IRIE
International Review of Information Ethics
ISSN 1614-1687

Vol. 8 (12/2007)

Ethical Challenges of Ubiquitous Computing

edited by David Phillips and Klaus Wiegerling

Editors of this issue:

Prof. David Phillips PhD, University of Toronto, Canada
E-Mail: davidj.phillips@utoronto.ca

PD Dr. Klaus Wiegerling, University of Stuttgart, Germany
E-Mail: Wiegerlingklaus@aol.com

Editors of IRIE

Editorial Office

ISSN 1614-1687

Vol. 8 (12/2007)

Content

ISSN 1614-1687

Editorial: On IRIE Vol. 8

IRIE definitely does not follow the traditional model of a journal. In contrary, it is available online (only) - for free for everybody anywhere in the world who has access to the Internet. You may read these lines on your desktop or your laptop at home, at work or while travelling whenever you like. And, you may perceive all this as quite modern (or at least quite convenient due to the modern technologies involved). Nonetheless, this issue No. 8 will inform you that all this is water under the bridge as the post-desktop era of human-computer-interaction has arrived.

As opposed to the desktop paradigm, in which users directly and consciously engage a single device for a specialized purpose, ubiquitous computing (UbiComp) envisions the engagement of many computational devices and systems simultaneously, in the course of ordinary activities, with users who may not necessarily even be aware of such an engagement.

What would be e.g. the implication for a (modern) journal such as IRIE? Will UbiComp fundamentally change the very nature of the journal itself? Will it then become pervasive, ambient, sentient, context sensitive or any of the other concepts connected with UbiComp and what would that look like? In the end, we will have to see. However, for now scientific journals are not yet in the focus of the use cases envisioned by UbiComp think tanks at present or even in the near future. These are more in line with the extension of computing power into everyday scenarios ('things that think'). That is exactly where UbiComp receives its ethical explosiveness.

In that case, we have to rethink not only many ethical concepts, but also some very basic philosophical notions like reality and subjectivity. If the traditional reality of things develops into a computed ambience and if decisions taken in a certain situation are more and more dependent of artificial agents we may not even be aware of, then this will fundamentally change our basic understanding, not only of moral responsibility, but also of persons acting in the world itself.

The authors of this issue nonetheless discuss these problems the traditional way: within very interesting articles - ranging from visionary to critical; from more descriptive to more normative.

The guest editors of this issue, David Phillips, Toronto, and Klaus Wiegerling, Stuttgart, have done a wonderful job in setting the agenda with their elaborate call for papers, selecting the articles and organizing their review.

We are very happy with the outcome and hope you once again will appreciate this issue of IRIE as a valuable input for your academic and professional work.

Yours sincerely,

the Editors

ISSN 1614-1687

David Phillips and Klaus Wiegerling:

Introduction to IRIE Vol. 8

Abstract:

Ubiquitous Computing, an idea introduced by Mark Weiser[1], and often bracketed with slight modifications under the concepts of Pervasive Computing or Ambient Intelligence, imagines in the extreme case the entire mesosphere saturated by information and communication technologies (ICT). All of the essays of this issue probe the practices, ideologies, and power relations of UbiComp development. They note both the successes and the failures of a variety of ethical and theoretical approaches to UbiComp and they offer alternative approaches. Thus they provide a much-needed intervention into the creation of new forms of subjectivity, awareness, and power.

Authors:

Prof. David J. Phillips, Ph.D.

- University of Toronto, Canada
- E-Mail: davidj.phillips@utoronto.ca

PD Dr. Klaus Wiegerling

- University of Stuttgart, Germany
  E-Mail: Wiegerlingklaus@aol.com

[1] Weiser, Mark (1991): The Computer of the 21st Century. Scientific American 265 (3) 1991

ISSN 1614-1687

Ubiquitous Computing (UbiComp), an idea introduced by Mark Weiser[1], and often bracketed with slight modifications under the concepts of Pervasive Computing or Ambient Intelligence, imagines in the extreme case the entire mesosphere saturated by information and communication technologies (ICT). In this fantasy, ICT will accompany all aspects of our life. Our everyday world will be made intelligent, and all our actions, at all times and everywhere, will engage some kind of ICT support. We will be appropriately guided, monitored, and provided with our needs and desires. In a sense, UbiComp, as the total connection of all material and not-material entities, becomes a theological-philosophical term -- a term for god, omniscient and omnipresent.

