

Community Imaging

Vassilis Kostakos

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Community Imaging

Who



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What



Social networks and
crowdsourcing



Sensing urban
mobility



Public interactive
displays

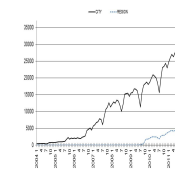


Security and
privacy

How



Instrumenting mobile
platforms



Real-time
city-sensing



Human subjects
studies



Large scale
deployments

Brief history of computing



1960's



1980's



2000's



3 “Waves” of computing



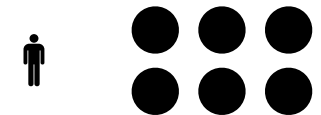
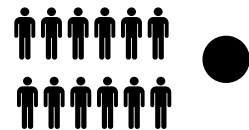
Capabilities



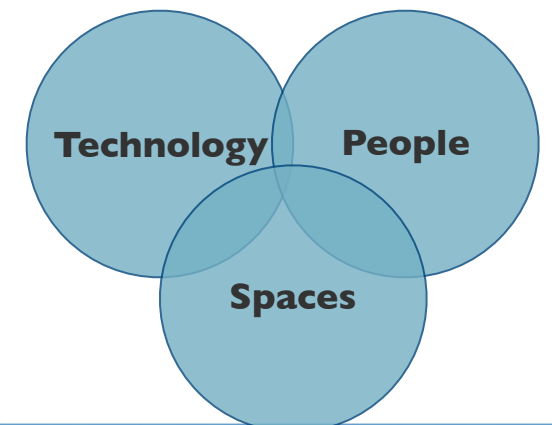
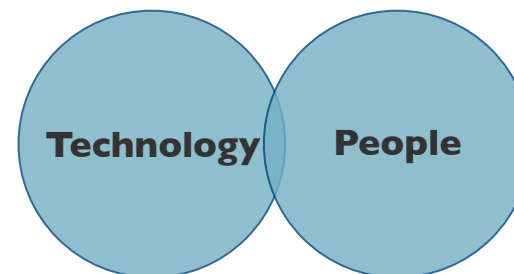
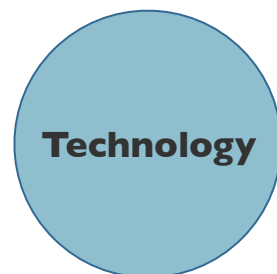
Size



Usage



Research



Research on the next wave of computing



Theory



Practice



Application



Vision



Our research



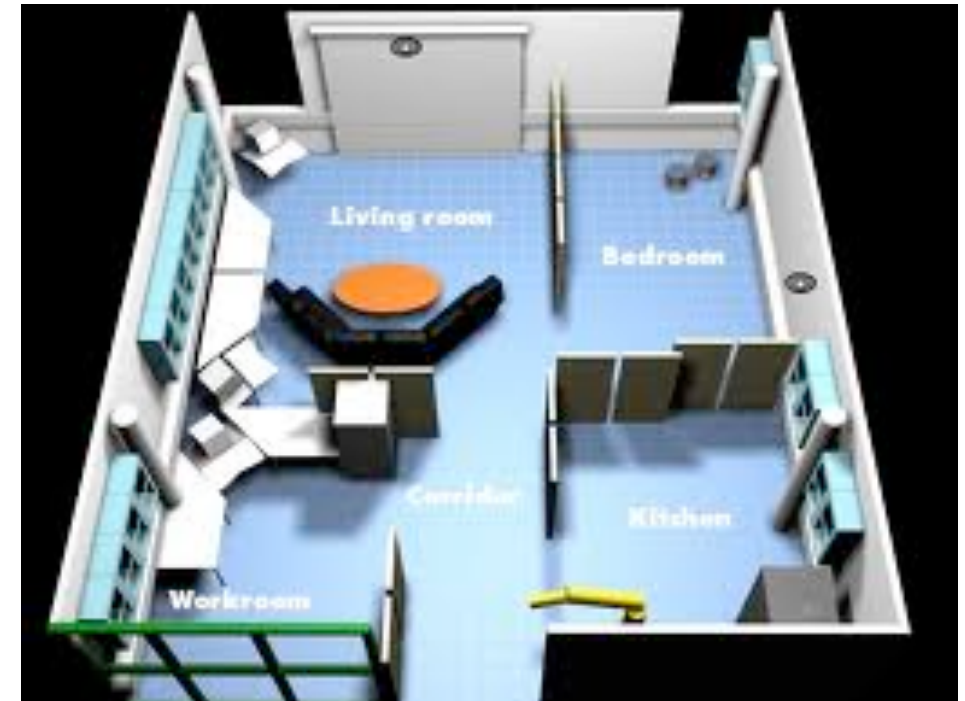
Failed (?) visions



Dave... I'm afraid I can't
let you do that...



Ubiquitous computing: “smart” things and spaces



Our approach: the CITY is the system



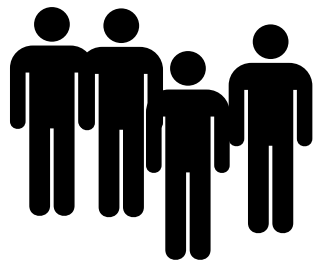
Our approach: the CITY is the system

Output

Input

Bandwidth

Cognition



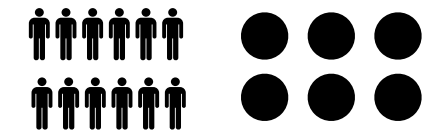
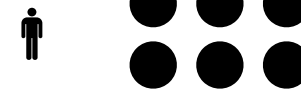
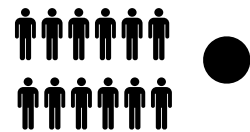
Human-Computer Interaction

