# **Low-Cost Microclimate Monitoring System**

New York Department Of Environmental Conservation

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#### Introduction

- Our developments into our Data Acquistion Subsystem for the field unit for the Low-Power Microclimate System.
- Why is this important
  - Knowing how climate change affects microclimates helps us better protect local environments and agriculture.

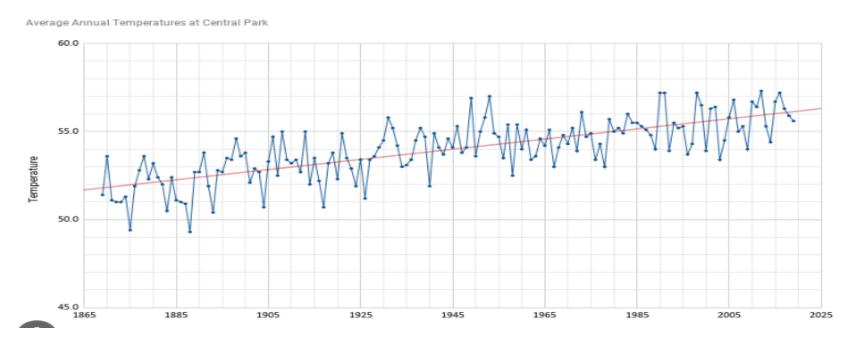


### **Background**

- Climate change is an issue that has caused abnormal weather, wildfires, and poor air quality
- More studies are being done to address and resolve the issue behind climate change
- Many costly weather systems exist that can record and analyze different parts of the weather
- Our weather monitoring system stands out as an affordable design for gathering and sharing weather data

#### **Problem Statement**

■ The New York Department of Environmental Conservation seeks to develop a cost-effective weather monitoring system to analyze the effects of climate change on microclimates in New York State.



## **Key System Requirements**

### **Functional Requirements**

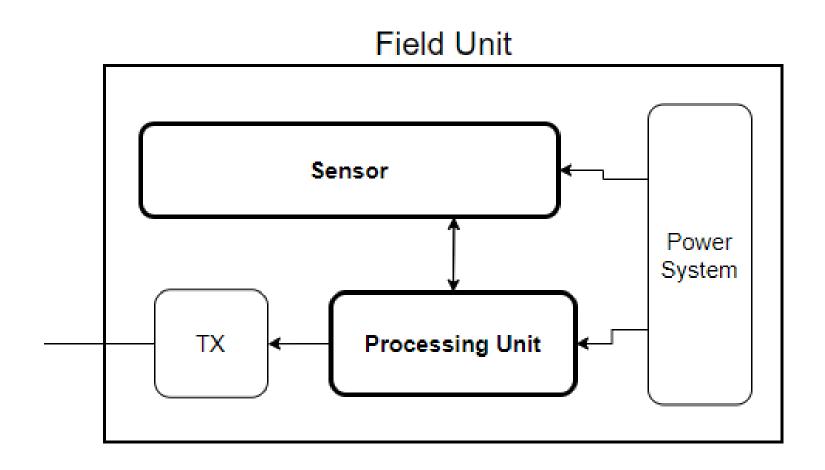
- Accuracy
  - Temperature +/- 5°C
  - +/- 5% relative humidity
- Scalability
  - Easy integration of additional sensors

### **Non-functional Requirements**

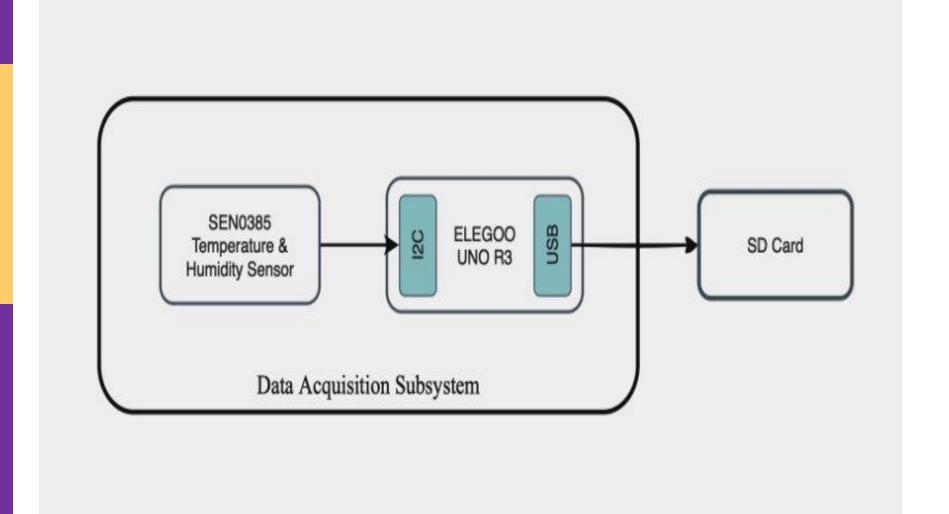
- Durability
  - Withstand weather conditions