More prosaically, Ubiquitous Computing systems generally consist of interlinked capacities for memory and data storage, for perception and environmental sensing, and for the interpretation of contexts and situations. These activities might be carried out using various kinds of technology. And indeed, a whole host of technical research fields are working toward this goal, from mechatronics to materials science, from network engineering to computing and AI research. Of course, ubiquity or omnipresence will never be total. For technical, economic, and other reasons, there will only be pockets where Ubiquitous Computing systems come into effect.

Present research scenarios often focus on military sites of activity, as well as on workplaces such as factories, offices, and hospitals. Nevertheless, this research entails applications that will have more or less impact on every domain of life. We must now, in the relatively early stage of UbiComp development, take into account its potential, without knowing how far this potential can be realised in detail, and without knowing the fields in which pervasive ICT will find acceptance. Any research program that may so radically infiltrate our daily life requires some kind of ethical framework, to complement and counterbalance the economic and militaristic motivations supporting the research, and to provide direction with respect both to traditional values and to our hopes for the future. The eight essays in this special issue begin to construct that framework.

Two related themes resonate through this collection. The first is the problem of the invisibility of ubiquitous systems. UbiComp media intentionally and by design disappear into and become one with the contexts that they mediate. In certain sense we may say that UbiComp, by disappearing, diminishes the confrontational character of reality.

The second, related, theme is agency. The more invisible, pervasive, and transparent these systems become, the more they disappear and are taken for granted, the harder they will be to consciously confront, oppose, or engage. Moreover, UbiComp will necessarily perceive and act upon subjects and situations as ideal types, or stereotypes. Situations may be reduced to typical moments. Ambivalence and ambiguity may be lost. If the mechanisms by which these systems produce and ascribe identities, situations, and contexts are unavailable for engagement by the subjects of the system, then those subjects may lose the skills and resources necessary to negotiate the construction of these identities, situations, and contexts. It may simply become necessary to accept the system's reification of the typical.

Two of the essays critique the model of the human subject common in some current UbiComp research. Soraker and Brey critique the behaviorist presumptions underlying UbiComp design paradigms. Curry argues that UbiComp models have not yet grasped the fact that reference – the pointing to of existing entities – is always a social achievement.

Other essays probe the construction of UbiComp's "seamlessness" (Ratto) and call for the integration of discursive openness. Several suggest that UbiComp media leave readable "clues" to its activities. Hubig suggests that the media incorporate levels of parallel communication; Swift calls for a discursive code structure for negotiation; Hofkirchner et al describe a two-stage model for persuasive actions by UbiComp systems, allowing the subject to explicitly agree to the goals and ends of the system's knowing actions.

But too much discursive openness defeats the purpose of UbiComp. At some point, to be effective, the subject must trust the system. Heesen and Siemonet describe how engagement and openness at a political level, especially about issues of privacy and autonomy, facilitate the trust necessary for comfortably seamless UbiComp. Hubig, too, discusses this kind of "meta-mediation" – communication among developers and users of the media, between users and the media system, and collectively within society at large about the media.

Finally, the essays point to avenues for new consideration of the ethical implications. Brown and Adams

[1] Weiser, Mark (1991): The Computer of the 21st Century. Scientific American 265 (3) 1991

advocate incorporating and integrating the practical ethics of the site of UbiComp. Ratto offers infrastructure studies as a resource for the critique of and response to seamless, practically invisible, and pervasive information systems.

All of these essays probe the practices, ideologies, and power relations of UbiComp development. They note both the successes and the failures of a variety of ethical and theoretical approaches to UbiComp and they offer alternative approaches. Thus they provide a much-needed intervention into the creation of new forms of subjectivity, awareness, and power.

