Towards a Living Lab research facility and a ubiquitous computing research programme

Position Paper, for the CHI 2001 workshop:
'Distributed and Disappearing UI's in Ubiquitous Computing'

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Introduction

My interest in the topic of this workshop stems from my current involvement in setting up a new research facility at the Eindhoven University of Technology. This facility is called the 'Living Lab', and is quite similar to related projects around the globe in that it aims to study how people experience a ubiquitous computing environment, when they will inhabit it and use it for prolonged periods of time. The slogan of this development, is 'Vacation on Campus'.

The project is currently at the initiation phase. We have proposed a white paper [1] describing the concept and the research programme, and we are currently working to involve stakeholders from different departments of the TU/e, e.g., Architecture, Electrical Engineering, and Technology Management, and of the local industry. (E.g., Philips).

In the remaining of this position paper, I outline our research concept and our programme.

Concept - Vacation on Campus

The Living Lab, will be a cross between a traditional residence and a usability laboratory. It will be used to user-test novel technological products for periods of 1 or 2 weeks, as opposed to 1-2 hours as in a traditional usability laboratory, and in a situation closer to the normal daily life of the subjects.

Contrary to 'smart home' type projects, we do not intend this lab as a showpiece or an integrated vision of the 'home of the future'. It is our intention that the Lab is a testing facility in principle, and is orthogonal to the technology that will be housed within it. Our primary research agenda is to focus on how ubiquitous computing technology can be designed to fit the daily lives of the Lab inhabitants. However, we plan partnerships with companies and university departments interested in adaptive systems for air quality control, nutrition, etc., who do not require the development of a ubiquitous computing environment, but who need a test-bed for the prolonged usage of their technologies.

Implicit in the above is that we extend our notion of what usability and usability evaluation means, to test the prolonged, implicit and continuous interaction with an adaptive environment such as an Aware Home. Compared to the traditional concept of usability (as in ISO 9241), it is clearly not sufficient in such a context, to talk of effectiveness and efficiency, although some stretch these terms beyond their intended meaning. A more appropriate target for such a system is to design so that it becomes part of our every day life [2].

Operationalising this requirement and how to test for it, is one of our first methodological concerns. We believe that in the Living Lab, there will be little need for one way mirrors and think aloud protocols, although some video observation (round the clock) may be necessary. To protect the privacy of the users, we need to make it clear that they can veto and control completely the video recording. Clearly, these methodological issues are an important component of our research agenda for the Living Lab.

Research programme

Our current research programme is an evolution of our earlier research in several fields:

- Video based communication for the elderly [2]. Assessing the illusion of 'co-presence' sustained by video based communication, with the aim of supporting the social life of elderly people living alone.

- Information appliances for the home. At IPO we have already developed and experimented with minimalist photo-sharing applications [4] and family message appliances [3], that can be used without training and that provide a very basic functionality to their users.

- Interaction for children. We are currently developing interaction concepts for children, based on a mix of implicit and explicit interactions.

Conclusion

Our research in this field is still in its infancy, although we are building on a strong expertise in human computer interaction for home electronics.

Looking at the current state of the field, we feel that a convincing application of this technology is still lacking, largely because the real benefits from implicit interaction have not yet been reaped. Concept demonstrators, require extremely complex computer vision and middleware solution for switching lights on and off, transferring audio and video streams from room to room, controlling the heating etc. While these are compelling demonstrations of the potential of these systems, and are necessary stepping stones for building up more complex ubiquitous computing environments, they fail to deliver to the user benefits far above those of explicit interaction. For example, token-based interaction can easily guide lighting control and redirection of video and audio sessions.

Our contention that drives our approach to this research field is that the true benefits from aware environments will arise

1. In situations where they cannot be replaced by explicit interactions: e.g., health monitoring, child minding, etc., and

2. Where the sensing and actuating behaviours of the aware environment are purpose-specific and of great value to the user of the system, e.g., safety, education.

3. The reactive behaviour of a system should be observable and re-configurable by users, e.g., parents configuring the environment watching over their child, or doctors should be able to reconfigure a patient monitoring system.

To meet these conditions we need an in depth understanding of the targeted human activities and to build up expertise in designing and testing these systems. The Living Lab described earlier is part of this long term research effort.

References

1. Markopoulos, P., and Rauterberg, M.,(2000) Living Lab - A White Paper, IPO - Annual Progress Report, 35.

2. Bouwhuis, D.G. (2000) Parts of life: Configuring equipment to individual lifestyle. *Ergonomics, 43(7),* 908-919

3. Vroubel, M., Markopoulos, P., and Bekker, M. (in press) FRIDGE: exploring intuitive interaction styles for home information appliances. To be presented as an Interactive Video Poster in CHI 2001.

4. De Greef, P., and IJsselsetein, W., Social Presence in the Photoshare tele-application, in *Proceedings PRESENCE 2000*.