Remarkable Computing

-the Challenge of Designing for the Home

Marianne Graves Petersen
Department of Computer Science
University of Aarhus
Aabogade 34, DK-8200 Aarhus N, Denmark
mgraves@daimi.au.dk
+45 89 42 93 47

ABSTRACT
The vision of ubiquitous computing is floating into the domain of the household, despite arguments that lessons from design of workplace artefacts cannot be blindly transferred into the domain of the household. This paper discusses why the ideal of unremarkable or ubiquitous computing is too narrow with respect to the household. It points out how understanding technology use, is a matter of looking into the process of use and on how the specific context of the home, in several ways, call for technology to be remarkable rather than unremarkable.

Categories & Subject Descriptors: H.5.2 [Information Interfaces and Presentation]: User Interfaces — Theory and methods; H.1.2 [Information Systems]: User/Machine Systems — Human factors; General Terms: Design, Human factors, Theory

General Terms: Design
Keywords: Domestic Technology, Remarkable Computing, Ubiquitous Computing, Aesthetic Interaction

INTRODUCTION

In line with Tolmie et al. [22], this paper argues that domestic life is particularly interesting to study, as this domain is increasingly addressed by the development of new technologies. Moreover, it challenges prevailing assumptions around design of workplace technologies. Although Tolmie et al. [ibid] motivate their study in this way, they move on to investigate how the ideal of ubiquitous computing [23], which was originally formulated around work technologies [ibid], can be pursued in the design of domestic technologies.

One of the examples put forward by [22] is the case where two neighbour women coordinate their trips to pick up their children from school. As the first person leaves, she knocks on the others' door, to signal that she takes off. Unless the other person reacts by e.g. opening her door, to signal that she is on her way, and wants to walk along, the first person just takes off, without awaiting further reactions from her next door neighbour. Tolmie et al. [ibid] see this instance as a prime case for how people coordinate their domestic activities seamlessly, and thus they argue that computing for the household, should equally seamlessly and unremarkably fit into our existing lives.

CHI 2004, April 24–29, 2004, Vienna, Austria.
ACM 1-58113-703-6/04/0004.

There are at least two reasons why this case does is not a very good exemplar for the challenges of designing for the home. First this situation of seamless coordination does not provide a new challenge to existing understandings of how people use IT enhanced environments to coordinate their activities. In 1992, Heath and Luff exemplified how people, who work in the control room of London underground, coordinate their activities seamlessly through rendering their activities visible for their collaborators [9]. In essence, this is what happens as the two neighbour women coordinate their trips through knocking on each others' doors as they leave their houses.

Secondly, [22] emphasise that we should understand what is done in the doing of people's actions, and not only focus upon actions in isolation. But it seems as if Tolmie et al. [ibid] themselves, focus on too limited actions. In their argument, the mothers' coordination of their trips to school is part of a routine matter. However, viewing this action in a broader perspective, focusing not only what happens in the moment of coordination but also on what happens afterwards, it could be argued that their purpose of coordination is exactly to make the trip less routine in a sense. Through enjoying each other's company on the trip, they try to make it more of an experience. They try to make it remarkable.

REMARKABLE COMPUTING

In the following different motivations for designing remarkable computing are outlined and it is discussed why in several ways, the ideal of unremarkable computing is a problematic starting point for designing domestic technologies.

Learning through use

No man found a bicycle unremarkable, when taking off for the first ride. The practice of the two mothers who coordinate their trips was probably also established over time. No technology is inherently ubiquitous or unremarkable ([2], [15]), certainly not throughout the lifecycle of use [1]. Over time, technologies may become invisible in use, as people gain experience with using them [2]. Talking about interactive technologies as inherently invisible fails to identify what happens before and after this state occurred and thus fails to understand the process of use and how it could be supported through design. [15] provides examples of what happens as domestic technologies are appropriated over time. One of the cases reported is a couple who bought an integrated television and surround-sound system, which provides a cinema experience. The couple was visited and interviewed regularly over a period of six months starting at the time of their purchase. While the metaphor of the cinema experience, as expressed through sale and in the physical design of the television, left the couple very excited and motivated to explore and use their new system. However, the facilities which initially motivated them never became unremarkable.

The woman in the family had to force her way through months of trial and error in understanding the modal remote control in order to set up the cinema experience herself. Her husband, on the other hand, was very motivated by a new programming facility offered by the integrated video recorder. The video recorder can be programmed directly through tele-text. Despite his motivation and engagement (he left the manuals at his bed-side for reading) during the six months of the study, he never succeeded in recording the intended contents despite several attempts. He ended up asking his son to make the video recordings for him.

