Modeling mobility patterns from smart phone data

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Motivations: customized service

Customized services

Understanding Mobility Patterns

Mobility Advice
You usually come here (Ouchy) to take a ferry to Evian in weekdays after 6:00pm. You probably live in Evian.

The next ferry will depart in 15 minutes.
Motivations: Rich Data

Surroundings

Ambient Sound
Motivations: Rich Data

Phone

- Camera
- Calendar
- Media Play
- Call Log
- Accelerometer
Data Collection Campaign

>100 smart phones

Remote server

[Map of a region with a remote server connected via internet]
Mobility Patterns

Activity: work

Which Route?
Transport: car

Wait? Mode?

Which fastest?

How to infer them from smartphone data?
Location-based Activity Inference:

- GPS +
- Land use

- Shopping
- Leisure
- Work
Activity Inference: understanding the environment

- More information from smart phones (e.g. Bluetooth)

- Shopping
- Leisure
- Work

- Wife
- Friends
- Colleagues
BT-Activity relationship

![Graph showing activity distribution among different groups: group_1, group_2, G, J, L. The y-axis represents count, and the x-axis represents device or group. The graph shows the distribution of work, shopping, and leisure activities. The Wife is indicated by an arrow pointing to the group_1 category.]

- Work: group_1 has the highest count, followed by group_2.
- Shopping: G has a moderate count.
- Leisure: J and L have lower counts compared to the other categories.
Activity Inference: Case study

- A particular event: Leisure activity performed at work location during afternoon/night
Route Inference: GPS track
Traditional method: map matching
Location (GPS) data from N95 smart phones: sparse and inaccurate
Probabilistic path observation generation
Conclusions

- Mobility is a complex phenomenon
- Behavior plays an important role
- We want to
  - Understand
  - Predict
  - Influence
- Research strategy: combine
  - Advanced mathematical models, and
  - Modern technology