Implementing LoRa Communication Technology on an Embedded Sensing Device for Enabling Real-Time Database Updates

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Exploiting crowdsourced measurement data to derive high resolution air-quality maps represents one of the core research thrusts of OpenSWISS project at DISAL. The goals in this domain include the development of a crowd-sensing platform, the design of necessary algorithms, and the assessment of required communication technologies. Leveraging the OpenSense II project, OpenSWISS is in the phase of prototyping modular chemical sensing platforms and establishing required backbone data collection/analysis infrastructures. The beMap (bicycle environmental mapping device) project started and run by four students at EPFL, on the other hand, has developed a platform for sensing air-quality and storing them together with the GPS data.
The main goal of this project is to work on the communication aspect of wireless sensor networks (that potentially can be used in both OpenSWISS and beMap) and study the use of long-range low-power LoRa technology (which is a communication standard for the Internet of Things). This technology can allow setting up low-cost sensor networks communicating in real-time with a base-station.

In particular, the student will set up a network of multiple devices communicating their measurements to a base-station/server via a LoRa network. This work will be initially based on existing off-the-shelf modules (e.g., Raspberry PI as the gateway/base-station and Arduino as the sensors). In the second phase, the student will integrate the LoRa technology into OpenSWISS/beMap sensor nodes. The required communication protocol between the sensor nodes and the gateway will then be adapted/improved. Finally, experimental analysis on transmission range, data rate and energy consumption will be made.

Recommended type of project: semester/master project

Work breakdown: 10% theory, 20% hardware, 40% software, 30% experimentation

Prerequisites: Broad interest in communication and sensing, familiarity with communication protocols, good command in software and hardware development

Keywords: LoRa, WSN

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References:
[1] http://www.nano-tera.ch/projects/474.php
[2] www.bemap.ch
[3] www.lora-alliance.org