Leveraging Community Partners and IoT Based Sensors to Improve Localized Air Quality Monitoring in Communities

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Project Challenge

Problem: Air quality monitoring in Northeast Ohio may not accurately represent the air that residents breathe. In a pilot deployment, a PM 2.5 sensor demonstrated an approximately 2x difference of air quality between two deployed locations less than 4 miles apart (Figure 1).

Main Challenge: current air quality monitoring sensors are expensive, hard to use for an average community resident, or both. Our work addresses this challenge through development of low-cost and easy-to-use air quality sensors that residents can confidently deploy and use for improving their communities.

Secondary Challenges: Secondary challenge: community members don't know how to access or use air quality data. Our work addresses this challenge by developing an open-source curriculum that any individual can access and leverage for collecting and/or reading air quality data. communities can expand air quality monitoring.

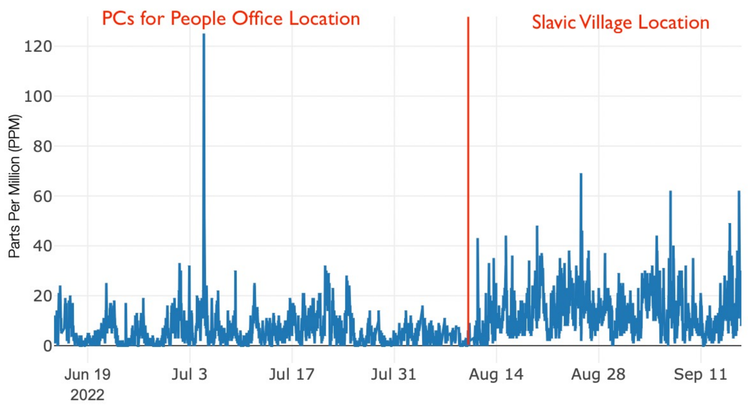

Figure 1 – Readings from two Installed locations within 3.39 miles show significant difference in PM 2.5 readings

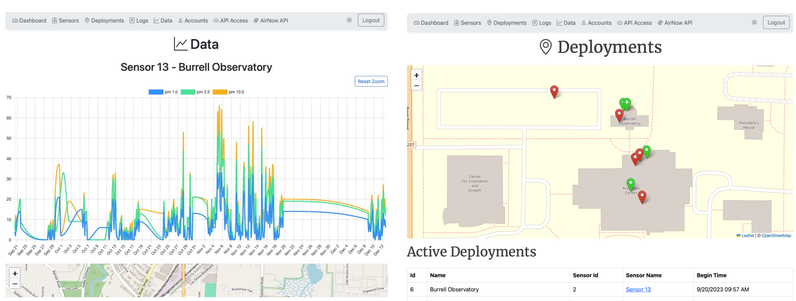

Figure 2 – Screenshots of web dashboard showing test deployment of sensors and current deployments

Progress

- Established partnerships with community partners: PCs for People, Slavic Village Development, and Incarnate Word Academy
- Created an interdisciplinary team of students across Computer Science and Engineering
- Created a prototype sensor that can be deployed with PCs for People
- Created web services and web dashboard to receive and display data (Figure 2)
- Create a curriculum that is currently being piloted at Incarnate Word Academy where students can create their own sensor to deploy at a school (Figure 5)
- Performed extensive LoRa testing for future partnership and deployment
- Developed a prototype sensor enclosure which records similar readings as an "open-air" sensor, while protecting from environmental conditions such as rain. (Figure 4)

Figure 3 – Test sensor deployed on our campus using both MicroPython and CircuitPython in an electrical enclosure.

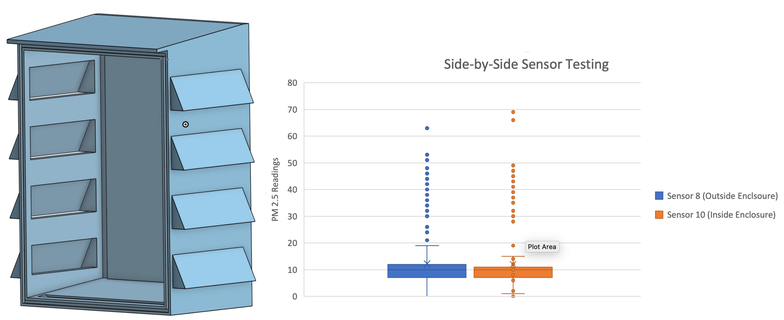

Figure 4 – Enclosure prototype design and testing sensor side-by-side with enclosure.

Broader Impacts

- Established partnerships with community partners: PCs for People, Slavic Village Development, and Incarnate Word Academy
- Created a prototype sensor that can be deployed with PCs for People
- Create a curriculum that is currently being piloted at Incarnate Word Academy
- Created web services and web dashboard to receive and display data
- Performed extensive LoRa testing for future partnership and deployment

Future Goals

- Deploy sensors at all PCs for People locations
- Evaluate sensor readings over several months
- Complete enclosure design
- Evaluate student responses to after-school program
- Share findings with Slavic Village Development
- Meet with City of Cleveland to identify areas of future collaboration and data sharing
- Partner with PCs for People to finalize locations for IRG grant proposal
- Prepare and submit IRG grant proposal to expand program to other communities

Figure 5 – Students participating in after-school program at Incarnate Word Academy

PCs for People | Incarnate Word Academy | Slavic Village

More Information

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