# Section Sciences et Ingénierie de l'environnement
# Design Project 2014 (semestre de printemps)

## Proposition n°32

## Generating Air Pollution Maps in Lausanne Using the OpenSense Fine Particle Network Data


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**Descriptif du projet**

In the context of the OpenSense II project [1], we are looking into enabling air quality monitoring in urban environments using mobile sensing platforms anchored on public buses provided by TL (Transports publics de la région lausannois). Currently the Lausanne deployment consists of 10 buses equipped with sensors for measuring CO, CO2, NO2, O3 levels and Particulate Matter (PM) using the Naneos Partector [2].

Adding mobility to Wireless Sensor Networks (WSNs) can bring significant benefits to a monitoring platform: finer spatial resolution, coverage of wider area with fewer required nodes, cheaper maintenance (since nodes can be brought to a single site for inspection), etc. On the other hand, the mobility aspect raises hard challenges especially in field estimations since the data is sparse spatially and temporally. Not much literature exists on field estimation for non-static sensor networks and the specific constraints of air pollution mapping using mobile sensors have been very little researched.

In this project, to estimate the fine particles level in each street of Lausanne, measurements obtained through the National Air Pollution Monitoring Network (NABEL) and weather stations operated by MeteoSwiss together with the measurements from the OpenSense network in the nearby streets will be fed to the model, to increase the accuracy.


[1] Nano-Tera OpenSense - http://www.nano-tera.ch/projects/423.php
[2] Naneos Particle Solutions GmbH - www.naneos.ch

**Objectif**
The main goal of the project is to address the problem of modeling and field estimation of the particulate matter and to select the appropriate spatio-temporal techniques for generating PM maps for Lausanne.
Using lung deposited surface area (LDSA) measurements from the OpenSense deployment, together with additional sources of information (e.g., other modalities from OpenSense network, vehicles mobility data, traffic count data, weather data, land-use maps) the students will have to derive an air pollution estimation model for the city. They will then evaluate the capacity of this model to predict measured concentration levels. Finally they will be able to use the model and the measurements to generate the air pollution maps with high resolution in space and time.

**Descriptif tâches**
The project tasks can be summarized as follows:

- get familiar with the OpenSense project constraints regarding mobility models and particulate matter sensing
- get a working understanding of the previous modeling/mapping efforts in OpenSense framework
- analyze the different available sources of information and their utility in deriving a usable particle matter concentration model
- derive the model
- analyze and evaluate the predicting performance of the model
- generate the particulate matter maps of Lausanne

**Divers**
Work breakdown: 25% theory, 40% data analysis, 35% programming
Prerequisites: Matlab programming
Keywords: environmental monitoring, air pollution modeling, mobility, wireless sensor networks
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