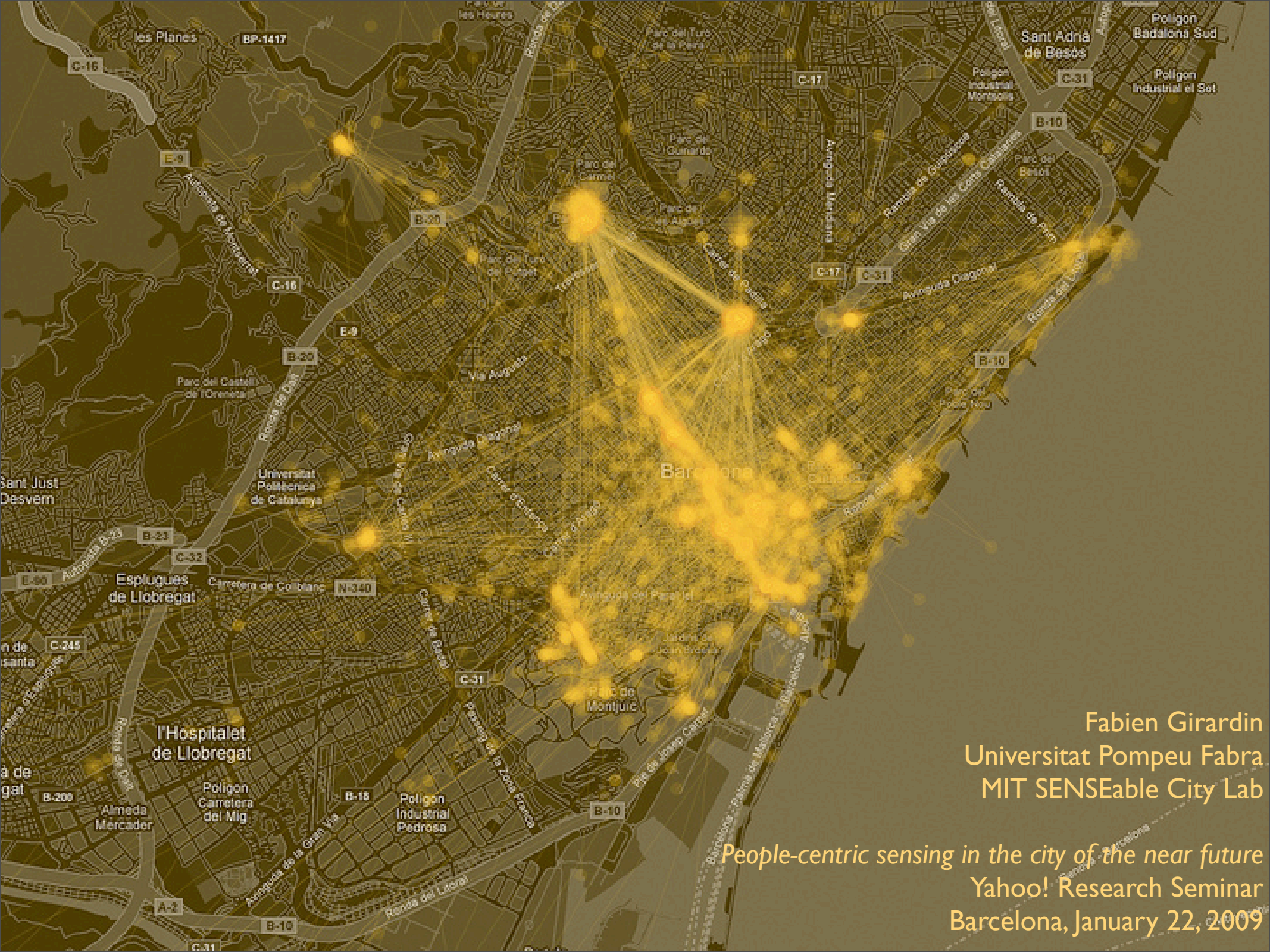
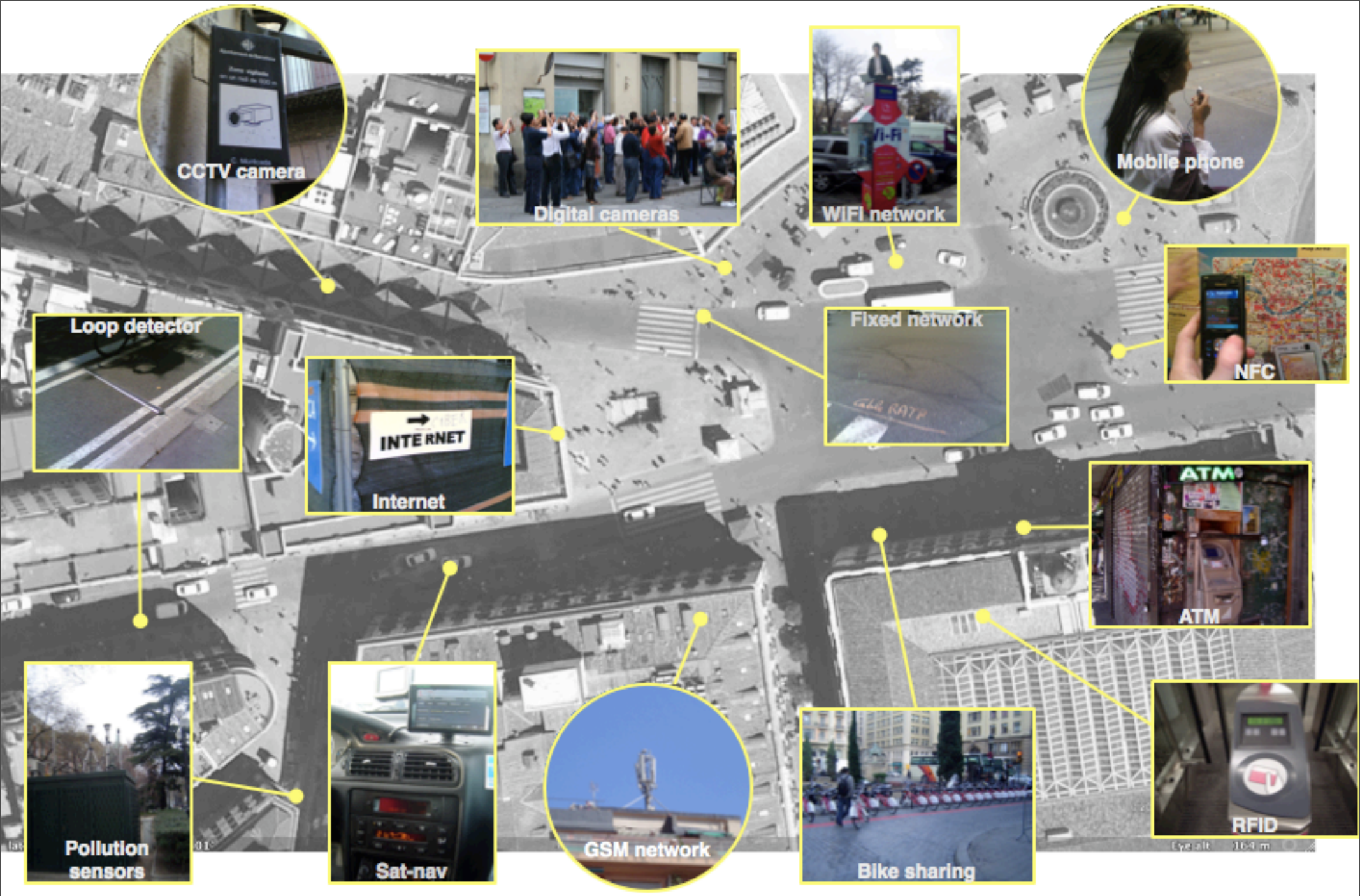

Fabien Girardin
Universitat Pompeu Fabra
MIT SENSEable City Lab
People-centric sensing in the city of the near future
Yahoo! Research Seminar
Barcelona, January 22, 2009



new urban *actors*

Digital shadows

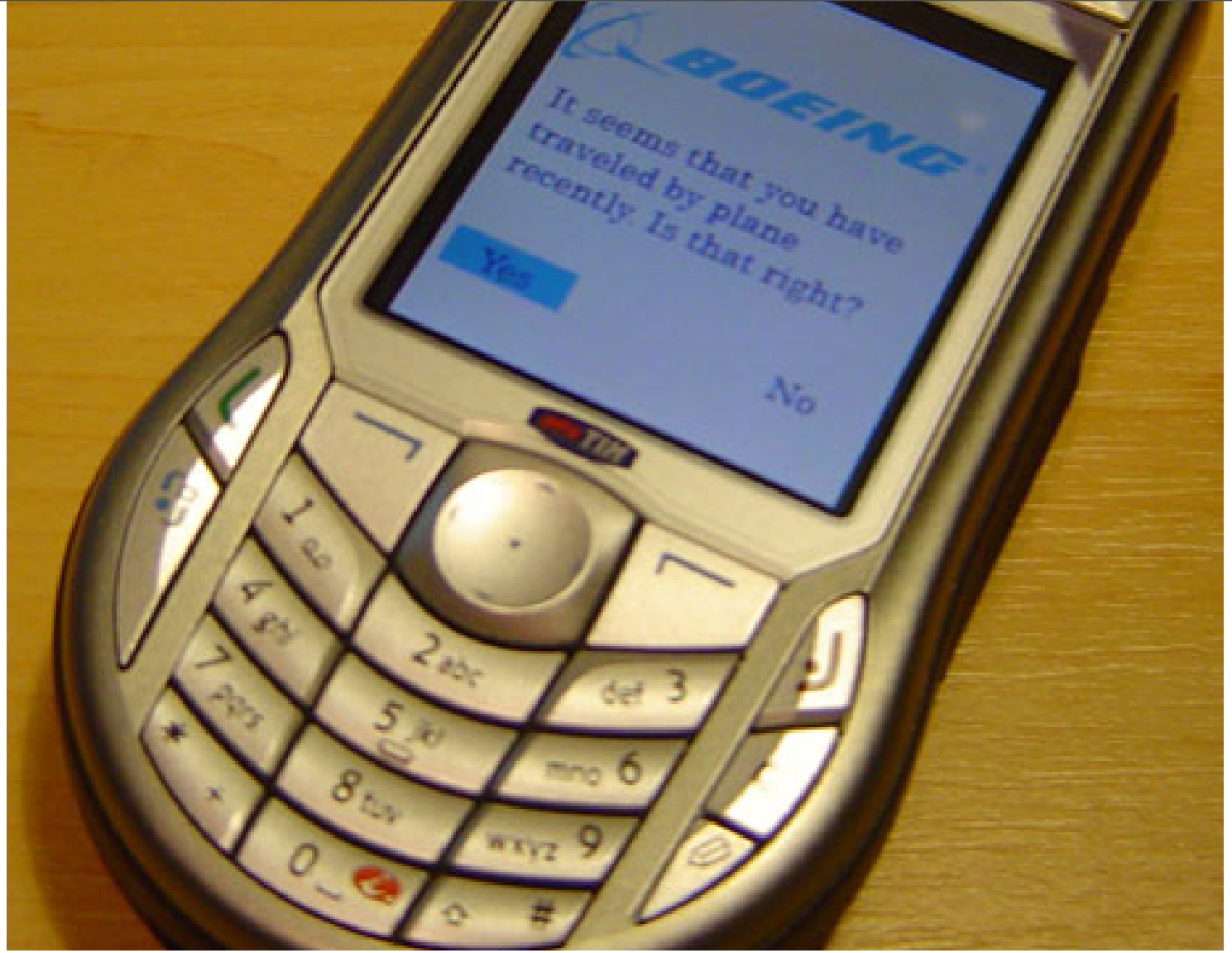
- Records of implicit interactions with these new urban actors in the physical space with digital means
- Examples: RFID card (bike sharing, metro), tangible sensors, wireless networks (GSM, Wi-Fi), fidelity cards, credit cards, etc