Mobility analysis

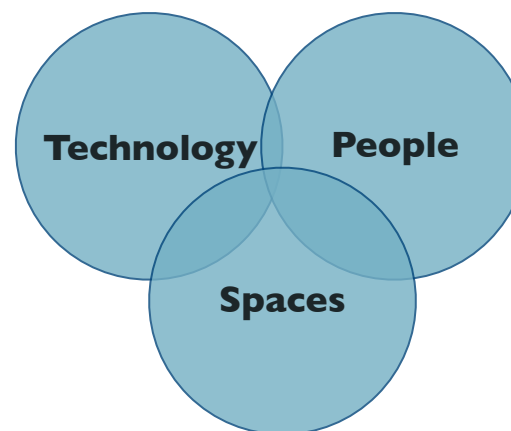
Crowdsourcing



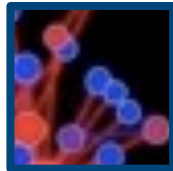
Ongoing research



Usage



Research



Social and complex networks



Sensing urban mobility



Public interactive displays



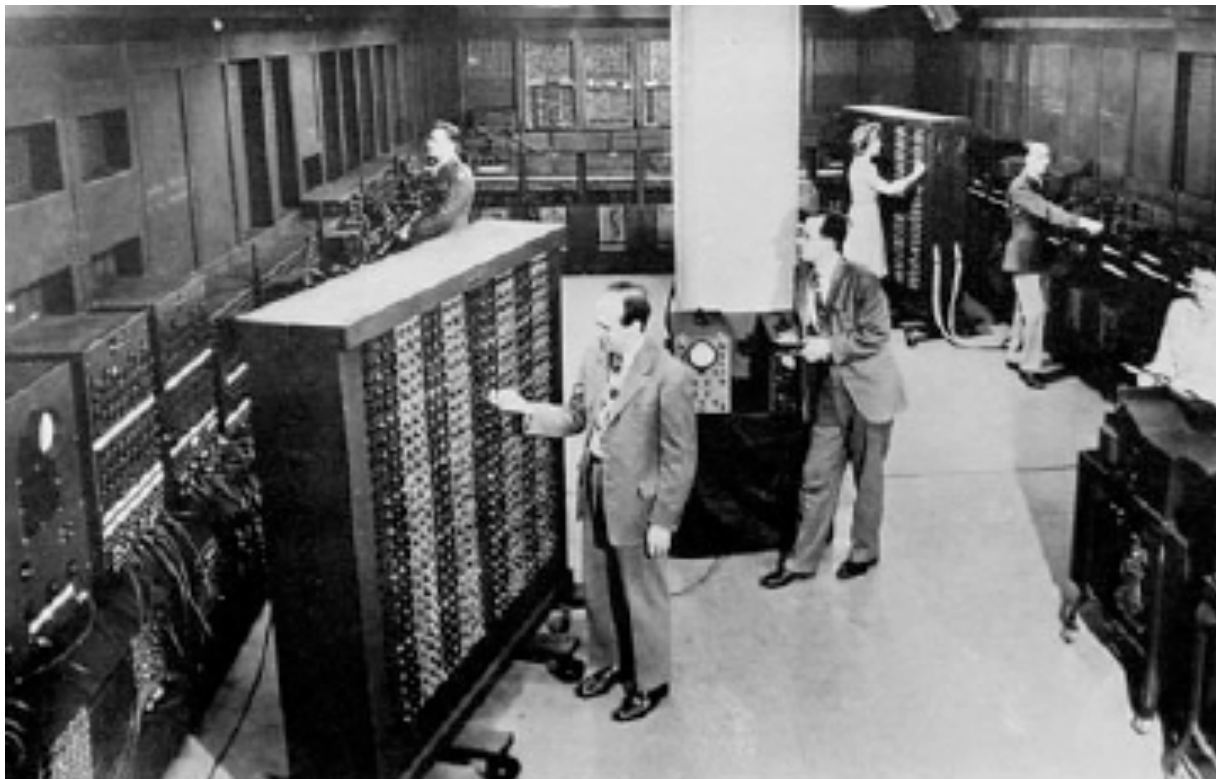
Instrumenting mobile platforms



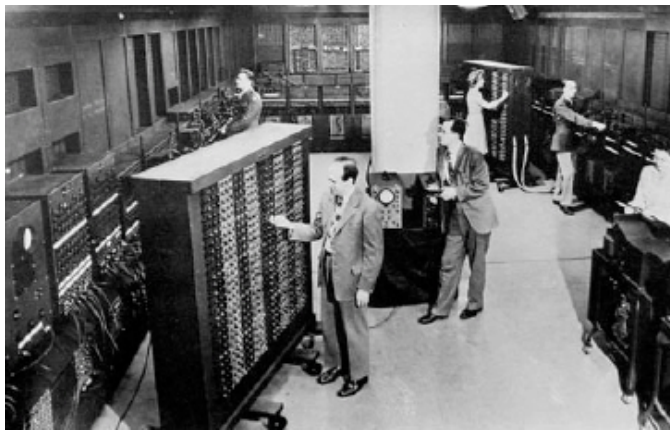
Security and privacy



It is still early days



It is still early days



1960's



1980's



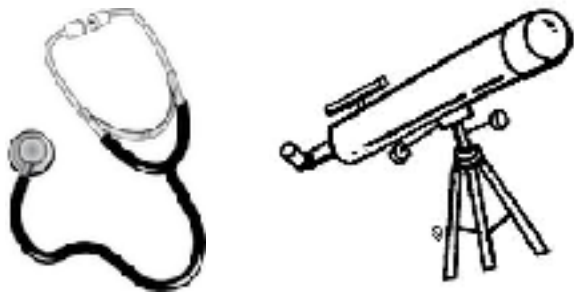
2000's



2020's



Killer app?



Sense

Movement
Activities
Interactions
Locations
Socioeconomic



Detect/Predict

Obesity
Accidents
Crime
Alienation
Economy

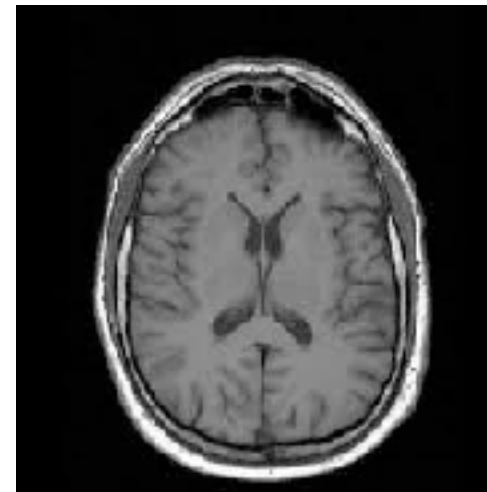
Imaging Technologies



X-RAY



Echocardiogram



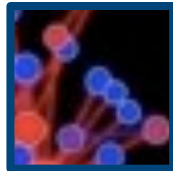
MRI



Community Imaging



Research



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Public interactive displays



Instrumenting mobile platforms



Security and privacy



Research



Social and complex networks



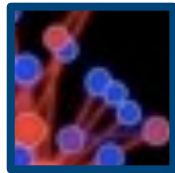
Sensing urban mobility



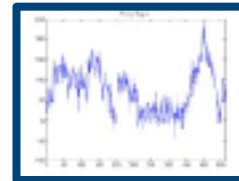
Instrumenting mobile platforms



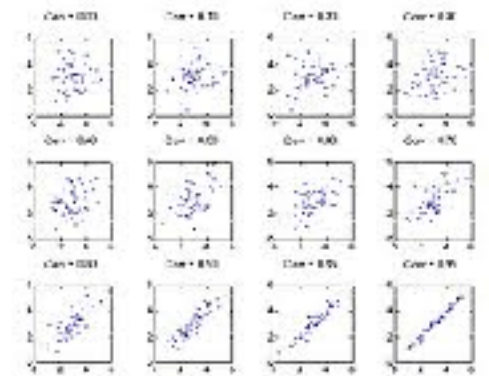
Social and complex networks



Capture social network
(Instrumentation)



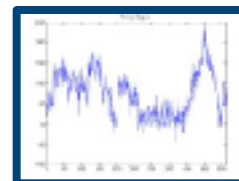
Calculate metrics



Establish correlations



Capture behavior vector
(Questionnaire)



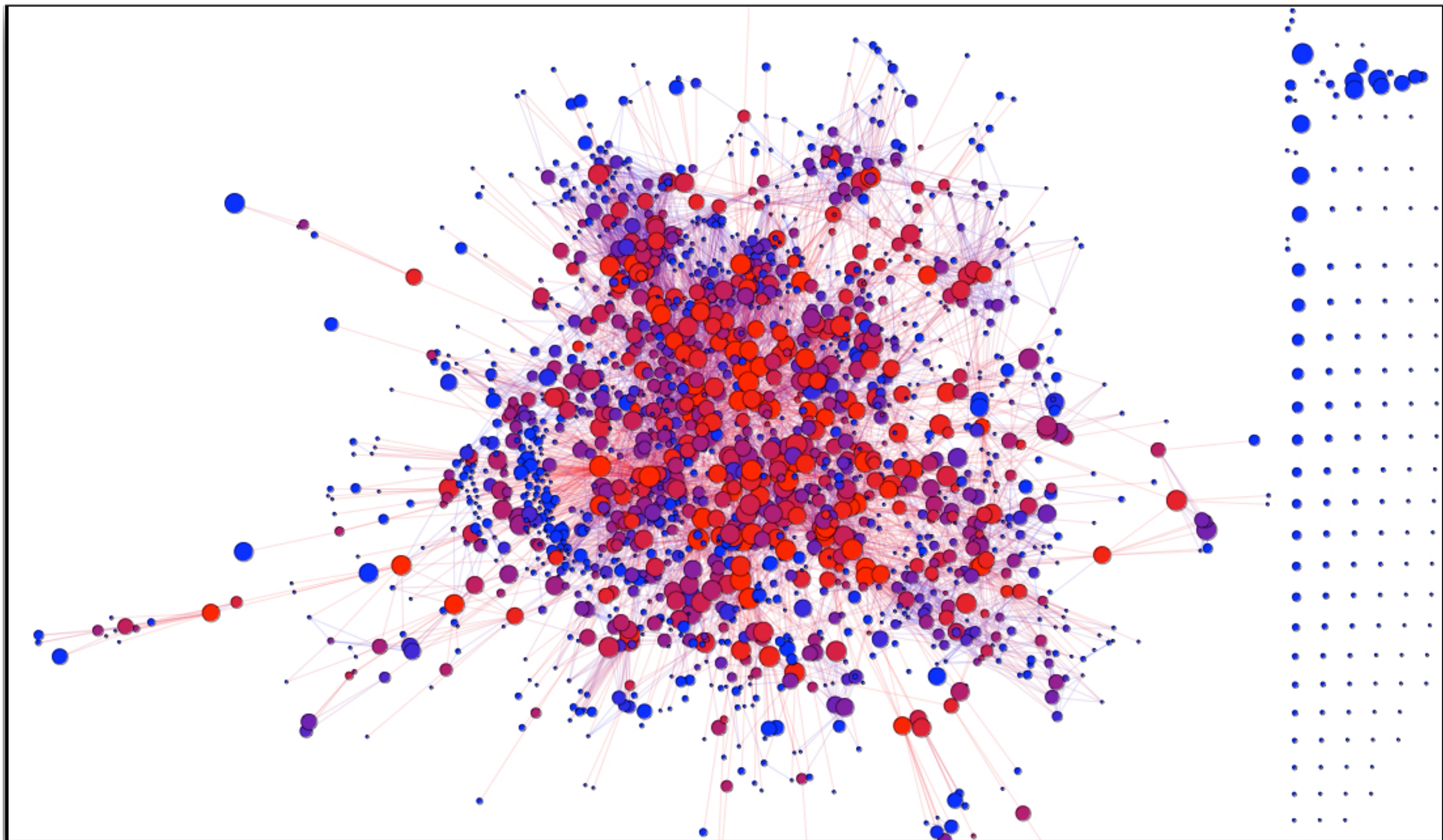
Calculate metrics



Social and complex networks

- BIG-5 personality traits
 - Openness (curious vs. cautious)
 - Conscientiousness (organized vs. careless)
 - Extraversion (outgoing vs. solitary)
 - Agreeableness (friendly vs. cold)
 - Neuroticism (nervous vs. confident)
- Empathy
- Social capital
- Trust
- Social network metrics
 - Centrality (betweenness, closeness, degree)
 - Structural holes
 - Clustering coefficient
 - Constraint