This story has two points. First it is important that the design of the technology reveals the facilities offered by the system in order to motivate users to relate the possibilities of the technology to the actual needs, dreams and wishes of the users. For this purpose, domestic technologies should be remarkable rather than unremarkable. In line with this Carroll argues that, metaphors only really come in to play, when they fail to comply with the target of the metaphor [3]. That is when the metaphor makes the user question the technology at hand, start investigating it, become motivated to exploring it, and looking upon it in new ways. The metaphor then provides new horizons of use. The metaphor of the cinema experience supported this well. But the technology was not unremarkable in this situation, it was remarkable indeed. The frustrations and limited success of the couple who bought the television system arose from the limited support for learning through use in the design of the television system. A highly modal, general purpose remote control left little traces of how the cinema experience could be obtained through the more detailed interaction. There was little support for learning through use in the interaction design. The case further suggests that learning time can be long, particularly in the home, where there is often limited support from more capable peers. Thus even though learnability has been a well established aspect of usability [12], there is a lack of focus on this aspect, especially in the course of the present hype on ubiquitous computing or unremarkable computing.

Visible possibilities

In discussing how to achieve ubiquitous computing in the home, Tolmie et al. [22] further challenges prevailing assumptions that computers should literally disappear and become perceptually invisible. They provide examples of how perceptual invisible technologies can be both unremarkable as well as remarkable. And they argue that the "challenge for design is to go beyond simply focusing upon the perceptual qualities of devices and to make computational resources that can be unremarkably embedded into routines and augment action" ([ibid] p. 404). While we agree that perceptual invisibility in no ways guarantees invisibility in use, we find that there is a more pertinent problem relating to visibility and invisibility of technologies in the home. What we currently see is an increased digitization of domestic material in the home ([16], [20]). Photos, movies, calendars, recipes, notes, messages from the school etc. are increasingly digitized and thus no longer have an inherent physical form. When studying "domestic information systems" in terms of both digital and physical information, it is striking that particularly physical materials are highly distributed in homes, and that persistent visibility is an important matter for some of this material ([4], [16]). In contrast, most systems that are currently envisioned, specifically for a domestic context, contain one large display in one room ([7] , [11]), one large display in each room ([18]) or highly co-located displays ([10]). There is little discussion on issues of persistency and distribution of material throughout the home.

History and Lifestyles

Further, when it comes to domestic technology in particular, it is interesting to notice that people in their homes surround themselves with objects, which have history and biographies ([21], [13]). Objects that are not artefacts to be used transparently and unremarkably but on the contrary objects, the raison d'etré of which is to be dwelled upon and investigated in their own right. Or as put by [14] "Home is a staging of personal memory. It functions as a two-way mediator - personal space expresses the personality to the outside world, but, equally important, it strengthens the dweller's self-image and concretizes his world order" ([ibid], p. 6). As domestic objects are increasingly embedded with interactive technology, they become objects of lifestyle and identity too. An additional example of lifestyle aspects of domestic technologies is Pine and Gilmore, who argue that we are heading for an experience economy [19]. They argue that companies need to experientialize their goods, so that they engage

costumers in a memorable way. According to Pine and Gilmore this can for instance happen through sensorializing goods or through staging events, that are related to products [ibid]. While this is a very marketing oriented approach, it certainly represents a trend we are seeing now, and we need to understand how this trend affects the way people adopt and use domestic technologies. It provides an additional example of how domestic technology becomes remarkable rather than unremarkable. Again suggesting a more complex picture than the ideal of unremarkable computing represents.

DESIGNING REMARKABLE COMPUTING

As argued, the home is a complex place to design for, and there is still a long way to go before we understand the consequences of this sphere for the design of interactive technology. In the following a couple of suggestions are provided. First, aesthetic interaction is described as an approach, which represents different ideals for interaction than that of the unremarkable computer. Second, a scenario of future remarkable computing is presented in order to set the scene for further discussions within the field.

