EECS, IoT2US Lab

Smartphone-based Activity Recognition and Multi-sensor Fusion based Indoor Positioning System

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1. Introduction

Motivation

over 80% of time people spent indoors

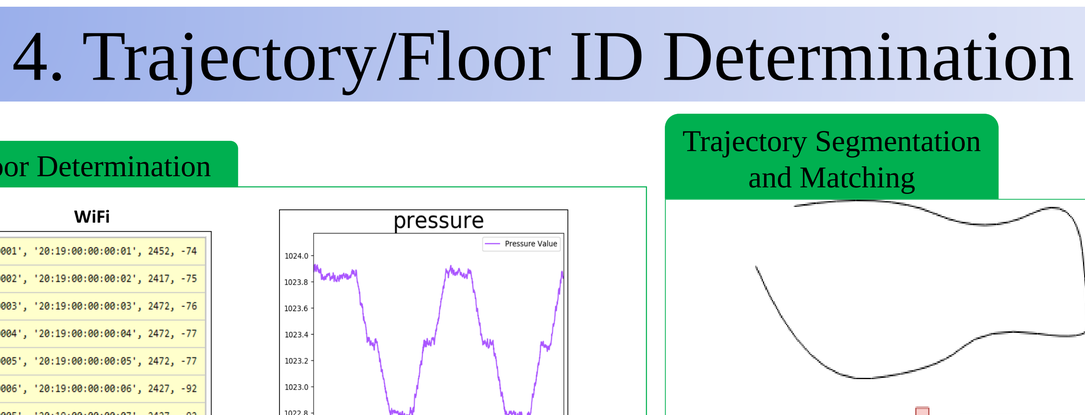
without mature ubiquitous Global Positioning Systems and maps for indoors

Applications: smart health, smart home, asset management..

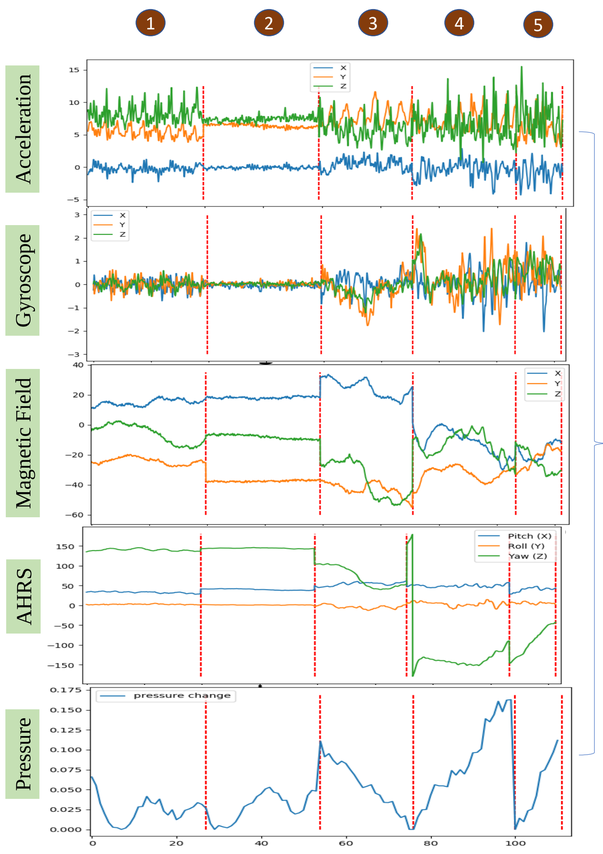
Multi sensors, e.g., built-in to smartphone enabling accurately positioning

