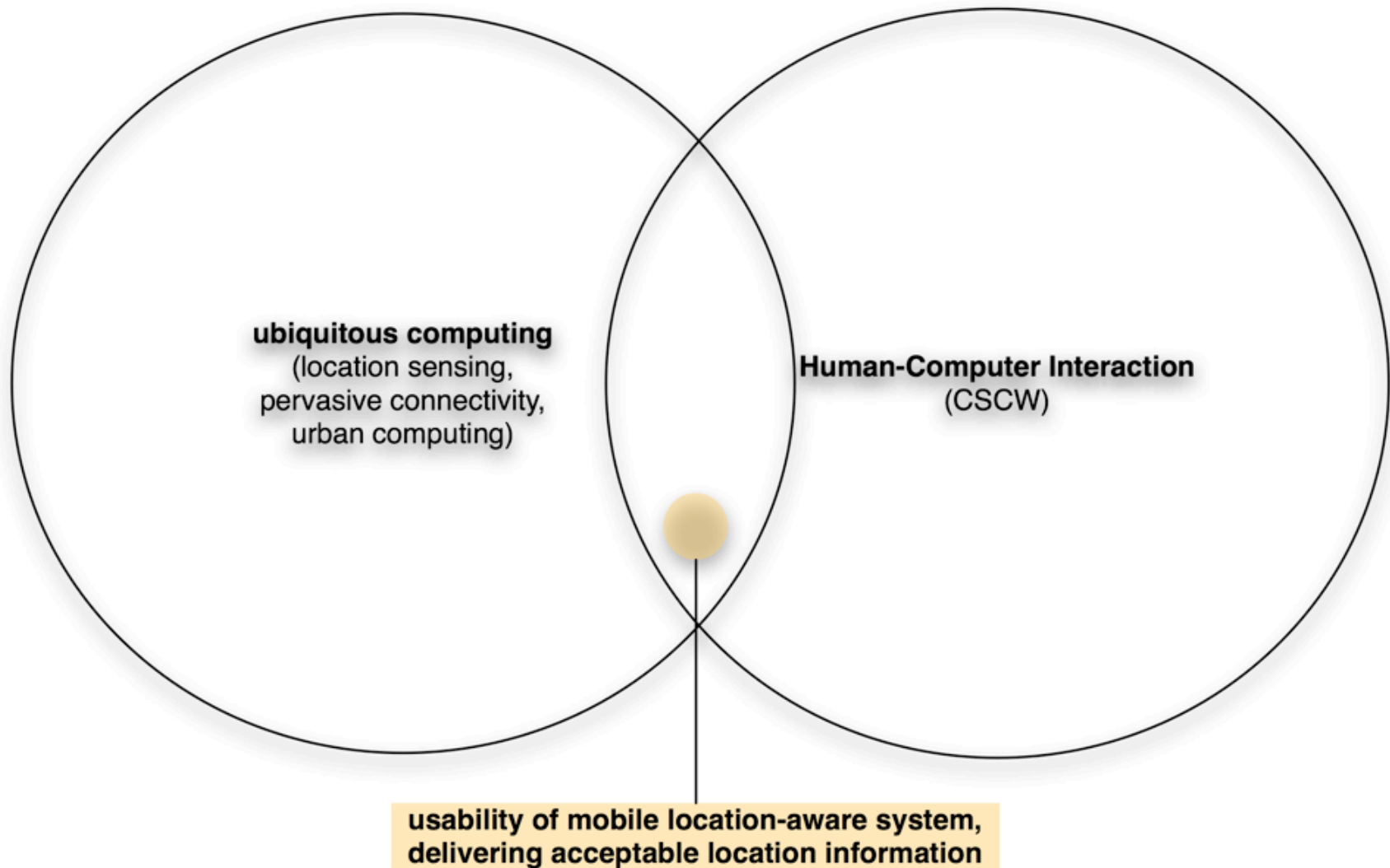


Bridging the Social-Technical Gap in Location-Aware Computing

Fabien Girardin

Interactive Technologies Group, Pompeu Fabra University
Talk at Urban Mapping, San Francisco, April 27, 2007