Johnny Hartz Søraker and Philip Brey:

Ambient Intelligence and Problems with Inferring Desires from Behaviour

Abstract:

In this paper we will argue that many of the ethical problems raised by Ambient Intelligence stems from presupposing a behaviourist conception of the relation between human desires and behaviour. Insofar as Ambient Intelligence systems take overt, natural behaviour as input, they are likely to suffer from many of the same problems that have fuelled the widespread criticism of behaviourist explanations of human behaviour. If these limitations of the technology are not sufficiently recognized, the technology is likely to be insufficiently successful in supporting the needs and desires of human users. We will focus on four distinct challenges that result from this behaviourist presupposition, all of which ought to be taken into consideration at the design stage: reciprocal adaptation, bias towards isolated use, culture-specific behaviour, and inability to manually configure the system. By considering these issues, our purpose is to raise awareness of the ethical problems that can arise because of intelligent user interfaces that rely on natural, overt behaviour.

Agenda

Authors:

Johnny Hartz Søraker, Ph.D. Research Fellow:

Organization and contact address: Department of Philosophy, Faculty of Behavioural Sciences, University of Twente, Netherlands

Telephone, email and personal homepage: ☎ +31-53-489-4639, ✉ j.h.soraker@utwente.nl, 💻 http://www.utwente.nl/ceptes/research_staff/Soraker/

Prof. Dr. Philip Brey:

Organization and contact address: Department of Philosophy, Faculty of Behavioural Sciences, University of Twente, Netherlands

Telephone, email and personal homepage: ☎ +31-53-489-4426, ✉ p.a.e.brey@utwente.nl, 💻 http://www.gw.utwente.nl/wijsb/medewerkers/brey/

ISSN 1614-1687

Ambient Intelligence is a vision in which computers play an increasingly pervasive yet unobtrusive part of our everyday lives. Whereas some hold that increased ubiquity alone will constitute a revolution in computing, others hold that it is not really a paradigmatic shift from more traditional forms of computing. In the words of pioneer Mark Weiser, "ubiquitous computing will produce nothing fundamentally new, but [make] everything faster and easier to do, with less strain and fewer mental gymnastics" (Weiser 1991:104). Although it is debatable whether ubiquitous computing introduces anything *fundamentally* new, it might come to exacerbate many of the ethical problems that arise as a result of our increasing dependence on computer technology. These problems include oft-debated issues such as invasion of privacy, identity theft, reduced autonomy and values-in-design.[1] Even if ubiquitous computing does not pose any unique problems, this is not a reason to ignore the phenomenon. To paraphrase Friedrich Engel's laws of dialectics, quantitative changes sometimes lead to qualitative changes. Our concern in this paper, however, is to argue that *Ambient Intelligence*, in virtue of adding Intelligent User Interfaces to ubiquitous computing, does introduce novel features that deserve special attention. Specifically, we will argue that AmI presupposes a behaviourist conception of the relation between human desires and behaviour. Insofar as we interact with AmI devices through natural, overt behaviour, we need to pay special attention to what kinds of behaviour these devices require, what kinds of desire-behaviour relations that are presupposed, and to what degree the required behaviour might be reinforced. Thus, rather than framing our discussion in terms of privacy, autonomy, risk or similar notions, we will focus on the functions and capabilities of Intelligent User Interfaces, in particular what kinds of behaviour they require and might come to foster. In doing so, we will propose and consider four distinct issues that signify when designers and engineers ought to pay special attention to the ethical and social impact of the behavioural requirements.

What is Ambient Intelligence?

Ambient Intelligence (AmI) is an approach that combines two major technologies: Ubiquitous Computing and Intelligent User Interfaces (IUI). In Ubiquitous Computing, computers do not appear as distinct objects, but are embedded into everyday working and living environments in an invisible and unobtrusive way. They make information, media and network access constantly and transparently available.[2] To the Ubiquitous Computing approach, AmI adds the technology of Intelligent User Interfaces. These interfaces, which are based on human–computer interaction research, go beyond traditional interfaces like the keyboard, mouse and monitor. They aim to make information technology easier to use by making interactions with it more intuitive, efficient, and secure; by "dissolving design in behaviour" (Greenfield 2006:26). As such, they are designed to allow the computer to know a lot more about users and the user environment than traditional interfaces can. Intelligent User Interfaces have two key features: profiling and context awareness. Profiling is the ability to personalize and automatically adapt to particular user behaviour patterns. Context awareness is the ability to adapt to different situations. Profiling and context awareness depend on sensors to record aspects of the environment and of user behaviour, and intelligent algorithms to make inferences about situations and users. IUIs are capable of creating a perceptive and proactive computer environment, rather than a passive one that relies on active and comprehensive user input.