Research



Social and complex networks



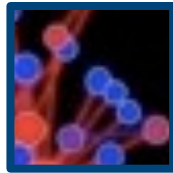
Sensing urban mobility



Instrumenting mobile platforms



Research



Social and complex networks



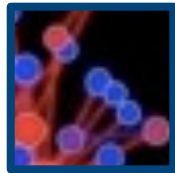
Sensing urban mobility



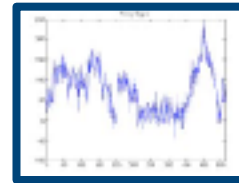
Instrumenting mobile platforms



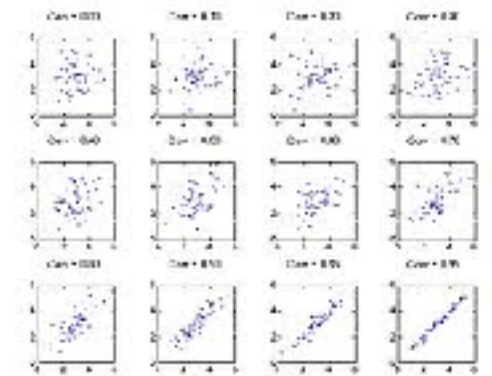
Sensing urban mobility



Capture mobility data
(Instrumentation)



