Chapter 15

Issues of Sensor-Based Information Systems to Support Parenting in Pervasive Settings: A Case Study

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ABSTRACT

The vision of the home of the future considers the existence of smart spaces saturated with computing and pervasive technology, yet so gracefully integrated with users. Sensing technology and intelligent agents will allow the smart home to empower dwellers’ lifestyle. In today’s homes, however, the exploration of pervasive and ubiquitous systems is still challenging. Lessons from past experiences have shown that social and technology issues have affected the implementation of pervasive computing environments that “fade into the background”, and of supportive applications that disappear from user’s consciousness. This paper presents our experience with the exploration of a pervasive system that aims to complement a parent’s awareness of their children’s activity in situations of concurrent attendance of household and childcare. To minimize issues such as sensing reliability and variations with parenting needs around this kind of pervasive support, parents are enabled to configure and adapt the UbiComp system to their current needs. From responses of a user study we highlight opportunities for the system on its current status, and challenges for its future development.

INTRODUCTION

The home of the future is meant to anticipate and collaborate with its occupant’s needs. The smart home, spaces and artefacts will identify inhabitants’ “routines” and offer computing-based services that fit the current dweller’s needs for comfort as well as individual’s moods. The achievement of this vision of the smart home, however, is many decades away. So designers must deal with the constrained technological sophistication that the today’s accidentally smart home can accept, which is challenging. Past experiences have shown that issues from the technical and social domains affect the creation of “intelligent” environments (Edwards & Grinter, 2001). Regarding the social
context, factors such as cultural norms, income, number of family members, individual feelings and moods to name a few, are implicit but unpredictable constituents of domestic routines, which make the implementation of “smart” activity recognition systems a challenging problem (Abowd, 1999; Belloti & Edwards, 2001). Regarding the technical context, the imprecise and ambiguous nature of real-world events (especially as “observed” by some sensing system) make it difficult, if not impossible, for a system to infer the subtle inflections of users’ routines (Jamie et al., 2006).

Designing today’s smart homes, requires taking into account inhabitants’ participation to reduce intrusive and obtrusive issues of sensing-based information systems and “intelligent” services. Today’s smart environments provide information for users to help them make decisions, to help inhabitants to understand what the computing technology can do and how they can override and adapt any proactive support given by the system. Rather than proactive support, mediated spaces could reassure occupants that they are still in control of their home. Smart systems that do not moderate this support, it is argued, can be both psychologically and physically debilitating (Intille, 2002). The following examples help to illustrate the user’s active participation to configure the level of “smartness” that they may accept from pervasive designs.

The jigsaw-like editor tool of (Humble et al., 2003) embodies the suggestion that it is important to enable users to configure or re-configure devices and services to meet their current needs. The jigsaw pieces represent augmented objects that represent the different artefacts or devices that can be used to build collaborative services for home. For instance, a user can interconnect the jigsaw-like pieces representing a webcam, a door bell, a lamp and an output device to build a personalized surveillance system. VRDK (Knoll et al., 2006) is a visual tool that allows users to develop and experiment with a smart home system. The user can digitally interconnect devices, artefacts and processors to build and to explore the functionality of the service of interest. A similar approach is used in eBlocks (Lysecky & Vahid, 2006): smart devices can be individually configured, and connected together to build customized sensor-based systems. The whole system’s functionality can be simulated before physically be deployed. These experiences might be an indicator that human beings, and not technology, should define the degree of intrusion that can be accepted for ubiquitous collaboration in the domestic setting (Davidoff et al., 2006).

In this paper we present the case study of a system that aims to assist parents in monitoring their child’s (potentially risky) activity, especially in situations of concurrent attendance of household work and childcare. Similarly to the above experiences, to minimize intrusive and obtrusive performance of our system, users are enabled to take the initiative to be constructive, to be creative, and ultimately, be in control of the UbiComp support (Rogers, 2006). To identify the potential opportunity of UbiComp systems under this context, we review previous studies that explored pervasive computing environments to support parents at home, and we collected direct information from three parents on how they managed the attendance of household and childcare. Then, we moved sensing technology into a real setting, and afterwards we implemented a user-mediated system which is alert of the children’s whereabouts. Finally, a user study was undertaken in order to get insights of parents’ feelings for this kind of pervasive support; and to identify opportunities for the system on its current status, and its challenges for its future development.

INFORMATION NEEDS TO SUPPORT PARENTING IN TODAY’S SMART HOMES

There is vast literature that suggests that parents might welcome a support based on technology for
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