Digital footprints

- Explicit user-generated content with geographic anchor: "*from shoeboxes to digital footprints*"
- Fall of prices to store data
- Raise of online social networks and 'new cartography' as ways to map and visualize the city through images and narrative descriptions

People-centric sensing

- Data produced through people's interactions with digital systems and infrastructures
- Capture a sample of human, social or environmental state (individuals act as sensors)
- Bottom-up , decentralized nature



Detecting air travel to survey passengers

"The consequences for the social sciences will be enormous: they can finally have access to masses of data that are of the same order of magnitude as that of their older sisters, the natural sciences." Bruno Latour

Latour, B. (2007). Beware, your imagination leaves digital traces, Times Higher Education Supplement, April 2007.

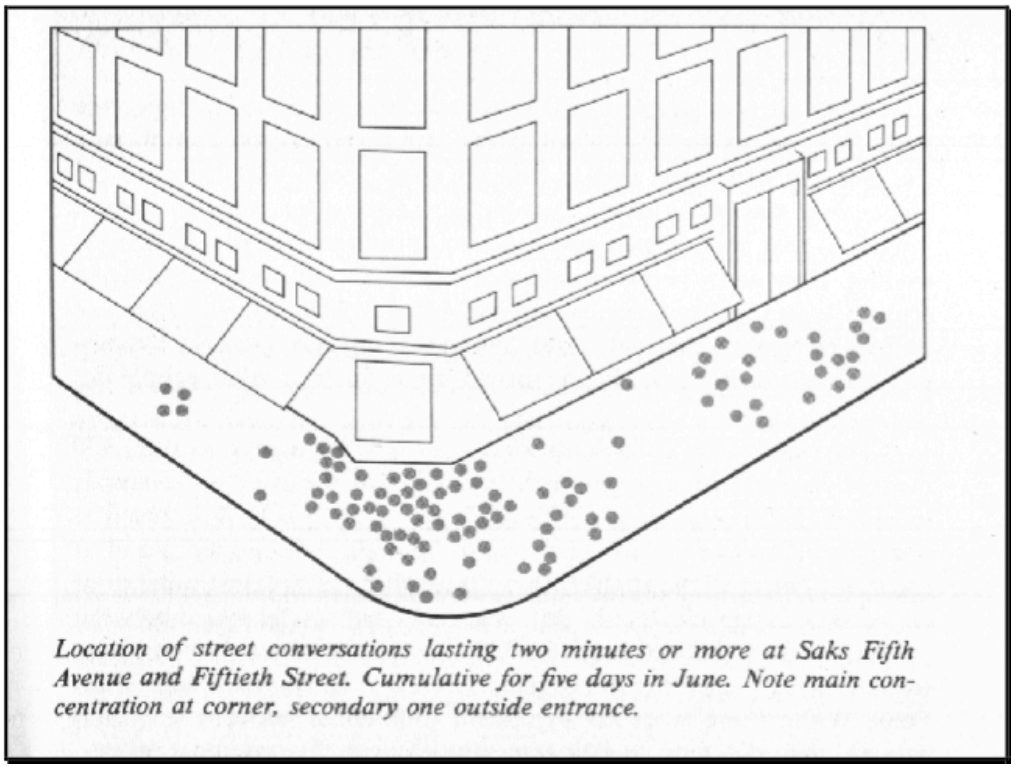
Urban informatics

1. Urban data gathering (What can be sensed?)
2. Urban data analysis (What can we do with what is quantitativly sensed and qualitativly observed?)
3. Information visualization (What can we communicate?)
4. Designing urban technologies and services (How to design to improve?)

Sentient cities

- Technologies that gets embedded in the fabric of our lives and giving us the ability to show previously invisible urban processes
- Literature: *pulsing cloud of data, reveal the city as we experience it, instantaneous information, enhancement of our perception*

Traditional techniques

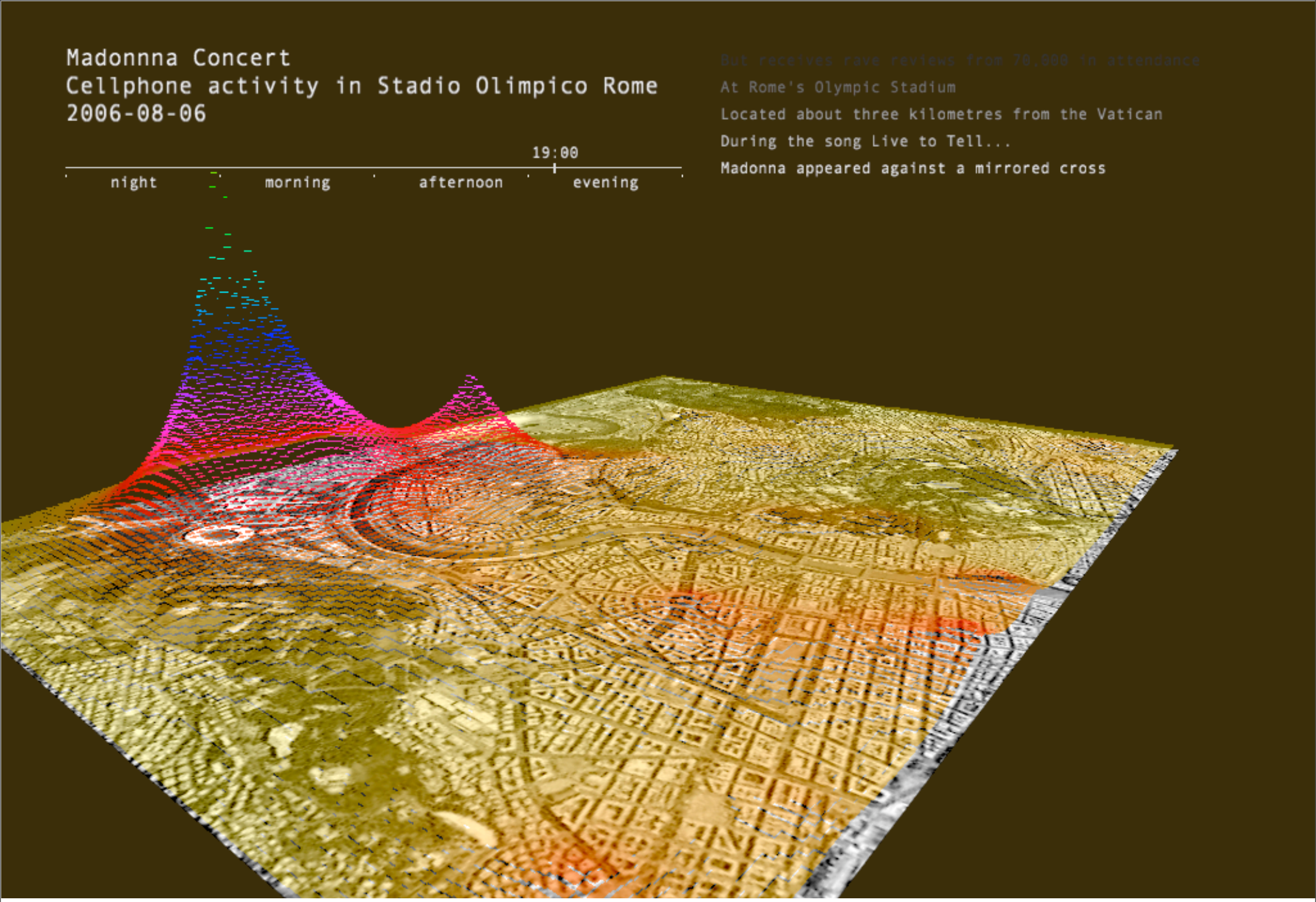


Location of street conversations lasting two minutes or more at Saks Fifth Avenue and Fiftieth Street. Cumulative for five days in June. Note main concentration at corner, secondary one outside entrance.

1971

2009

Whyte, William H. 1971. City: Rediscovering the Center. New York: Anchor Books.



Cellular network traffic as proxy of city dynamics

Ratti, C., Pulselli, R. M., Williams, S., and Frenchman, D. (2006). Mobile landscapes: Using location data from cell-phones for urban analysis. Environment and Planning B: Planning and Design, 33(5):727 – 748.