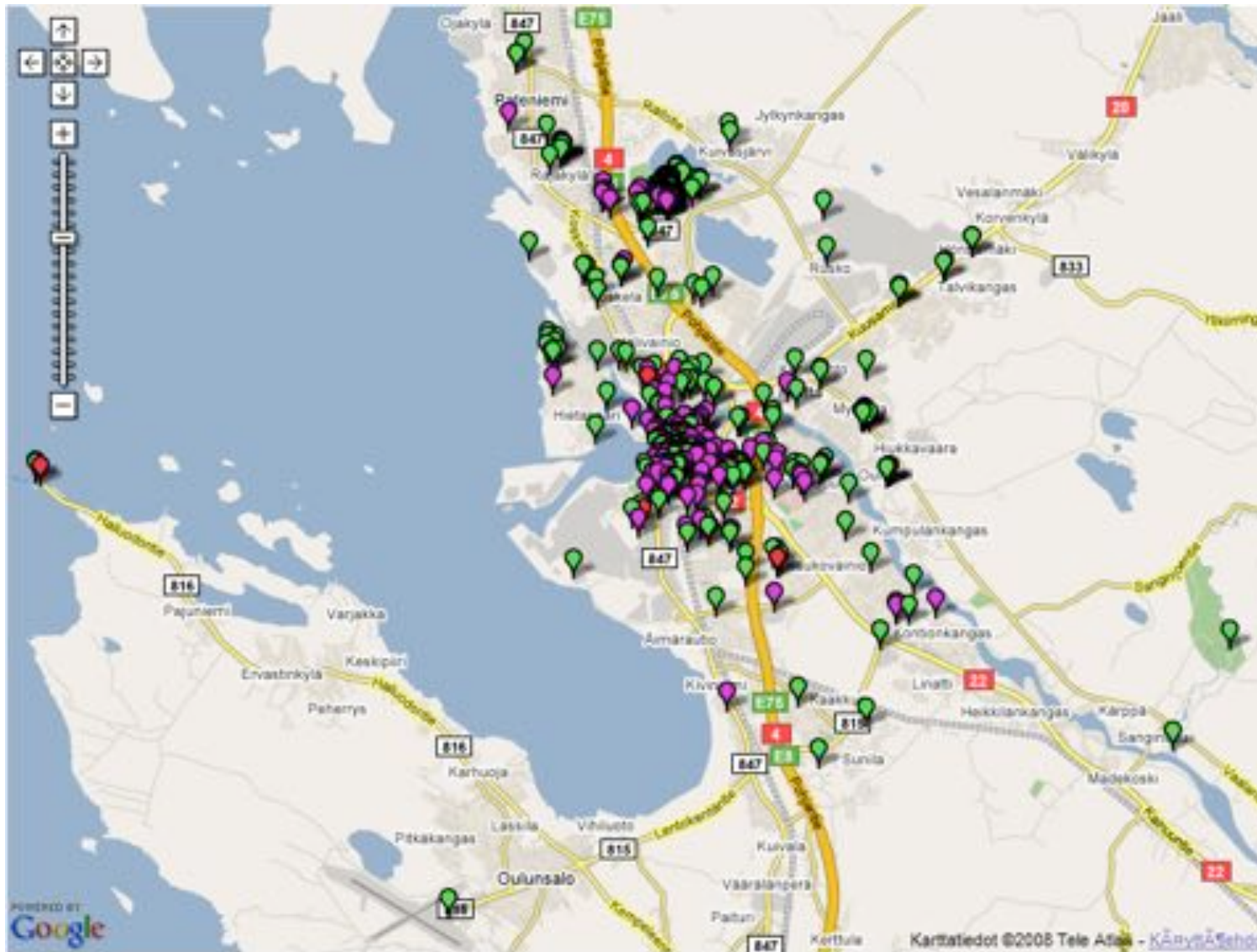
Calculate metrics



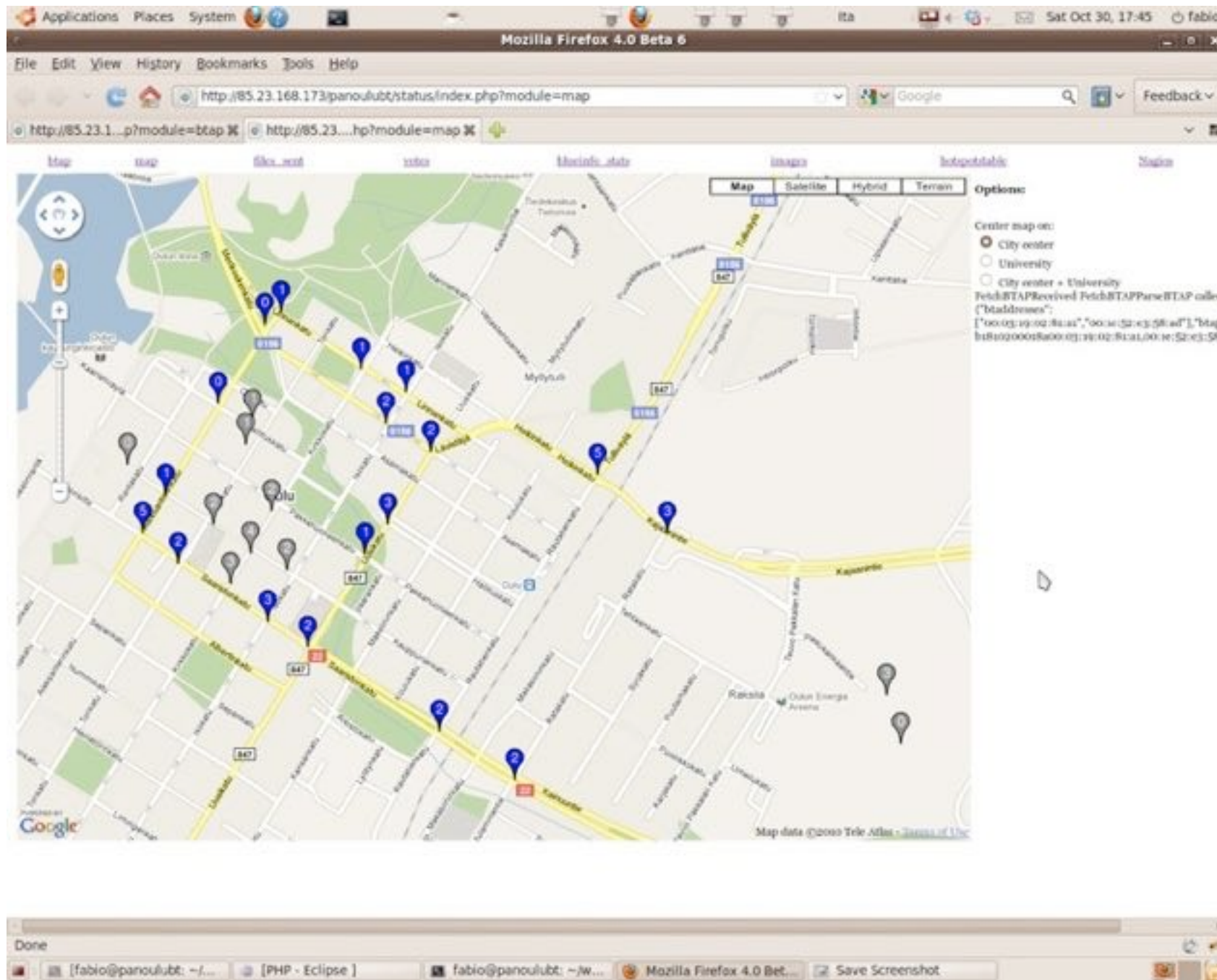
Establish clusters



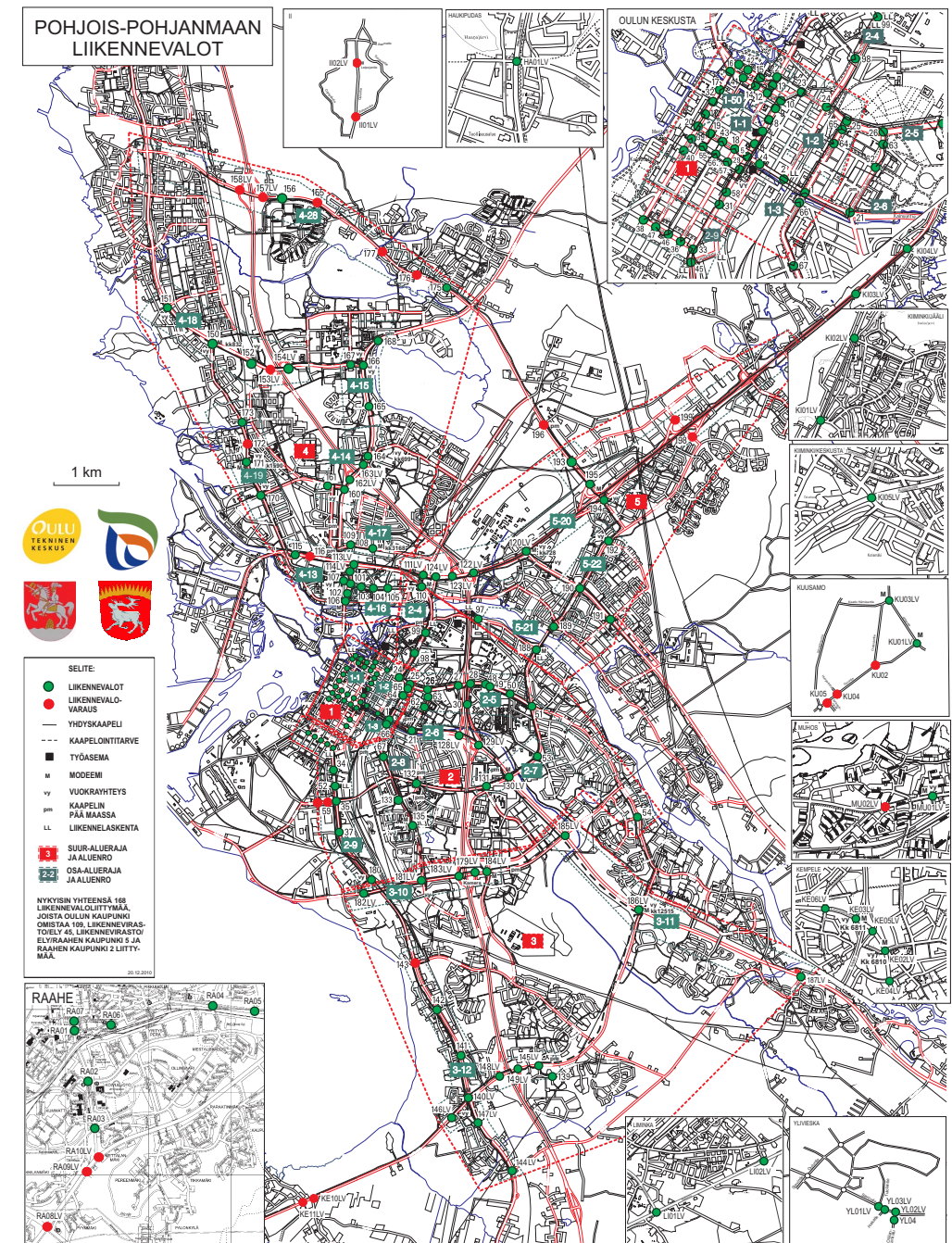
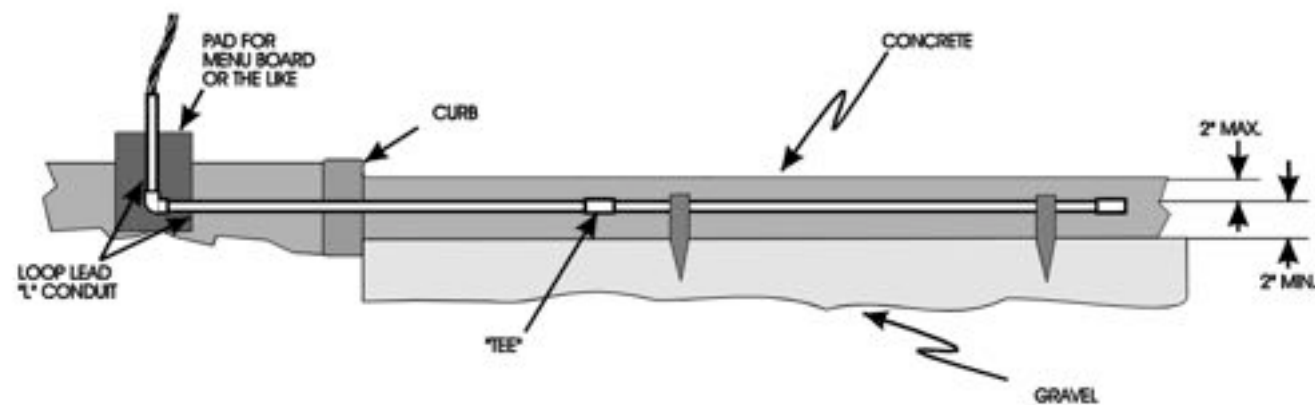
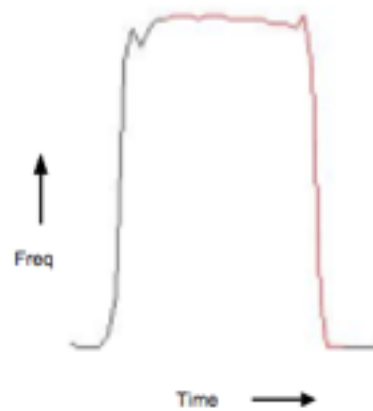
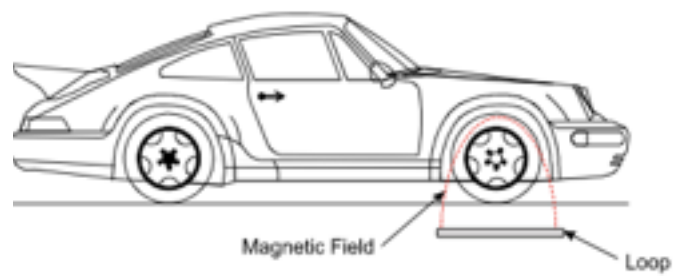
panOulu WiFi