Scope



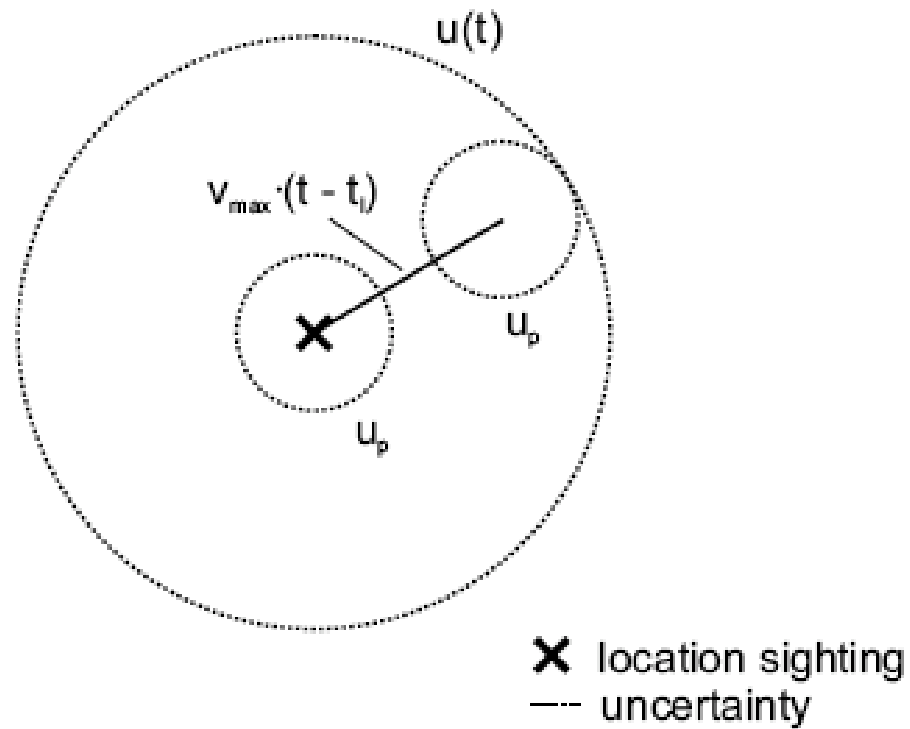
Location-aware applications



Location quality and timeliness



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

Location information granularity

The image shows a Google Maps interface with several key elements:

- Top Navigation:** A bar with "IN THE AREA" and zoom options: "1 KM", "3 KM", "10 KM" (selected), and "50 KM".
- Map Style Selection:** Three buttons labeled "Map", "Satellite", and "Hybrid".
- Map Content:** A street map of a city area with yellow highlighted roads. Numerous blue location pins are scattered across the map. One pin is enlarged to show a photo of a person. Other pins contain icons for a house, a plane, a fork and knife, and a laptop.
- Map Controls:** On the left side, there are navigation icons: a compass, a street view pegman, a zoom in (+) and zoom out (-) button, and a vertical zoom slider.
- Scale and Attribution:** At the bottom left, a scale bar shows "2000 ft" and "500 m". Below it is the "POWERED BY Google" logo. At the bottom right, it says "Map data ©2006 TeleAtlas" and a link to "Terms of Use".
- Filtering Options:** At the bottom, there are checkboxes for "SHOW ME: People: Contacts Contacts' Contacts Everyone" and "Plazes: Newest Most interesting". There is also a search input field and a "Show" button.

The social-technical gap

Technical

Sense and model the physical space to a degree of reduction that matches computers



