Uncertainty in Location-Aware Systems

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This 10min talk is about

HCI in Ubiquitous Computing

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Location key element of context

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Spatial uncertainty

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My thesis

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The approach and methodology

Ubiquitous Computing…

… forces the computer to live out here in the world with people

… is anywhere, anytime

… key enabling technologies WiFi, RFID, GPS, GSM, BT

… supporting our activities according to a sensed context

… is a very difficult integration of human factors, computer science, engineering, and social sciences

Technical

Need to model the physical world to a degree of reduction that matches computer systems

Social

The users must be supported in making their own inferences

Gap

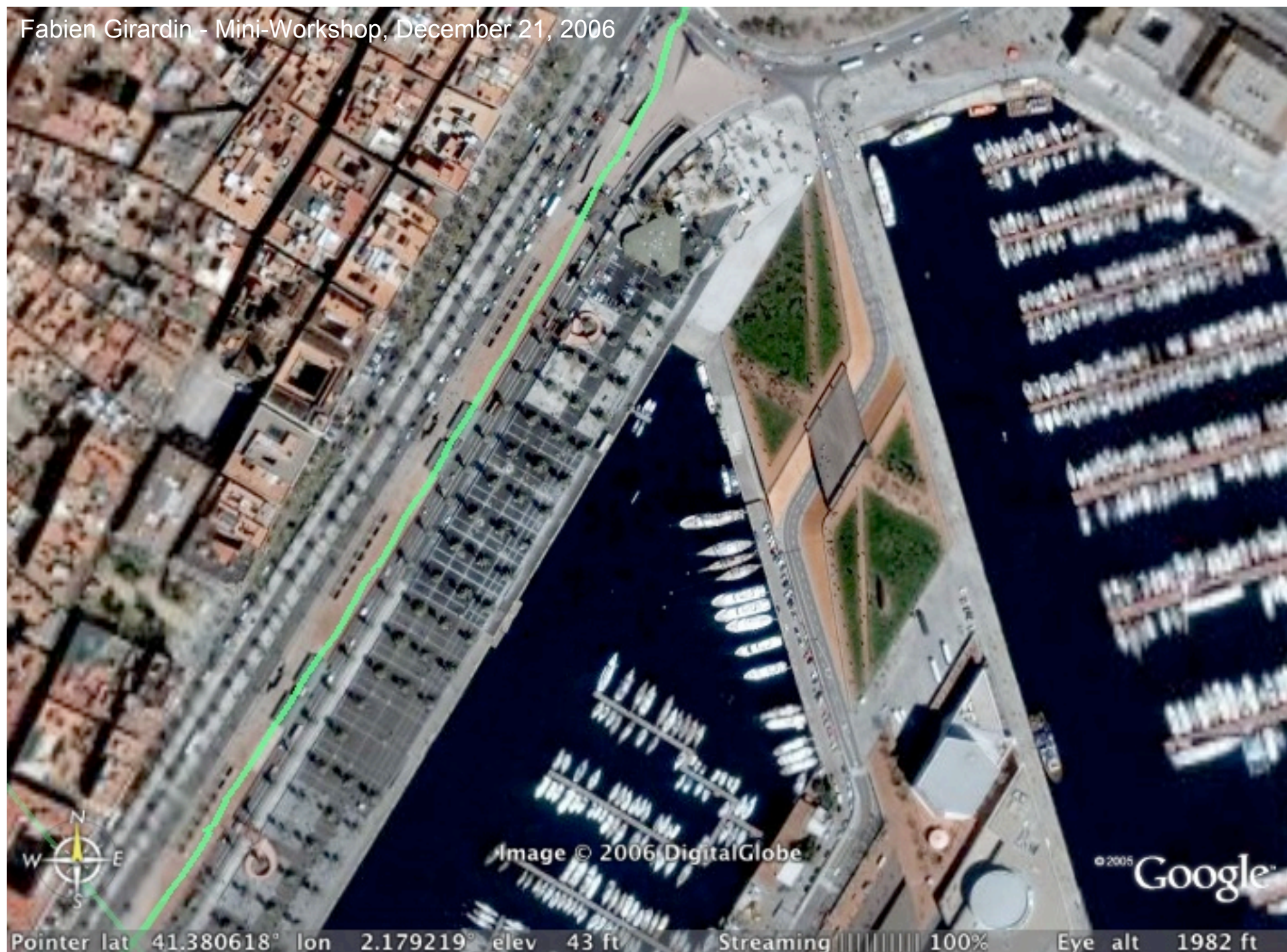Without undermining the benefits of ubiquitous systems

"Let's do smart things with stupid technology today, rather than wait and do stupid things with smart technology tomorrow". (Bill Baxton)

Location matters

Location is the most important **contextual dimension** concerned with ubiquity

Navigation, finding and tracking, **location awareness**, location-linked information