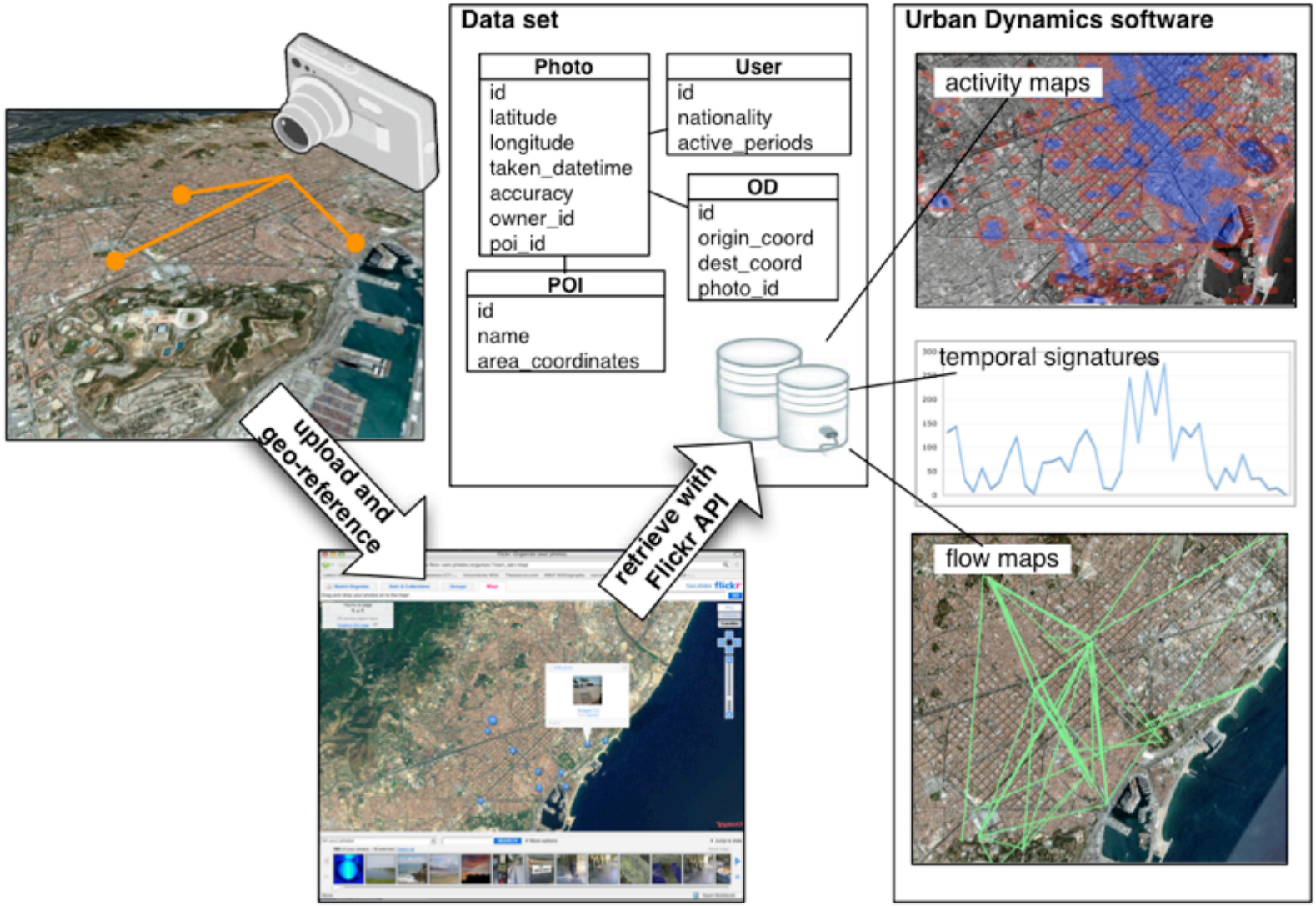
Nowadays tourists leave digital footprints behind them that reveal their presence

The World's Eyes
Where are the Britons?

Current Week in 2007

28 45

Digital footprinting



Girardin, F., Dal Fiore, F. , Ratti, C., and Blat, J. (2008). Leveraging explicitly disclosed location information to understand tourist dynamics: A case study. Journal of Location-Based Services 2, 1, 41–54.

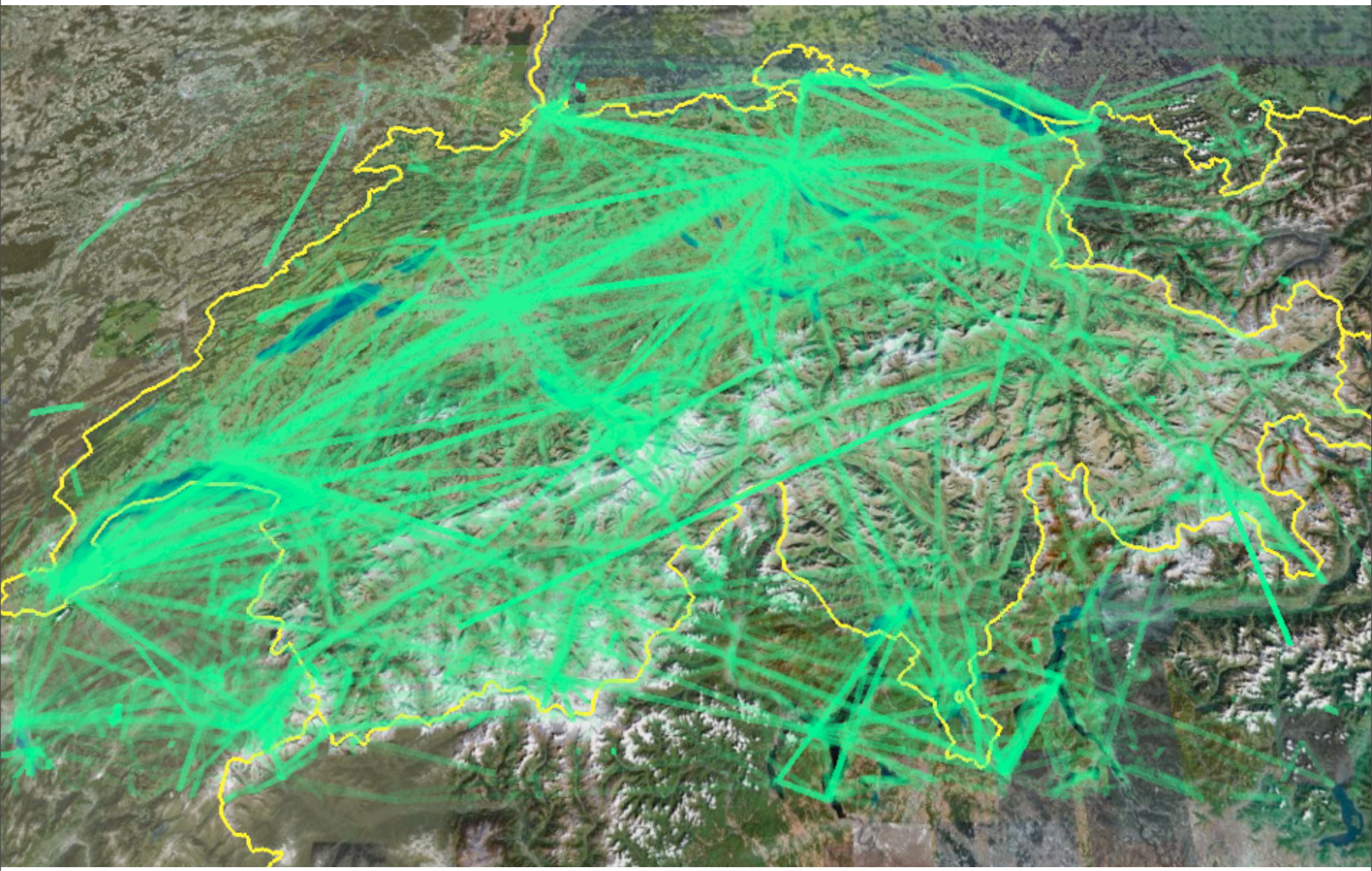
2 years (2005-2007)

Region	Photos	Photographers
Barcelona	154,106	5818
Province of Florence	81,017	4280
Rome	144,501	6018

Scales

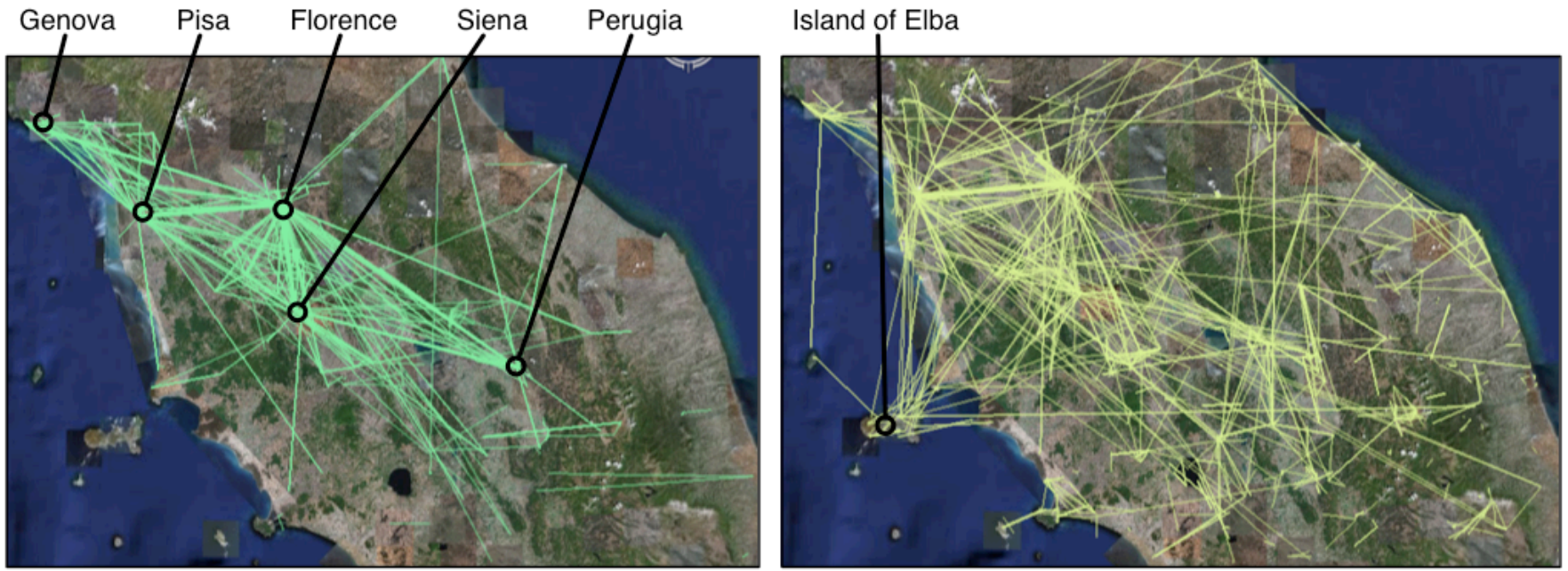
Density of photographers in Tuscany in 2007 at region, city and monument scales. Fabien Girardin, UPF