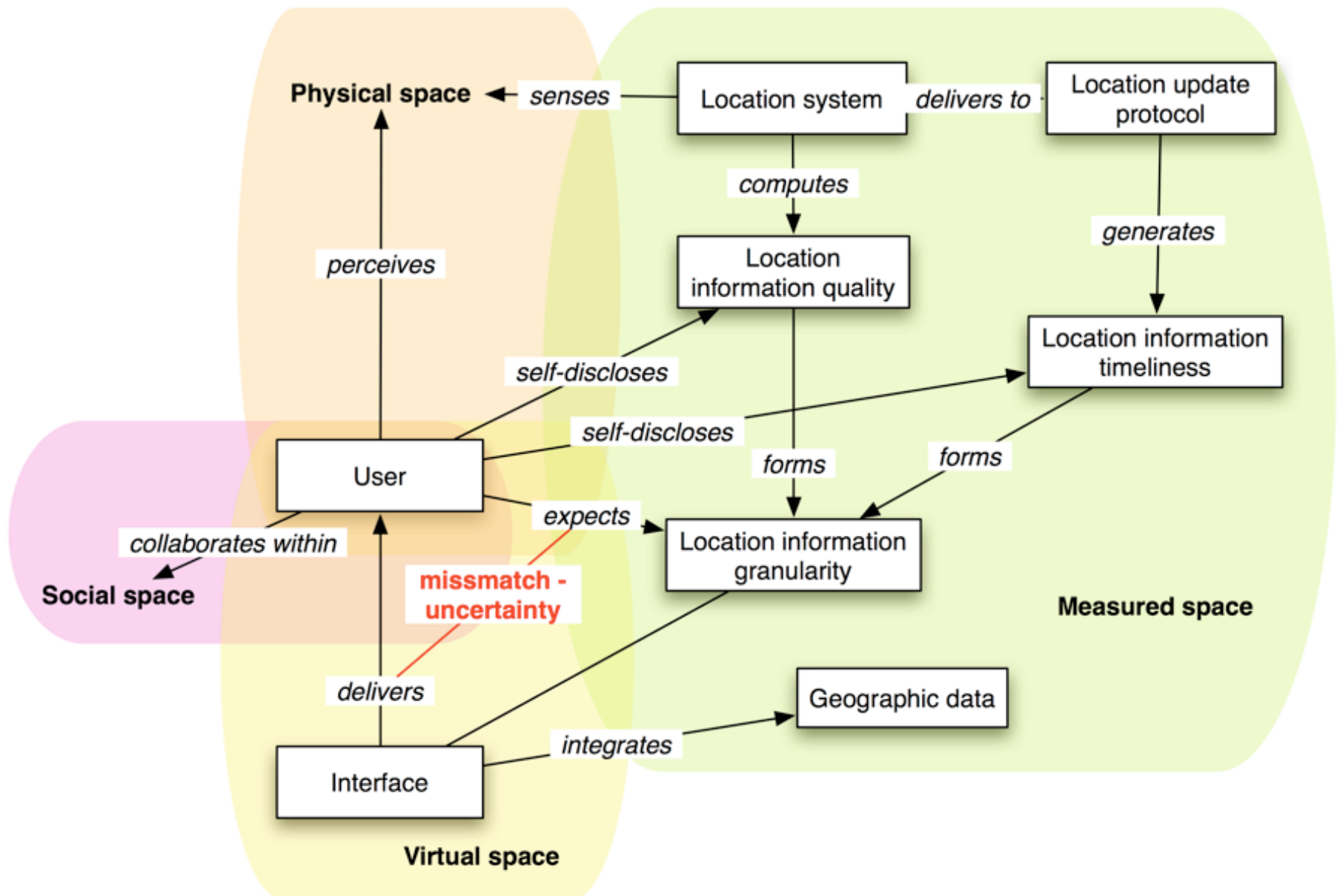
Gap

Without undermining the benefits of location-aware systems

Social

The users must be supported in making their own inferences

Model

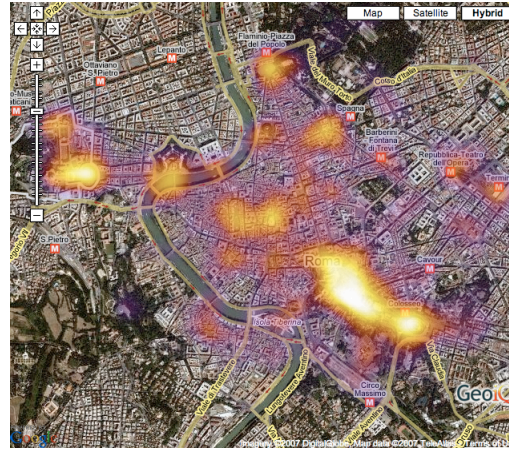


Research questions

How to build a collaborative location-aware system that take into account the spatial uncertainty inherent to ubiquitous technologies?