One of the most interesting and novel aspects of Ambient Intelligence is the way human-computer interaction is redefined. The user interfaces of AmI seek to radically change the way we interact with computer technology – primarily by means of letting the computer infer our desires on the basis of overt and natural behaviour. The traditional way of issuing commands to a computer is by means of specially adapted peripherals such as mouse, keyboard or joystick. These traditional interfaces are limited in the sense that they require what we could refer to as "digital" behaviour – that is, discrete, non-natural actions that can easily be converted to digital input.

[1] See Brey (2006) and Tavani (2007:355-361) for an overview of some of the ethical issues that arise in connection with the Ambient Intelligence paradigm.

[2] Tavani (2007:356) makes a helpful distinction between pervasive *computing* and ubiquitous *communication*, but for the purposes of this paper we have subsumed these under the heading 'ubiquitous computing'.

Consequently, our behaviour in front of the computer is usually different from our behaviour away from the computer, which also means that we can easily distinguish between human-computer interactions and other actions.[3] If we go beyond the traditional human-computer interfaces, there are primarily three different ways in which more natural, less discrete behaviour can be used to control computers. We will refer to these as different behaviour-desire relations – that is, different ways of inferring our desires (what we want the computer to do) on the basis of our behaviour:[4]

Pre-configured behaviour-desire relations: The device can be manufactured in such a way that specific non-peripheral behaviour leads to the desired results. One simple example is the infamous "Clapper" technology, which allows the user to turn the lights on and off by means of clapping in a determinate way.

User-configured behaviour-desire relations: The device can be manufactured in such a way that the users themselves can configure it to respond to specific behaviour. For instance, many mobile phones allow the user to record voice commands that correspond to specific functions.

User-adaptive behaviour-desire relations: More advanced forms of user interfaces, and one of the cornerstones of Ambient Intelligence, is to let the device observe your natural behaviour and infer how your behaviour relates to your desires. For instance, Mark Weiser gives an example of an IUI in your bedroom that interprets restless rolling in the morning as an (imminent) desire for coffee (Weiser 1991:101).

One device can of course employ more than one of these interfaces, but the most interesting and unique challenges, and advantages, of Ambient Intelligence stem from *user-adaptive* systems. Having a computer system adapt to our behaviour means that we do not have to configure it ourselves, which ensures that the technology disappears in the background. In order to become a transparent, unobtrusive technology that will effortlessly blend into our everyday lives, Ambient Intelligence depends on the successful implementation of user-adaptive interfaces. This is also where the unique challenges posed by Ambient Intelligence begin.

Problems with inferring desires from behaviour

Ambient Intelligence differs from traditional IT in the sense that we no longer consider what our desires are and interact with the device (behave) accordingly. Instead, we leave it up to the device itself to infer "what we really want" on the basis of our natural behaviour. In order for AmI to function optimally, it must therefore be possible to reliably infer certain human desires by way of observing behaviour alone. As such, AmI presupposes that behaviourist accounts of human behaviour are valid, at least for the application domain in question. This raises one of the most discussed issues in philosophy of mind and psychology: can desires be reliably inferred on the basis of behaviour alone? The near-consensus in psychology and in philosophy of mind is that this is not the case (see e.g. Fodor 1975; Searle 2001). The common view is that it is not single beliefs or desires that can be correlated with particular behaviours, but only complex webs of mental states. If I *want* coffee, for example, I may *take* the coffee in front of me, but only if I *believe* that the black liquid in the cup is coffee, I do not *believe* that the coffee is poisoned, and I do not *fear* that it is so hot I will burn myself, etcetera. Conversely, my coffee-taking behaviour may be caused by a desire for coffee, but also by a desire for the cup itself, a fear that a nearby child will spill the coffee over itself, or a belief that the cup contains tea, which I happen to desire. In spite of these kinds of problems, fully developed IUIs seem to presuppose a classical behaviourist account of the behaviour-desire relation in which desires can be reliably inferred from behaviour. This behaviourist underpinning gives rise to four challenges.[5]

[3] To put it bluntly, when away from the computer we do not press our left finger twice when we open a document or tap our fingers on plastic keys when we communicate.

