Semester Thesis:

Sense the Air You Breathe!

Motivation: Urban air pollution is a major concern in modern cities. Atmospheric pollutants considerably affect human health; they are responsible for a variety of respiratory illnesses (e.g., asthma) and some are known to cause cancer if humans are exposed to them for extended periods of time. Additionally, air pollution is responsible for environmental problems, such as acid rain and the depletion of the ozone layer. Traditionally, air pollution is monitored by a network of static measurement stations operated by official authorities. The extensive cost of acquiring and operating static stations severely limits the number of installations and with that the density of these measurement networks.

In recent years new gas sensors appeared on the market, which are inexpensive, small, and suitable for mobile measurements (see Fig. 1(a)). As part of the OpenSense project, we integrated several such low-cost sensors into compact air pollution monitoring stations, which are deployed on top of several trams in Zurich, as shown in Fig. 1(b). Thereby, we achieve a good coverage of the city with only a few mobile sensor nodes.

Task: The goal of this thesis is to analyze the performance of two electrochemical gas sensors, which recently appeared on the market. This involves for you the following tasks:

- Design a small circuit board to power the gas sensors and to convert the analog output signals to digital values.
- Write a software tool to control the sensors (e.g., adjustment of the sampling interval) and to process the sensor readings.
- Evaluate the performance of the gas sensors and the impact of the digital circuit by comparing the sensor readings to measurements from a traditional static monitoring station.

OpenSense web page: www.opensense.ethz.ch

Requirements: For this thesis you should have some knowledge of circuit board design and be interested in building a small system from bottom to top.

Interested? Please have a look at http://www.tec.ethz.ch/research.html and contact us for more details!

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