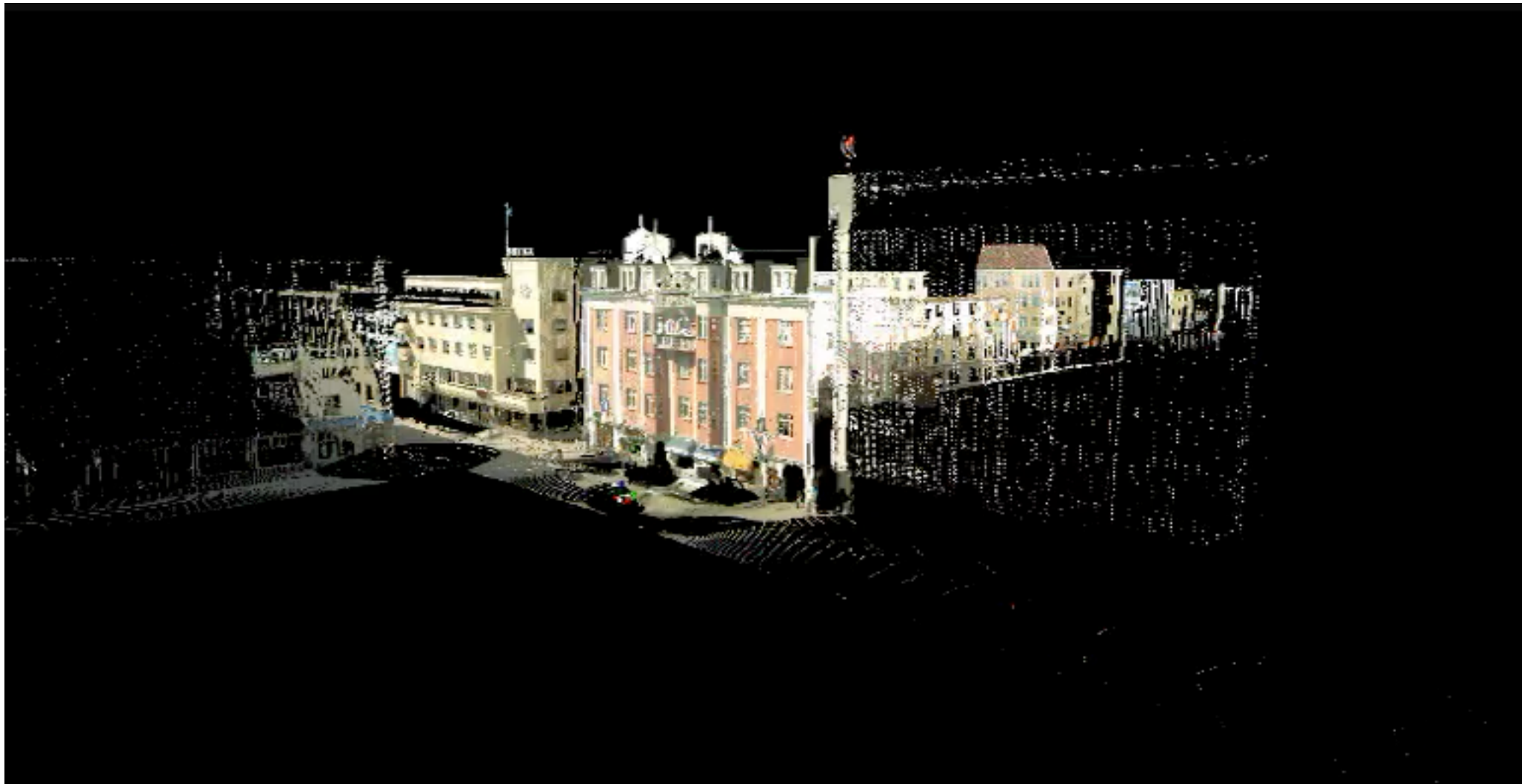
Bluetooth network



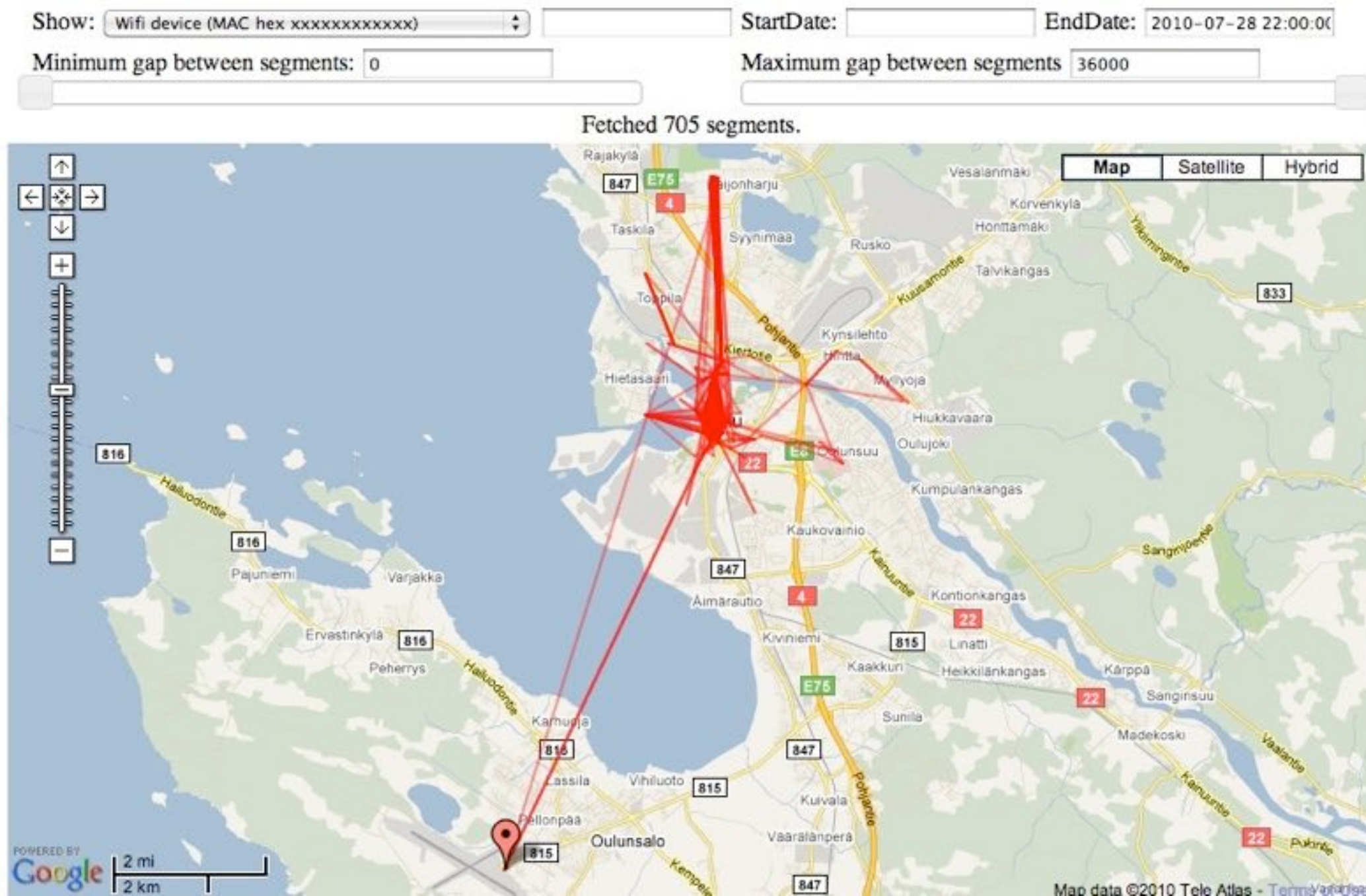
Induction loops



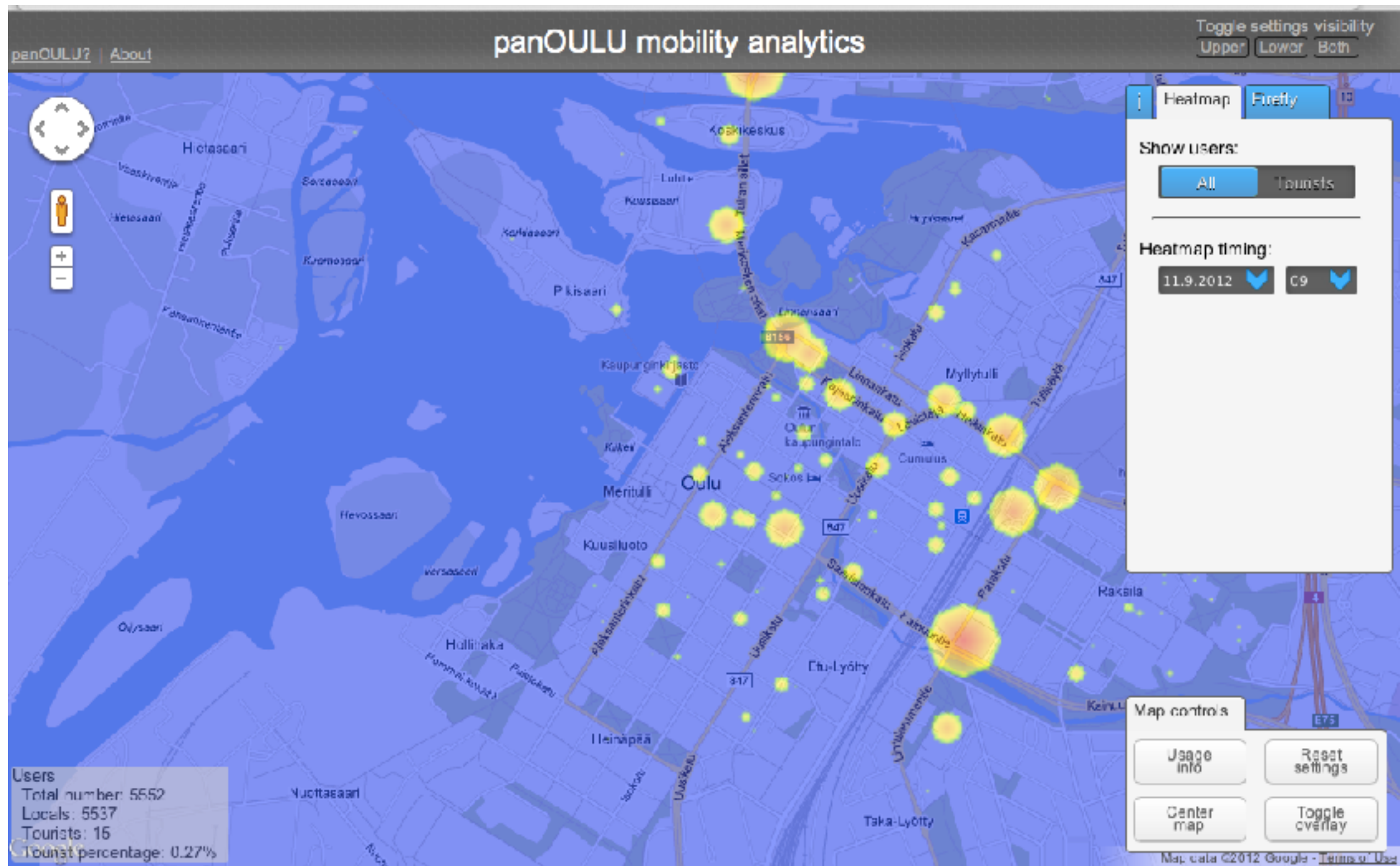