[4] One could add highly advanced brain-computer interfaces to this list, which raises even more profound questions with regard to the relation between our desires and observable brain signals. We are still far away from seeing these kinds of technologies in widespread use, however.

[5] Some of these challenges can be described as constraints on our autonomy. For a discussion in these terms, see Brey (2006).

Reciprocal adaptation

In a perfect world, we could envision intelligent user interfaces that reliably and accurately infer our desires from our behaviour, but this is not the case, neither when humans nor computers try to do so. To use a common example, a desire to escape pain does not necessarily lead to pain-aversive behaviour, and pain-aversive behaviour does not necessarily signify a desire to escape pain. As a result of this basic problem with behaviourism, successful interaction between humans and user-adaptive systems requires some adaptation on the human's part as well; we need to act in such a way that our desire becomes evident and predictable. In many ways, making a computer system adapt to your desires is similar to making a *pet* adapt to your desires. In order to properly train and command a pet animal, your behaviour must be discrete, predictable and overt, as opposed to vague, random and subtle. Since the artificial intelligence that underpins these user interfaces is unlikely to exceed the intelligence of most pet animals, we must adapt our behaviour in a similar fashion in our interactions with user-adaptive systems. Consequently, AmI is likely to make us change our natural behaviour to accommodate its limitations.

In this connection, it is also interesting to note that behaviourism is not only a theory of how to *explain* human behaviour. Although behaviourism has been largely discredited as an *explanatory* framework, its continued influence in psychology primarily stems from its ability to prescribe and predict how behaviour can change as a result of conditioning. Through concepts like positive and negative reinforcement, avoidance learning and habituation, behaviourism yields insight into how certain stimuli can lead to dramatic changes in our behaviour. Thus, if a user-adaptive system yields some kind of visual, auditory or tactile stimulus apt for conditioning, our behavioural adaptation to the system could become more entrenched, instinctive and even transferred to situations where we do not interact with the system at all. If behaviourism is correct in assuming that these mechanisms are particularly powerful with children, we should be especially aware of AmI devices that can reinforce behaviour in children.

In other words, not only the computer system will come to adapt its "behaviour" according to ours, it is also likely that we come to change our behaviour in order to effectively make the user-adaptive system comply with our desires. It should be noted that this is a problem with many other technologies as well. For instance, in order to watch TV, the user needs to be located relatively still in front of the television set. As a consequence, TV does not only require immobility but the more it becomes a part of our lives the more it comes to *foster* that behaviour – what is sometimes referred to as the couch potato syndrome. If we add the hypothesis that couch potato behaviour is responsible for an alarming increase in obesity in many countries, then it becomes clear that behaviour fostered by technology can have profound implications. Although these kinds of affordances can be found in many technologies, AmI not only implicitly, but explicitly requires particular forms of behaviour. This is the reason why the behaviourist presuppositions of AmI deserve special attention. With a technology that is both designed to become a part of our everyday life *and* that explicitly requires certain forms of behaviour, we should be particularly aware of what kinds of behaviour such systems require and therefore might come to foster.

Bias towards isolated use

One design problem with AmI devices is that user-adaptation sometimes becomes difficult when multiple users interact with the same device. For instance, when your AmI-enabled TV has perfectly adapted to your desires and can anticipate your preferences after having observed your behaviour for a long time, you run the risk of loosing that adaptation if someone else starts using it. Thus, the optimal adaptation of AmI devices often requires interaction with only one person, which in turn means that each user needs an individually tailored device. If we return to the previous analogy, a television set fosters sitting still in front of it, but it does not discriminate between watching it alone or together with other people. An AmI-enabled TV, on the other hand, might foster sitting still in front of it *alone*.[6] It should be noted that this is not a general feature of all AmI devices. Compromises can often be found when the device manipulates variables that form a continuum, as in temperature regula-

[6] Such individualized profiling also raises many of the same issues that Cass Sunstein has raised with regard to profiling on the Internet. According to Sunstein, social interaction and external deliberation is related to having had mutual experiences that can be the source of discussions in public fora and "around the water cooler". These mutual experiences, Sunstein claims, would be diminished if we all have individually tailored sources of information (Sunstein 2001).

tion, or when one device allows for multiple profiles. However, *if* an AmI device works best when used in isolation, it is likely to foster use in isolation as well. A similar worry is expressed in the recommendations of the Information Society and Technology Advisory Group (ISTAG). ISTAG stress that AmI should facilitate community building and provide "flexible participation in … family/social interactions" (ISTAG 2003:10). For some AmI devices, the behavioural requirements will make it difficult to live up to this standard.

