

“Development of methods to design private spaces of ubiquitous computing”

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Abstract

Because of new possibilities collecting and analyzing data, the design of complex computer systems is a challenging problem for every developer nowadays. While we are already surrounded by a lot of computers in our daily life, the future will embed us into a fully computerized environments. The question in this thesis will be, in which way the human being has to be handled in such a high technological environment.

The space of ubiquitous computing points to some basic problems: the conflict between informational and physical self-determination of the human being and the technical environment. So in this thesis the aspects of humanity, individual and social needs has to be analyzed and explained. To understand the first two terms, I examine a personal skill: the creativity and try to explain it with the liberal demands of 'will', 'act' and 'autonomy'. To understand the third term, the social needs of a human, I analyze in which way each of us acts in society, how society is connected, which networks are existing, and which roles the human being plays in different societies. With the collected knowledge I relate the human to its technical visionary environment. The result, a list of recommendations for a "good" design of rooms with embedded computer systems, wants a better control of the informational and physical self-determination as well as higher privacy standards. The list will be discussed with two experts in the field of technological impact assessment and technological research. The discussions clearly focus on different definitions of 'reality': the one defined by the human, the other by a technical system. The discussions question the list of recommendations critically and give new perspectives on how the human being has to be seen in the context of a ubiquitous, selective and context-sensitive environments. Finally the results are summarized.

Tags: ubiquitous computing, human centered development, informational and physical self-determination, creativity, freedom, will, autonomy, social systems, society

Introduction

As **Mark Weiser**¹, founder of the term ubiquitous computing, first spoke about his idea of a technical context-sensitive environment, he had also the idea of a human centered development of such environments. In the future, he wrote, the human being should use the computer without thinking and without noticing, using it as a “helping hand”, rather than thinking of hardware or software problems. The person has the possibility to act free and can focus on his tasks he has to solve, while the computer and the systems will disappear more and more until they are fully embedded into our life environment. To ‘solve tasks’ means to work and concentrate on specific problems, while ubiquitous computing will help us handling all surrounding tasks.

But today's visions of ubiquitous computing pointing into a complete other direction, as the industry sees its high potential. Under the name of ‘Pervasive Computing’, new commercial projects try to embed the person into a whole predefined process, in which the person himself has just a bit of freedom left. In its, so called, ‘Future Store’, the retail chain ‘METRO’ sees their customers steering the trolley guided by a digital personal assistant.² This little laptop sized display guides the customer to the right racks, depending on the digital personal shopping list, and offering new products on the way. To purchase we just have to cross a gate at the exit, which automatically charges our credit card.

The idea of a supporting technical environment, where the user can act free and autonomously, supported by the computers, completely disappeared. The vision shows us a computerized environment, where the user publicly gives his rights of self-determination and privacy away to get a convenient lean-back situation. The danger of a potential manipulation of the human being, makes a discussion between these two visions unavoidable.

Because of that danger, I see the need to analyze the human and his potential technical environment, to discuss his situation and to assess the environment.

If you ask yourself, how and in which way a technical world has to be developed to fulfill the human rights, you will find the answer in many disciplines through the third-level institutions. Especially the psychology, philosophy, the social sciences, the political sciences, sciences of law, and of course the computer sciences are highly involved in this whole world covered discussion.

As it is impossible to bring every discipline into this thesis, even they have the right to be recognized, I will concentrate on core aspects of a human centered view, which will hopefully give me the conclusion in which way a ubiquitous computing has to be developed. With this paper, I want to create a basic platform for discussions concerning a human centered development of ubiquitous computing spaces.

It is not my goal to find ‘Golden Rules’ or ‘Best Practice Methods’ to get to such a development philosophy, as with an incomplete set of disciplines I can look at, it would be just an incomplete assessment and list of rules. For the disciplines I choose,

¹ Weiser, Mark, “The computer of the 21st century” : 1991

² The daily newspaper “Die ZEIT” - Article “Das Philadelphia-Experiment” : 05.062003

the disciplines I find important, my goal is it to examine them as good as possible to get a satisfied conclusion.

If we follow the human-centered thesis of **Weiser**, we see that he wanted to bring the *work* back to the front, while the computer should disappear in the back. In the way *work* is defined in his papers, it is close to the idea of creativity, that wants to focus on creation and creative action when it speaks of working.³ At the same time creativity is a self-admission for every human being and an expression of his freedom to do and to act, how he needs to. So creativity seems to be a good aspect to examine a *human-centered* development, if we examine its character and requirements. But because of the fact that every person acts in a social way--interacting with other persons and groups--as well as an individual character, I need to examine creativity also in relation to these aspects.

For that reason I force a composition of the idea of **Mark Weiser's** *Ubiquitous Computing* and the will of every person to be creative, to define a human-centered way of a technical environment, using creativity as an indicator.

First I will describe ubiquitous computing and its technical parts to understand what possibilities and dangers the technology offers us. I choose a general access to the topic as the different streams of high-technological environments will be seen more clearly.(chapter 1) After that I define creativity in the way it is important for the thesis.(chapter 2) The technological knowledge and the definition of creativity will show, that the terms 'freedom', 'will' and 'autonomy', how they are seen in philosophy, are important to know as well, to link the three elements together. (chapter 3) But when we look at a more individual view on the human being, we should not forget that he acts in a social environment every day including family, friends and work life.(chapter 4) The knowledge of every four chapters will be linked with each other: First to enhance the term of creativity and than to relate it to the vision of *Ubiquitous Computing*. Through this step it will be possible to write a first recommendation for developing ubiquitous computing spaces.(chapter 5) To question this list of recommendations I do two interviews with experts in the field of technological impact assessment and technological development. In this interviews more problems with context-sensitive environments are described.(chapter 6) The thesis ends with a final conclusion and an assessment for future research.(chapter7)

³ see chapter 3