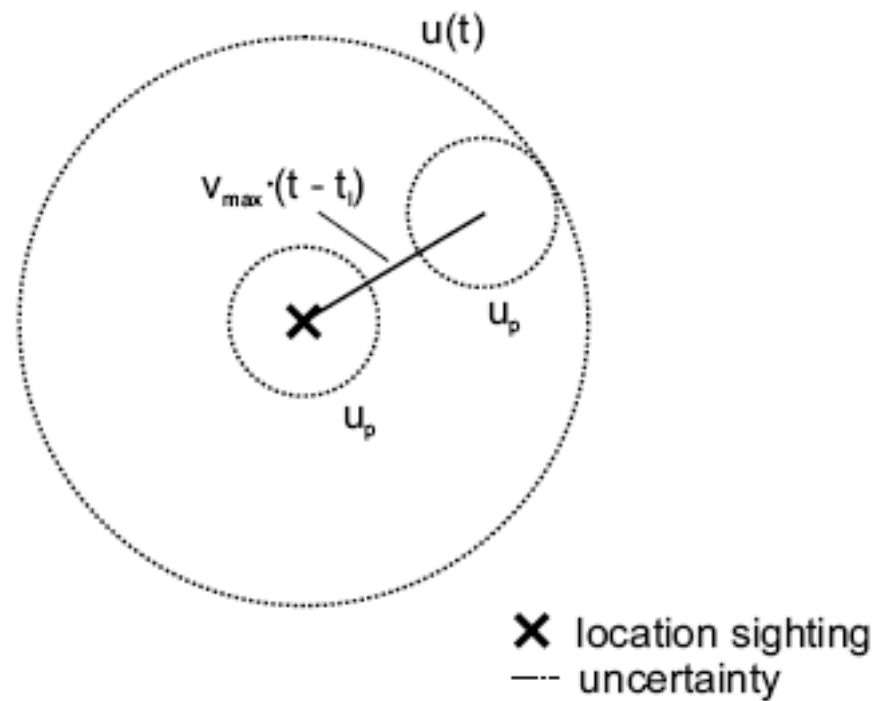Indoors, outdoors, **large scale, urban settings**

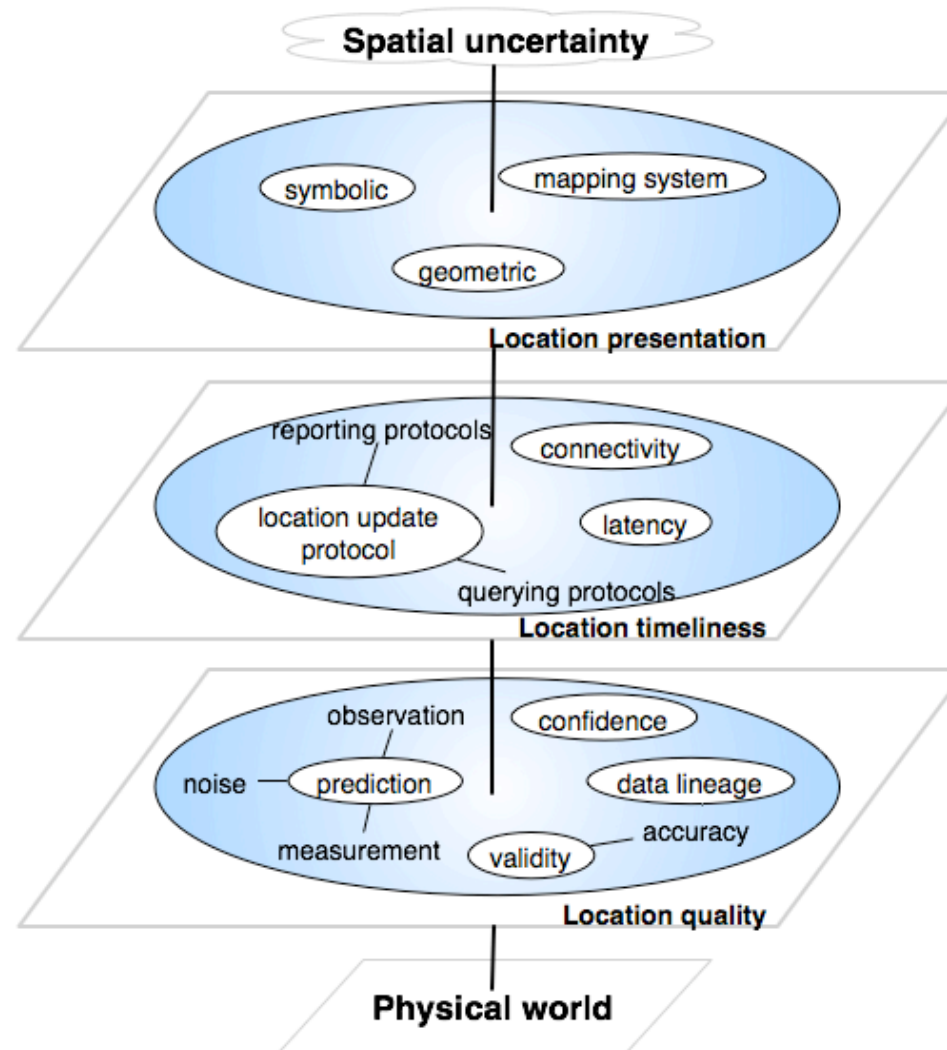Pointer lat 41.380618° lon 2.179219° elev 43 ft   Streaming |||||||||| 100%   Eye alt   1982 ft
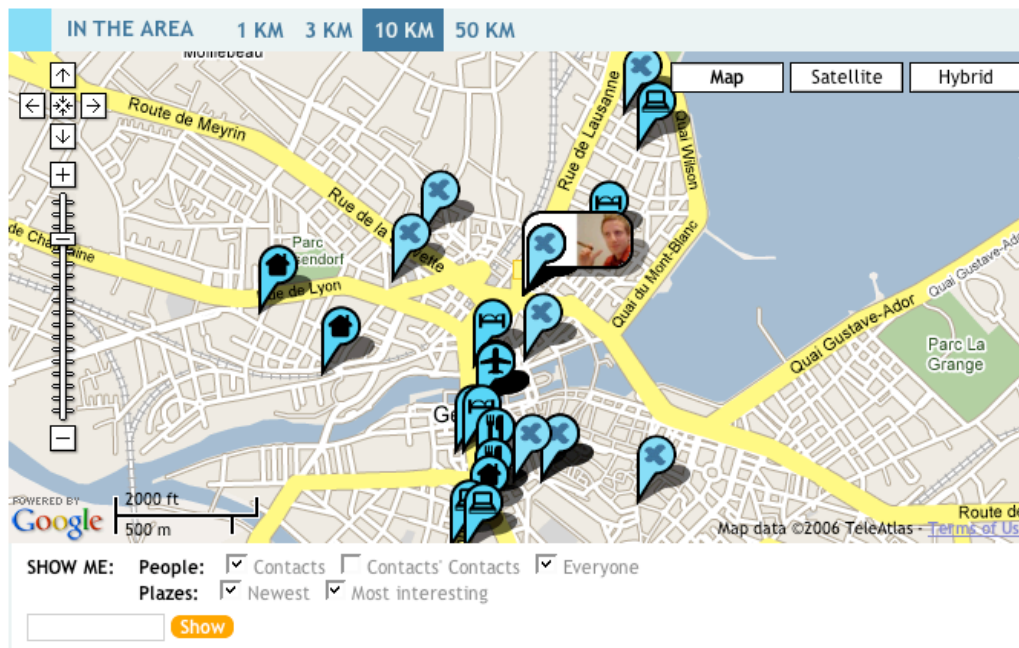
Spatial Uncertainty

