Privacy and Participation in Urban Sensing

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Introduction: Exploring privacy and participation when mobile phones are sensors

As sensors, network-connected mobile handsets are embedded near the ultimate elusive subjects: people and their built environments. But human-connected sensors pose new challenges for privacy, data security, and ethics. Leveraging these sensors both effectively and conscientiously will require models that prioritize people's **participation** in sensing. Participation can vary from individual control of data capture to user direction of research goals and objectives. In participatory sensing, user input and experience becomes a critical part of system design.

Problem Description: How can we design conscientious sensor networks for personal data?

Develop network architecture, participatory systems, and data protection approaches to enable individuals and communities to employ mobile devices as sensors in a safe and credible way.

Relationship between participation and privacy
Can ensuring a balance between privacy measures and sharing encourage participation?

User participation in privacy decisions
Privacy decisions are complex; how can we facilitate user participation in these decisions?

Ethical tensions
How do we balance data capture with exclusion, data sharing with restriction, and data retention with deletion?

Data differentiation
What are the privacy and sharing complexities inherent in different types of data?

System design
How do we reflect these questions our findings in embedded network sensing system design?

Process: Social, Cultural, and Technological Research

Privacy-Enhancing Technologies, Encryption Insufficient [1]

- Individuals treat privacy as more than protection of anonymity. Privacy can be a process of regulating boundaries or portraying personal identities [2].
- Individuals may raise privacy concerns during data collection, data sharing, or if data remain accessible over time.
- Recent research [3] has re-emphasized the personal importance of privacy, even in a networked world.

Fig 1. Location data tracking users' movements for their own use or sharing.

Participation's Effects on Privacy Decisions

- Participatory systems incorporate the knowledge, experience, and initiatives of users.
- When people participate in decisions about their data, they may feel differently about sharing and privacy issues.
- Participatory sensing systems may raise new types of privacy concerns, and privacy choices may affect individuals' decisions to participate in Urban Sensing projects.

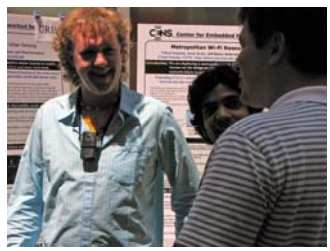

Fig 2. Mobile phones collect image data, including bystanders

Research Questions

How is balance between sharing and privacy negotiated by participants in US scenarios?
How can we adapt system design to the behaviors and preferences participants exhibit in these scenarios?

How do these social balances and negotiations vary for different types of data?
For example, is location data collected by Global Positioning Systems (GPS) treated differently by participants than image data collected by mobile-phone-embedded cameras? Should US systems treat these data differently?

How can systems facilitate user participation in complex privacy decisions?
How do we design systems with affordances for privacy concerns? How do we enable these same systems for user-controlled sharing?

[1] Burkert, H. (1998). Privacy-enhancing technologies: Typology, critique, vision. In P. E. Agre & M. Rotenberg (Eds.), *Technology and privacy: The new landscape* (pp. 125-142). Cambridge, MA and London: The MIT Press.

[2] Palen, L., & Dourish, P. (2003, April 5-10). *Unpacking "privacy" for a networked world.* In Proceedings of CHI 2003, Ft. Lauderdale, FL: ACM, 129-136.

[3] Friedman, B., Kahn Jr., P. H., Hagman, J., & Severson, R. L. (2006). The watcher and the watched: Social judgments about privacy in a public place. *Human-Computer Interaction, 21*, 235-272.