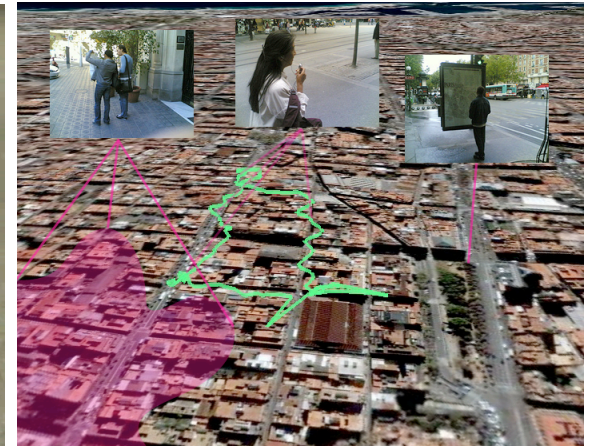
- what level of location information quality and timeliness must be delivered in order to be useful and relevant?
- what parameters influence successful spatial uncertainty visualization?
- what is the balance between implicit and explicit forms of human interaction with a location-aware system that communicates the inherent uncertainty of its location information?

Approach



case studies of the
the ubicomp of the
present

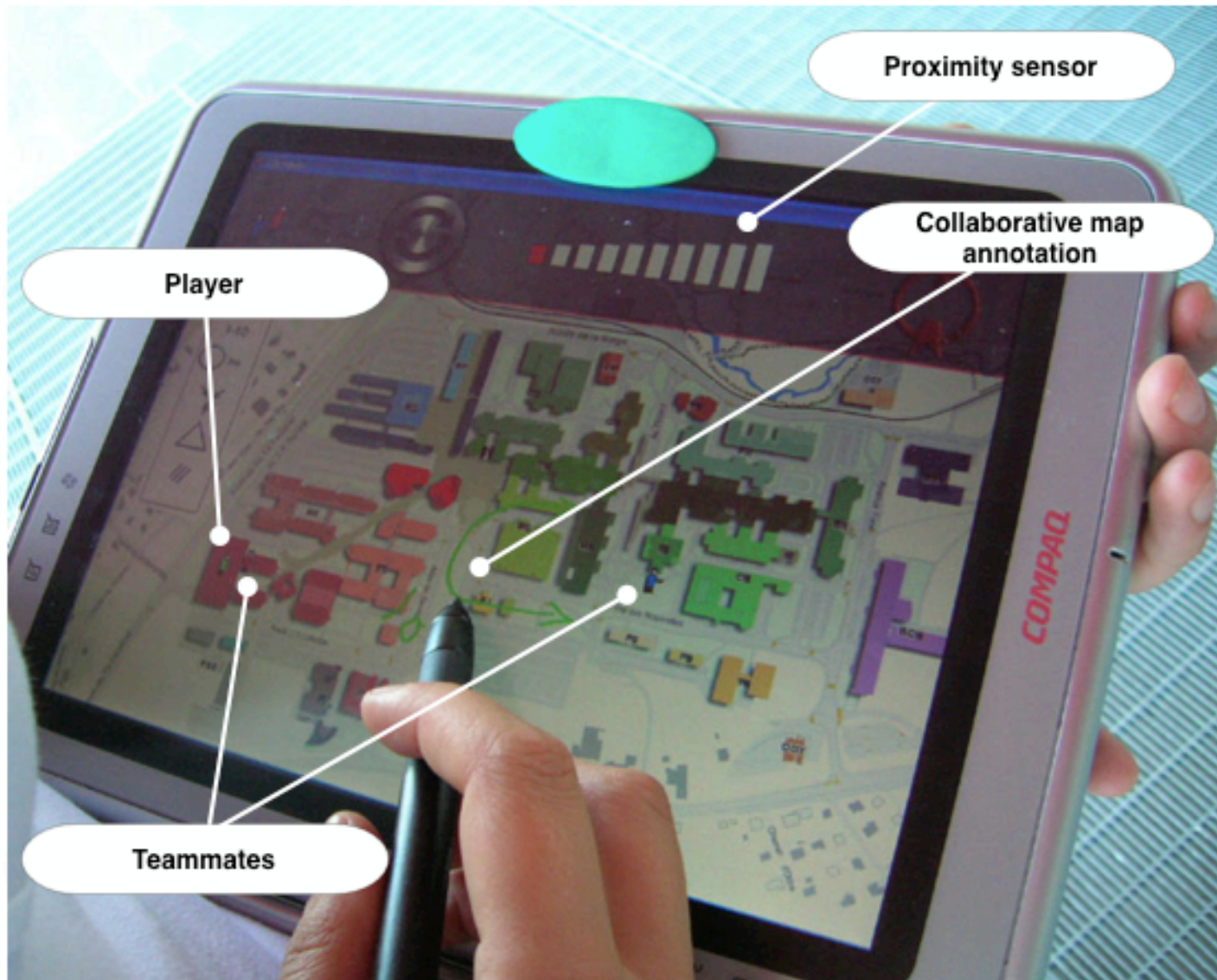
deploy real-world
field studies



Studies

Type	Context	Objective	Method