Source: Leonhardi, A. and Rothermel, K. 2001. A Comparison of Protocols for Updating Location Information. Cluster Computing 4, 4 (Oct. 2001), 355-367

Taxonomy

Handling spatial uncertainty

remove it, hide it, manage it, reveal it, or exploit it?

Lack of location information granularity in Plazes (hiding it)

Seamful design (reveal it)

Thesis project

How to to handle spatial uncertainty inherent to ubiquitous computing technologies?

Sub-question 1 (accuracy)

According to the activities supported by our location-aware system, **how certain (cf. taxonomy) do positional and tracking systems have to be in order to be useful and acceptable?**
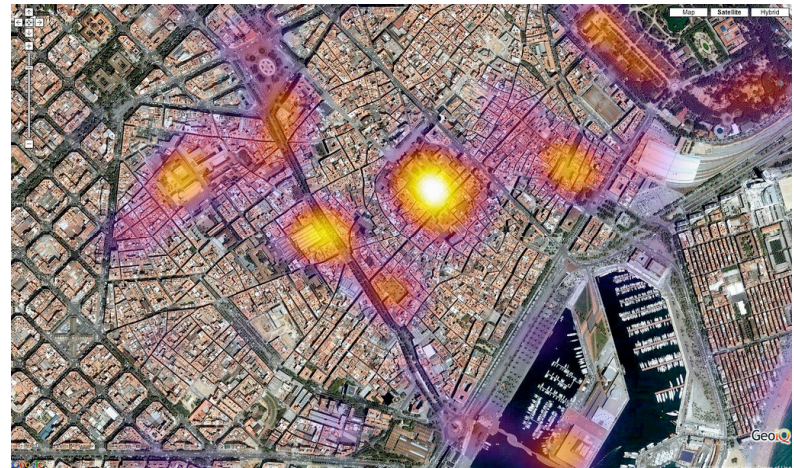
Accuracy level in Flickr

Sub-question 2 (interaction)

According to the activities supported by our location-aware system, **what is the balance between implicit and explicit forms of human interaction with a location-aware system.**

Sub-question 3 (infoviz)

There is no comprehensive understanding of the parameters that influence successful uncertainty visualization. With our scope of ubiquitous computing we will **explore the useful parameters to visualize spatial uncertainty in a real-time location-aware system.**

Approach and methodology

- Classic design-science research method (evaluation of the innovation)
- Running 2 field studies to evaluate designs. **Ubicomp needs more living laboratories to mature the practice of HCI evaluation!**
- Usability study do examine: **Does it work for the user?, Where does it work? When and compared to what does it work?**
- Use participatory-design with rapid prototyping techniques (iterative process)
- Use of pervasive games to engage users
- Mixed methods (qualitative and quantitative)

Pervasive games

CatchBob!

The Big Here Challenge

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