MyFlora
Personal Terrarium Monitor

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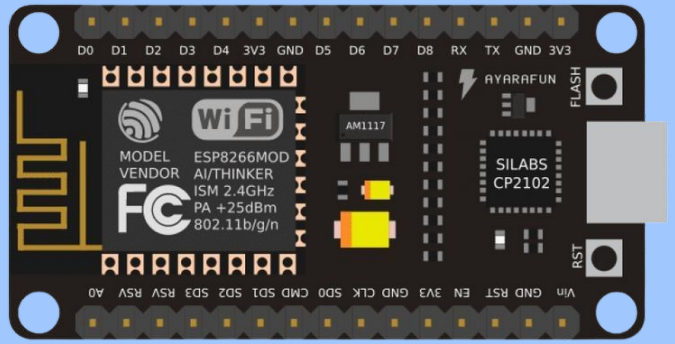
Over winter break, I left my terrarium in Chico and I came back to significant growth and changes. Curious about this new growth, I decided to build something to help monitor this data.

Introduction

- IOT Device to measure and log the atmospheric pressure, humidity, and temperature of a terrarium.
- Mobile App that communicates with IOT device to provide real-time measurements, and data logging over time.

Goals & MVP



IoT Overview

1.

An ESP8266 will be used as the main microcontroller. It will host an HTTP web server to communicate with a mobile app.

2.

A DHT11 or DHT22 sensor will be used to measure the atmospheric pressure, humidity, and temperature inside the terrarium.

3.

Data will logged every five to ten minutes and be written to an 8GB microSD card. 8GB will be sufficient for ~6,000 years of nonstop logging.

4.

The system will be fully independent and run perpetually, powered by a solar panel with a voltage regulator and battery for energy storage.

App Overview

1.

Flutter will be used to build the frontend. Flutter's Foreign Interface (FFI) will allow us to integrate C++ logic.

2.

Flutter will periodically send HTTP Get requests to display data from the IOT device.

3.

Data transmitted from the IOT device will be able to be analyzed in a graph. Realtime and past data will be available to view.

Challenges and Considerations

Ensuring that the IoT Device is still functional in a moist environment will be a challenge. I will have the ESP8266, microSD reader, and power components on top of the lid, while then sensor will be mounted to the bottom. A hole will be drilled in the lid to pass wires through and it will be sealed.

Challenge #1

The IoT Device will be responsible for logging measurements, writing data to a microSD card, and sending data to the mobile app over WiFi. I am hoping that a solar panel, voltage regulator, and battery will be enough to power the device to where it does not require human intervention.

Challenge #2

I have some experience with embedded systems and microcontrollers. However, I haven't used an ESP device before. Getting the power delivery and HTTP communication setup will be a first for me.

Challenge #3

Being able to test this product throughout the semester will be a challenge. I will bring in the IoT device as I make progress on it. For my mobile app, I will have my latest builds uploaded to GitHub. During our meetings, I will be sure to bring in my entire setup to showcase it working.

Challenge #4

The above points outline the challenges and areas of difficulty in this project.

Stretch Goals

Standalone Version

I'd like to develop a version that has an LCD screen on the IoT device to display the metrics, rather than send them to a mobile app.

AI Integration

In addition to the sensor, a camera would be installed on the bottom of the lid. Apps such as "Seek" offer flora classification through your camera. Using their API would allow me to detect what new species are growing in the terrarium.

Collection

I'd like to expand production of the devices and have more people use them to. I'd also like to view multiple devices from the app.

Account System

I'd like to integrate an account system to have cloud storage and see friends' terrariums.

Phase 01

This will consist of sourcing the components and assembling the IoT device. In this initial build, we will hold off on incorporating the solar panel. At this point, the device should measure and log data consistently.

Phase 02

Now that we have an embedded system that is functioning, we will setup the web server on the ESP8266 so that it can communicate with the mobile app over WiFI. By the end of phase two, we should be able to consistently read sensor data from our mobile app.

Phase 03

With our embedded system and app working in conjunction, we are ready to start polishing the setup. A case for the device will be 3D printed and moisture-proofing will be complete. Our app should also look presentable and visually appealing at this point.

Phase 04

An instance of the IoT device should be fully installed onto a terrarium where it will go through testing. This phase is a stress-testing period will I will ensure the device and mobile app will continue to function as they should. Hopefully, I will have at least two terrariums being monitored simultaneously (separate IoT devices, same application)..

Timeline