Map My Air

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Introduction

Map My Air is a system that would be attached to a vehicle to monitor the air quality where you travel. Our goal is to measure certain features such as the amount of harmful particles in the air, the temperature, humidity, gas detection as well as the overall brightness. After collecting all the sensor data, we send it to the cloud through LoRaWAN. Each set of values will have a set of GPS coordinates associated with it. Once we have the data in the cloud, we use Thingspeak to collect that data. Next, we put the data through a python script to format the data. Then we display a live map of the data and the GPS coordinates. We plan to try and predict our parameters for "unexplored" areas of the live map using some machine learning algorithms.

Methods

Sensors that we used for this project:

- Air Quality Sensor
- GPS Sensor
- Temperature & Humidity Sensor
- Gas Sensor
- Light Sensor
- LoRaWAN Transmitter

Methods

These values are then transmitted through LoRaWAN to the cloud. Figure 1 shows the transmission of some of our data. Figure 2 shows how the data comes through on Thingspeak. We then run the data through a python script to format the data properly, the last step is to show our data onto a "live map"

```
19:31:45.129 -> Altitude: 160.60
19:31:45.129 -> Particles > 2.5um / 0.1L air:2
19:31:45.129 -> mac tx cnf 4 Lat Transmission
19:31:46.108 -> ok
19:31:47.342 -> mac_tx_ok
19:31:47.342 -> mac tx cnf 4 Long Transmission
19:31:48.405 -> ok
19:31:50.064 -> mac_tx_ok
19:31:50.064 -> mac tx cnf 4 Alt Transmission
19:31:51.061 -> ok
19:31:52.263 -> mac_tx_ok
19:31:52.263 -> mac tx cnf 4 Air Quality Transmission
19:31:53.314 -> ok
19:31:55.076 -> mac_tx_ok
19:31:55.076 -> Fix: 1
19:31:55.076 -> 4300.1865N, 7847.2593W
19:31:55.076 -> Altitude: 160.60
19:31:55.076 -> Particles > 2.5um / 0.1L air:0
```

Figure 1: Arduino Serial Interface displaying successful transmissions

```
▼ 1:
    created_at:    "2021-11-12T22:13:41Z"
    entry_id:      2
    field1:        "179D80F0B2"
▼ 2:
    created_at:    "2021-11-12T22:13:59Z"
    entry_id:      3
    field1:        "04300D08F0B0"
▼ 3:
    created_at:    "2021-11-12T22:14:15Z"
    entry_id:      4
    field1:        "07847D24F0B1"
▼ 4:
    created_at:    "2021-11-12T22:43:14Z"
    entry_id:      5
    field1:        "04300D18F0B0"
```

Figure 2: Sensor Data in Thingspeak

Data Analysis

We plan to use machine learning algorithms to predict the air quality of future locations. Parameters that we could consider for this are:

- Type of roadway
- Types of buildings
- Tourist attractions
- Population Density

We would also like to reduce any bias coming from the type of vehicle used

Results

Our current results is that we can successfully transmit all of our data through LoRaWAN to the cloud and process the information inside of a python script. We are still working on the live map and predicting the air quality of future locations
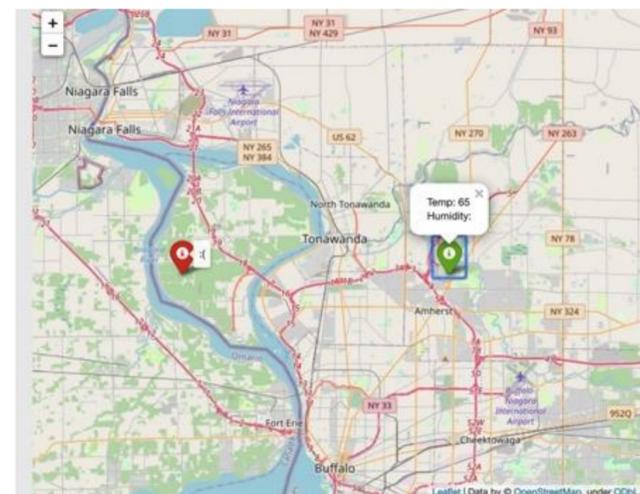
Figure 3: Live Map with Sensor Data.

Conclusion

Our project goal was to display a live map with data related or associated with air pollution. Thus far, we have verified all the sensors in our system. We have also transmitted all this data using LoRaWAN to the cloud. We are still working on the live map portion as well as analyzing the data.
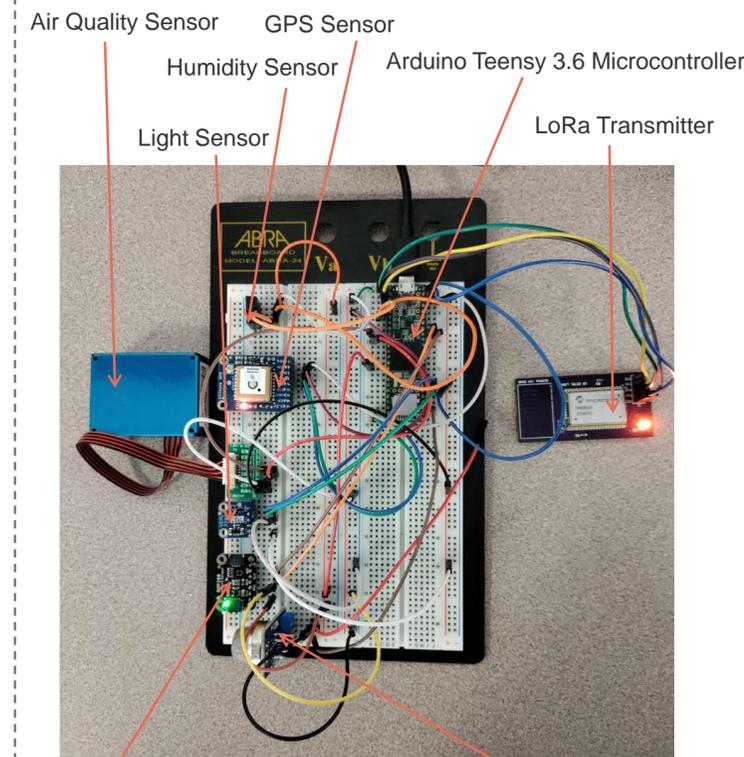
Figure 4: Map My Air Hardware System.

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