Aesthetic interaction

A further aspect, which calls upon domestic computing to be remarkable rather than unremarkable, is the role of aesthetics in the design of computing for the home. Several have pointed out how aesthetics is an important issue to consider in the design of domestic technology ([5], [7], [8], and [17]). Many different assumptions underlie the potential role of aesthetics. Some see aesthetics as simply the look of things [7], e.g. does it go with the couch. Where others look upon it as intimately tied to use and instrumentality ([5], [17]). "Aesthetic interaction is not about conveying meaning and direction through uniform models; it is about triggering imagination, it is thought-provoking and encourages people to think differently about interactive systems, what they do and how they might be used differently to serve differentiated goals" [17]. Making this experience an integral part of the interaction is a way to support design for learning through use. We have previously developed prototypes exploring the perspective of aesthetic interaction [ibid]. Examples include an 'emote' which is a remote control providing access to music through gestures. Secondly, we have presented the idea of an interactive floor, where documents are being picked up and displayed on the floor through bouncing a ball. Both interaction concepts are thought provoking, establish new relationships with digital material, and encourage users to play with the material.

Aesthetic interaction is also a possible response to concerns on making future interactive homes too transparent and straightforward as expressed by [14]. "One of the reasons why contemporary houses and cities are so alienating is that they do not contain secrets; their structure and contents are conceived at a single glance. Just compare the labyrinthine secrets of an old medieval town or any old house, which stimulate our imagination and fill it with expectation and excitement, with the transparent emptiness of our new cityscape and blocks of flats". ([ibid], p. 9)

Through providing remarkable, surprising and engaging facilities in the design, we may set out new horizons of use and motivate users to explore the technologies in new ways grounded in the needs of their everyday lives. Aesthetic Interaction is a resource in this respect.

A remarkable computing scenario

Jack comes home from school with his friend Bob. As they enter the door they stumble over a message displayed on the floor in the hallway from Jack's mother. The message says that she will be home at 3 pm, but that they can find something to eat in the kitchen. As they move through the corridor towards the kitchen Bob stops and notices some new pictures on a picture collage on the wall. It is pictures from their holiday and Jack starts to explain about the experiences he had in Disneyland. They start playing with the slider on the side to browse through previous collages. Suddenly Bob notices that he is wearing a new t-shirt with a picture of Donald Duck. A tag on his t-shirt provides a link to a digital version of the picture from his t-shirt, which appears on the display in the corridor. The kids find out that the pen at the display can be used to augment the picture, and they start to draw funny faces on top of Donald. After playing with this for a while, they move into Jack's room. They start playing with the scenery of his room in order to set the scene for their play. There are no predefined scenes. Part of the joy is to play around with different combinations of pictures and lights on the walls and to ditch music to match their play. They start to play and change the scenes depending on the specific theme of their game, which is constantly developing.

As the mother comes home, she cannot see from the house map where in the house her son is (as proposed in a scenario from Philips [18]). Instead, she sees the 'augmented' Donald duck on the wall and can tell that her son has had fun with his friend. She is confirmed about this as she see a new note on the floor saying 'hi mum - see if you can find us' Thus it is not the case that as she enters, she briefly connects to the playroom to say hello to her child, and her video picture automatically appears on the flat screen that is currently used by him, (as proposed by Philips [ibid]). Instead she starts to play hide and seek with Jack and Bob and she gives them both a real, physical hug as she finds them.

In Center for Interactive Spaces (www.interactivespaces.net), we currently work on implementations of most of the technologies presented in this scenario.

CONCLUSION

The thesis that domestic computing should be unremarkable is challenged through pointing out several cases and concerns where the ideal breaks down. The message of this

paper is not to suggest, that this ideal is inherently wrong, but to point out that complementary perspectives are needed, if we are to design successful technologies for the home. Remarkable computing is suggested as a relevant complementary perspective.

Finally, a fictive scenario of remarkable computing is presented in order to suggest, that the interesting question concerning how to design technology for the home is not how to design ubiquitous computing for the home. In this way, we may blindly transfer our ideals for technology from the workplace to the home. More importantly we need to identify what kind of homes we wish to shape with future technologies.

ACKNOWLEDGMENTS

Thanks to inspiring colleagues in Center for Interactive Spaces for useful discussions around the ideas expressed in this paper. Thanks to Kaj Grønbæk and Susanne Bødker for constructive comments on earlier versions of this paper.