- Where am I?
  - Which building?
  - Which floor?
  - Which path?
  - …

2. System Framework



3. Mobility Mode Detection



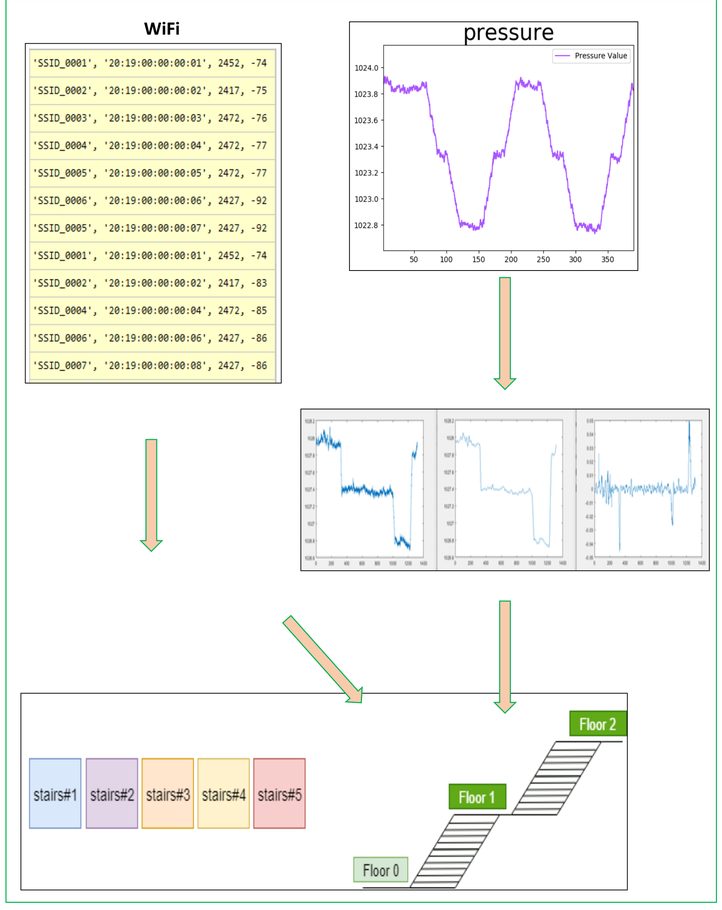
Different modes of mobility can be detected using machine learning or deep learning algorithms using multi-sensor data.

Supervised Learning Algorithms

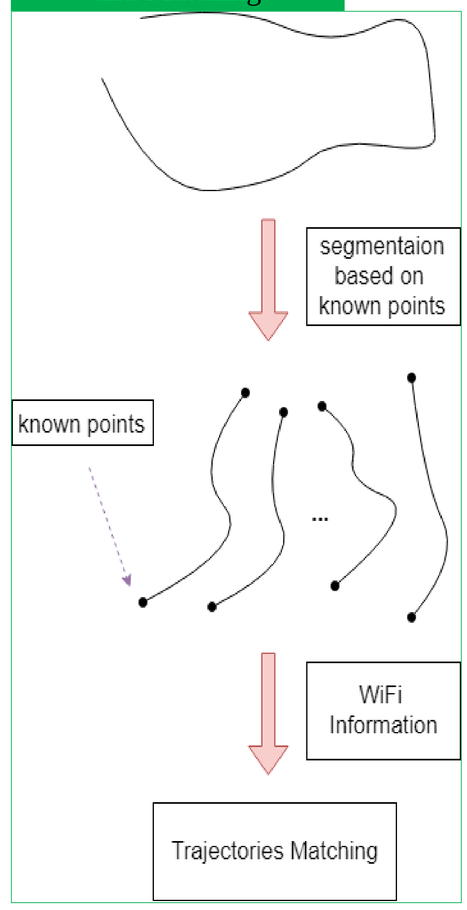
1. walking
2. stationary
3. ascending (stairs)
4. descending
5. turning