act of communication



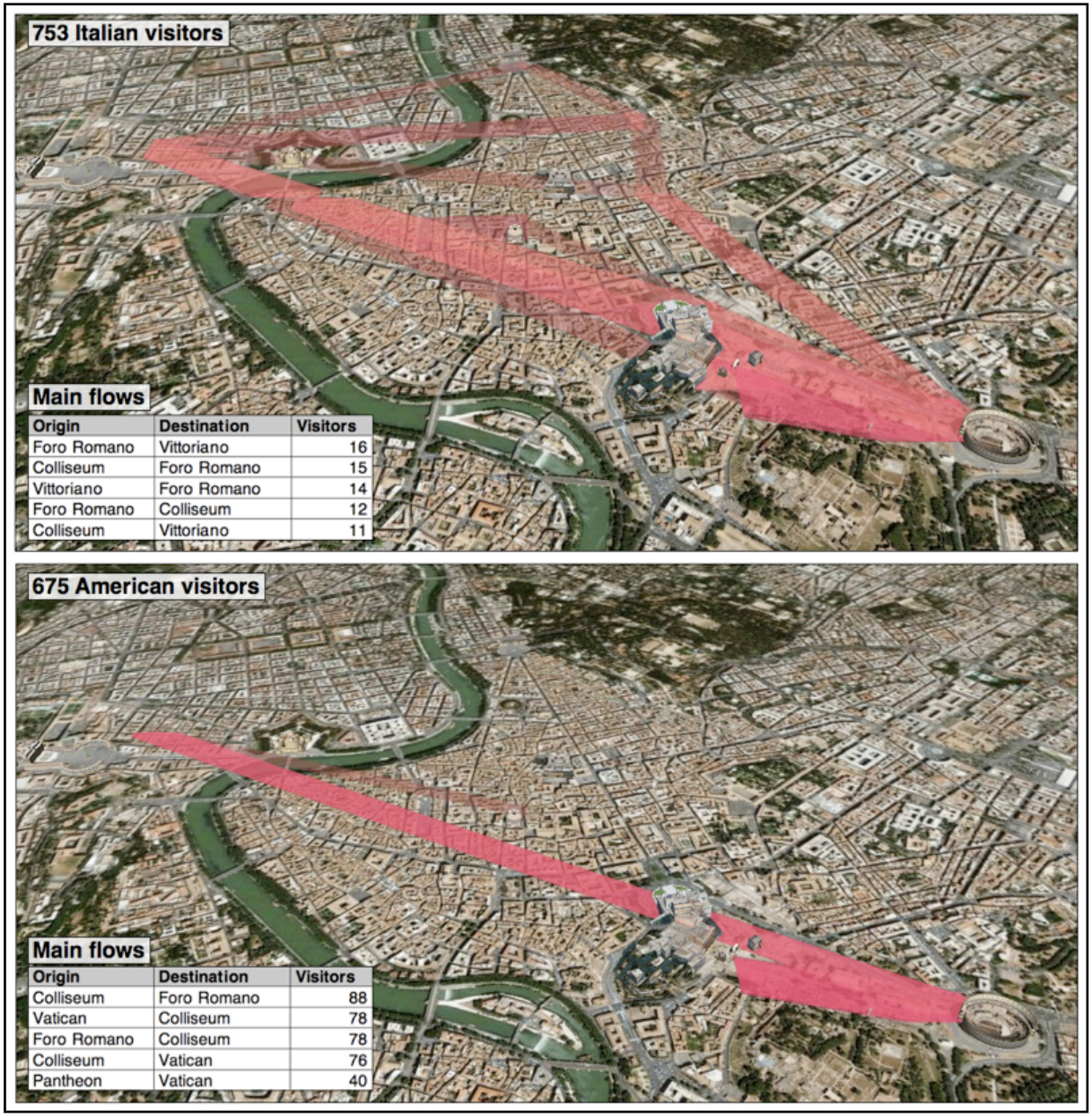
Tourists traces in Switzerland in 2007. Fabien Girardin, UPF
http://www.flickr.com/photos/drremulac/464000368/in/set-72157600018368138/

Types of visitors



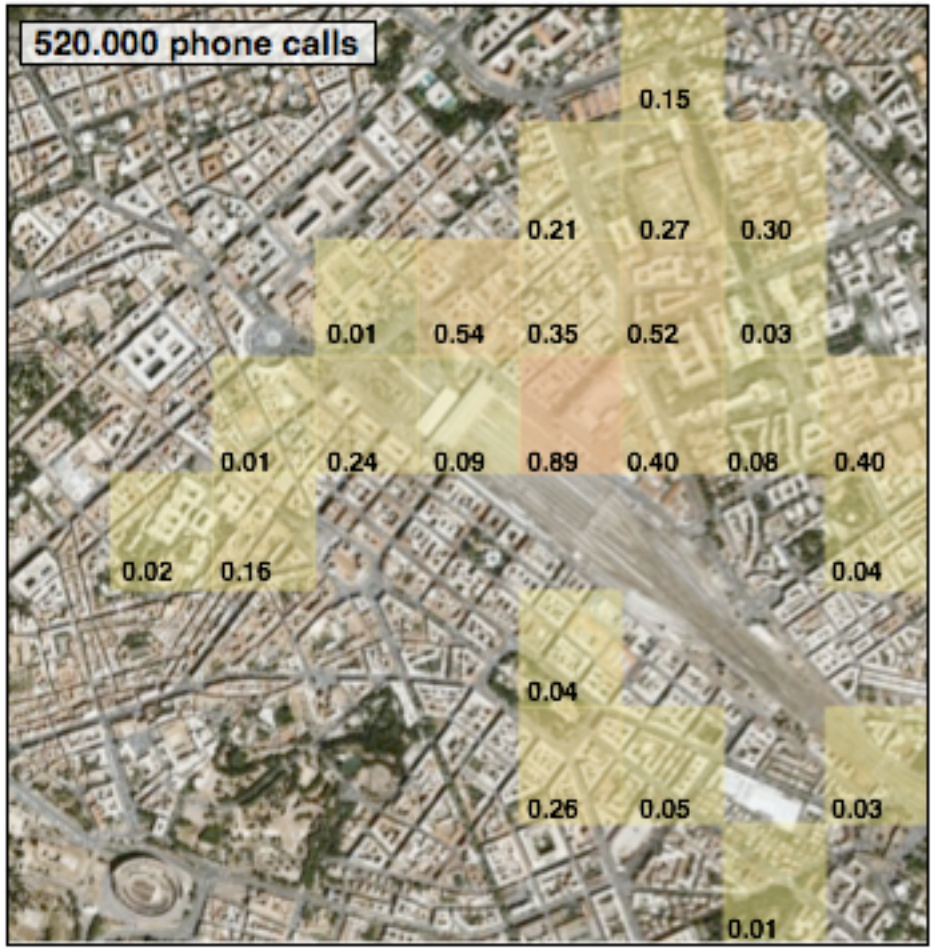
Tourists and locals can be recognized from their practice
60% of users disclose their home country

Flows

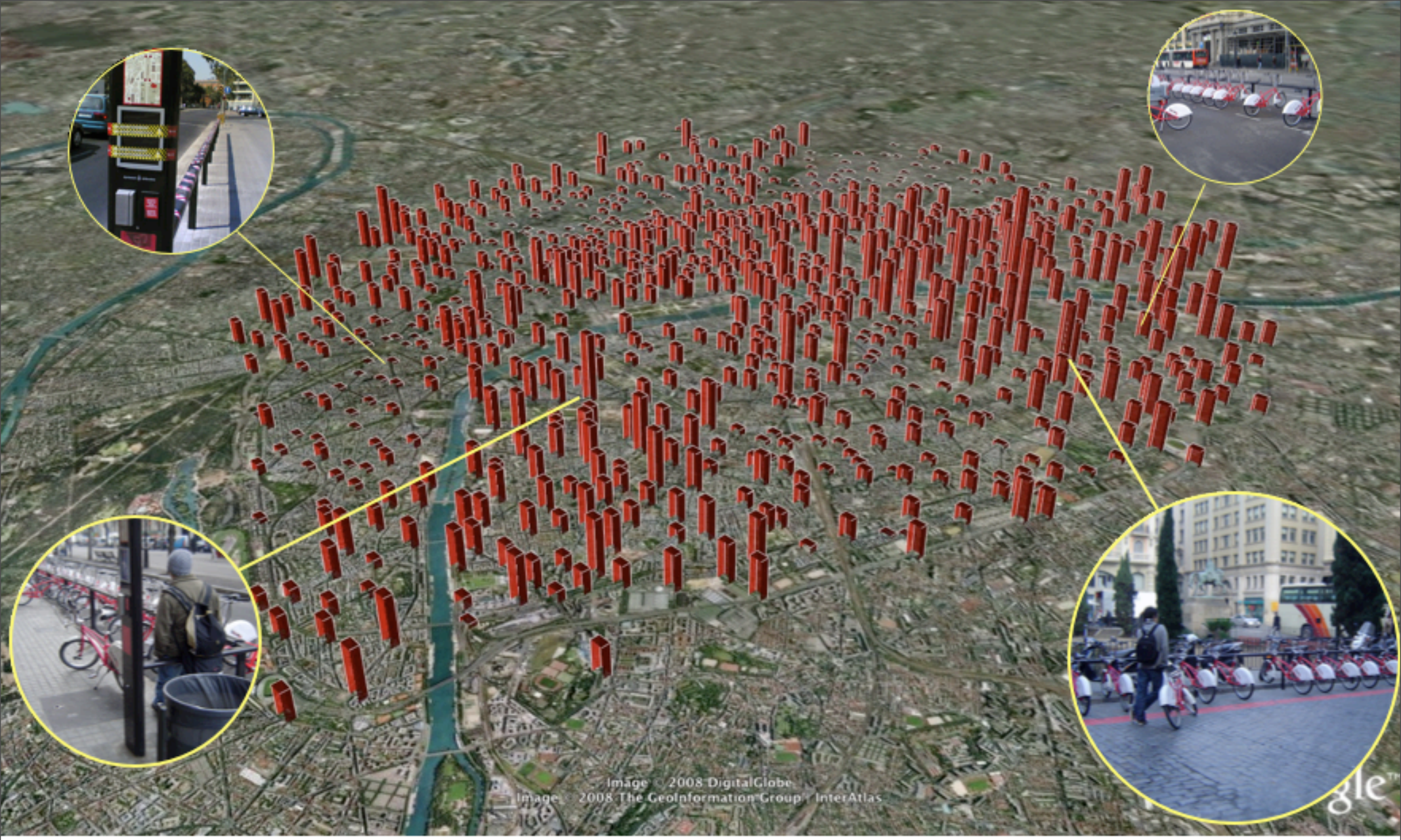


Girardin, F., Calabrese, F., Dal Fiore, F. , Ratti, C., and Blat, J. (2008). Digital footprinting: Uncovering tourists with user-generated content. IEEE Pervasive Computing, 7(4):36–43.