Field study 1	collaborative pervasive game	Explore the sources of spatial uncertainty and analyze players' behaviors towards spatial uncertainty	mixed, exploratory
Case study 1	sharing and geotagging photos	Identify the users behaviors when making use of location information granularity	descriptive, exploratory
Case study 2	taxi drivers use of GPS	Identify the main issues when a location-aware system fails expectations	ethnographic, exploratory
Field study 2	collaborative urban-scale environment	Analyze the integration of location information granularity in the design of the application, to evaluate strategies to manage spatial	mixed

Field study: CatchBob!



Field study: CatchBob!

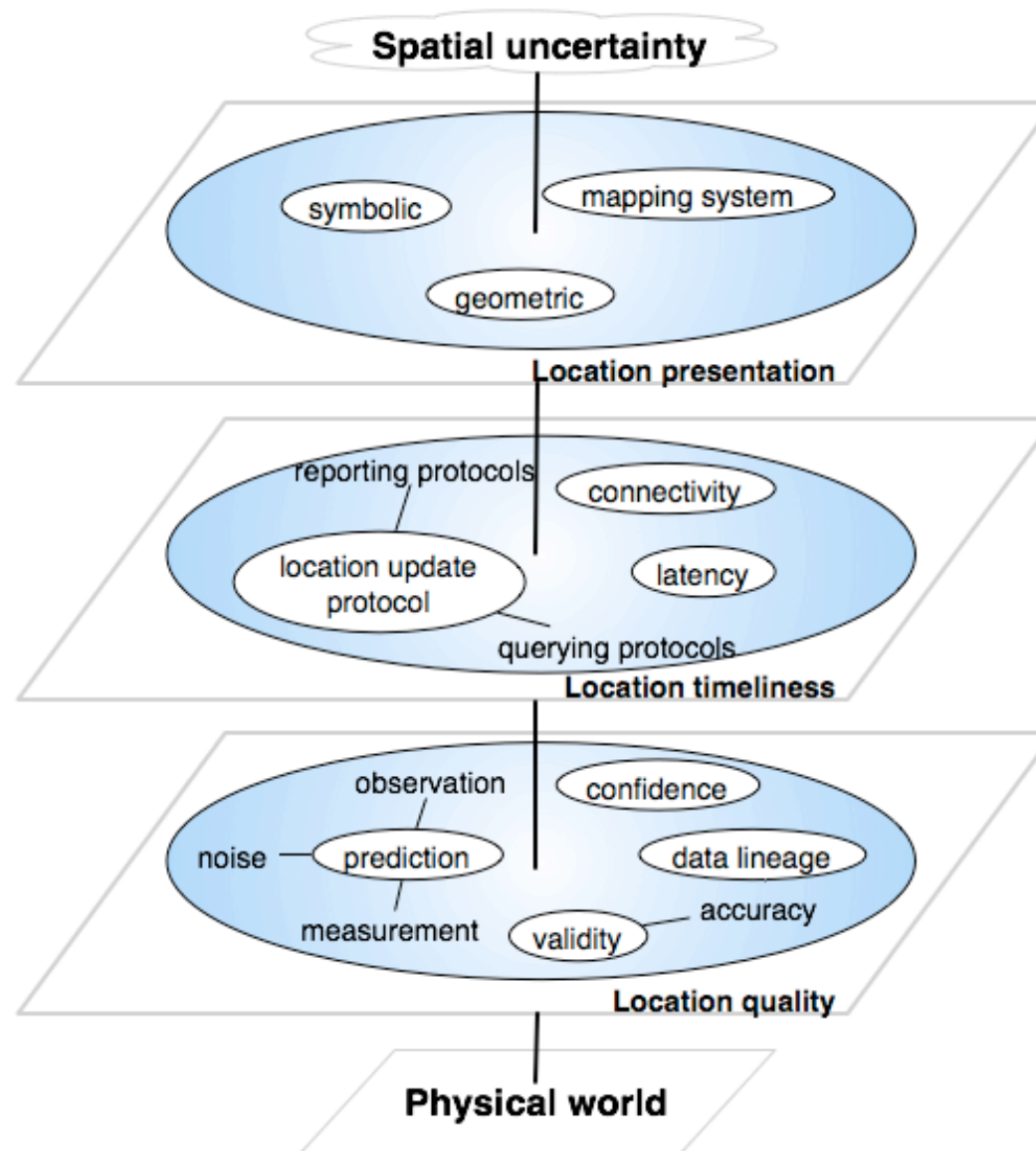


CatchBob!

