Sun Tracking Solar Panel

Daniel Bullock, Rohan Gore, Tyler Newlin

Objective

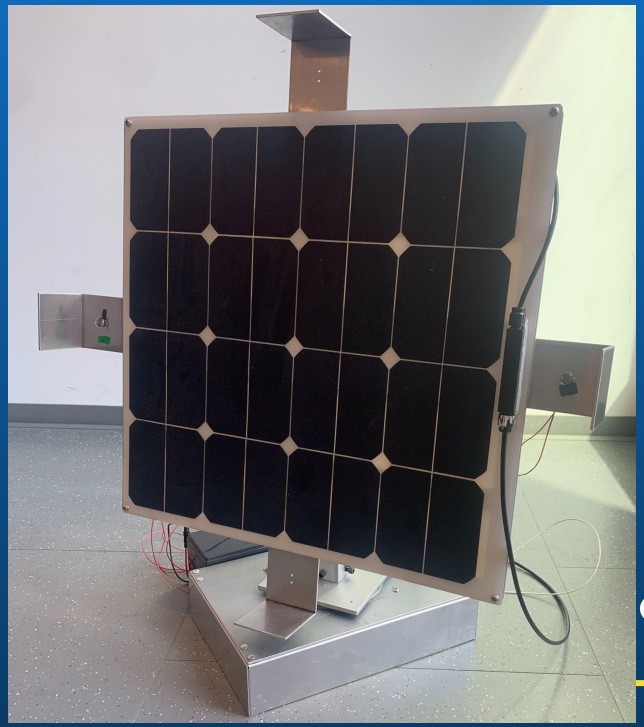
Our project's goal is to improve the efficiency of solar panels by allowing them to follow the sun using dual axis solar tracking

Requirements:

- The panel must utilize the photoresistors to be perpendicular +/-10° to the sun at all hours of the day
- The panel must generate and store power in a battery used to power its functions, while still producing at least 15% more net power than a stationary solar panel
- A stream of data containing the power generation and efficiency of the panel must be generated and sent to a mobile app which will display live graphs and data

Our Solution

- A solar panel which rotates to face the sun
- Detects the sun using photoresistors, not requiring any setup
- Sends solar panel voltage, current, and power production to a phone application
- Phone application can turn off sun tracking