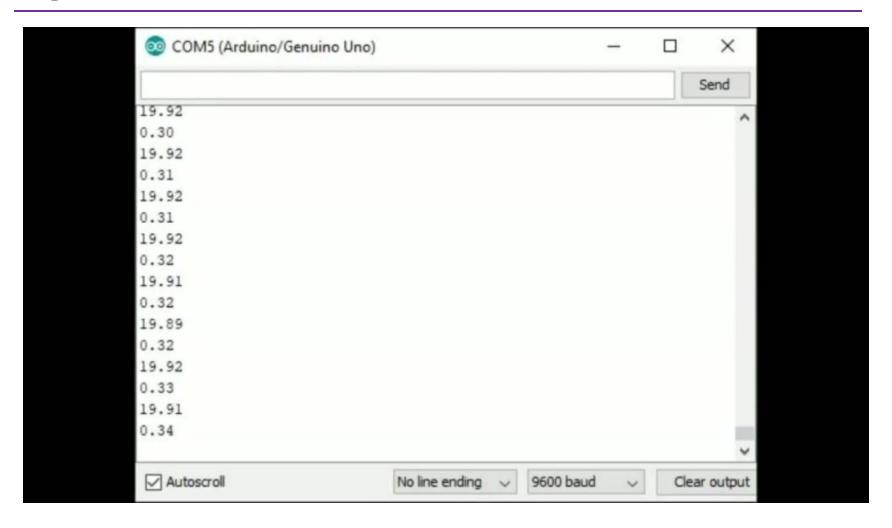
# **Logical Design**



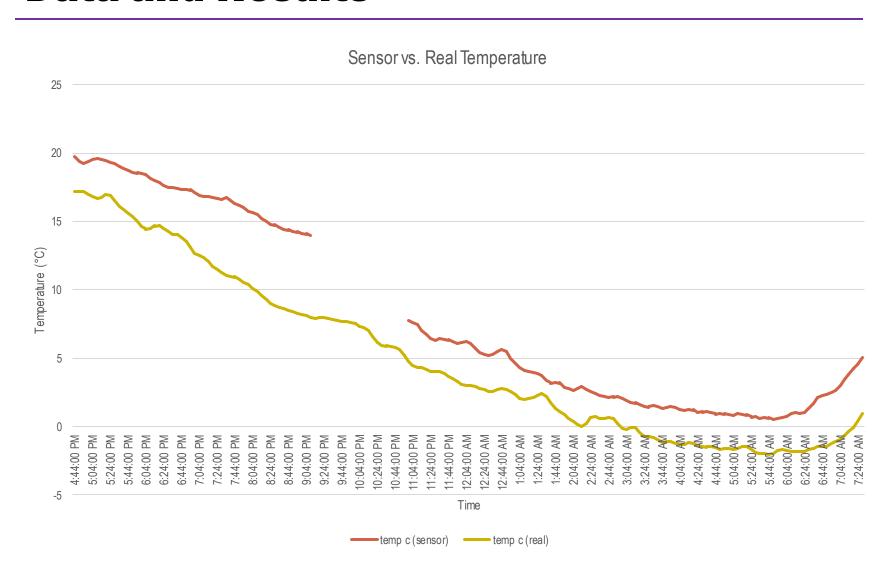
# **Physical Design**



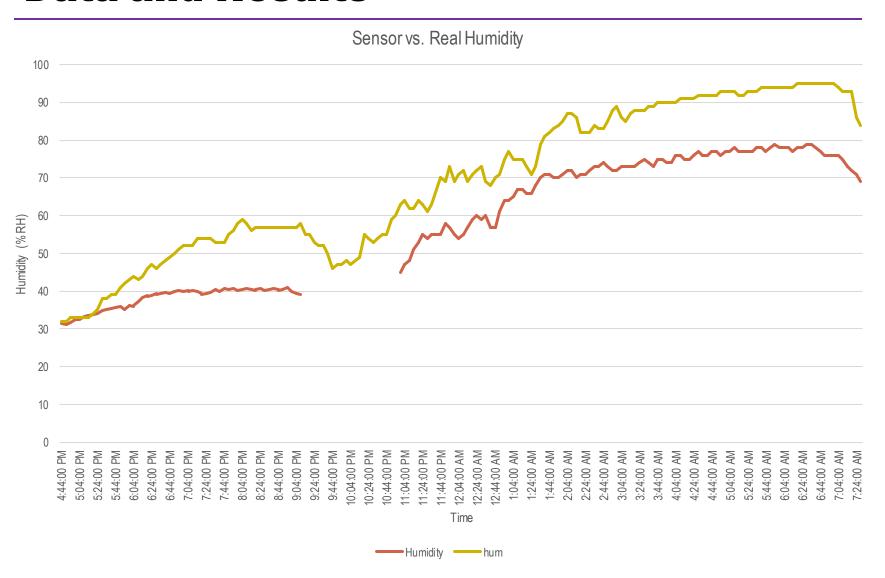
# **System Demonstration**



#### **Data and Results**



#### **Data and Results**



## **Analysis and Discussion**

- Initial Testing
  - Collected 100 samples every ~5 mins
  - System placed by a window for tests
- Average difference between sensor and underground data
  - 3.16C and 12.63 %RH
- Potential inaccuracies in sensor measurements due to window placement

#### **Limitations**

#### Limitations

- Time and Cost
- Sensor accuracy, limited spatial coverage, temporal resolution

#### Challenges

- Unresponsive system due to failed system/chip initialization
- Memory management
- Measurement outlier detection / filtering

#### **Recommendations for Future Work**

- Test system outside and analyze data for accuracy/reliability using multiple datasets
- Develop criteria for identifying discrepancy vs. microclimate variation
- Re-print enclosure with weather-proof material such as ABS Plastic or Polycarbonate

#### **Conclusions**

- Significant variations observed in NYS compared to locally available data
  - Avg temp difference: 3.16 °C
  - Avg humidity difference: 12.63%
- Despite discrepancies, the data acquisition monitoring system demonstrates potential for cost-effective microclimate monitoring (total cost ~ \$35)
- Implications
  - Scalability
  - Robust enclosure design
  - Provides insights into microclimates for DEC's mission

### **Questions**