Cultural differences in behaviour

The most advanced AmI research and development centres are spread across the world, and we are likely to see AmI devices from both Western and East Asian countries. In order for AmI to function optimally, it is important that the behavioural input is natural and highly indicative of the underlying desire. However, what is seen as natural behaviour and how certain forms of behaviour relate to underlying desires depends to some degree on our cultural background. Behavioural indicators such as the range and importance of gesticulation, facial expressions and body language can differ radically from one culture to another. Problems regarding culture-specific forms of human-computer interaction is already an important issue in computer ethics (cf. Ess 2002), and these problems are likely to become more pressing as our interactions become more pervasive, ubiquitous and requiring reciprocal adaptation. For instance, some AmI-devices might discriminate against certain culture-specific forms of behaviour. Returning to reciprocal adaptation, globalization researchers have expressed concern over homogenization of cultural expressions as a result of technology being transported from one culture to another. AmI devices that require users to adapt to culture-specific forms of behaviour is one way in which such homogenization might occur.

Inability to configure manually

A common response to many objections raised against AmI is to simply include the possibility to override the user-adaptations and reset or configure the system manually if it misbehaves. This is somewhat question-begging, since the purpose of AmI is to make our interactions transparent and seamless, which is undermined if we constantly have to manually reconfigure the device in question. More to the point, given that many people are unable or unwilling to configure devices such as video recorders or mobile phones, it is a legitimate concern that many will simply go along with whatever behaviour the AmI device requires. If we are dealing with AmI that targets multiple users, the ability to adjust the system individually could also mean that savvy users will have more influence on the system than others. In other words, a digital divide could arise between those who simply adapt to the required behaviour and those who are savvy enough to configure it manually.[7]

Concluding remarks

The purpose of this paper has not been to show that Ambient Intelligence necessarily leads to unwanted behaviour, nor that the fostering of certain kinds of behaviour is necessarily wrong.[8] Rather, the purpose has been to show that insofar as an AmI device infers our desires based on natural, overt behaviour, designers and engineers need to pay special attention to what kinds of behaviour it requires – and to what extent it can reinforce this behaviour. This is especially the case if it 1) requires reciprocal adaptation, 2) has a bias towards isolated use, 3) requires culture-specific behaviour, or 4) cannot easily be configured or reset manually. These considerations become especially important when dealing with AmI devices targeted at children, given that they are more susceptible to reinforcement. If these and similar considerations are taken seriously at the design stage, we could avoid many of the societal and ethical implications that can arise from Ambient Intelligence.

References

Brey, Philip (2006). Freedom and Privacy in Ambient Intelligence, Ethics and Information Technology 7(3), 157-166

[7] A related concern, especially with AmI systems used for public services, is that there could be no easy way of opting out of the required behaviour either – at least not by other means than giving up the service entirely (cf. Greenfield 2006:246-247).

[8] An argument could be made to the effect that the explicit and pervasive behavioural requirements of AmI could be seen as wrong in-principle, in virtue of reducing our autonomy and/or constituting a questionable way of forcing the designers' values upon the end-user.

Ess, Charles (2002). Cultures in Collision: Philosophical Lessons from Computer-Mediated Communication, Metaphilosophy 33 (1&2), 229–253

Fodor, Jerry (1975). The Language of Thought. Cambridge, MA, Harvard University Press

Greenfield, Adam (2006). Everyware: The dawning age of ubiquitous computing. Berkeley, CA, New Riders Press

ISTAG (2003). Ambient Intelligence: from vision to reality (Working Group Report, September 2003). Retrieved Nov 1, 2007, from http://cordis.europa.eu/ist/istag-reports.htm

Searle, John (2001). Rationality in Action, Cambridge, MA, MIT Press

Sunstein, Cass (2001). Republic.com, Princeton, NJ, Princeton University Press

Tavani, Herman (2007). Ethics & Technology: Ethical Issues in an Age of Information and Communication Technology. Hoboken, NJ, John Wiley & Sons

