Towards Improving City Structure by Monitoring and Analyzing Pedestrian Mobility

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http://geoanalytics.net
Data collection procedures

1. Monitoring city visitors
   - GPS receivers are distributed in access points to the city
   - questionnaire is used to get essential background information on the participant and the trip

2. Monitoring households
   - Each household member has his/her own ‘personal’ device and carries it during all outdoor activity during a determined number of days
   - Every participant produces multiple trips during the project
   - questionnaire is used to collect general information on the household and participant
Research questions

1. Which routes are used, which destinations are visited {by different groups}?
2. What is the influence of spatial and temporal aspects?
Monitoring households: HR11 project

- Residents of several high-rise buildings
- 432 daily trajectories of 303 persons have been collected during 11 days, from 26/04/2011 till 06/05/2011
- 252,756 time-stamped positions with constant sampling rate of 5 seconds
- each trajectory is associated to a residence address (building)
Summarization

Generalize and summarize trajectories by regions of 100m radius
Compute hourly time series of visitor counts

Coloring of trajectories in further slides reflects the geography of the origins (buildings)
Plaza + Weena {Center+Toren}
Galjoen + Klipper
Witte Keizer + Coopvaert
Clustering places by the dynamics of visits

Saturday, 30.04.2011, hourly time series
Clustering by kMeans, 7 clusters
Assigning colors to clusters using Sammon’s projection
Compare 2 days (Sat 30.04. – Sun 01.05.)

Colors are not consistent across different days
Monitoring city visitors: 2012 project

- 544 daily trajectories have been collected during 4 days, from 03/05/2012 till 06/05/2012
- Starting from 3 different parking garages in the city center
- 623,835 time-stamped positions, constant sampling rate of 5 seconds
Extracting and clustering stops

Stop: BRD(3min)<50m

ST clusters of stops:
   25m, 10min, 5 neighbors

1st round of interpretation

After removing noise:
   S clusters of stops:
   25m, 5 neighbours
S-Cluster 3 – cinema/cafés
Cinema - cont
Findings, recommendations

Visitors starting at different parking garages behave differently
Local authorities can be advised to improve corridors connecting these locations and find ways to encourage visitors to use alternative paths

Proper data cleaning needed

Missing methods for understanding group movement and behaviour
What we can do

Detect stops, analyze stop patterns in S & T
Detect places (as concentrations of stops), analyze dynamics of POI attendance, clustering places by similarity of dynamics, clustering times by similarity of situations
Analysis of flows between places, detection of usual behaviors
Detection of unusual behaviors / events

Details: