
Mixing methods in the Ambient Kitchen

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Abstract

The use of mixed methods underlines the interdisciplinary approach to understanding practices in the Ambient Kitchen at Culture Lab. In this paper, we outline three research projects across a spectrum of social science and computational methods which merge novel data capturing tools and situated practices. We outline the use of novel persuasive and technology probes used in the BinCam and FridgeCam projects, the use of embedded sensors and activity recognition to capture food practices in the Balance@Home and LanCook projects, and the use of pervasive environments to understand social interaction in the Telematic Dinner Party. These projects point to the use of novel technologies and methods to understand and design for situated practices in the home.

Author Keywords

Methods, ethnography, activity recognition, food practices, situated practices.

ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

Introduction

The Ambient Kitchen is a research platform and pervasive computing environment installed at Culture Lab since

early 2007. The kitchen was originally designed to demonstrate how people with dementia might be able to use it to remind them to take medication, to aid them in cooking, and to monitor activity. The current Ambient Kitchen makes use of a rich sensing environment including embedded wireless-accelerometer (WAX) sensors, RFID technology, tablet computers and embedded LCD monitor displays. It has been used as a platform for projects whose topics range from providing assistance to older people, and people with cognitive and physical impairments, to encouraging healthy eating habits, to assisting in language learning. The pervasive environment is also augmented by additional research systems, including for instance, the BinCam and FridgeCam systems, which use visual images to sense and provide feedback on everyday food practices in the kitchen. Beyond the kitchen, food practices have also been examined at the dining table with the Telematic Dinner party exploring the playful communication of a dinner party in a high-fidelity environment for remote diners.

In addition to the novel pervasive environment a rich strand of social science research supports the understanding of and design for situated food practices. Central to these understandings are methods such as ethnography, video analysis, interviews and participatory and user-centred design methods. With the Balance@Home project, mixed methods approaches compliment each other with ethnographically inspired methods [1] and activity recognition and questionnaire based research [8] providing insight on the processes of planning and preparing meals. Technology systems such as FridgeCam are often designed as technology probes - intended not as an ideal technological solution to a problem, but as a point from which to initiate discussion with households.

With each of these projects, the Ambient Kitchen serves as a platform from which to understand situated practices – the 'doings and sayings' of everyday life [5]. Situated practices are the "everyday activity of persons acting in setting" [7], as they are enacted towards constantly adjusted goals of those activities. Understanding these practices requires both an understanding of the embodied enactment of practices and the value and goal orientated organisation and co-ordination of those actions. We argue that using a mixed methods approach combining activity recognition and social science methods can achieve this. While embedded and body worn sensors can be used to analyse the physical activity of the individual (such as slicing a carrot, or stirring a pot), social science methods such as participant observation can help to reconstruct the context of these actions. Moreover, mixed methods produce a composition image that is greater than the sum of its parts – for instance, where visual and sensor data can be used as a probe for social science methods. That is, not only do the various methods provide counter-points to each other, they mutually construct a 'ground truth' of everyday practice in both the doing and the saying of those practices.

In the following section, we explore how situated practices are understood within three projects in the Ambient Kitchen. Each project provides methodological challenges and theoretical insight on everyday practices in the home.

Projects

BinCam and FridgeCam

BinCam is a social persuasive system designed to motivate reflection and behavioral change in peoples food waste and recycling habits. The system replaces an existing kitchen refuse bin and automatically logs disposal of items through digital images captured by a smart

phone installed on the underside of the bin lid. Captured images are uploaded to a BinCam application on Facebook. Here, users can explore, review or share communications about bin-related behavior of themselves and others. While primarily designed to 'change' behaviour, the BinCam system is built on the premise of increased self-awareness and reflection. As such, it constitutes a key data source in reconstructing everyday practices with participants, both directly as a prompt in post-study interviews and indirectly as an anchor for reflecting on personal action during the deployment.

FridgeCam is a technology probe, designed to prompt users to reflect on every day food practices in the kitchen. A mobile phone is attached to the inside of a refrigerator (fridge) door. For every second that the fridge door is opened the camera in the phone takes a picture and uploads it to a dedicated website. Users can access captured images through their smart phones or computers, enabling them to reflect on their food practices and the contents of their fridge. They may also pro-actively seek out FridgeCam images to reduce food waste, for instance by seeing whether some specific food is required when shopping.

Both prototypes are innovative in supporting food management and intervening to avoid food waste. They were designed towards critical reflection on food and waste practices at the home in making certain actions visible. Despite the similarities between the technologies employed, the differences in methodological approaches highlight the potential of simple interventions to reveal a great deal about food management in the home, and the role of technology in understanding everyday practices. While persuasive technologies, here represented by BinCam, have become a popular means to conceptualize

behavior change interventions, technology probes, here represented by FridgeCam, seek to first better understand everyday practices to inform later design.

Balance@Home and LanCook

The EU FP7 framework funded Balance@Home project explores technological means to assist households and individuals in maintaining a balanced diet. There are significant challenges faced by individuals in this regard, and the project employs both social science methods [1] and state of the art activity recognition [3, 4] to support healthier food choices and increased confidence in food practices [8]. In this latter phase, the goal is to design and deploy digital technologies that can improve people's cooking skills and thereby positively impact on the nutritional quality of their diet. Demonstrating the mixed methods approach taken with the Ambient Kitchen, observational studies were undertaken in people's homes to establish the parameters of cooking competence, which are later used to tune activity recognition in the Ambient Kitchen. Using the embedded sensors in the kitchen utensils, we can accurately recognise those activities which suggest levels of competence.

Utilising the same sensors, the LanCook project [2, 6] seeks to assist in Task-based learning processes. Studies have shown that Task-Based Learning, in which students utilise the language they have learned within a practical setting, is a far more effective way to learn languages. With the LanCook project we can turn the Ambient Kitchen into a platform for Task-Based Learning of foreign languages. Originally created to offer users a recipe in French, it has since been expanded to include German, Italian, Finnish, Spanish and Catalan. It uses the embedded accelerometers in the utensils to ensure that students have understood each step, and supports the

user by repeating or translating instructions where necessary. Students can apply their skills practically and with tangible results, making the experience of this Task-Based Learning more rewarding than the traditional classroom setting. Thus, while ostensibly a tool for education, the LanCook project points to the ability to understand and respond to on-going practices of learning and understanding in the kitchen.

Telematic Dinner Party

Moving outside the confines of the kitchen, the Telematic Dinner Party (TDP) is a high-fidelity prototype environment for sharing dining experiences among co- and dis-located diners. The TDP provides a media rich environment, including overhead video capture and projection which shares diners actions, directed audio channels between dislocated spaces to support communication and, in particular side conversation, periphery video displays to support ambient awareness, and networked turntables which synchronise their positions to provide for remote agency between spaces. Shared presence is facilitated through a combined virtual embodiment of projected actions and audio cues, which is afforded agency by the ability to playfully interfere with and engage in the dining experience of others, by, for instance, moving the networked turntables to remove food out of reach of a dislocated diner. The TDP provides insight on dining experiences, but also on the necessary technology systems to capture the rich social interactions across the dining table.

Discussion

In the Ambient Kitchen a mixed methods approach is applied to understand the situated practices of households as they shop, cook, throw away food and even learn foreign languages. These practices are identified and

analysed through embedded sensing technologies, machine learning and activity recognition, and contextualised through social science methods. These methods combine to produce a rich picture of everyday practices, but also to provide a platform for intervention, whether for cooking competence, reduced food waste or improved language learning.

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