4. Trajectory/Floor ID Determination

Floor Determination

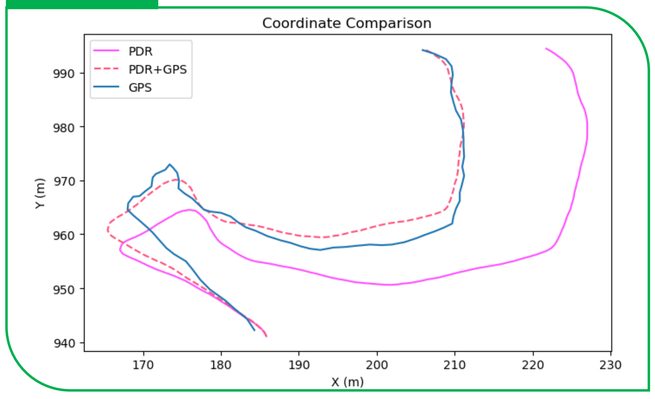


Trajectory Segmentation and Matching

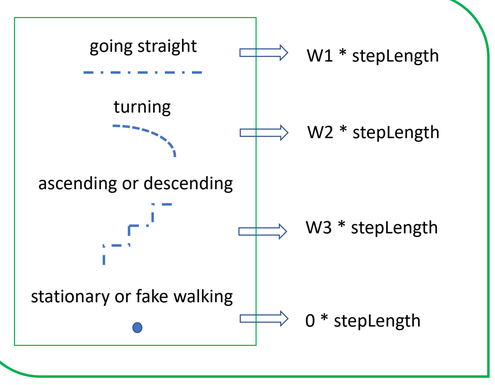


5. Information Fusion

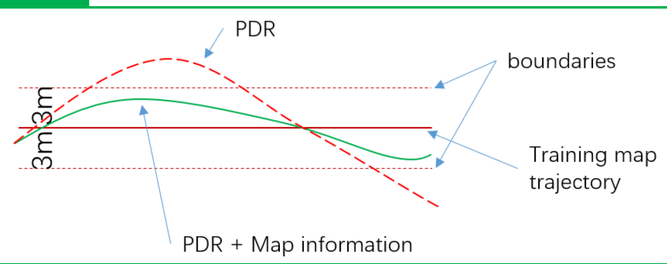
PDR+GPS



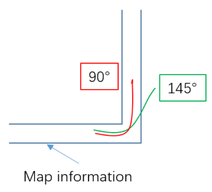
Motion Mode + PDR



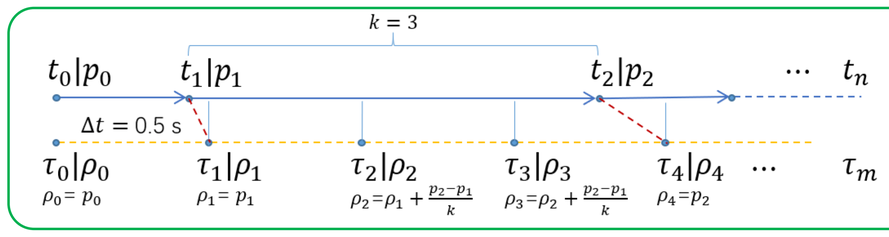
PDR+MAP



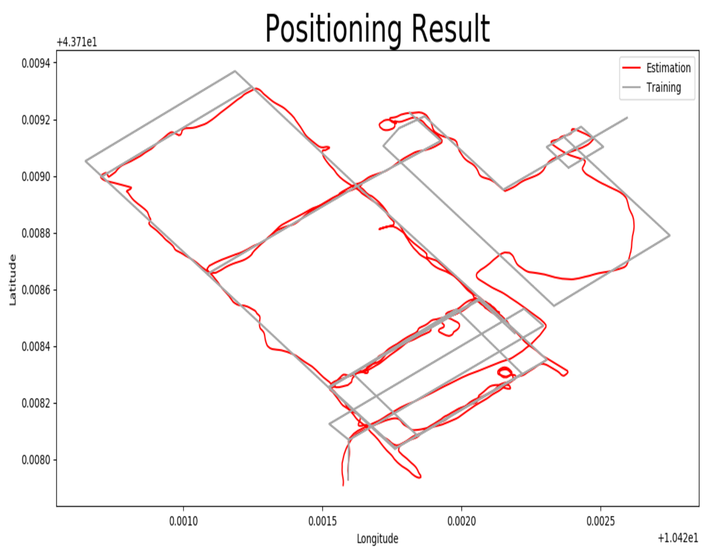
Heading Adjustment



6. Positioning Result Display



Resampling algorithm for the result.



The red line is the estimated result based on our system. The gray line is the training trajectories extracted from training map.

IoT2US Lab is working on Spatial Intelligence such as Indoor Positioning&Navigation, Human Activity Recognition, Spatial Big Data Mining, Artificial Intelligence, IoT Security and IoT + Environment Science. More information can be found at http://iot.eecs.qmul.ac.uk. We also welcome cooperation.