REFERENCES

1. Baillie, L. and Petersen, M. G. (2001) Emerging Themes in Designing Household Environments. In *Proceedings of the OIKOS2001 Workshop*, Aarhus University Press, pp. 44-46.
2. Bødker, S. (1991). *Through the Interface* – a Human Activity Approach to User Interface Design. Hillsdale, NJ: Lawrence Erlbaum Associates, 1991.
3. Carroll, J. M. & Mack, R. L. (1999) Metaphor, computing systems and active learning. In *International Journal of Human-Computer Studies* **51**, pp. 385-403.
4. Crabtree, A., Hemmings, T. and Rodden, T. (2002) "Coordinate displays in the home", CSCW Workshop on Public, Community and Situated Displays, Proceedings of the 2002 ACM Conference on Computer Supported Cooperative Work, New Orleans: ACM Press.
5. Djajadiningrat, J. P., Overbeeke, C. J., and Wensveen, S. A. G. (2000) Augmenting Fun and Beauty: A Pamphlet. In *Proceedings of DARE'2000.* ACM Press, pp. 131-134.
6. Edwards, W. K., and Grinter, R. E. (2001) At Home with Ubiquitous Computing: Seven Challenges. In Abowd, G., Brumitt, B., and Shafer, S. A. N. (Eds.) Ubicomp 2001, LNCS 2201, Springer-Verlag, Berlin, pp. 256-272.
7. Fogarty, J, Forlizzi, J., and Hudson, S. E. (2001) Aesthetic Information Collages: Generating Decorative Displays that Contain Information. In *Proceedings of UIST'01*. ACM Press, pp. 141-150.
8. Hallnäs, L., and Redström, J. (2002) From Use to Presence: On the Expressions and Aesthetics of Everyday Computational Things. In *ACM Transactions on Computer-Human Interaction*, Vol 9, No. 2, June 2002, pp. 106-124.
9. Heath, C., and Luff, P (1992) Collaboration and Control. In Computer Supported Cooperative Work (CSCW)1: pp. 69-94
10. Holmquist, L. E., and Skog, T. (2003) Informative Art: Information Visualization in Everyday Environments. In *Proceedings of the first international conference in computer graphics and interaction techniques in Australia and Southeast Asia*.
11. Millar, T., Stasko, J. (2001) The InfoCanvas: Information Conveyance through Personalized, Expressive Art. In *Proceedings of CHI 2001*, ACM Press, pp. 305-306.
12. ISO 9241-11 (1998) Ergonomic requirements for office work with visual display terminals (VDTs). Part 11: Guidance on usability. www.iso-standards-international.com/iso-9241-kit9.htm.
13. O'Brien, J., Rodden, T., Rouncefield, M., and Hughes, J. (1999) At Home with the Technology: An Ethnographic Study of a Set-Top-Box Trial. In *ACM Transactions on Computer-Human Interaction*, Vol. 6, No. 3, pp. 282-308.
14. Pallasmaa, J. (1994) Identity, Intimacy and Domicile. Notes on the phenomenology of home. In Finnish Architectural Review 1 / 1994. http://www2.uiah.fi/esittely/historia/e_ident.htm
15. Petersen, M. G., Madsen, K. H. and Kjær, A. (2002) Usability of Everyday Technology – Emerging and Fading opportunities. In *ACM Transactions on Computer-Human Interaction*, Vol. 9, No. 2, June 2002, pp. 74-105.
16. Petersen, M. G., and Grønbæk, K. (in preparation) Domestic Hypermedia.
17. Petersen, M. G., Iversen, O. S., Krogh, P. G., and Ludvigsen, M. (Submitted for publication) Aesthetic Interaction - a pragmatist aesthetics of interactive systems
18. Philips research on Ambient Intelligence http://www.research.philips.com/InformationCenter/Global/FArticleSummary.asp?lNodeId=712
19. Pine, B. J. and Gilmor, J. H. (1999) The Experience Economy. Work is Theatre and Every Business a Stage. Harvard Business School Press. Boston Massachusets.
20. Premkumar, G. P. (2003) Alternate distribution strategies for digital music. In *Communications of the ACM*, September, Volume 46, Issue 9.
21. Silverstone, R., Hisch, E. & Morley, D. (1992) Information and communication technologies and the moral economy of the household. In *Consuming Technologies. Media and Information in Domestic Spaces.* Routledge. London and New York. pp. 15-31.
22. Tolmie, P., Pycock, Diggins, T., MacLean, A., and Karsenty, A. (2001) Unremarkable Computing. In *Proceedings of CHI2002*, ACM Press, pp. 399-406.
23. M. Weiser, M. (1991) The Computer for the 21st Century, Scientific Am., Sept., 1991, pp. 94-104; reprinted in IEEE Pervasive Computing, Jan.-Mar. 2002, pp. 19-25.