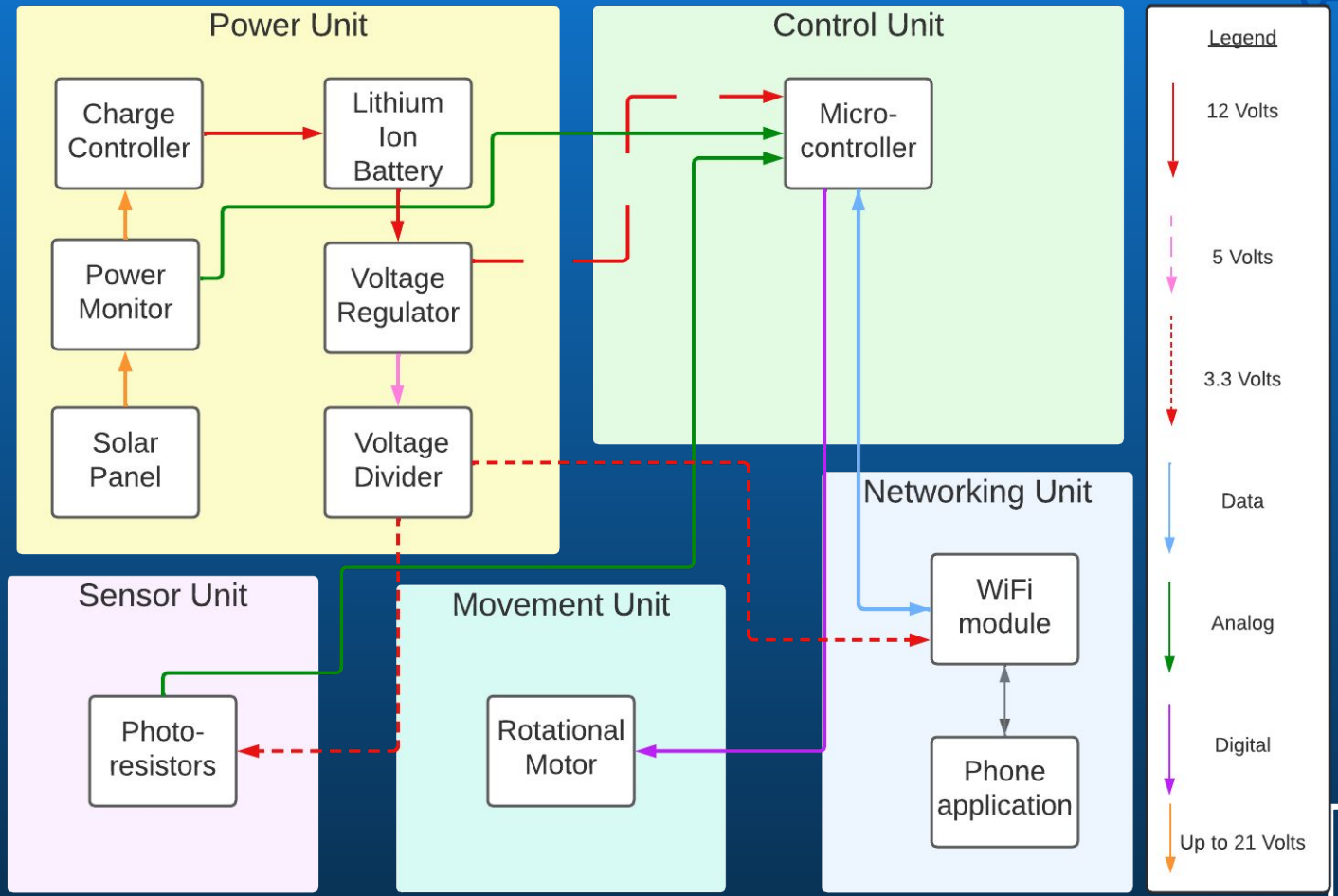
Challenges faced

- MCU arrived extremely late
- First power chip showed up broken
- Voltage regulators burnt out
- Shorted the first MCU
  - Desoldered an MCU of of a RedBoard
- MCU would not program properly
  - Decided to use a RedBoard as our primary microcontroller
- Motor driver burnt out
- Tilt motor not strong enough

