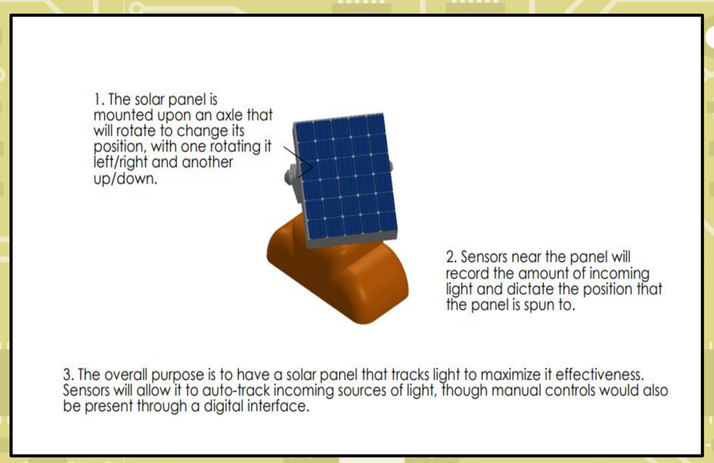
Solar Tracker

EGR 314 Spring 2025: Embedded Systems Design Project II

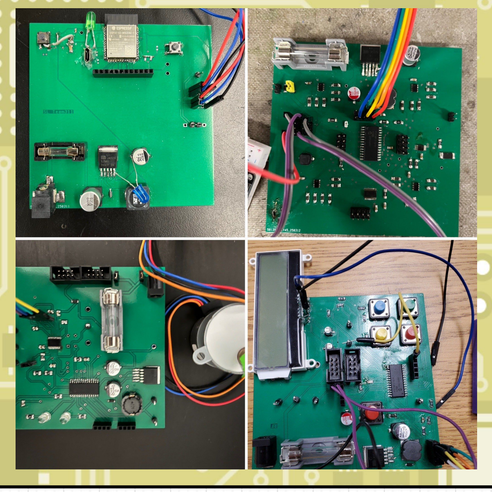
Rohan Fernandez, Shon Ha, Maximus Mathews, Shelton Larance

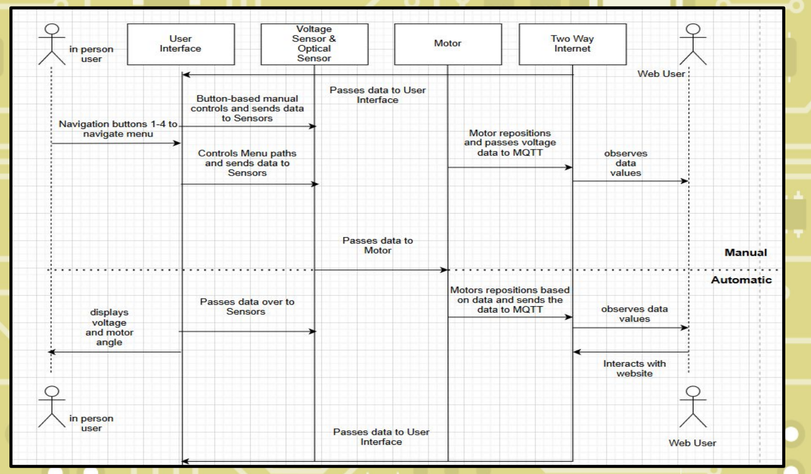


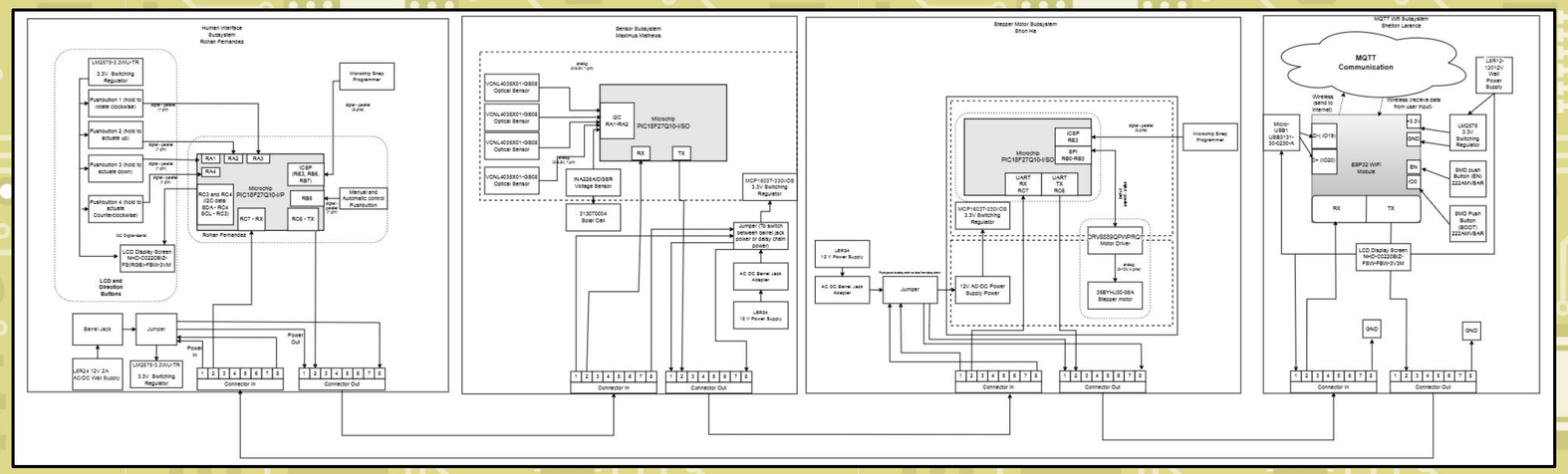
Our project is a hands-on solar panel system that tracks sunlight using sensors and a stepper motor. Students can control it with buttons or remotely through Wi-Fi. An LCD shows real-time voltage data, helping visualize how solar energy works.

“Our mission is to spark curiosity and excitement for STEM by creating an innovative, web-interactive device that not only captivates students but transforms complex concepts into a fun, hands-on experience.”

The system is built with four parts—motor control, sensors, HMI, and Wi-Fi—connected through a UART daisy network. It’s designed to be fun, educational, and accessible, specifically for ages K-6. Critical needs for our museum visitors include ma







The block diagram features four distinct subsystems each being done by one teammate. The motor subsystem, HMI, and sensor subsystem use the PIC18F27Q10 while the MQTT functions with an ESP32. The four subsystems communicate via UART by taking in character buffers and interpreting them based off each subsystem’s functionality. Power is also shared throughout the daisy chain with each subsystem being fully modular in case of emergencies and to test functionality separately. All subsystems are equipped with a 3.3V Voltage Regulator to power internals of the IC chips and microcontrollers.

The Process Diagram demonstrates how the individual boards communicate with each other, going from in person users to wifi users. The HMI can control the motor using two buttons while the MQTT to toggle the automatic and manual modes of the device. The sensor measures the light levels and voltage levels to later pass down to the other subsystems. This includes the motor, MQTT, and HMI. Together, our system has five message types: mode toggle, optical sensor data, voltage sensor data, manual control, and unique team identifiers to understand who is sending messages.

Ira A. Fulton Schools of Engineering
Arizona State University