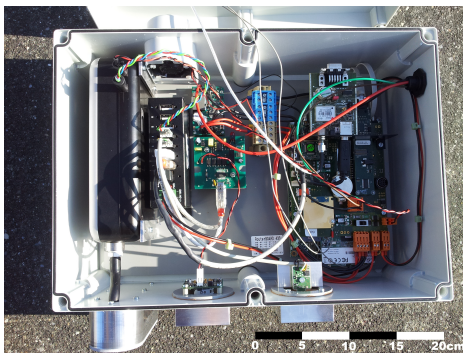


Semester or Master Thesis:

People Flow Monitoring: Tracing Public Transport Users Using WiFi Monitors

Motivation: Monitoring the occupancy of public transport systems is interesting for a wide range of applications, such as transport network schedule optimization, occupancy-based pricing, or allocation of public transport funds. However, manual passenger counting is very labor-intensive and the deployment of automatic passenger detection systems (*e.g.*, infrared door monitors) is expensive. In this thesis we will pursue an innovative approach to monitor occupancy and analyze people flow. We exploit that smartphones with WiFi enabled, periodically transmit WiFi messages (*e.g.*, probe request packets). By capturing and counting these packets it is possible to estimate the occupancy of public transport vehicles, detect crowded stations, and people flow direction.

As part of the OpenSense project, we built small sensor nodes to monitor different air pollutants and deploy them on top of public transport vehicles, as shown in Fig. 1. The sensor nodes are equipped with wireless router boards, which can be used to capture the probe request packets of the public transport users' smartphones and therewith estimate the occupancy rate.



(a) Sensor node with a wireless router.



(b) Sensor node on top of a public transport vehicle in Zurich.

Figure 1: WiFi routers deployed on top of public transport vehicles can be used to estimate the occupancy rate of public transport vehicles.

Task: In this thesis the student develops a system for occupancy monitoring of public transport vehicles. This involves the following tasks:

- Study related literature and get familiar with the MikroTik router board.
- Play around with the packet sniffer, collect some data, and come up with an algorithm to estimate the occupancy rate of our office floor.
- Implement and run the software on the sensor nodes to collect real-life data. Use the data to evaluate the occupancy level of the monitored public transport vehicles.

OpenSense web page: www.opensense.ethz.ch

Requirements: For this thesis you should enjoy programming and have fun making sense out of large amounts of data.

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