Nicolas Nova, Fabien Girardin, Pierre Dillenbourg
Center for Research and Support of training and its technologies (CRAFT)
Swiss Federal Institute of Technology Lausanne (EPFL)

Images: Ecole des Arts Décoratifs de Genève
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CatchBob!: Sources of spatial uncertainty



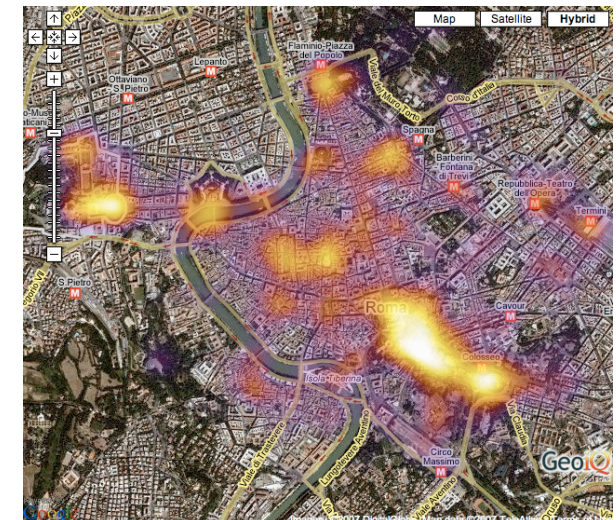
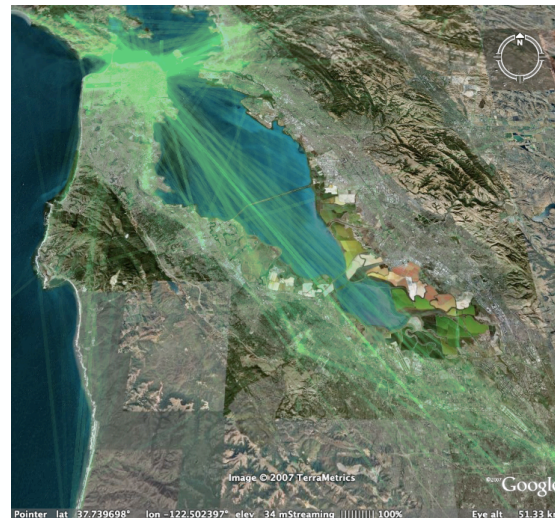
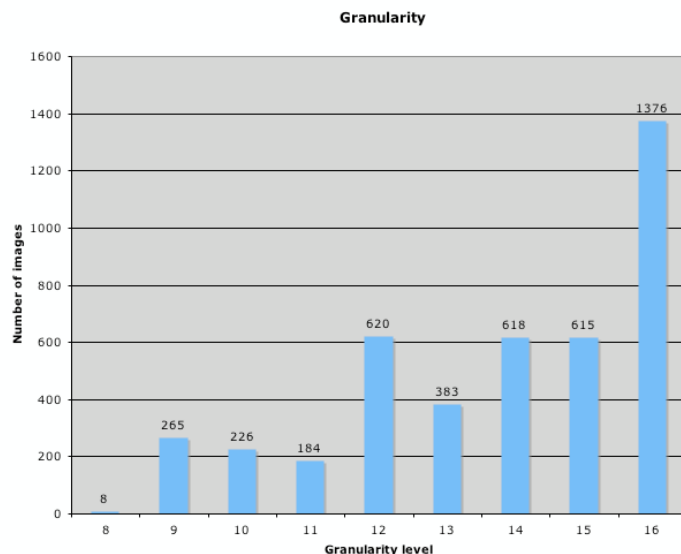
CatchBob! take-aways

- Players reaction to uncertainty: Believing, not understanding, and overcoming
- Automatic location-awareness \neq Giving one's location (act of communication carrying intentions)
- Players without a location awareness tool took better advantage of the annotation feature: picking up the relevant fact

