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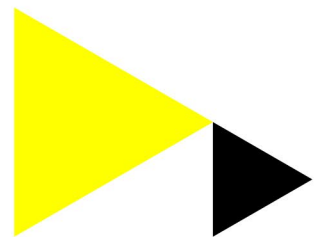
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Miniature Play: Using an Interactive Dollhouse to Demonstrate Ambient Interactions in the Home

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ABSTRACT

The project discussed in this paper is aimed at increasing people's understanding of the existence and desired workings of ambient technology in the home by demonstrating its potential. For this purpose, an interactive dollhouse is presented. The dollhouse, a miniature model of a sensor-equipped home, was developed and used to engage elderly users in the design of an ambient monitoring system. This paper explains the design of the interactive dollhouse and the ways it was used as an elderly-centered design method for increasing understanding of the desired workings of ambient monitoring in the home.

Author Keywords

Activity monitoring, Ambient technology interactive dollhouse, Ambient Assisted Living, Elderly-Centered Design method

INTRODUCTION

As interactive systems are becoming increasingly smaller and integrated into the environment, technology is disappearing into the surroundings. This is particularly valid for ambient technology, which in line with Weiser's vision [6], is to operate as invisible tools. This means that much of the ambient technology that people come across every day goes unnoticed and that the (potential) workings of ambient systems are not always consciously perceived or clearly communicated to the user. This has implications for engaging people in the design of such systems, because if people are not aware of the workings and scope of a system, they cannot truly approve, control or adopt it. This paper aims to address this issue by demonstrating the potential of such systems through seeking to increase people's awareness and understanding of the technology. The work discussed particularly focuses on democratically engaging elderly in the discussion of an ambient assisted monitoring system. A dollhouse is presented as an explanatory tool and elderly-centered design approach to engage elderly in the discussion of designing and using an ambient system to monitor their daily activities in the home.

Background work

This research explores miniature play as a user-centered design method for realizing desired ambient interactions. Researchers have already shown the power of playful

methods for expression, such as using technology-enhanced puppets and dolls to encourage children's storytelling [5]. The demographic change of aging populations around the world has motivated a large body of research to specifically focus on technologies that are targeted at the elder user. In this vein, Ambient Assisted Living (AAL) is an emerging field of research that focuses on ambient technologies to support and help elderly live longer independently. Residential monitoring is particularly being explored for this purpose. Typically, it is focused on monitoring elderly Activities of Daily Living (ADL); a set of activities used by physicians to benchmark physical and cognitive decline. According to a literature review by Duh et al [1] more work that focuses on understanding the needs of the elderly in the design process is needed. One problem with exploring ambient design concepts with elderly is adequately explaining the scope of the technologies involved. Researchers [4] already found that demonstrating simple mappings between sensors and display in demonstration applications in an ambient-technology augmented kitchen could greatly improve users' understanding of the potential functionality. This is promising, as according to Mitzner and Rogers [3] by involving older adults in the design process, technologies can be developed that are more useful and usable for older adults and may, therefore, increase their acceptance rates and contribute to successful aging.

SYSTEM DESIGN

The interactive dollhouse was initially developed as part of the Senior-Create IT [2] project that investigates the needs and attitudes with regards to the monitoring of daily activities from an elderly-centered design perspective. A focal point of this project is mapping the sensor data sharing needs (and privacy and design considerations) of elderly people.

The first interactive dollhouse, as shown in Figure 1, was originally developed for and used in a residential care centre in the Dutch city Naarderheem,. This dollhouse, a scale model copy of the elderly participants' homes in Naarderheem, has been equipped with simple sensors that are able to track movement and so simulate the actual monitoring environment. The dollhouse communicates with a graphical user interface (via Arduino) that displays simple feedback on what is being monitored in the dollhouse on a computer screen.



Figure 1. The Dollhouses (1st version above, 2nd version below)

The second developed version, a re-iteration of the first dollhouse, is a scaled copy of residential care homes, which were recently completed in De Keyzer, a newly built living complex in Amsterdam, The Netherlands. This dollhouse demonstrates the workings of the hidden sensors that the new apartments are equipped with, and, differently than the first model, hides the wires and sensors, making this second demo-model more robust. This dollhouse contains seven sensors that mimic the situation in their sensor-equipped home. The pressure and motion sensors are each connected to a separate small screen to show the registration of an activity, such as opening a door, or flushing the toilet. When entering the house is re-enacted in the dollhouse, the corresponding display indicates the motion that is registered at the front door. This second version also offers the functionality to connect the dollhouse to a larger screen to present more advanced visualizations of sensor activity.

HOW THE DOLLHOUSE WAS USED

The dollhouse was used to explain the concept of ambient activity monitoring and engage elderly in the desired workings of such a system. It was used as a research method in interview sessions with seniors to study and generate discussion on acceptance issues (See also [2]). Particularly in the case of de Keyzer, the purpose of the model was also to demo, discuss and inform the residents of De Keyzer about the sensors which some of the apartments were already equipped with. The scale model gives users the opportunity of seeing and understanding how the technology has been integrated in their apartment. By using the interactive model, the elderly can play and act out their daily activities, so to gain understanding into what happens in their home. This makes the invisible sensor processes more transparent to the user in a playful way.

DISCUSSION

By means of miniature play, the dollhouse was presented as

a method in which the visibility and desired workings of ambient technology can be uncovered and discussed with users. This is needed, as our latest questionnaire study amongst 40 elderly people living in the Dutch cities Lelystad and Enkhuizen showed that the majority of participants (27) said not to understand the concept of sensor monitoring initially. Hence, the interactive dollhouse is still being used in various locations in The Netherlands to increase understanding of the concept of sensor monitoring, to make more people aware of the workings of ambient technology, to generate democratic discussion and to further study the attitudes of elderly with regards to monitoring their daily activities. The dollhouse as an elderly-centered design method increased understanding of how a monitoring system for the elderly should be designed, particularly in terms of interface design and visualizations of the sensor output, which has also inspired further needed research. The dollhouse method could also evolve to be used in other settings for engaging the wider public in the design of ambient technology. In this way, users can hopefully become more consciously, playfully and democratically involved in the process of designing and using ambient ‘invisible’ systems.

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