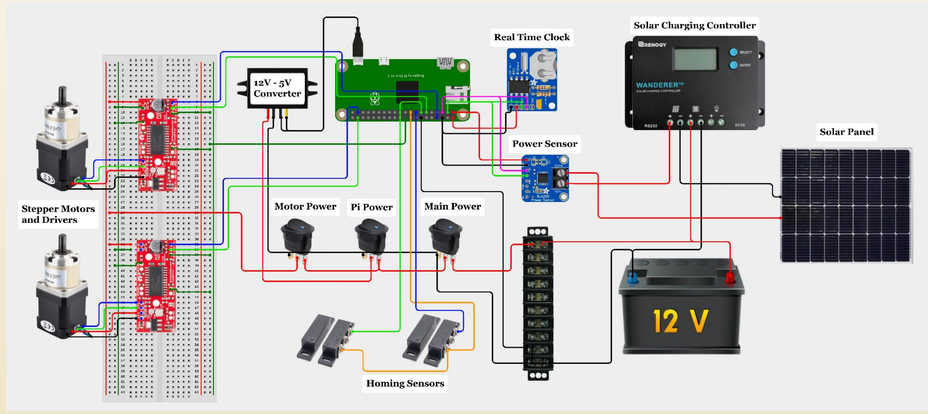
https://github.com/mattbowie/solar-tracker

Project Description

The purpose of this project is to efficiently track the sun with an automated solar tracking system. This project features two stepper motors that tilt and twist the panel towards the sun throughout any day of the year in any location. A Raspberry Pi Zero is the brains of the project, using a mathematical model of the sun to calculate it's location and control the motors. The solar panel is connected to the battery through a solar charger so the battery will stay charged, allowing the system to be self-sufficient. The system is completely autonomous once a flash drive with the coordinates is inserted into the raspberry pi and the system is powered on. The QR code on this poster links to the GitHub repository where our code is published.

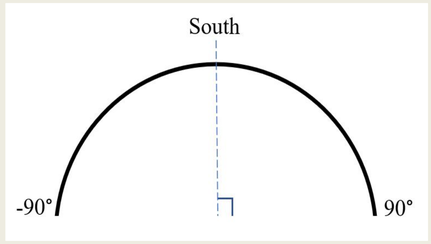
Design Overview



Mathematical Model

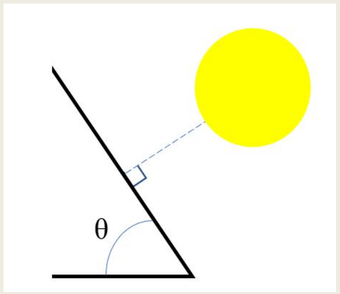
Inputs: Lat/Long Coordinates, Day of Year, Current Time

Twist Model



The twist angle is generally in the range from 90° East at sunrise and 90° West at sunset. However, in the summer months the sun will rise and set slightly past these limits.

Tilt Model



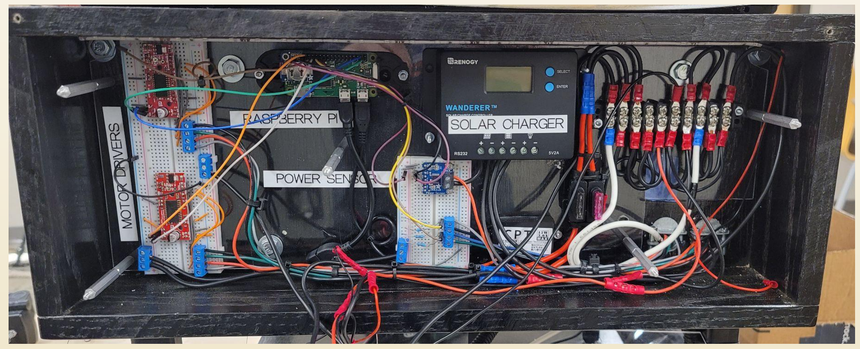
The tilt angle is always between 0° and 90°. In Springfield, MO the angle will never reach 0° as we are North of the equator. The panel will be positioned at 90° during both sunrise and sunset.

Acknowledgments

Dr. Douglas Carroll

Dr. Tayo Obafemi-Ajayi

Hardware Implementation



Value Proposition

The solar tracking system is designed to tilt and twist the panel throughout the day to efficiently track the sun. Most solar panels are designed to be stationary on roofs or stands, but the improved design allows the solar panel to follow the sun as it moves throughout the day. This allows the solar panel to capture as much sunlight as possible. This tracking should allow the panel to capture more energy than it would if it was stationary.

From Left to Right: Aaron Ivie, Matt Bowie, Jeremy Long, Bronson Tavenner