Space and visitors activities

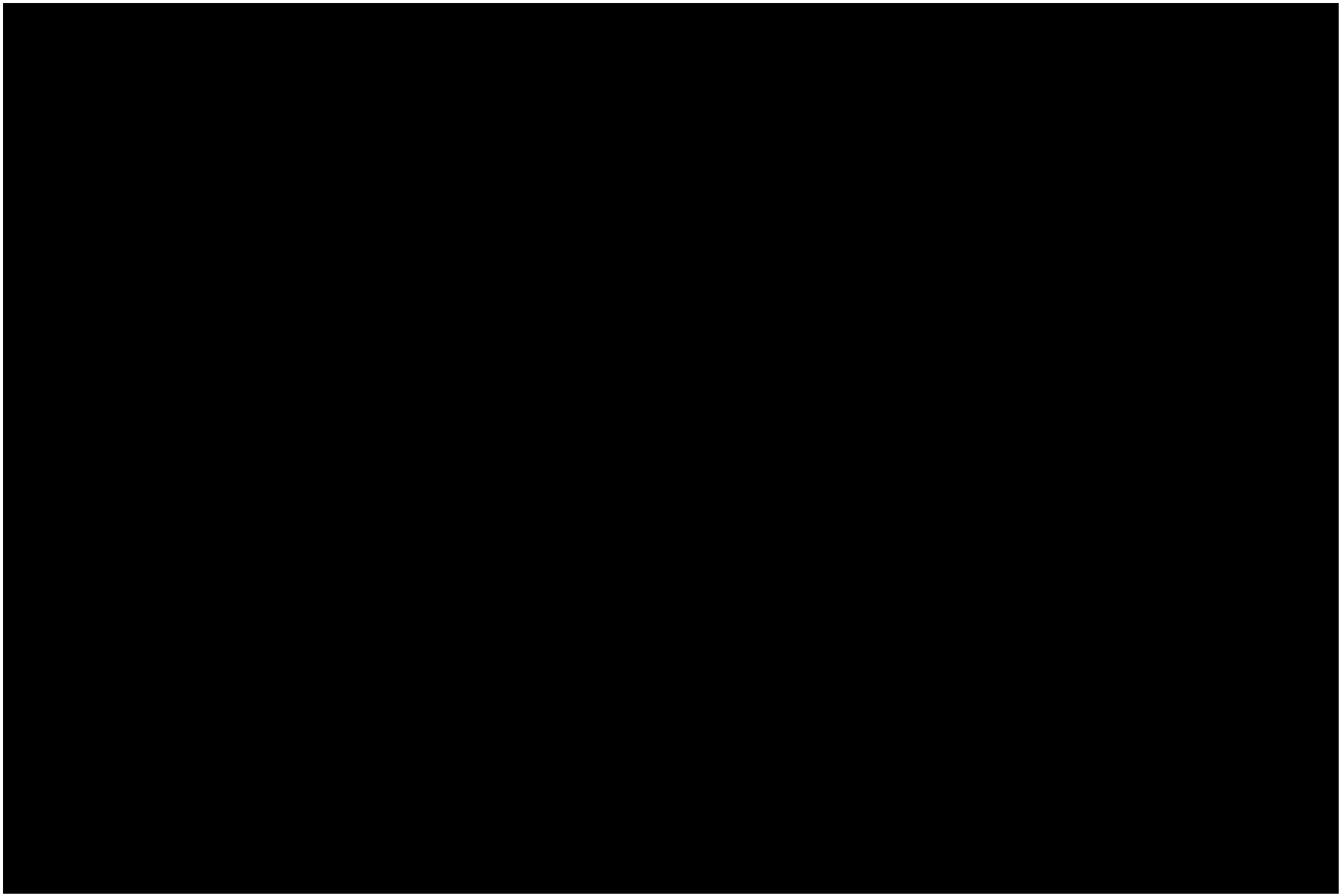


Girardin, F., Blat, J., Calabrese, F., Dal Fiore, F. & Ratti, C. (2008) Digital Footprinting: Uncovering Tourists with User-Generated Content. IEEE Pervasive Computing, October/November 2008, pp. 36-43.



bikes as sensors

Paris Through Velib'



Fabien Girardin, Universitat Pompeu Fabra
Revealing Paris Through Velib' Data: http://www.girardin.org/fabien/tracing/velib/

Eyeballs as sensors

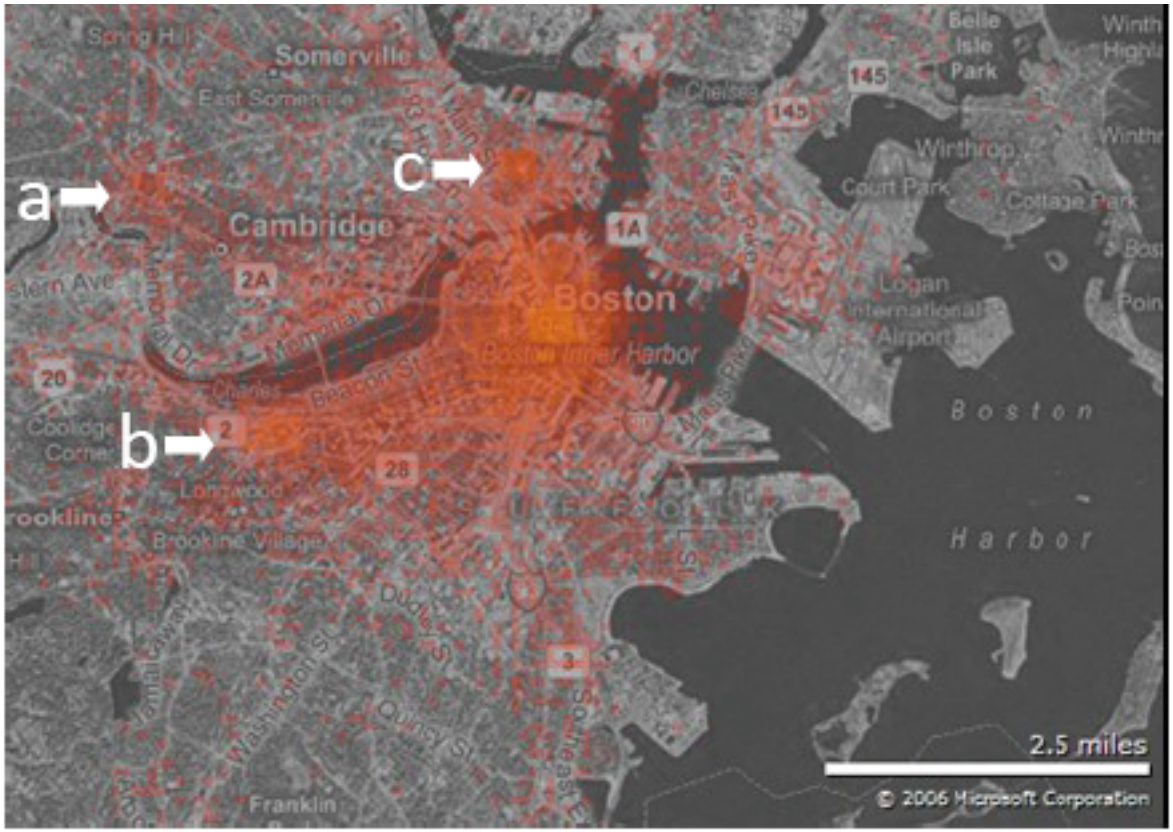
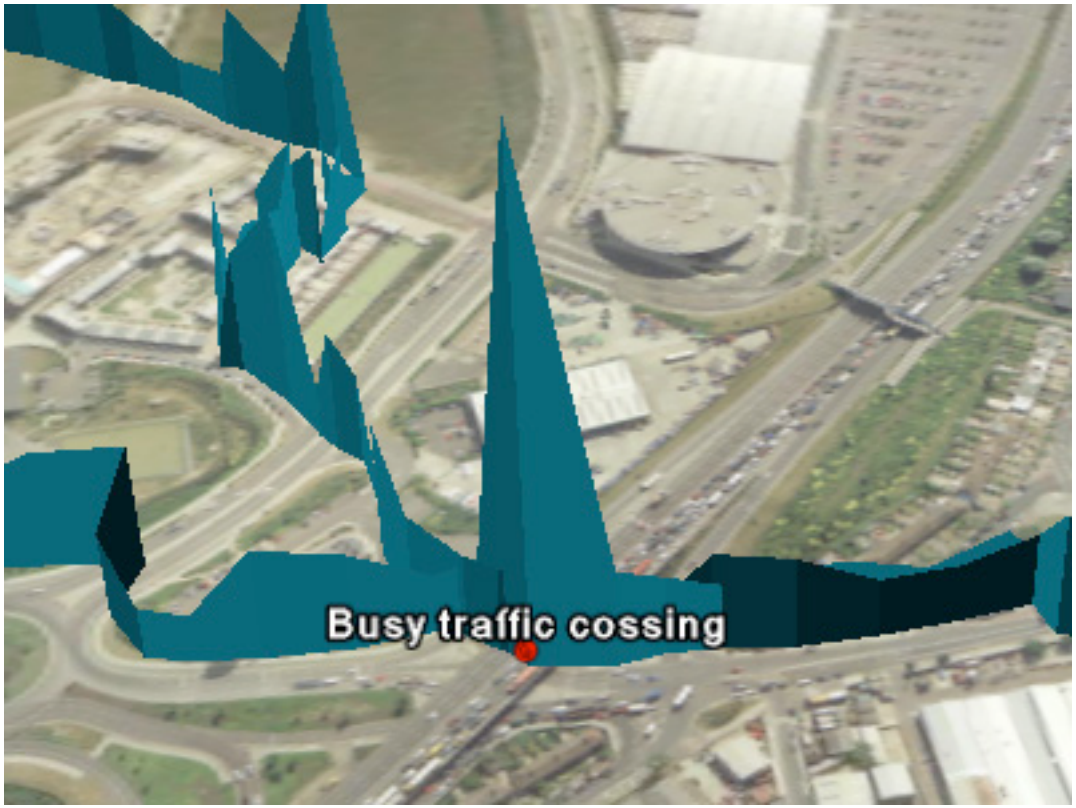


Figure 2. Hotmap showing the Boston area. Brighter spots depict tiles that have been downloaded more times. Note bright spots at (**a**) academic Harvard University, (**b**) athletic Fenway Park, and (**c**) the historic Bunker Hill Monument, in addition to downtown. Imagery depicted is at level 18 (60 cm per pixel).

