Using Multi-modal Sensing for Human Activity Modeling in the Real World

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Bridge the gap

- Two technological trends
  - Smaller and smarter mobile devices
  - More advanced infrastructures
    - Time consuming
    - Expensive
- Focus
  - Wearable mobile sensing device
  - Sense and infer physical activities all day long
  - Encourage people to be active

Outline

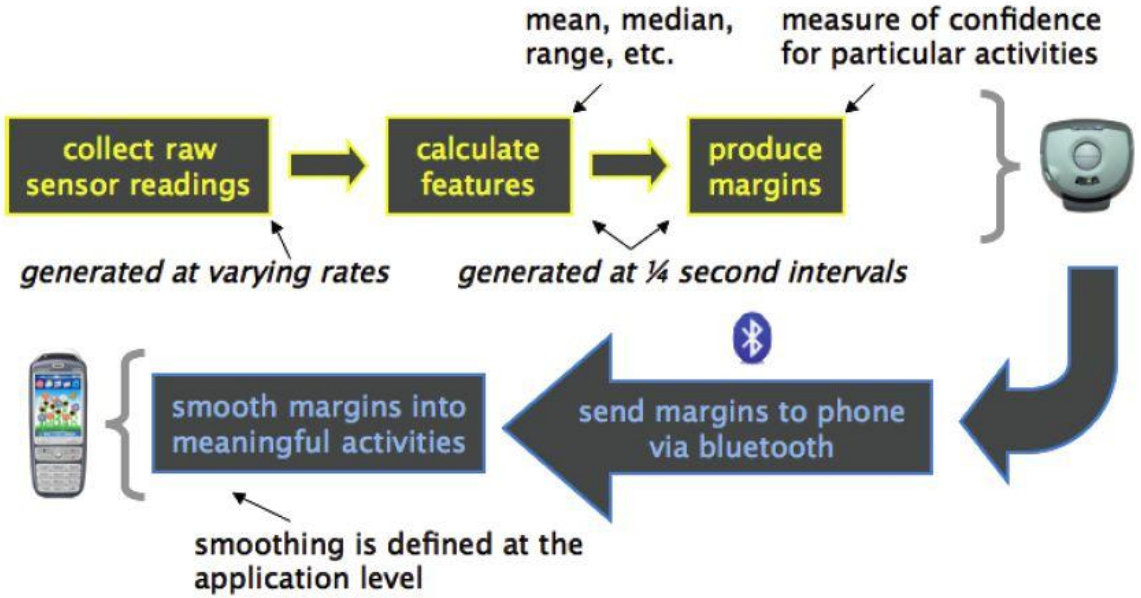
- Mobile Sensing Platform (MSP)
- UBiFit Garden system
- Usability
- Adaptability
- Credibility
- Comments

Mobile Sensing Platform (MSP)

- Built to capture activities throughout the day
  - Walking/ Running/ Cycling/ Elliptical trainer/ Stair machine
- It is a pager-size, battery powered computer
- Bluetooth communication with mobile phones
- Embedded sensors
  - Accelerometer
  - Humidity
  - Light and infrared
  - Barometer pressure
  - Temperature
  - Sound (microphone)
  - direction
- Boosted decision classifiers (weak classifier)

UBiFit Garden system

- Automatically infer and communicate with MPS
- Set minimum duration and tolerance for activities
- Asks about unknown activities



Usability

- Form Factor and Design
  - Large
  - Heavy
  - Uncomfortable
  - Bulky
- Power and Connectivity
  - Power outage on continuous data transmission
- Accuracy and Generalization
  - “out-of-the-box” performance
  - 2-Level modeling

Adaptability

- Activity Log
  - Manual data entry
  - Communicate the uncertainty with the user
- Improving Accuracy using active learning methods
- Flexible Application specific heuristics
  - Confidence margins
  - Length of each episode
  - Gap between episodes

Credibility

- Data alteration
  - Manually change errors
- Ambiguity of User Interfaces
  - Uncertainty should not be transparent to user
- Learn from user corrections
  - Active learning techniques

Comments

- This chapter is the case study of the prototype
- Many details put together to make the prototype
- The field trials, findings are really valuable
- Many different technologies may also help:
  - Solar panels
  - Pressure power generators
  - Use of different communication channels

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