



Ethics in Pervasive Computing Research

Nigel Davies

Recent editorials for this department have explored some cross-cutting concerns in the field of pervasive computing—in particular, the issues of time (January–March 2013) and privacy (April–June 2013). Here, I want to explore the question of ethics in mobile and pervasive computing research. Although this topic is central to researchers in the field, the question of adopting an ethical approach to pervasive computing extends beyond the research domain, affecting practitioners as well.

ETHICAL CONSIDERATIONS

Research into many aspects of mobile and ubiquitous computing is increasingly multidisciplinary, occurring in multiple locations and requiring ethnographic observations and numerous user studies. For example, in many pervasive computing projects, the teams comprise computer scientists, designers, architects, and social scientists. Experimental work might include both lab-based studies and extensive field work. These characteristics are common in topics as diverse as pervasive displays, usable security, smart homes, behavior change applications, and citizen science.

One of the significant challenges in conducting this type of research is in gaining appropriate ethical approval. The nature of the approval required varies dramatically by discipline and

country. For example, in the US and UK, there are well-established ethics procedures for human-subject research, and institutional review boards (IRBs) provide a well-defined process and oversight. These procedures typically require researchers to submit detailed descriptions of planned studies before permission to conduct the experiment is granted. However, not all institutions have such procedures—especially in

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many parts of Europe, where gaining ethical approval often isn't required unless the research is in the medical domain.

A formal ethics process involving an IRB also suffers from a shortcoming in that it's typically only conducted at the start of the project. This raises two significant challenges. First, in computer-science-driven projects, the focus often changes during the course of the research, as new technologies become

available. More critically, the IRB process often involves just the principal investigators of the project, because the students and researchers aren't in place at the outset. Consequently, the researchers actually conducting the study might feel distanced from the approval process. Of course, new researchers usually must undertake some sort of ethics training, but this isn't the same as being involved in the approval process and having an associated buy-in.

THE BENEFITS OF A SYSTEMATIC APPROACH

Following a defined process that ensures ethical conduct is widely accepted in the research community and considered good practice. No researcher would question the necessity of such an approach, and there's general agreement that it's essential in research to prevent unethical studies. When preparing a study or running an experiment, the individual researchers often view the additional (administrative) overhead of a formal ethics-related approval process as a burden. However, when such processes aren't required by local legislation, the absence of an approval process can also be a burden for researchers, because they then must carry the full responsibility for a trial and its design without receiving feedback.

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As an investigator on a multidisciplinary European pervasive computing project, I have first-hand experience with this problem. My project colleagues and I have worked to create an ethics framework for this type of pervasive computing research.¹ In creating the framework, it became clear that an approval process in this area must meet a number of design goals. The process should

- have a low barrier entry, so team members without prior exposure to the topic can quickly learn the basic motivation behind the process and its significance in human-subject research;
- be easy to apply and scalable in use, such that simple studies are simple to process, while complex ones might require more effort;
- adapt to different legal and institutional requirements;
- adapt to different types of studies and practices; and
- provide additional value (other than just approval) to the researchers involved.

Additional approval might be required for data storage and retention to comply with data-protection legislation and privacy regulations. The framework we outline¹ isn't intended to be a definitive solution—rather, it's simply one attempt to design a process that meets these design goals. Many other processes exist or can be developed, but for the most part, the important design goals are consistent.

RELEVANCE FOR PUBLISHING RESULTS

As pervasive computing begins to “leave the lab” and tackle important societal challenges using techniques such as behavior change, the importance of gaining appropriate ethical approval only increases. Clearly, all researchers would seek to meet their own institutional guidelines. However, the question of what constitutes an acceptable level of ethics compliance for the global

research community is challenging, owing to the diverse set of approaches. There's an important piece of work to be done in this space to try and help develop a common understanding of appropriate ethics compliance, so it becomes common knowledge—as common as the understanding that authors shouldn't submit papers to multiple venues simultaneously. This needs to be a collective debate, however, because individual attempts are likely to be heavily informed by local experiences and conventions.

IN THIS ISSUE

Our theme for this issue is “Understanding and Changing Behavior,” a topic that clearly has significant ethical considerations. This is also an area of intense interest, and we had a very large number of submissions. I thank our guest editors, Albert Ali Salah, Bruno Lepri, Alex “Sandy” Pentland, and John Canny for their diligence in soliciting reviews and selecting six articles for the issue. This is one of, if not the, largest number of submissions we've received on a single topic, reflecting the timeliness and importance of the topic.

This issue also contains a feature article, “Discovery-Driven Prototyping for User-Driven Creativity,” in which Younkyung Lim, Daesung Kim, Jaesung Jo, and Jong-bum Woo describe a new prototyping technique to assist in the design of pervasive computing systems. Our Innovations in Ubicomp Products department is also concerned with prototyping—in this case, with technologies that can be used to create prototypes of new physical devices. While the Arduino platform is well known and has been widely used, the department highlights some of the newer platforms, communication technologies, sensors, actuators, and development tools, which are opening up new opportunities for ubiquitous computing.

The Wearable Computing department also focuses on the creation of new physical systems—through the use of smart textiles. Although much

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of the research in this area has focused on the use of smart textiles for display purposes, in this department, the authors explore how smart textiles can be used to support mobile sensing applications.

The Conferences department reports on HotMobile 2013, which took place earlier this year at Jekyll Island, Georgia. This year saw the broadest participation yet, with approximately 90 attendees enjoying two days of paper presentations, demos, and posters. The program also included an excellent keynote from Thad Starner, who discussed a wide range of projects that he has worked on, including Google Glass.

Our Notes from the Community department, edited by Jason Hong and Mary Baker, offers a curated summary of interesting news and research in pervasive and mobile computing, with content drawn from submissions from a shared community on the social news site Reddit, available at www.reddit.com/r/pervasivecomputing. This issue, the topics include new interaction platforms, energy conservation and, in keeping with the theme of the issue, behavior change research.

Our Pervasive Health department is also strongly related to the issue theme, focusing on the applications

and challenges of developing behavior-aware mobile and pervasive health applications. Because many behavior-change researchers focus on health as a possible domain, this department provides important background information for researchers in this field.

Finally, I'd like to offer a special thanks to Scott Midkiff, who steps down as editor of our Education and Training department. Midkiff has edited this department since the magazine's inception and has helped establish the department as one of the mainstays of the magazine. ■

REFERENCE

1. M. Langheinrich et al., "A Practical Framework for Ethics—The PD-Net Approach to Supporting Ethics Compliance in Public Display Studies," *Proc. Second Int'l Symp. Pervasive Displays (PerDis 13)*, ACM, 2013.

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