Fisher, D. (2007). Hotmap: Looking at geographic attention. IEEE Trans. Vis. Comput. Graph., 13(6):1184–1191

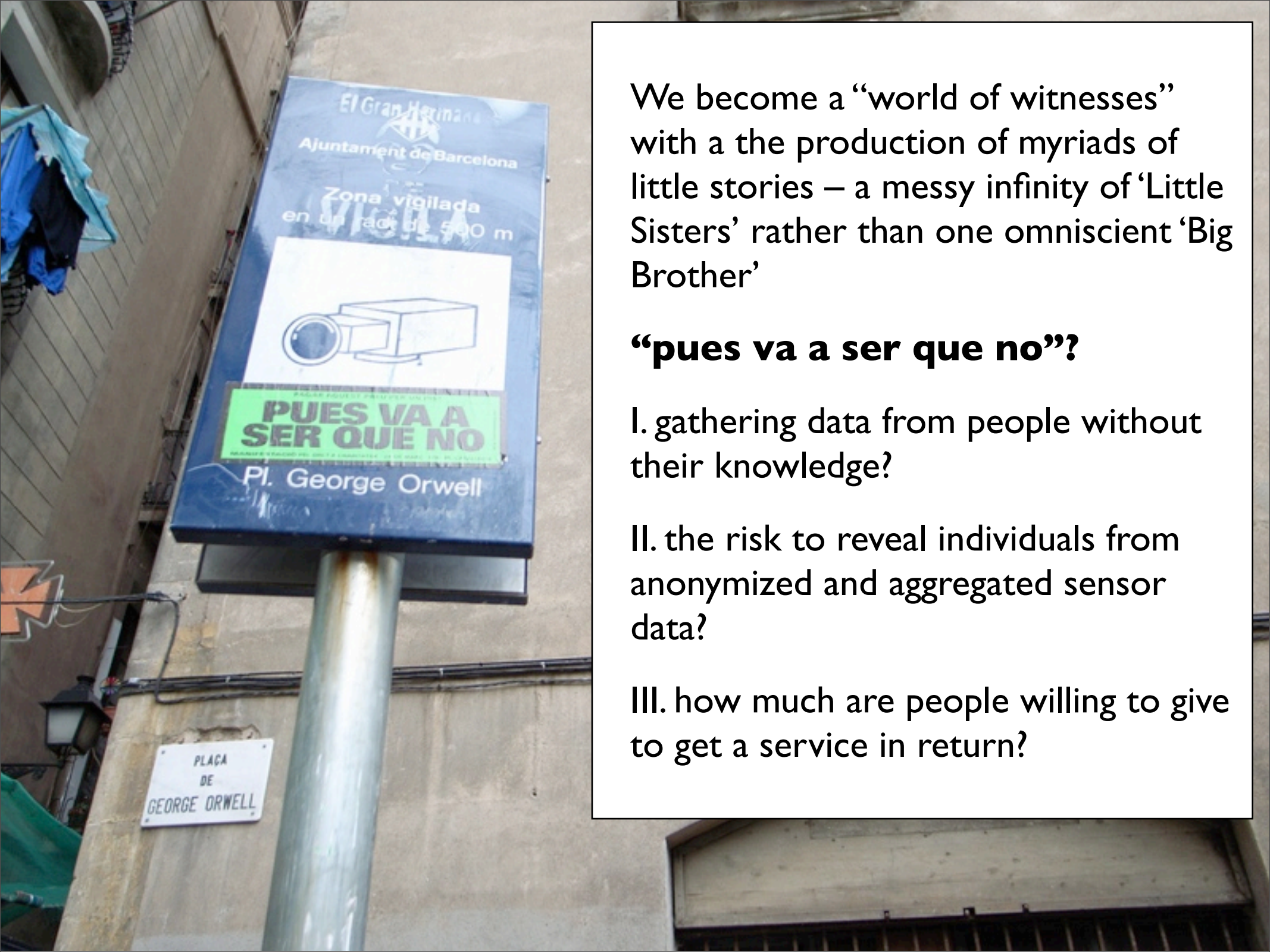
Biomapping



Christian Nold, http://www.biomapping.org

Limitations

- Provide a glimpse to reality. Sense what is cheap to sense, plus lack of data interoperability
- Reveal phenomena. But does not explain them.
- Need to prove that these data bring at least the same amount of knowledge than their “manual” data (e.g. surveys).
- Need of new skills and techniques to analyze and grasp the significance of these data



We become a "world of witnesses" with a the production of myriads of little stories – a messy infinity of 'Little Sisters' rather than one omniscient 'Big Brother'

"pues va a ser que no"?

I. gathering data from people without their knowledge?

II. the risk to reveal individuals from anonymized and aggregated sensor data?

III. how much are people willing to give to get a service in return?

Stretching the imagination

Local authorities and their public opinion

The public in general

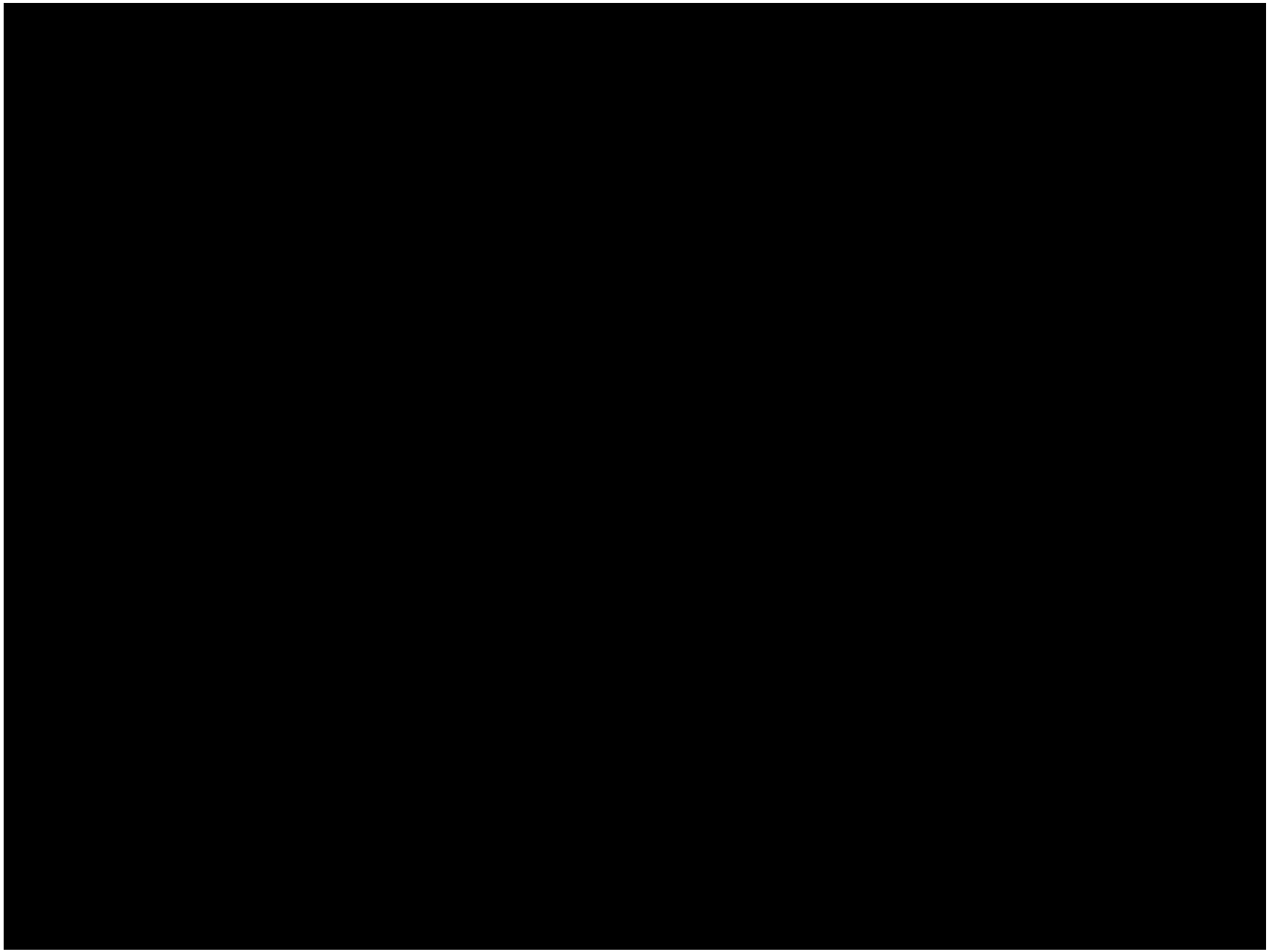
Sentient cities: so what?

- We have been developing microscopes and telescopes
- Still no science on “what we see”

