

Move and Chill Challenge: Chair Tracking in Zürich

Short Description

Design and evaluate a low-power and possibly self-sustaining sensor platform, including LoRa and GNSS. The goal is to track the occupancy of movable public chairs in Zürich.

Introduction

Until today there is no data about how the public chairs in Zürich City are used over the year. How do people arrange them in space? How long do they sit on it? Are there spots where more chairs are needed? To collect those information, a cheap and long-lasting sensor platform is needed. Changes in occupancy and position is transmitted over LoRa in real-life. For a long-lasting system, energy harvesting may be added.

Prerequisites

- Knowledge in embedded systems, microcontroller programming (ARM Cortex-M /or others) and low-power circuit design.
- Basic knowledge circuit design tools (e.g. Altium).
- Knowledge of the communication protocol LoRa is beneficial.
- Knowledge of GNSS is beneficial.
- Basic knowledge in machine learning is a plus.

Project Tasks

The main goal of this thesis is to investigate, develop and evaluate hardware and firmware for a chair-localization and occupancy-detection device. The main focus lies on long-battery lifetime, cost-efficient design and functionality. It includes the following tasks:

- Understand and evaluate which sensors are most suited for occupancy detection.
- Understand and evaluate different localization methods.
- Build a demonstrator of the best suited methodology.
- Evaluate the performance and limits of your demonstrator

Thesis Type

According to the level of the student, the thesis can be done as **bachelor/semester/master** thesis. The final task description will be elaborated in detail.

Supervisors

Dr. Michele Magno (michele.magno@pbl.ee.ethz.ch)
 Dr. Tommaso Polonelli (tommaso.polonelli@pbl.ee.ethz.ch)
 Lukas Schulthess (lukas.schulthess@pbl.ee.ethz.ch)

References

[1] P. Mayer, M. Magno, A. Berger, L. Benini, "RTK-LoRa: High-Precision, Long-Range, and Energy-Efficient Localization for Mobile IoT Devices"



Movable chairs



Folding chair & Wooden Stool



Beanbag