Aware of Air: Measuring Local Air Quality Using Portable Arduino-based Sensors

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Poor outdoor and indoor air quality causes disease and shortens life expectancy. Air pollution accounts for about 6.4 million deaths worldwide, according to a report published in the journal Lancet in 2017. The annual toll from particulate matter (PM2.5) and ozone in the US has been estimated to be 200,000. The goal of this engineering project was to design, fabricate, program, calibrate, and test low-cost, portable air quality sensors that can connect to a cell phone. The effort included the development of an Android app to record the data and send it to a database in the cloud for data collection and analysis. The device was based on an Arduino Nano and included sensors for temperature and humidity; CO; volatile organic compounds; ozone and NO2; and particulate matter. It was enclosed in a clear case and included a fan for air circulation and a battery pack for backup power. The device serves a need for local information about pollution to detect air quality trends during forest fires or chemical spills. The hypothesis tested is that low-cost air quality sensors can be assembled and connected to a cell phone to provide local real-time information about pollution trends. This hypothesis was proven to be true. The sensors were calibrated against (i) outdoor air quality monitoring stations; (ii) known concentration of pollutants in a lab; and iii) calibration curves published in a refereed scientific journal. The results demonstrate the potential of low-cost air quality sensors in monitoring localized air pollution.

Awards Won:

Third Award of $1,000

American Meteorological Society: Second Award of $1,000