Low-cost Data Acquisition Subsystem for Microclimate Monitoring

Shereena Thames, Ryma Chowdhury, Nick Iverson, Dua Kaurejo

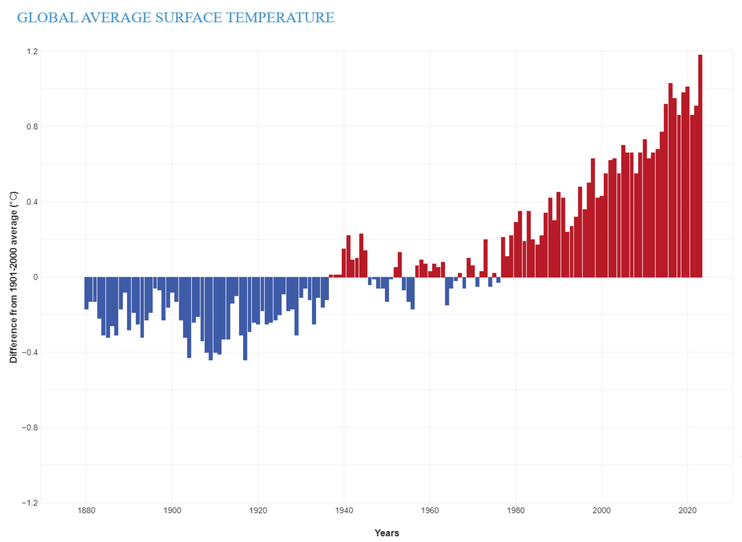
Department of Electrical & Computer Engineering, University at Albany

Problem Statement

The New York Department of Environmental Conservation seeks to develop a cost-effective weather monitoring system to assess the effects of climate change on New York State's microclimates. This project will design a scalable and efficient data acquisition station providing real-time data essential for environmental management.

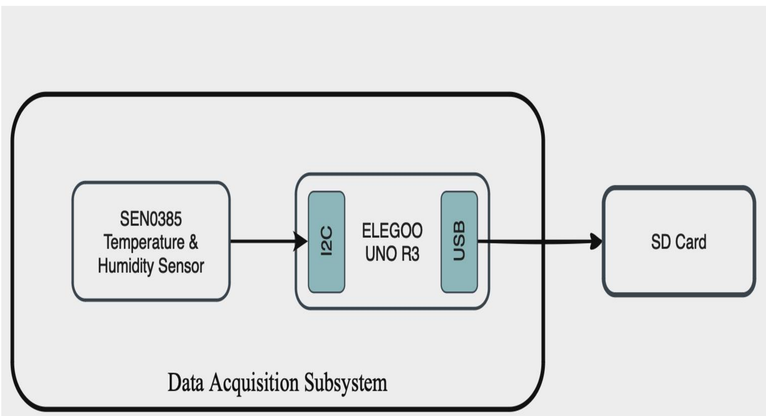
System Requirements

- **Scalability:** The design should facilitate seamless integration of additional sensors or functionalities without requiring extensive system modifications.
- **Accuracy:** Sensors must provide precise readings of temperature with an accuracy of +/- .2°C and humidity readings within +/- 2%RH.
- **Power:** The system should employ a power-efficient data collection by using intermittent high-frequency sampling over short durations.
- **Durability:** Designed to withstand various weather conditions, ensuring long term operation of up to 30 days without intervention.
- **Portability:** System should be simple to transport, and robust enough to withstand movement without risking damage.



R. Lindsey and L. Dahlman, "Climate Change: Global Temperature," Climate.gov, Jan. 18, 2024.
https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature

System Design



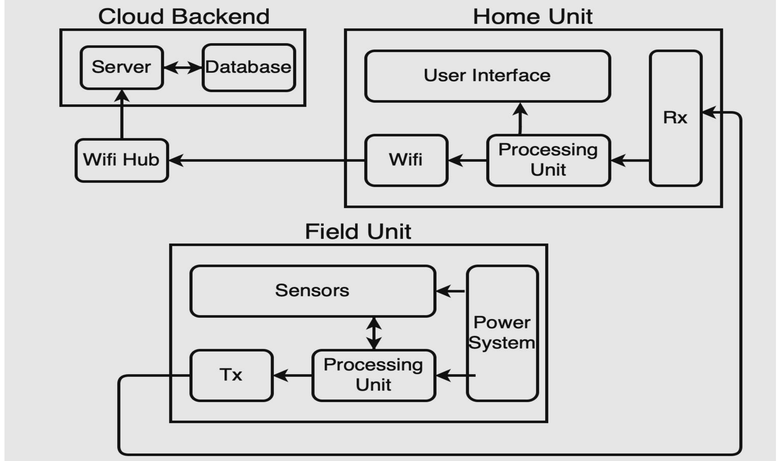
Physical Design of our Data Acquisition Subsystem
Our subsystem is equipped with a weatherproof sensor that captures temperature and humidity data. Utilizing I2C protocol ensures efficient data transmission and facilitates scalability. The ELEGOO UNO R3 microcontroller processes the data and subsequently stores it on an SD card. This configuration enables seamless data transfer to the communication subsystem.

System Design

Key System Features

To satisfy system requirements, we integrated the following design specifications:

- Utilization of I2C for easy scalability
- SEN0385 sensor with +/-0.2°C and +/-2%RH accuracy
- Implementation of frequent, short-duration data sampling cycles followed by extended delay periods



Logical Design Diagram

Bill of Materials

Part	Purpose	Cost
SEN0385	Sensor used to collect data	$19.90
UNO R3 Board	Microcontroller reads data from sensor	$15.19
Enclosure	3D printed enclosure	$3.09
	TOTAL	$38.18