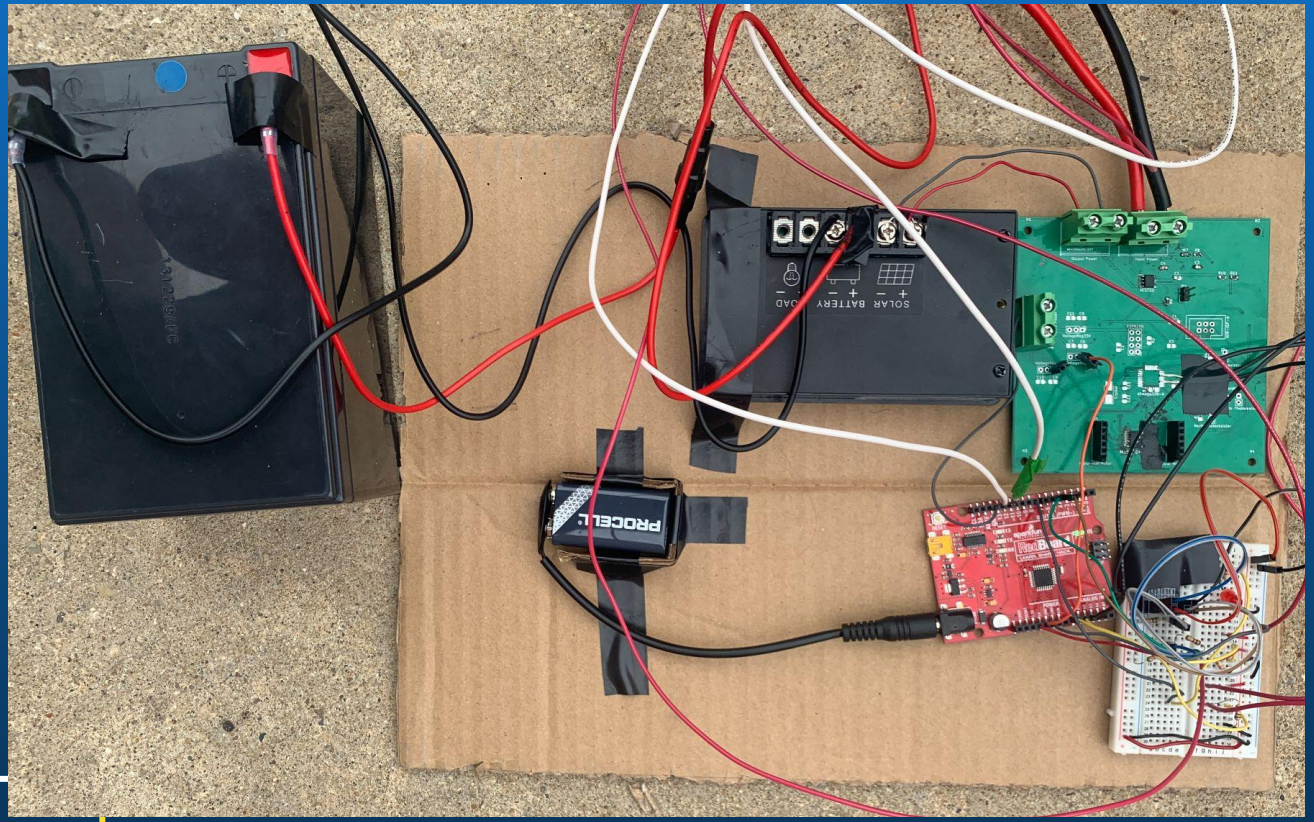
Changes made

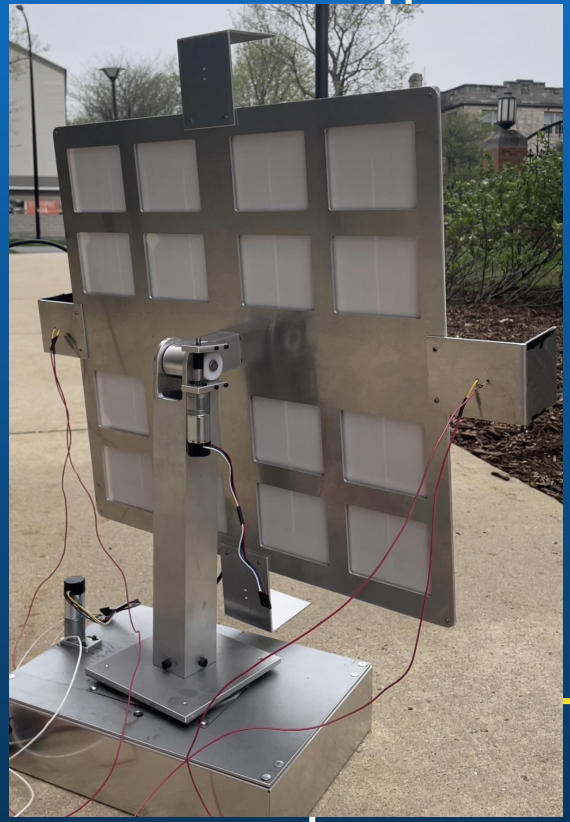
- Redboard instead of MCU
- Photoresistors and wifi chip on separate breadboard
- Using Redboard instead of motor driver
- Used perfboard for voltage regulators
  - Voltage divider for 3.3
- Different power chip
- Phone application instead of web application
- Taped photoresistor shading flaps

Final Block Diagram



Final Circuit Design



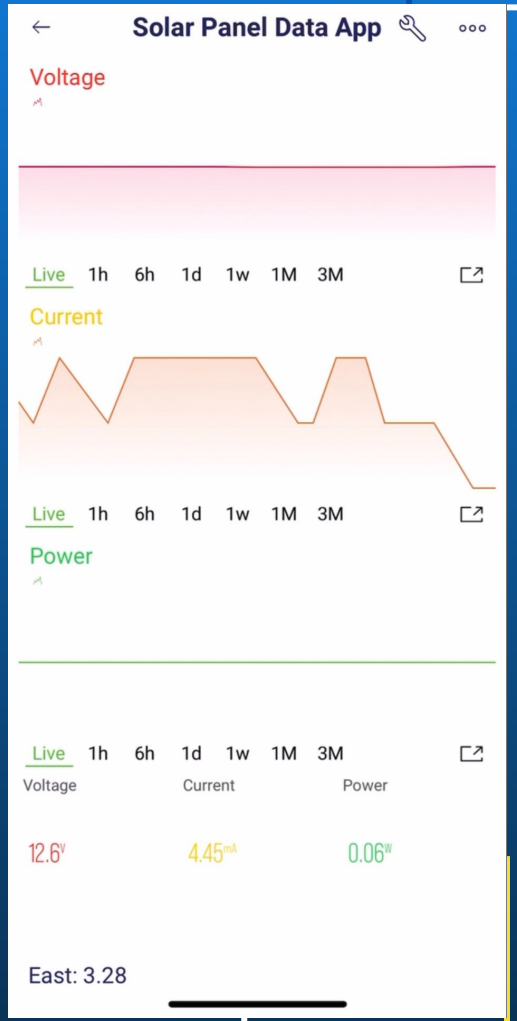


Sun Tracking Implementation

- Voltage across photoresistors decreases in low light levels and increases in high light levels
  - Can be measured with microcontroller
- Motors are moved in the direction that makes photoresistor voltages closer to each other
- At the optimal angle, voltage across photoresistors is close to equal

Mobile App

- Uses Blynk app and API
- TCP/IP protocol and AT commands to connect to WiFi network
- User connects to same WiFi network as the module
- Remote control and auto tracking button toggles



Results

- Can track light along the horizontal axis but not the vertical axis
- Theoretically it would increase power production
- Accurate graphs displaying power generated by the solar panel were able to be seen on the mobile app

Future Work

- Fix tilt motor
- Test over a whole day alongside a stationary panel
- Get everything on a singular PCB
- Optimize photoresistors’ shading flaps
- Implement Maximum Power Point Tracking
    - Our charge controller uses PWM

Thank you!