Weiser, Mark (1991). The Computer for the 21st Century. Scientific American 265(3):94-104

Michael R. Curry:

Being there then: Ubiquitous computing and the anxiety of reference

Abstract:

It is common today to see the world as increasingly unpredictable, and to see that unpredictability as a major source of anxiety. Many of the proposed cures for that anxiety, such as systems like Memex and MyLifeBits, have sought solutions in systems that collect and store a thorough record of events, at a scale from the personal to the global. There the solution to anxiety lies in the ability to play back the record, to turn back the clock and be there then. Both this anxiety and its solution are best seen not simply as remedies for an immediate problem—of terrorism, for example—but rather as evidence of a more deep-seated set of cultural changes, which emerged early in the twentieth century. Paradoxically, the technological solutions offered, whatever the scale, embody the very thing, a lack of a connection to a community, that is both the source of the anxiety and a fundamental impediment to its elimination.

Agenda

Author:

Prof. Michael R. Curry

Department of Geography, University of California, Los Angeles, California

☎ +1-310-825-3122, ✉ curry@geog.ucla.edu, 💻 : http://baja.sscnet.ucla.edu/~curry/

ISSN 1614-1687

Today there exists a particular anxiety, one that emerges from a desire to feel secure in a world in which the disease seems to be a lack of certain knowledge. How can we know whether this person is really a terrorist, or is really not a pedophile? One proposed cure has envisioned certainty as achieved through the creation of a fully digitized account of the world, or at least of some part of it. We see this today in David Gelernter's Mirror World and in Gordon Bell's more recent and rather stranger MyLifeBits, but we also see it, earlier, in Vannevar Bush's Memex and in Ted Nelson's Project Xanadu. We see these cures, that is to say, in systems for ubiquitous computing.

As pervasive as it is today, this anxiety did not exist in the same way through much of the nineteenth century. Indeed, there is little doubt that the most recent solutions would through much of the nineteenth century have been seen by many as merely new and cumbersome solutions to a problem that had long been solved, and solved more elegantly. Rather, the rethinking of the anxiety of uncertainty, in a form that has seemed to make ubiquitous computing a solution, arose only during the late nineteenth century's transformation into a mobile and networked world of strangers.

But this is not to say that in its framing of and solution to the problem of uncertainty, ubiquitous computing did not have antecedents. We find them in the philosophy of language, in concerns about linguistic reference that extend back as far as Frege (1952 [1922]); and we find them in the late nineteenth century's orgy of inventions for identification and classification of humans (Caplan & Torpey, 2001; Cole, 2001). If those antecedent solutions in one sense bear a striking similarity to those offered by Gelernter and Bell, they at the same time differ in important ways. Indeed, a comparison of the models offered by Gelernter, Bell, and others with those offered within certain post-Fregean works in the philosophy of language will suggest that the former are in a very fundamental sense flawed, that they cannot achieve what they set out to do.

In what follows I shall briefly describe the way in which four systems for ubiquitous computing—Memex, Xanadu, Mirror Worlds, and MyLifeBits—deal with the issue of certainty. I shall pay special attention to the most recent of these, MyLifeBits. I shall then suggest the ways in which recent work in the philosophy of language, and especially that by Saul Kripke, suggests fundamental difficulties with the ways in which in each the issue of certainty is handled.

From Memex to MyLifeBits

Vannevar Bush, director during the Second World War of America's Office of Scientific Research and Development, is today perhaps best known for his development, as early as 1936, of the idea for what he termed the "Memex,"

> *a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory (Bush, 1945).*

Bush's Memex would organize information through a process of association.

> *It affords an immediate step, however, to associative indexing, the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another....*
>
> *Wholly new forms of encyclopedias will appear, ready-made with a mesh of associative trails running through them, ready to be dropped into the Memex and there amplified [Emphasis added] (Bush, 1945).*

A person would input readings, photographs, and notes, and then organize them in the way that seemed best; she could then provide the records and the system of associative trails to another person, for integration into another Memex. There would, ultimately, be what amounted to a network of Memexes, although it would be what used to be called a "sneaker," and not electronic, network.

