Geophysical Research Abstracts
Vol. 15, EGU2013-5146, 2013
EGU General Assembly 2013

The AirQuality SenseBox

Dustin Demuth (1,2), Daniel Nuest (1,2), Arne Bröring (2), and Edzer Pebesma (1)

(1) Institute for Geoinformatics, University of Münster, Weseler Strasse 253, 48153 Münster, Germany, (2) 52°North Initiative for Geospatial Open Source Software GmbH, Martin-Luther-King-Weg 24, 48151 Münster, Germany

In the past year, a group of open hardware enthusiasts and citizen scientists had large success in the crowd-funding of an open hardware-based sensor platform for air quality monitoring, called the Air Quality Egg. Via the kickstarter platform, the group was able to collect triple the amount of money than needed to fulfill their goals. Data generated by the Air Quality Egg is pushed to the data logging platform cosm.com, which makes the devices a part of the Internet of Things. The project aims at increasing the participation of citizens in the collection of data, the development of sensors, the operation of sensor stations, and, as data on cosm is publicly available, the sharing, visualization and analysis of data.

Air Quality Eggs can measure NO_2 and CO concentrations, as well as relative humidity and temperature. The chosen sensors are low-cost and have limited precision and accurracy. The Air Quality Egg consists of a stationary outdoor and a stationary indoor unit. Each outdoor unit will wirelessly transmit air quality measurements to the indoor unit, which forwards the data to cosm. Most recent versions of the Air Quality Egg allow a rough calibration of the gas sensors and on-the-fly conversion from raw sensor readings (impedance) to meaningful air quality data expressed in units of parts per billion. Data generated by these low-cost platforms are not intended to replace well-calibrated official monitoring stations, but rather augment the density of the total monitoring network with citizen sensors.

To improve the usability of the Air Quality Egg, we present a new and more advanced concept, called the AirQuality SenseBox. We made the outdoor platform more autonomous and location-aware by adding solarpanels and rechargeable batteries as a power source. The AirQuality SenseBox knows its own position from a GPS device attached to the platform. As a mobile sensor platform, it can for instance be attached to vehicles. A low-cost and low-power wireless chipset reads the sensors and broadcasts the data. The data is received by gateways that convert the data and forward it to services. Although cosm is still supported, we also use services that are more common in the scientific domain, in particular the OGC Sensor Observation Service. In contrast to the “One Sender - One Receiver” (pair) setup proposed by the platform developers, we follow a “Many Senders - Many Receivers” (mesh) solution. As data is broadcasted by the platforms, it can be received and processed by any gateway, and, as the sender is not bound to the receiver, applications different from the gateways can receive and evaluate the data measured by the platform.

Advantages of our solution are: (i) prepared gateways, which have more precise data at hand, can send calibration instructions to the mobile sensor platforms when those are in proximity; (ii) redundancy is obtained by adding additional gateways, to avoid the loss of data if a gateway fails; (iii) autonomous stations can be ubiquitous, are robust, do not require frequent maintenance, and can be placed at arbitrary locations; (iv) the standardized interface is vendor-independent and allows direct integration into existing analysis software.