3D Oulu



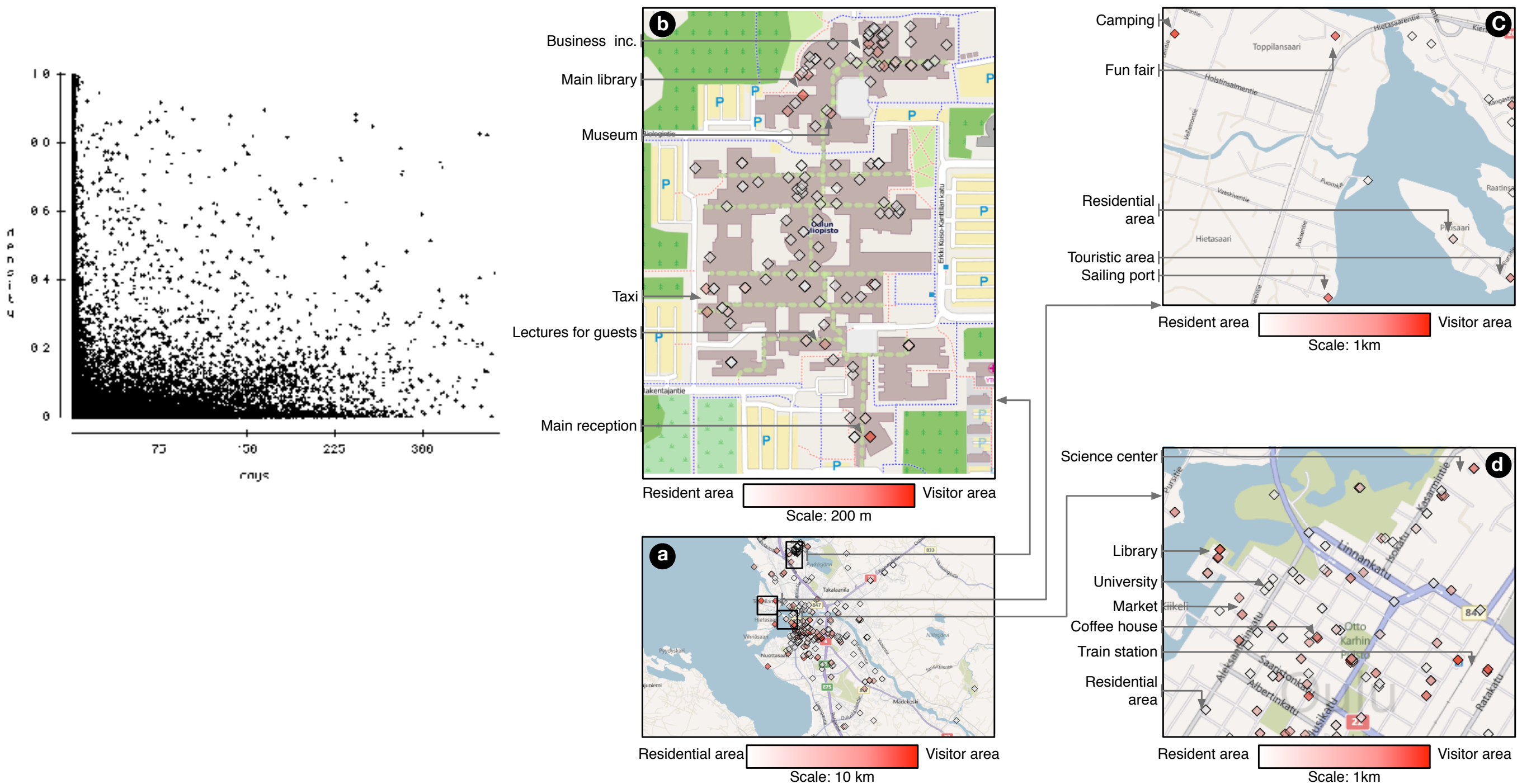
Reconstructing movement



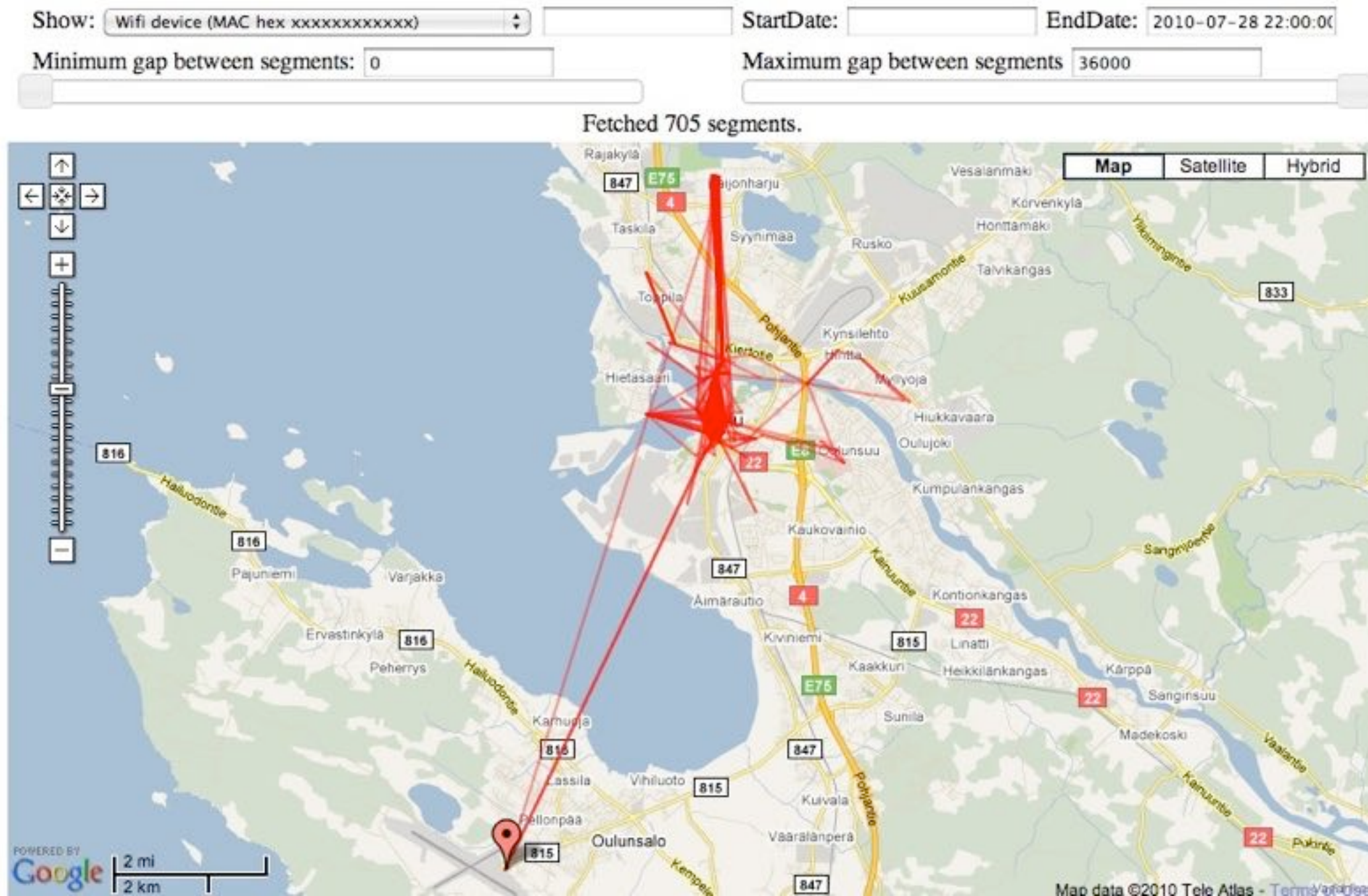
Where is it busy now?