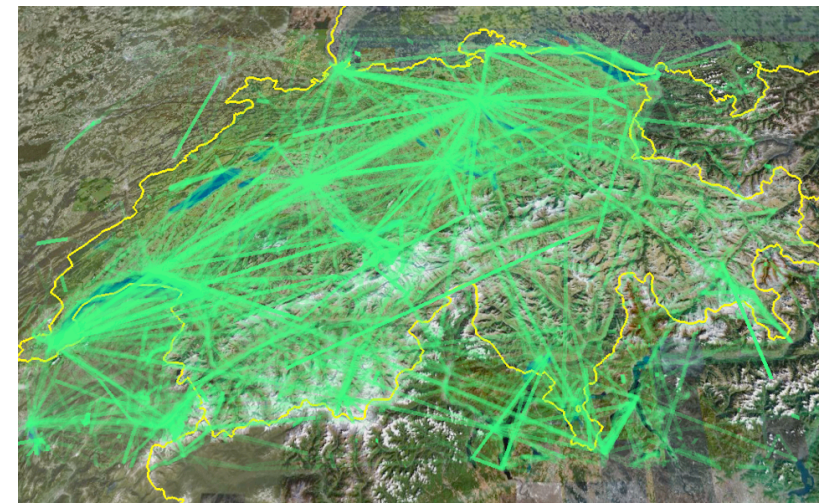
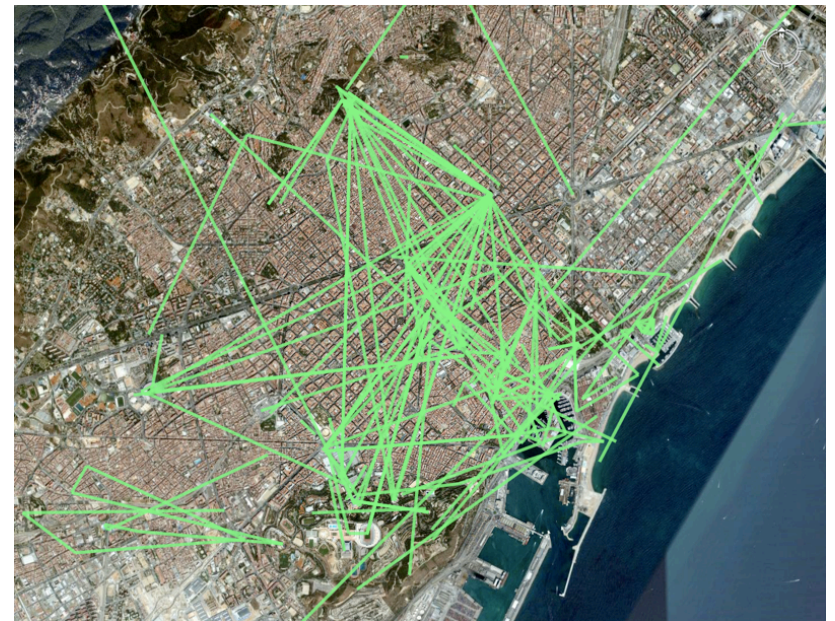
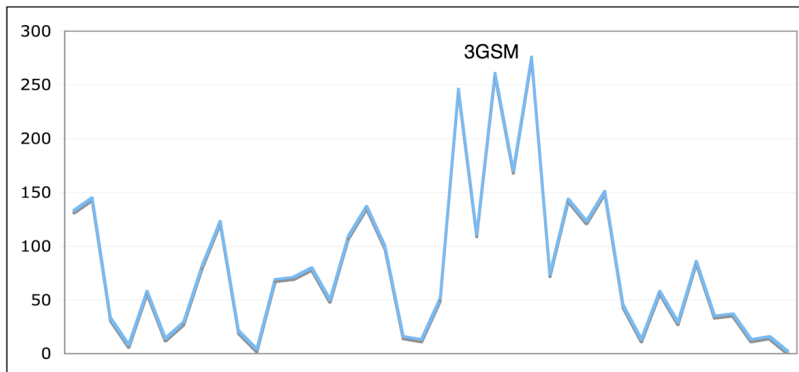
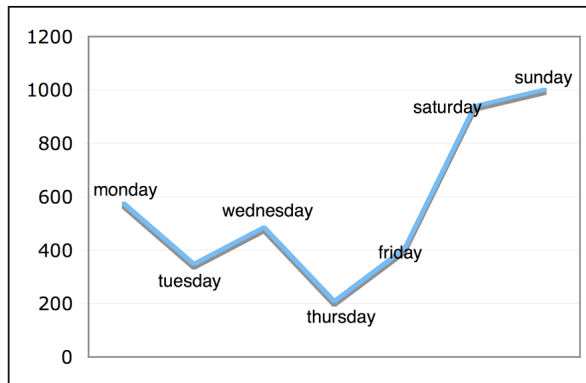
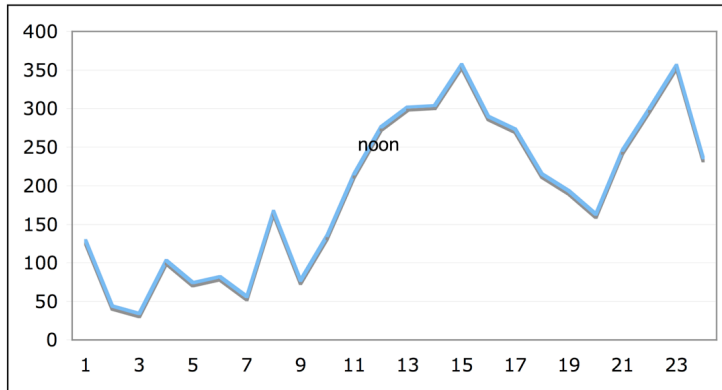
Case study: Tracing the visitor's eye

