

Section Sciences et Ingénierie de l'environnement Design Project 2013 (semestre de printemps)

Proposition n°25

Developing an Environmental Field Layer for an Integrated Mobile Sensor Network Simulator

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Descriptif du projet

In the context of the OpenSense project [1], we are looking into enabling air quality monitoring in urban environments using mobile sensing platforms anchored on buses provided by TL (Transports publics de la région lausannois). The sensor nodes are based on the Sensorscope wireless platform, originally developed for weather monitoring, with added capabilities for chemical sensing. Current measurements include CO, CO₂, NO₂, and O₃.

Adding mobility to Wireless Sensor Networks (WSNs) can bring significant benefits to a monitoring platform: finer spatial resolution, coverage of wider area with fewer nodes, cheaper maintenance (nodes can be brought to a single site for inspection), etc. On the other hand, not much literature exists on field estimation for non-static sensor networks and the specific constraints of gas concentration mapping have been very little researched.

In order to get a better understanding of the principles by which the activities of such a mobile sensing network should be controlled we are currently developing an integrated simulation framework consisting of three layers: one for mobility, one for networking and another one for the environmental field.

[1] Nano-Tera OpenSense - <http://www.nano-tera.ch/projects/401.php>

Objectif

The main goal of the project is to add an environmental simulation layer for all or a subset of the targeted pollutants.

Using concentration measurements from the OpenSense deployment, together with additional available sources of information (e.g., vehicle mobility data, traffic count data, weather data), the students will have to derive a simple data-driven, statistical model for the pollution field in the central area of Lausanne. They will then evaluate the capacity of this model to predict measured concentration levels. Finally they will have to implement the air quality layer into the existing simulation framework.

Descriptif tâches

The project tasks can be summarized as follows:

- get familiar with the OpenSense project constraints regarding mobility models and chemical sensing
- get a practical understanding of the existing simulation framework
- analyze the different available sources of information and their utility in deriving a usable air quality model
- derive the model
- analyze and evaluate the predicting performance of the model
- add the air quality layer to the simulation framework

Divers

Work breakdown: 25% theory, 40% data analysis, 35% programming

Prerequisites: Matlab and basic Java programming

Keywords: environmental monitoring, air pollution modeling, mobility, wireless sensor networks

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