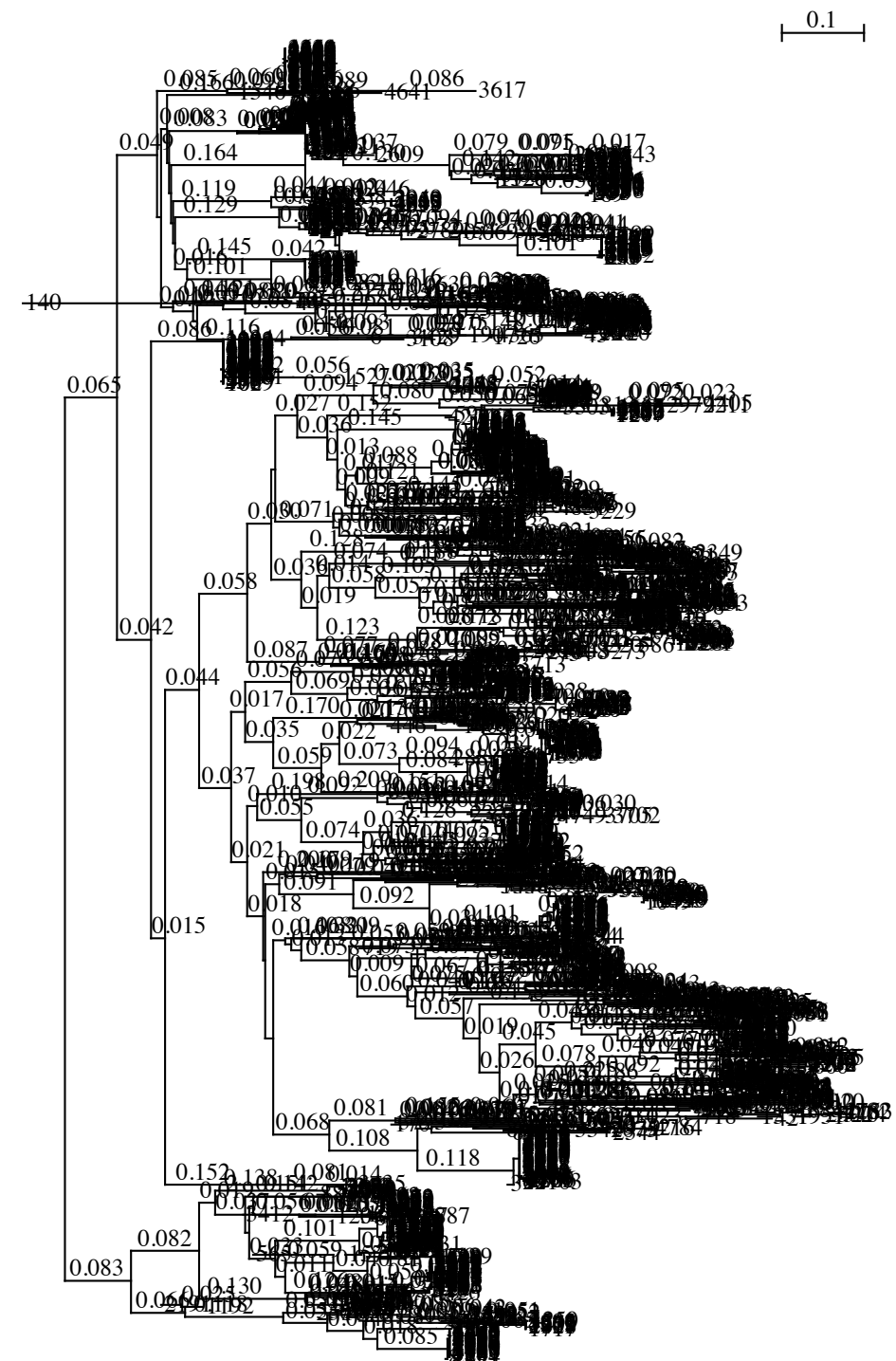
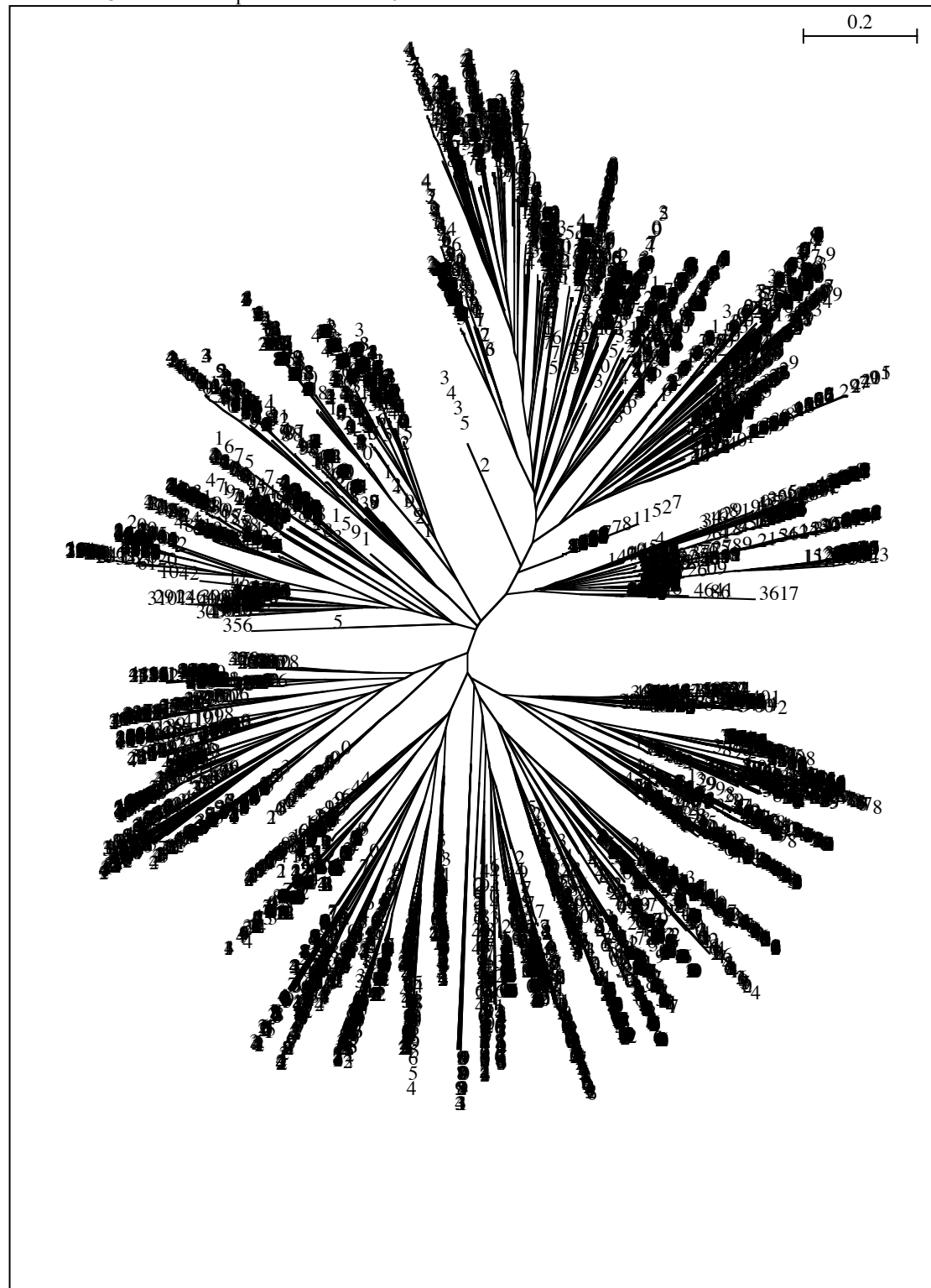


Find visitors & visitor locations

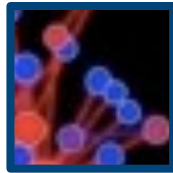


Finding “shoals”





Research



Social and complex networks



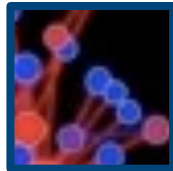
Sensing urban mobility



Instrumenting mobile platforms



Research



Social and complex networks



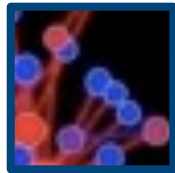
Sensing urban mobility



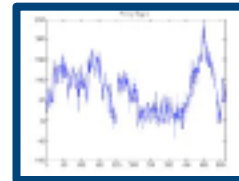
Instrumenting mobile platforms



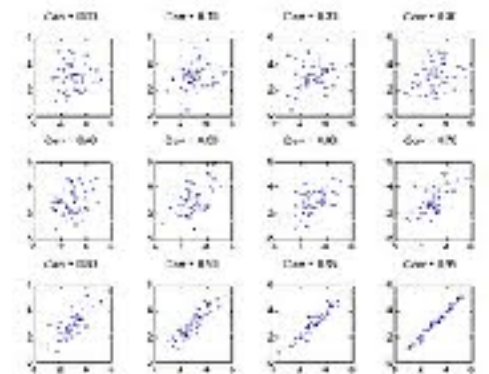
Instrumenting mobile platforms



Capture data on phone
(Instrumentation)



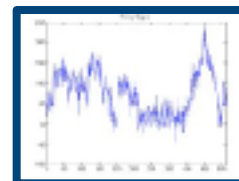
Calculate metrics



Establish correlations
Describe behavior



Capture behavior vector
(Questionnaire/Automated)



