Solar Tracker

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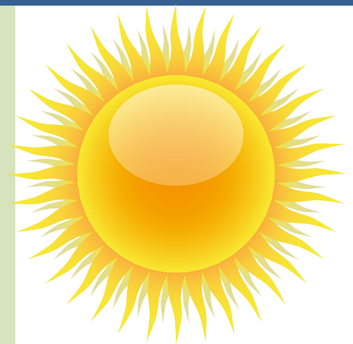
Computational Methods, ENGR-200



Abstract

In this project I'm creating a solar tracker. The system will move so the solar panel is always facing the sun, to maximize the conversion of energy. The solar tracker will be programmed in MATLAB and built using photoresistors and a servo motor controlled by an Arduino.

Code

The code for the project was written in MATLAB. In the first line clear is used to remove any previous variables stored in the workspace. Then the `arduino` function is used to connect the Arduino hardware to MATLAB. In line 6 `tic` is used to start the time. In the next line we have `while toc<20`. This will run the while loop for 20 seconds. In line 8 voltage values from each of the four photoresistors are stored into the matrix `v_read`. The voltage values are found using `readVoltage(a,pin)`. From line 11 to 25 if/else statements are used to compare the 4 different voltage values. Depending on what value is greater the servo motor is told to go to a certain position, using write`PWMDutyCycle(a,pin,dutyCycle)`.

```
1  clear
2  a=arduino;
3
4  %%
5
6  tic
7  while toc<20
8      v_read = [readVoltage(a,'A4'),readVoltage(a,'A3'),readVoltage(a,'A2'),readVoltage(a,'A5')];
9
10
11     if v_read(1) > v_read(2) && v_read(1) > v_read(3) && v_read(1) > v_read(4)
12         writePWMDutyCycle(a,'D3',0.2);
13
14     elseif v_read(2) > v_read(1) && v_read(2) > v_read(3) && v_read(2) > v_read(4)
15         writePWMDutyCycle(a,'D3',0.43);
16
17     elseif v_read(3) > v_read(1) && v_read(3) > v_read(2) && v_read(3) > v_read(4)
18         writePWMDutyCycle(a,'D3',0.66);
19
20     elseif v_read(4) > v_read(1) && v_read(4) > v_read(2) && v_read(4) > v_read(3)
21         writePWMDutyCycle(a,'D3',0.9);
22
23     else
24         writePWMDutyCycle(a,'D3',0.5);
25     end
26
27 end
```

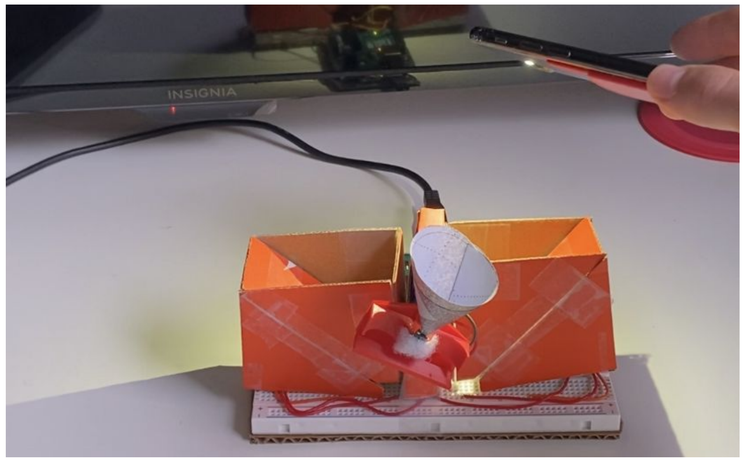
Methods and Materials

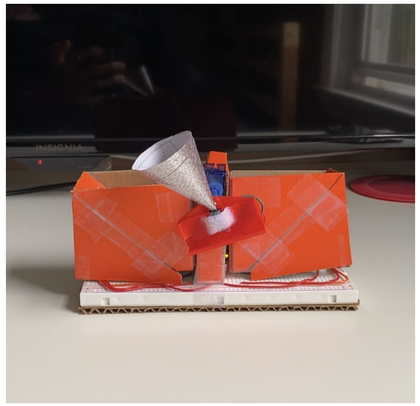
The materials used for this project was a SG90 servo motor, an Arduino Uno Rev3, photoresistors, 1k resistors, jumper wires, cardboard, tape, paper, breadboard and an exacto knife. The software used was MATLAB.

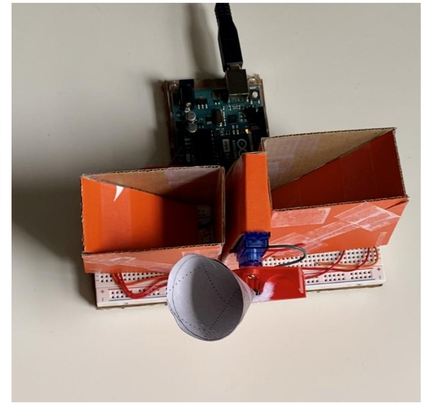
The first step in the project was to write a code in MATLAB making the servo motor move to a certain position determined by the amount of light detected by two photoresistors. The breadboard was then wired with the servo motor and two photoresistors. Two triangles where build out of cardboard to shade the photoresistors and match the servo position determined in the code. Once it was running smoothly, the code was modified and two more photoresistors were added to the breadboard. Two triangular cardboard rooms were added, giving the solar tracker four separate spaces to detect the sun. After that a photoresistor was attached to the servomotor inside a paper cone. The four different servo positions were then matched to each of the shading cardboard rooms, to always give the servo photoresistor the maximum amount of light.

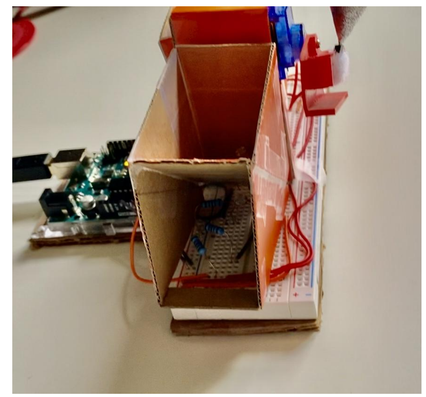
Conclusions

This project was a great opportunity for me to implement the skills acquired in ENGR-200. My plan is to add another axis to the tracker and output a graph in MATLAB comparing the data of the photoresistor connected to the servo motor to a graph of a photoresistor without the tracking system.









Video of Solar Tracker

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