Context: evaluate the potential of using people-generated geotagged information to contribute urban understanding.

- **Aim 1:** Identify users behaviors when explicitly disclosing location information (where, what, when, history of use).
- **Aim 2:** Analyze how Flickr users take advantage of the accuracy feature to georeference their images



Case study: Tracing the visitor's eye



Case study: Taxi drivers use of GPS

Context: Barcelona taxi drivers who use GPS navigation systems.
Ethnographic study

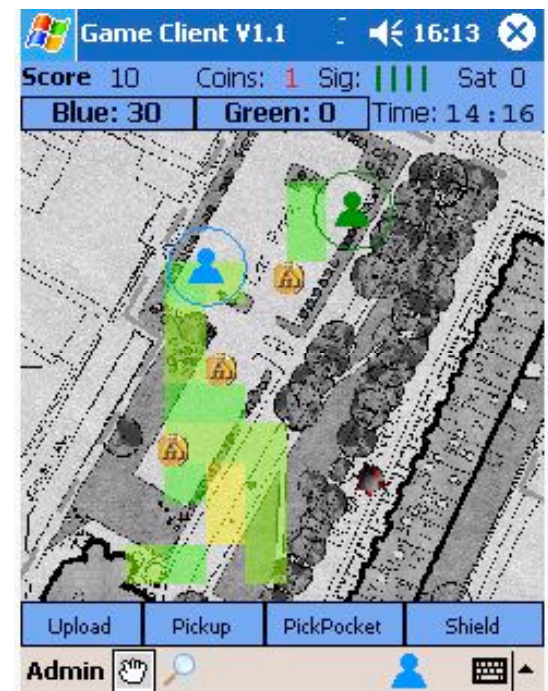
- **Aim:** identify the main issues embedded in the interaction of mobile workers with location information that fails to match a relevant quality



Field Study: Enhancing urban tourism experience

Context: Give an awareness to citizens and/or tourists on their behaviors and surroundings in a urban space.

- **Aim 1:** Evaluate design strategies to manage spatial uncertainty based on what has been learned in the first 3 studies (e.g. seamful design, assist not automate)
- **Aim 2:** Examining the usability (Does it work?)
- **Aim 3:** Study the contextual impact on usability (Where and when?)



Conclusion

- William Buxton aphorism “Let’s do smart things with stupid technology today, rather than wait and do stupid things with smart technology tomorrow?”
- Gain a comprehensive understanding of the human individual and collective use of location information while on the move.
- Systematic approach to understand the usability of location uncertainty representation methods and interaction.
- Evaluation of the approaches to integrate spatial uncertainty in the design of location-aware applications.

And you? Tell me!

- LBS useful in know environment? (go beyond the “closest Starbucks” scenario)
- What are the most popular location-related queries?
- How do you study the context of use?
- Do you get feedback from the people that use the system that use your licensed datasets?