Calculate metrics



Capture “everything” on phone

*Including “on-demand” questionnaires



AWARE

Android Mobile Context Instrumentation Framework

<http://AwareFramework.com>

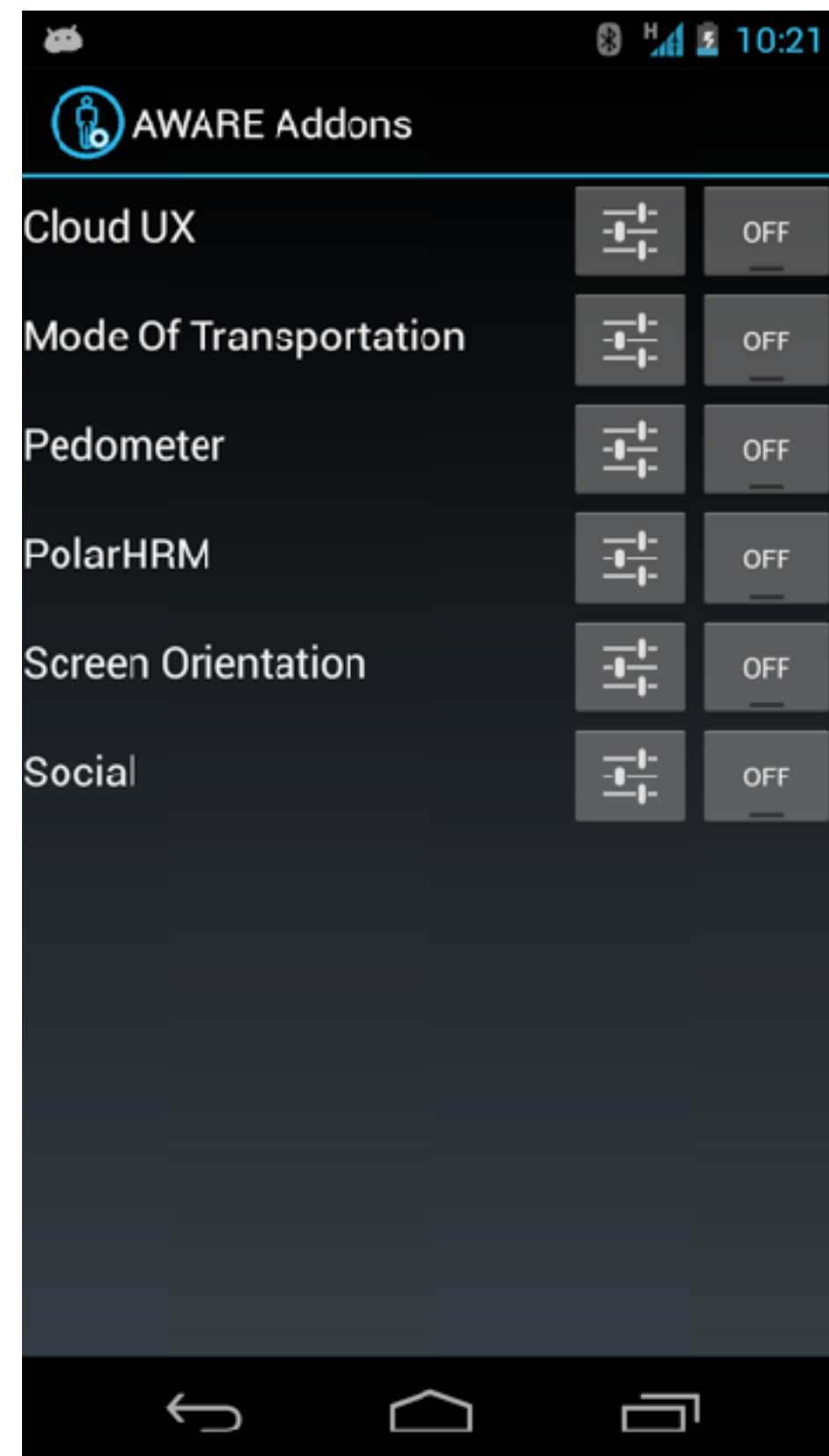
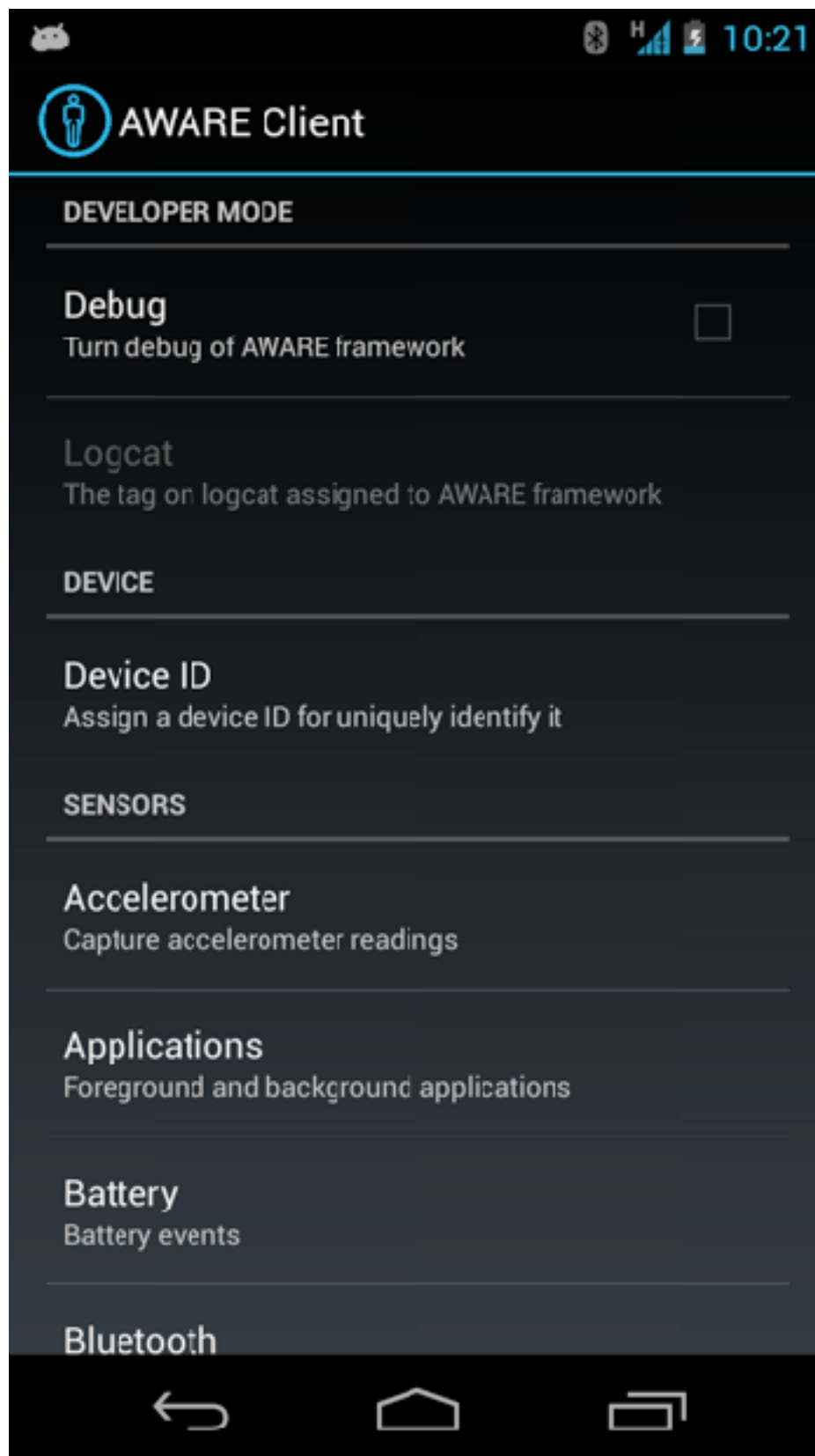
AWARE Client

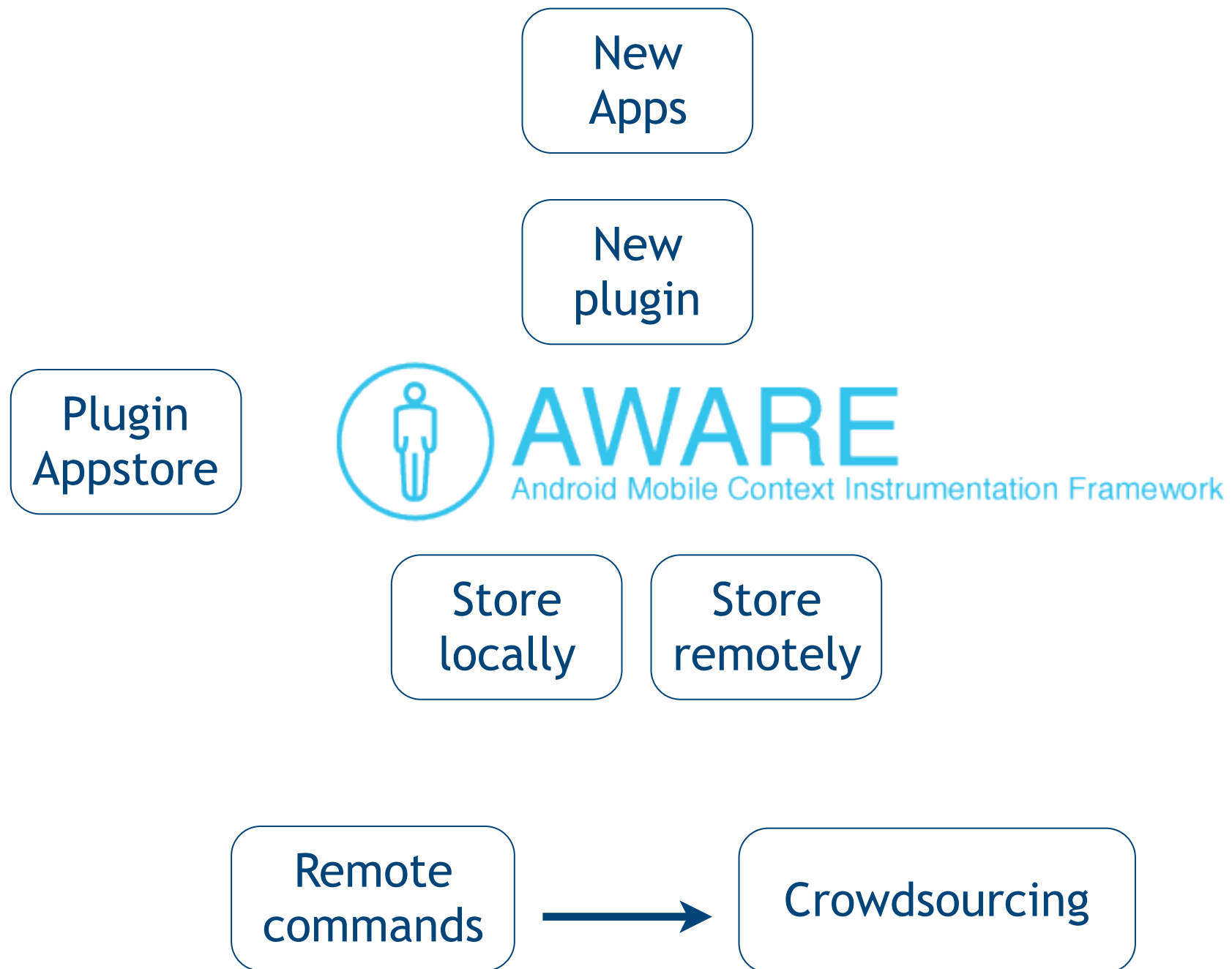
Android 2.3+ phone or tablet

AWARE Server

PHP + MySQL server







Closing thoughts

- We do a lot of instrumentation
 - Social
 - Mobility
 - Smartphone
- A lot of data describing individual & community-level behavior
- Great potential for combining with other metrics (health, economy, education, etc)
- AIM: develop Community Imaging techniques



The end