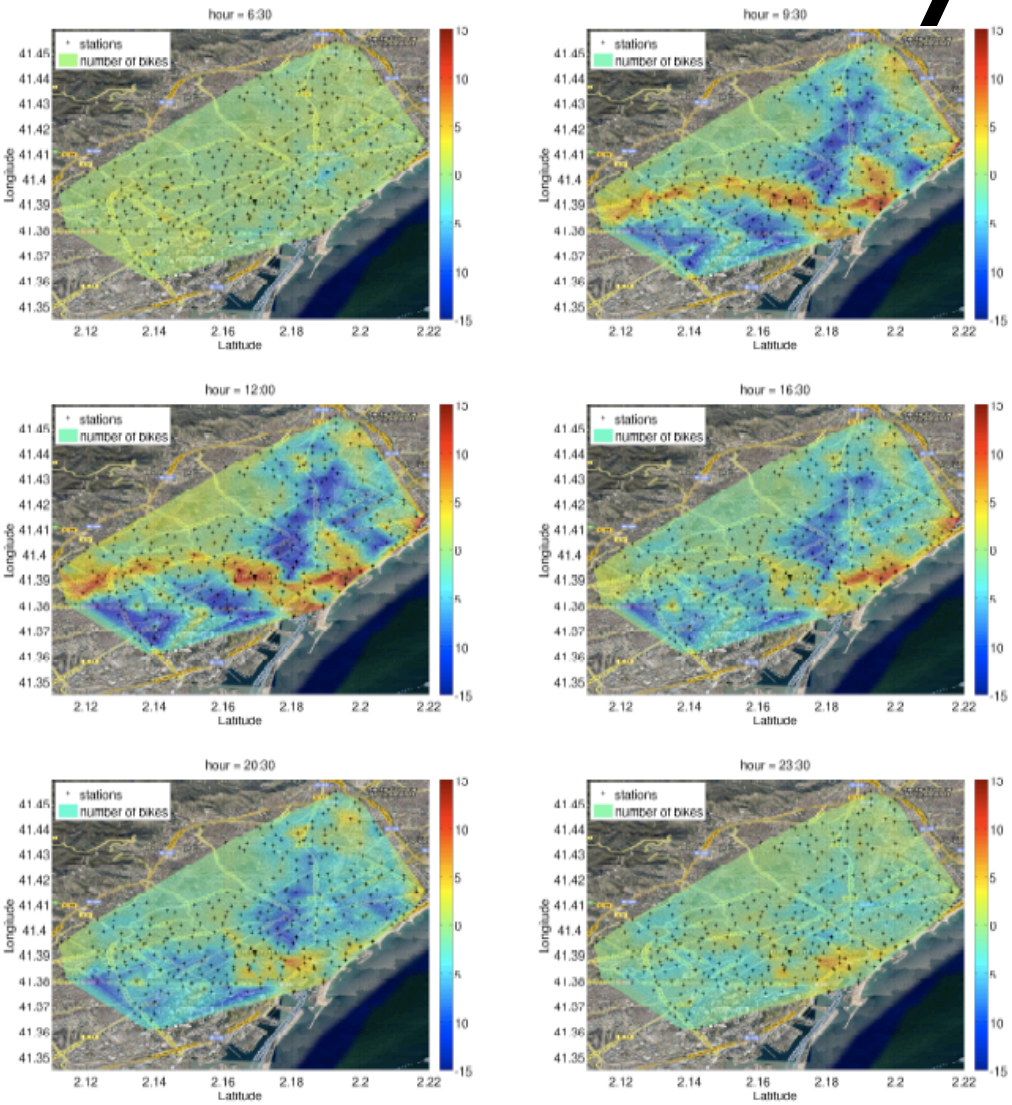
Responsive city

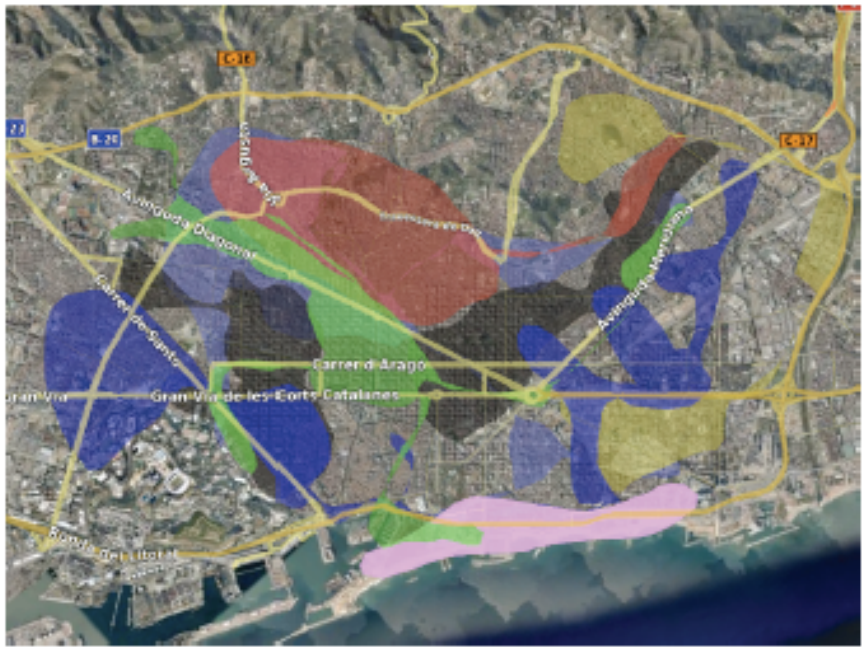
- Evidence-based urbanism (planning was about predict and accommodate and it becomes more observe and improve)
- Feedback loop (provide immediate information that can be acted upon)
- Citizen empowerment (pervasive tools and services)

evidence-based urbanism



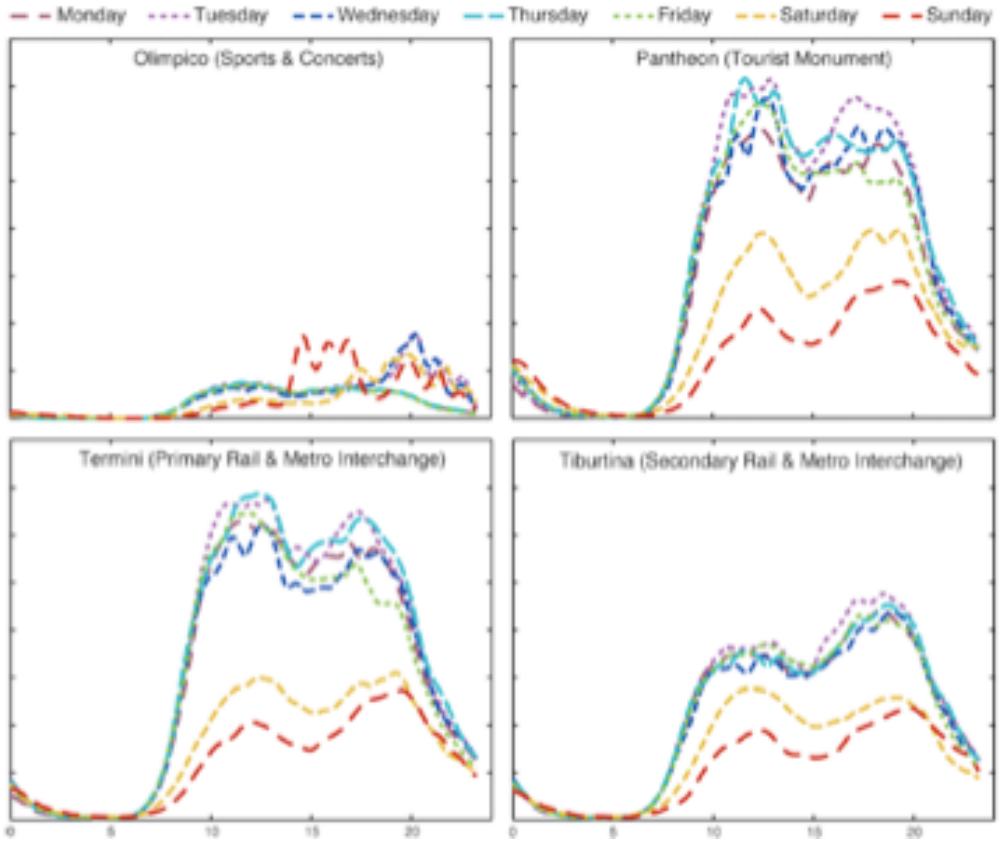
Spatial clustering from mobility patterns

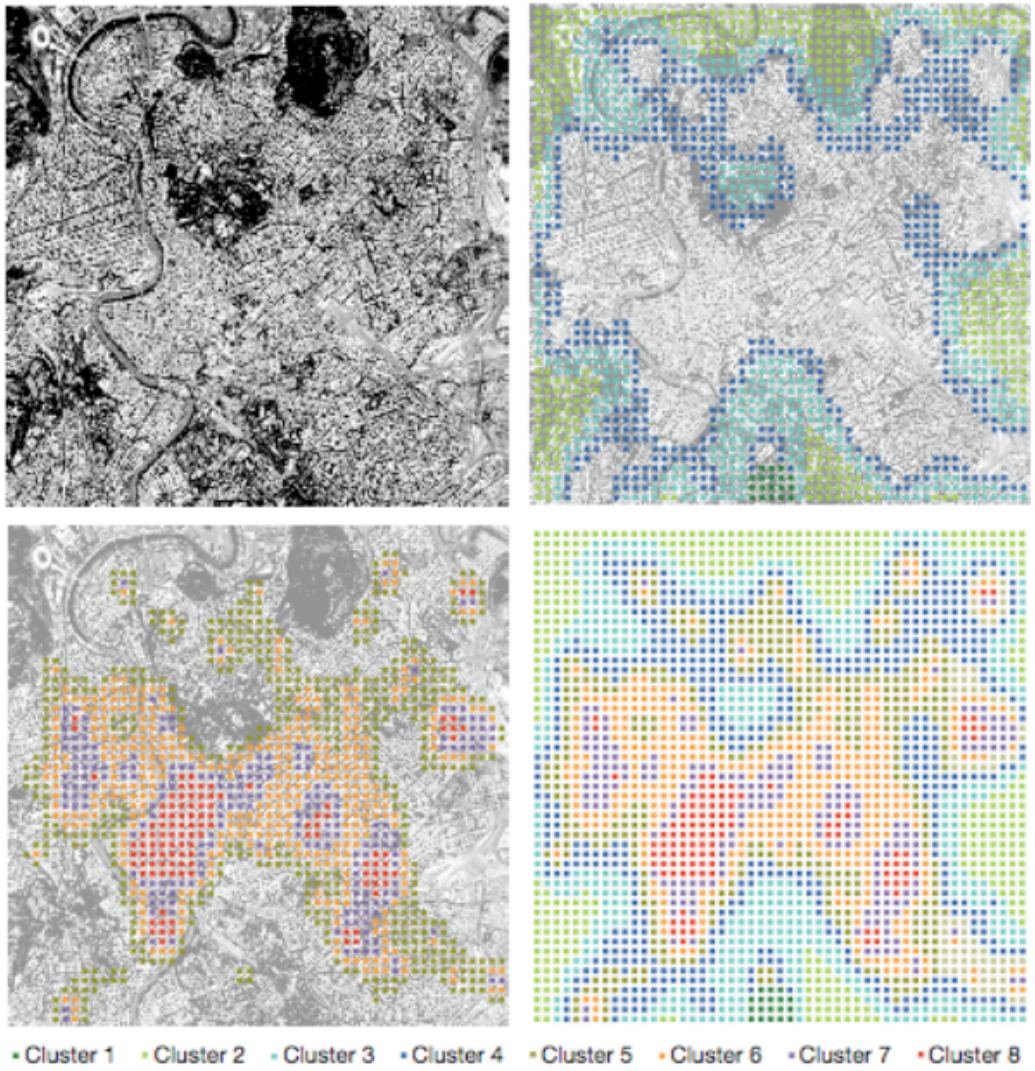




Kaltenbrunner et al. (2008) Bicycle cycles and mobility patterns (in submission)

