URB 04 Ethics in Personal Mobile & Participatory Sensing

URB 04.1 People

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- Faculty: Deborah Estrin, Computer Science, UCLA; Mark Hansen, Statistics, UCLA; Jeff Burke, Film, Theater & Television, UCLA; Jerry Kang, UCLA School of Law; Ramesh Govindan, Computer Science, USC.
- Researchers: Jim Waldo, Sun Microsystems
- Staff: Betta Dawson
- Graduate Students: Katie Shilton, Information Studies, UCLA

URB 04.2 Overview

The mobile phone network will likely become the largest distributed sensing system on the planet. Mobile phone users, however, are generally unaware of the dual use opportunities, in which their communication devices are also information gathering devices. What are the ethics of coordinating this alternative usage mode for research purposes? Can researchers achieve meaningful consent and active participation of mobile phone users? The three-year *Ethics in Personal Mobile & Participatory Sensing* research and education project will:

Research, design and assess a participatory approach to managing privacy in personal mobile sensing applications;

- Create both an immersion curriculum and a seminar curriculum to teach participatory ethics for urban sensing to diverse STEM undergraduate and graduate students;
- Evaluate the curricula and disseminate best practices for education in participatory urban sensing ethics to urban sensing, ubiquitous computing, and broader technology education communities.

URB 04.3 Approach

In personal mobile and participatory sensing, everyday mobile devices become a platform for coordinated investigation of the environment and human activity. But transforming phones into data collection instruments raises both technical and ethical challenges. We believe researchers should utilize this network of sensors with the consent and active participation of users. Facilitating responsible, socially trusted, and *participatory* ethics for data collection and analysis with urban sensing systems remains an open problem, and is the challenge undertaken in this research and education project. We focus on graduate and undergraduate students who are designing systems not just "for the future" but for ongoing pilot projects that have public participation.

During the research component of this project, we are formalizing, designing and assessing a privacy framework we call *participatory privacy regulation*. The education component of the project will teach participatory ethics such as participatory privacy regulation through development of two curricula for STEM students: a hands-on laboratory approach to designing ethical urban sensing technologies; and an interdisciplinary seminar-style course. The final phase of the project will evaluate and synthesize classroom findings into best practices for participatory urban sensing ethics education. We will disseminate the practices to educational, computing, and technology communities.

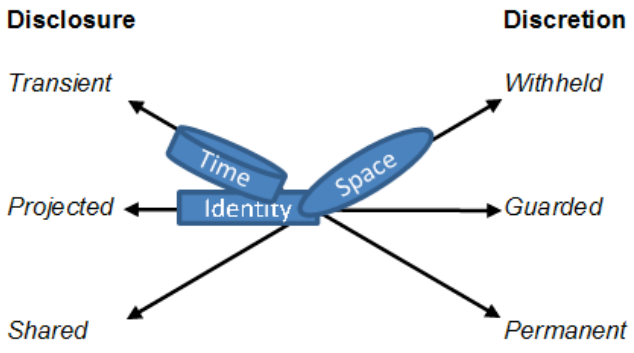

Figure 1: Participatory Privacy Decision-Making

URB 04.4 Accomplishments

During the last year, we have honed our core

approaches to privacy in personal mobile sensing systems: participant primacy, participant autonomy, participatory design, and working with minimal and auditable information. These principles have contributed to the design of the PEIR system, which will include data deletion and sharing mechanisms to engage users in privacy decision-making throughout their PEIR experience. The principles have influenced our research into inferring mobility states using parsimonious activity classification. Principles were also incorporated into the design of parsimonious approaches to establishing participant coverage and reputation for projects such as GarbageWatch. Finally, participatory privacy regulation principles are at the center of an ongoing project with Jerry Kang and Ramesh Govindan to design a Personal Data Stream architecture. The architecture is still under development, but will include a personal data vault, metadata, and filters to allow for user engagement in privacy decision-making.

URB 04.5 Future Directions

Creating and piloting the Personal Data Stream will provide a unique architecture for protecting and encouraging individual decision-making about sharing and disclosure. When the PDS architecture is compatible with CENS applications like PEIR and AndWellness, we will be able to assess how participants user and respond to the PDS architecture's features. As CENS builds a core of users, we will engage in interviews to answer the following:

- How deeply, and under what conditions, do participants engage with participatory sensing systems?
- How do participants in urban sensing negotiate decisions to capture, share, and retain their data?
- How well does participatory privacy regulation support privacy and sharing decision-making in participatory urban sensing systems?
- What are other key ethical questions in participatory urban sensing?

Qualitative data documenting interactions between participants and urban sensing systems can suggest answers to contextual questions about when and why participants make decisions to share or withhold data. Interviews with participants can elicit how participants feel while interacting with the systems and how much participants trust the systems. We will use explicit participant critique of our design methods, software, and conclusions to answer our second research question and assess the adequacy of participatory privacy regulation as an ethical framework. Do participants feel comfortable and secure using participatory urban sensing systems? What changes would they recommend? Are any ethical concerns unaddressed? Answering these questions through interviews and focus groups will help us examine participatory privacy regulation from the ethical perspective of those who matter most: the individuals and communities using urban sensing systems.

We will also draw upon previous interdisciplinary approaches to participatory ethics as well as our investigation of participatory privacy regulation to develop two curricula for STEM undergraduate and graduate students: a hands-on pilot project approach to building participatory urban sensing technologies and an interdisciplinary seminar-style course extending and debating participatory ethics in urban sensing and ubiquitous computing. The pilot project curriculum will enhance existing CENS campaigns to draw students into design projects and discussions focused on ethical system development. The seminar course will engage students from CENS as well additional students from fields such as computer science, electrical engineering, statistics, information studies, environmental studies, media studies, geography, law, political science, sociology, and philosophy. The nature of course participation will highlight design as well as other disciplinary approaches to participatory urban sensing ethics.

URB 04.6 External Research Partnerships

Collaboration with Dr. Jim Waldo of Sun Microsystems (Current)

Collaboration with Dr. Jerry Kang of UCLA School of Law (Current)

Collaboration with Dr. Daniel Weitzner and his research group in MIT's Computer Science and Artificial Intelligence Laboratory (planned).