
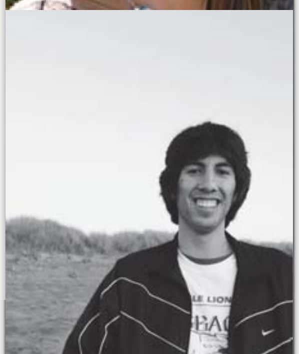
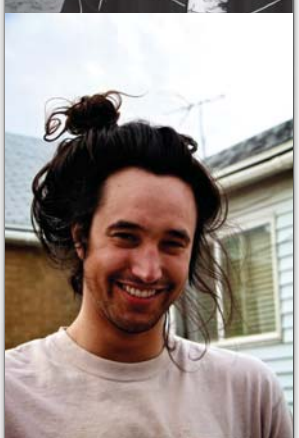

LOW COST AIR QUALITY SENSOR DEVELOPMENT & TESTING

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Salt Lake City has a unique geography. Thermal inversions, which trap pollution (mainly particulate matter < 2.5 um) occur in winter months. In summer, heat and sunlight react with volatile organic compounds and nitrous oxides to form photochemical smog, which includes ozone and secondary pollutants. We aim to test the accuracy of a low-cost, "Do-It-Yourself" (DIY) air quality sensor in relation to existing high-tech sensors. If accurate, many DIY sensors could be deployed over a larger area than presently studied, thus improving the spatial resolution of air quality data collection. The affordability of DIY sensors also allows for potential applications not feasible with expensive analyzers, such as education, citizen science, and science-based advocacy.

Keeping the sensor under a budget of $320 we built the sensor using Arduino circuit boards. Inside the sensor was installed a GPS as well as the CO2 and PM 2.5 sensors. Future work would involve assembling all of the components including battery fan, and data storage in a 3D printed box. The components were all soldered onto a soldering board. The code for the device is written in the common computer programming language C++. In analysis and visualizations, we used the statistical computing language R. After collecting collocated data with our calibrated instrument, we used regression and averaging techniques to improve the precision and accuracy of the measurements.

We have constructed the sensor, and initial results show CO_2, temperature, air pressure, and GPS readings are producing conclusive results. PM 2.5 proved to be inconclusive because of the time of year the data was collected showed a constant reading. We plan to continue testing the sensor. In the future we will focus the sensor on more elevation related study tracking the spatial distribution data in CO_2 and PM 2.5 readings, when stronger inversion patterns exist. We will test the sensor up in the Foothills and the Wasatch range to get spatial distribution data. With proper housing we would like to test diurnal cycles overnight at mountain peak locations to assess how day and night cycles affect CO_2 and particulate matter concentrations at higher elevations. We will also run comparison studies with current air sensors installed on campus