Building Smart Cities Technology to Monitor Spokane’s Air Quality

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Introduction
- Ambient particulate matter pollution caused 3.2 million deaths in 2010 and is the second leading environmental risk factor [1]
- We are deploying a network of air quality sensors for the Urbanova project in Spokane, WA
- Urbanova hopes to integrate technology into the city to foster a more environmentally-friendly and sustainable “smart” city
- Urbanova project looks to improve air quality, water usage, traffic, energy, and waste
- We developed a high-density low-cost wireless sensor network to monitor Spokane’s air quality
- Preliminary data from the Paccar building’s roof was collected before deployment of sensors

Methods

Sensor Assembly

Software
- Automated Python scripts used for data logging
- Amazon Web Services used to log securely to a cloud based database
- DynamoDB, a NoSQL database, is where the data will be stored
- Linux OS used to control Raspberry Pi’s

Rooftop Setup
- 5 complete Raspberry Pi 3 air quality sensors
- An LI840A CO2/H2O Gas Analyzer was used as a standard for calibration

Results

Results (Continued)

Discussion
- Similar sensor network being deployed in UC Berkeley’s BEACO2N program using Raspberry Pi 3 and Arduino Leonardo microcontroller [2]

Particulate Matter
- 4/5 OPCN2 units on the roof of Paccar failed to log significant data shortly after they were installed
- High enclosure temperature could be why the sensors failed based on post-experimental analysis
- Only one of the OPCN2 particle monitors worked the whole time it was on the roof so that is the only data available to analyze
- Interesting spike in PM just after 10 pm each day

Carbon Dioxide
- CO2 data from the Raspberry Pi’s was generally lower than the LI840A CO2 data
- Increases in CO2 happened early in the morning around 6 AM
- More calibration needs to be done before the sensors are deployed to ensure accuracy

Next Steps
- Deploy half a dozen sensors around Spokane
- Attach sensors to drones to measure air quality of vertical columns of air
- Work with WSU Health Department to analyze the health effects of ambient particulate matter pollution on Spokane’s citizens
- Calibrate the sensors to ensure accuracy

References