

# Increasing the Breadth: Applying Sensors, Inference and Self-Report in Field Studies with the *MyExperience* Tool

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## ABSTRACT

In this talk, we describe how the *MyExperience* tool uses sensing, machine inference, and self-report to gather information about human attitudes, behaviors, and mobile device usage. To illustrate this, we focus on four field studies that leverage different aspects of *MyExperience* to collect rich quantitative and qualitative data in the field. For each study, we emphasize how sensors are used to automatically derive knowledge about the user and how self-report is used to account for limitations in sensing and inference.

## Categories and Subject Descriptors

H.1.2 [Information Systems] User/Machine Systems – Human Factors; H.5.2 [User Interfaces] Evaluation/Methodology, User-Centered Design; D.2.2 [Design Tools and Techniques]: Miscellaneous; J.4 [Social and Behavioral Sciences]: Psychology

## General Terms

Design, Experimentation, Human Factors, Measurement

## Keywords

*In situ* Evaluation, Experience Sampling Method (ESM), Context-Aware Systems, Mobile Computing, Field Studies, Toolkits

## 1. MOTIVATION

Context-aware mobile computing has long held promise for improving the computing experience in everyday life; however, designing, building and evaluating context-aware systems is challenging. Often, this process involves a host of social and technical complexities that span domains from HCI to machine learning to system building. For example, most mobile context-aware systems require sensor integration, user modeling, statistical inference, short/long range wireless communication, adaptive interfaces, and ecologically valid evaluation. How can we collect data early in the design process to inform the machine learning and inference algorithms? Further, once these algorithms have been constructed and an application has been built, how do we evaluate its usage in an ecologically valid way (*e.g.*, in the field)?

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## 2. TALK OVERVIEW

We begin with an overview of the *MyExperience* tool, an open source context-aware system that combines automatic data traces with self-report to assist in the *design* and *evaluation* of mobile technology<sup>1</sup>. The key contribution of this tool is in lowering the barrier to researchers in conducting sensor-based data collection studies in the field. *MyExperience* provides access to over 140 types of events including communication (*e.g.*, phone calls, SMS), user context (*e.g.*, calendar appointments), and the environment (*e.g.*, location). This sensor data is automatically time stamped and logged to a database local to the device. The sensor events themselves can be used to trigger custom actions such as self-report surveys, screenshots, send SMS messages, and wireless database synchronizations.

Second, we walk through four studies that highlight different uses of the *MyExperience* tool, including: 1) using wearable heart rate variability monitors to trigger mobile therapy sessions related to stress and/or anger management; 2) investigating the use of wearable activity-inference devices and persuasive mobile phone technology for promoting physical activity; 3) examining the accuracy of recall for routine activities relative to the perceived participant burden (*i.e.*, frequency) in responding to *in situ* self-report surveys; and 4) utilizing mobile phones to collect *in situ* data on chronic pain and pain management. For each example, we emphasize how sensors are used to derive knowledge about the user and actively inform the dynamics of the study.

Finally, we close by enumerating high level challenges faced by researchers conducting field studies with *MyExperience* and some of the ways these limitations have been overcome. For example, in study #2 above, a “pager-sized” multi-sensing device must be worn by participants on their waists during waking hours. This device communicates with *MyExperience* via Bluetooth running on the participant’s mobile phone. During pilot studies, it was observed that participants would sometimes forget to wear or turn on their sensor platform and that at other times the Bluetooth connection would drop inexplicably. As a result, the researchers updated their *MyExperience* configuration file to include trouble-shooting prompts for the participant that would trigger after *N* minutes of Bluetooth communication silence. If these steps did not resolve the problem, an SMS was automatically sent to the research team.

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<sup>1</sup> <http://myexperience.sourceforge.net>