Cellular census

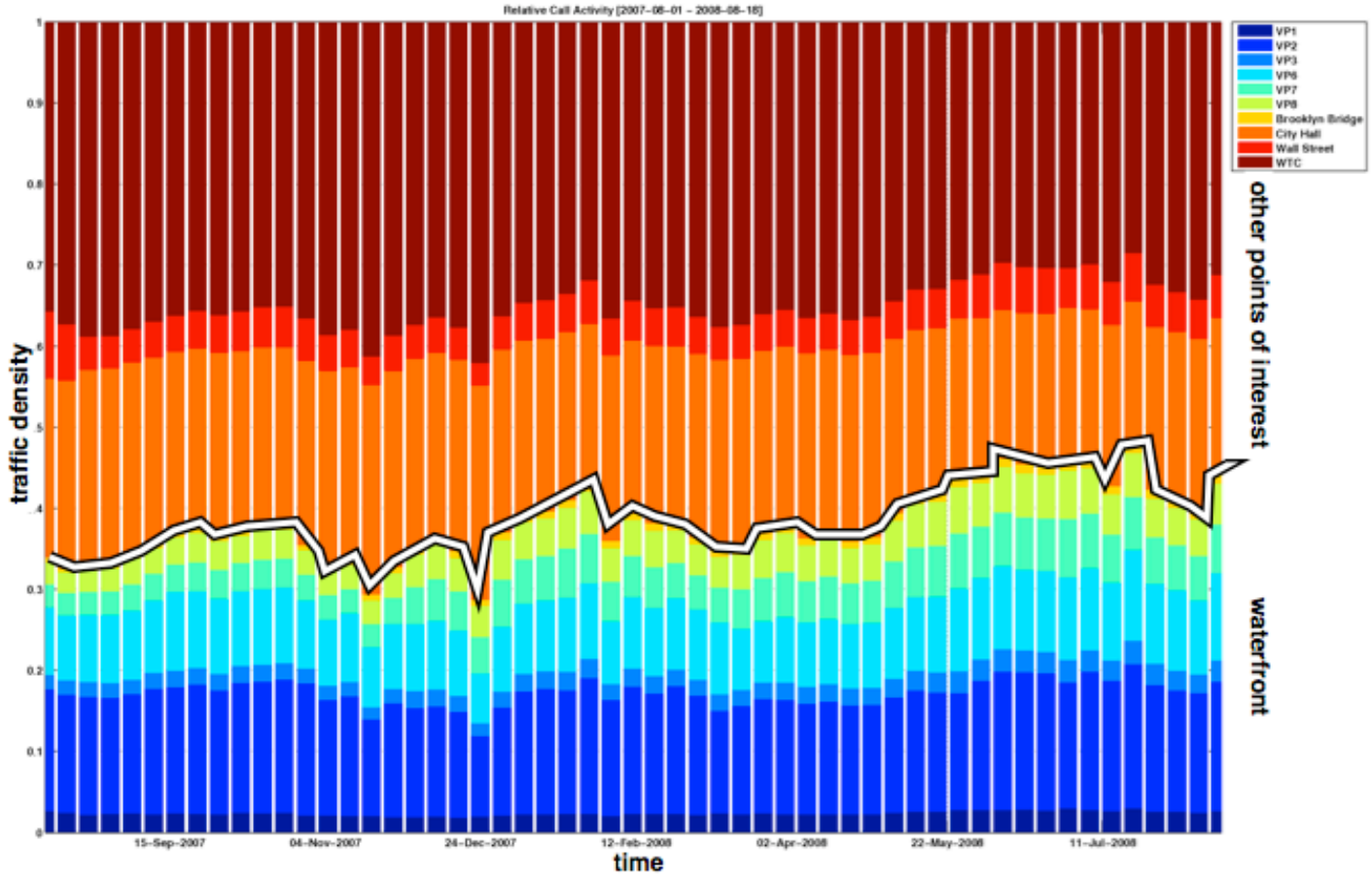




Reades, J., Calabrese, F., Sevtsuk, A. & Ratti, C. (2007) Cellular Census: Explorations in Urban Data Collection. IEEE Pervasive Computing, 6, 3, pp. 30-38.

attractiveness indicators

Comparative Relative Strength



PlaceRank

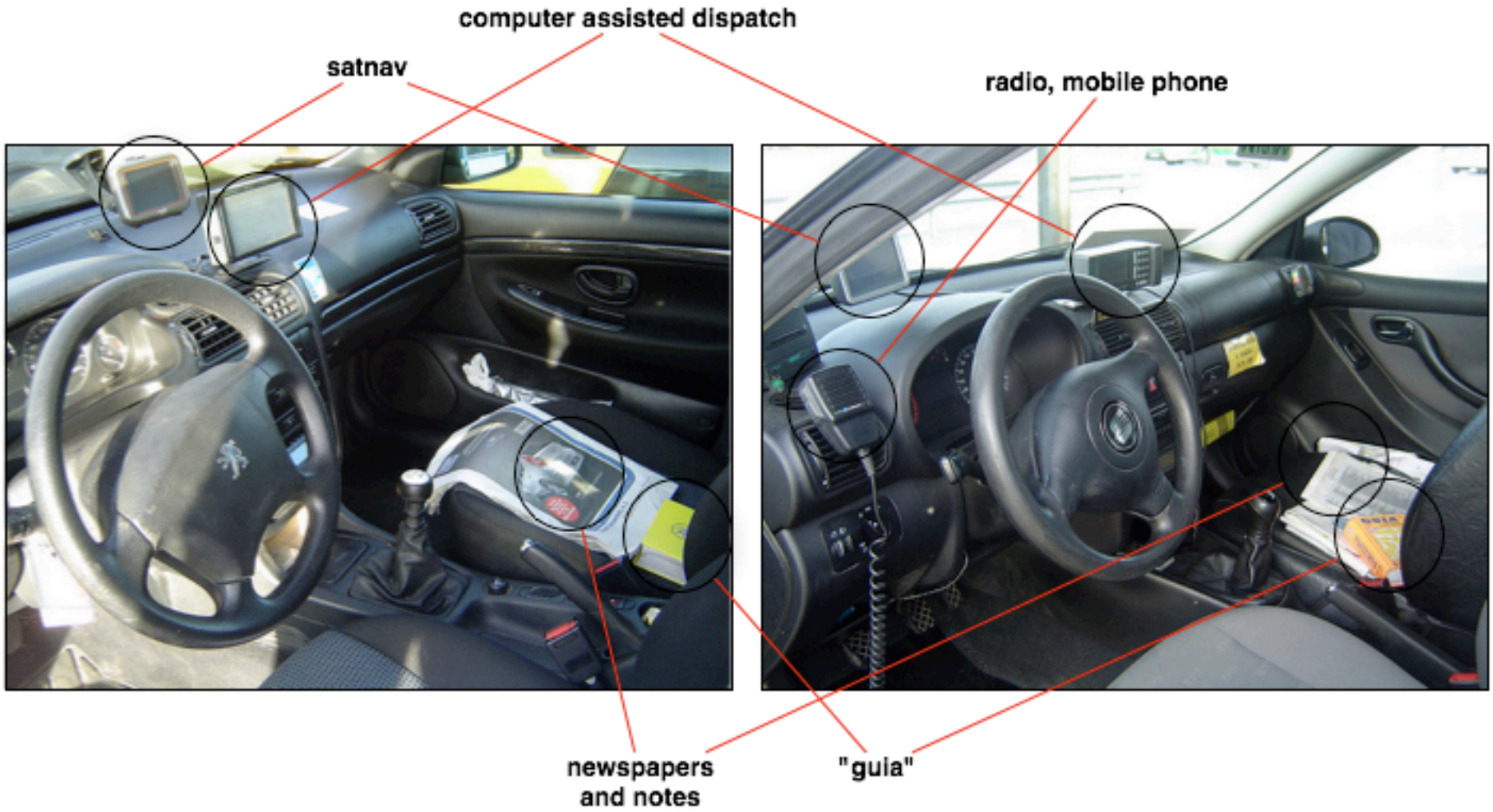
Feedback loop

New technologies and the city

- Driver: techno-determinism and utilitarian approach that talks of new technologies in hyperbolic terms
- The difference between solving a problem and contributing to the health of society
- Technologies are not drivers of urban change, but are rather caught up in complex networks (or 'socio-technical assemblages')


5.20

Integration into practices



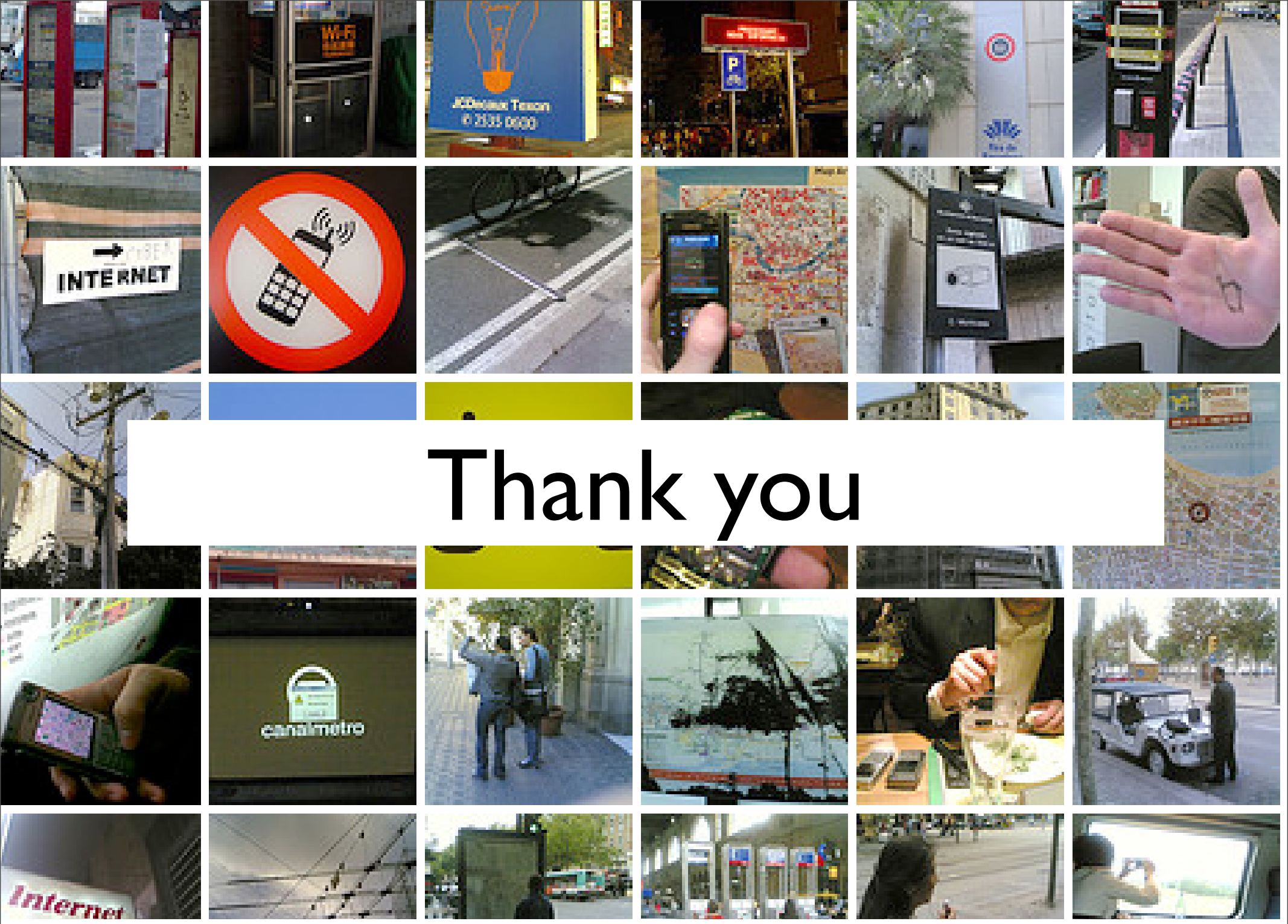
Girardin, F. and Blat, J. (2008). The co-evolution of taxi drivers and their in-car navigation systems. Situating Sat Nav session at the 2008 Association of American Geographers Annual Meeting, April 2008.

Co-evolution

- Wayfinding, tendency to be used less over time
- Not necessarly deskilling of navigation and orientation
- Maybe deskilling in social. Transfer of the trust from social interacting to machine-supported. May lose interaction with the client, important in the learning process.

Take-Aways

- Use of people-centric sensing to reveal the invisible (with still many obscurities)
- New techniques to transform these data into evidences to inform the design of built space
- Integration is part of a complex co-evolution that require new methods to inform the design of urban services



Thank you

fabien.girardin@upf.edu