

Weather Station and Smart Home

Project Goal:

1. Create a solar-powered, weather data acquisition system that wirelessly transmits collected data.
2. Make a smart home that receives weather data, and automatically adjusts “interior climate” settings.

How it works:

The wireless communication between systems is accomplished using LoRa, or Long Range data transmission. LoRa is a communication method that lets ‘small’ devices talk over long distances (miles with a good line of sight) and uses very little power. The weather station measures temperature, relative humidity, pressure, ambient light, particulate matter, and gas VOC. The smart home then displays the more ‘desirable’ data on an LCD character display and adjusts its interior lights and shutters.

Microcontroller / Language:

Raspberry Pi Pico 2 for UART pins to use Reyax RYLR LoRa modules with. CircuitPython.

Simplified code walkthrough:

Weather Station: Read equipped sensors and format measurement values. Process those values into a formatted string, so the model house can parse the data. Send that formatted string using LoRa wireless data transmission. Go to sleep for a while, the weather typically changes at a ‘slow’ rate.

Smart Home: Upon POR, modulate LEDs and Shutter servo to show they work. Wait for incoming data. Extract the payload from the incoming data string. Parse the payload into a dictionary (key:value pairs) so that it can act on the data. Change the LEDs and Shutter position. Update the LCD to display temperature, relative humidity, AQI, and light percentage. Continue waiting for incoming data.

Issues encountered:

Power supply issues with the smart house– removed fan function due to time constraints. Converting code from MicroPython to CircuitPython and to that extent– learning another programming language.

Unique Features:

Complete automation– the only human interaction needed is to ‘plug it in’. Intelligent data manipulation for actuator adjustments. The use of LoRa communication, measured ranges of 1500+ feet in a rural area while still having strong signal strength. Additional device that hosts a website for weather data, showing latest data, hour averages, and a temperature chart.

Cost: \$496.46

Github Repo:

