Purdue AirSense: An Affordable Way to Measure and Study Air Pollution

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ABSTRACT

Air pollution is a major health hazard worldwide, accounting for one-eighth of all deaths in 2012 (World Health Organization). Globally, there is a severe lack of ground-based spatiotemporal monitoring of gaseous and particulate air pollutants, particularly in Africa, South and Central America, and the Middle East. This is in great part due to the high costs of air quality instrumentation that meet accuracy and reliability criteria set by monitoring agencies. The air quality data that is available is often not presented to the public in a user-friendly manner. Taking advantage of recent developments in low-cost sensing technologies, an integrated sensor network based on the Raspberry Pi platform was modeled for <1.5K/unit. Each module includes sensors for coarse and fine particulate matter (PM10, PM2.5, PM1), ozone, nitrogen oxides, and carbon monoxide. The sensors can stream data to a user-friendly website where students and the general public can analyze large air quality data sets. Calibration protocols are being developed to ensure reliability of sensors' outputs. The observed benefits of an integrated set of low-cost sensors, compared to traditional air quality monitoring sites, are increased spatial coverage and a factor of 100 difference in cost. These innovations will make people's lives better as we work towards reducing the adverse effects of air pollution through increased awareness and availability of open-source data among the central Indiana community.

KEYWORDS

Air pollution, environment, sensors, low-cost, software, particulate matter