Senior Design Test Plan

Overall Test Plan: Our general testing strategies employed by our project are hardware performance, software to hardware integration, then algorithm optimization. First we will test if the hardware used is working correctly. Going through each circuit design outlined. Once the hardware is confirmed to have no physical issues, we will test integration of the arduino libraries for each component. Ensuring they can communicate with the arduino components properly. We will then move on to algorithm optimization for moving the solar panels.

Initial Testing of Hardware

H1.1 Hardware Test 1 Current Reader
H1.2 We need to ensure it is sensitive enough to detect changes in current.
H1.3 Testing the Current Reader ACS712 5v, which is the most important component, as it is getting data from the solar panel's current.
H1.4 Inputs: Solar panel angles/orientation. Shade and sunlight
H1.5 Outputs/Expected Results: Current reader shows notable differences when solar panel is placed at different angles/orientation
H1.6 Abnormal Results: current differences are not detectable

H2.1 Hardware Test 2
H2.2 Testing with one servo motor
H2.3 Test our second circuit with one servo.
H2.4 Inputs: Arduino code to move the servo to various positions
H2.5 Outputs/Expected Results: Servo moves to code input and correct position
H2.6 Abnormal Results: Servo stalls, or fails to move.

H3.1 Hardware Test 3
H3.2 Testing with two servo motors
H3.3 Testing with two servo motors. This is the diagram of our final circuit.
H3.4 Inputs: Arduino code to move the servos to various positions
H3.5 Outputs/Expected Results: Each servo moves to code input and correct position
H3.6 Abnormal Results: Servos stalls, fails to move, or move incorrectly.

H4.1 Hardware Test 4
H4.2 How does the system behave when solar is obscured
H4.3 Testing for shade/ cloudy weather
H4.4 Inputs: Place in shade or overcast weather
H4.5 Outputs/Expected Results: The servos attempt to adjust to the optimal position
H4.6 Abnormal Results: The device keeps readjusting or can’t find an optimal position.

H5.1 Hardware Test 6
H5.2 Find optimal rate of adjustment
H5.3 How fast the panel should adjust/update
H5.4 Inputs:Current reader data, Panel movement
H5.5 Outputs/Expected Results: Panel movement should be smooth and slowly adjust as needed
H5.6 Abnormal Results: jittery fast movement, constant adjustments.

H6.1 Hardware Test 7
H6.2 Rainy weather
H6.3 Test for waterproofing
H6.4 Inputs: Rain
H6.5 Outputs/Expected Results: Encased electronics are dry
H6.6 Abnormal Results: Encased electronics are not dry

Initial Testing of Software

S1.1 Software Test 1
S1.2 Testing if battery level is sustaining
S1.3 Can the battery sustain itself all day, output more than it inputs.
S1.4 Inputs: Electricity from the solar panel
S1.5 Outputs/Expected Results: Charged battery, battery is at a higher level than it started
S1.6 Abnormal Results: Device dies during the day.

S2.1 Software Test 2
S2.2 Testing if position information is being recorded
S2.3 Test libraries for arduino servos
S2.4 Inputs: Servo position
S2.5 Outputs/Expected Results: Servo position matches position in code
S2.6 Abnormal Results: Mismatch between logs and servo position

S3.1 Software Test 3
S3.2 How fast the panel should adjust/update (algorithm)
S3.3 For maximizing efficiency find the optimal rate for adjusting the panel throughout the day
S3.4 Inputs: Current reader to Algorithm
S3.5 Outputs/Expected Results: Panel moves slowly enough to maximize battery life
S3.6 Abnormal Results: Panel kills battery early from moving too much.

S4.1 Software Test 4
S4.2 Panel movement if it’s smooth/jumpy etc. (algorithm)
S4.3 Test algorithm output
S4.4 Inputs: Current reader, servo’s last positions
S4.5 Outputs/Expected Results: Servos move smoothly
S4.6 Abnormal Results: Servos have jittery/jumpy movement