The way forward from Bush's Memex was not simple and straightforward; indeed, it leads in three rather different directions, to Project Xanadu, to Mirror Worlds, and now to MyLifeBits. What they have in common s that each of these systems saw the Memex as a prototype of a system for information management, one within which and from which one might keep track of a wide range, or perhaps all, of the events in the world. The Memex was, one might wish to say, a prototype of the informational reincarnation of the Panopticon.

By the 1960s Ted Nelson was beginning to attempt to create a digital version of the analog Memex. Nelson has for many years struggled to develop and implement Project Xanadu (www.xanadu.com), a system reminiscent of the World Wide Web—though its initial versions predated the development of the Web—but substantially more ambitious. Like Bush's Memex, the hypertext model laid out by Nelson works fundamentally through a process of association. More complex than the later Web, it imagined a system for knowledge collection, organization, and interchange using bi-directional hyperlinks. The result would be, as Nelson put it, "New Freedoms through Computer Screens" (Nelson, 1974).

It is worth noting here that the model that underlies Project Xanadu is reminiscent of the curiosity cabinet, or Wunder-kammer, a forerunner of the modern museum. The curiosity cabinet, which flourished from the fifteenth to seventeenth centuries, was seen as a representation of the world.

> *Knowledge in a Curiosity Cabinet was not segregated into separate disciplines as it is in modern scholarship. The pursuit of knowledge was a synthesizing activity, based more on qualitative comparison than on quantitative analysis. Aesthetics and science, mathematics and mysticism, ethics and natural history were all interconnected, intertwined into an all-encompassing system of visual correspondence and poetic resonance. Any number of associations between objects could be made in a Curiosity Cabinet, and the objects thus participated in a variety of categories simultaneously ("Microcosms: Cabinets of curiosity", 2001).*

The world is engaged on the premise that it is ordered, and that the order is not yet, but may be, though never fully, known (Findlen, 1994).

As with the Memex and Xanadu, one function of the curiosity cabinet was information retrieval. The pattern of associations that operated to connect items within the curiosity cabinet at the same time had a mnemonic function; once one encountered and contemplated the cabinet it began to operate as a means of information storage, and the associations were means of retrieval of that stored information.

Twenty-five years after Nelson began work on his Project Xanadu, David Gelernter published *Mirror Worlds* (1992). With mirror worlds, he declared, we would "Put the universe in a shoebox." Mirror worlds

> *are software models of some chunk of reality, some piece of the real world going on outside your window.... A Mirror World is some huge institution's moving, true-to-life mirror image trapped inside a computer—here you can see and grasp it whole.... (Gelernter, 1992, 3-17 passim).*

This is a geographical vision.

> *The "geography" perspective is a natural starting point, sometimes.... In a City Mirror World, you see a city map of some kind. Lots of information is superimposed on the map, using words, numbers, colors, dials-the resulting display is dense with data; you are tracking thousands of different values simultaneously (Gelernter, 1992, 16).*

Indeed, though it is rather more complex than that, one can see the mirror world as a richly annotated map of the world, one that in large measure operates via a process of layering of digital and especially statistical information over that map. It is a system that takes seriously the cartographic grid and the notion of a world wherein everything has a location, a world where an absolute system of space provides the framework.

On MyLifeBits: Naming, necessity, and the anxiety of reference

Gordon Bell's MyLifeBits is both a more and a less ambitious story. Bell has described his goal as the creation of a "portable, infallible, artificial memory" (Bell & Gemmell, 2007, p. 58), one that allows him to be "there without really being there, then." For him this has meant digitizing the material elements of his informational life—articles, letters, financial documents, photographs, compact discs, and so on. So it has involved a process of collection. It has in addition involved the process of capture, through a kind of technological exoskeleton in which is embedded a camera that regularly captures images of his environment and an audio recording device that captures what he says and hears. He can record his telephone conversations, and he can trace and record his spatial location.

Moreover, he envisions a system that will include data captured from sensors, such as one's pulse, blood pressure, blood-sugar level, and blood-alcohol content can be continuously monitored. In the end, MyLifeBits is imagined as a full-scale telemetry system, capable of continuously reporting to its user, and to designated others, the state of her mind and body, and her environment. One can roll back the system to an earlier state and be "there, then."

So if Mirror Worlds is an information storage and retrieval system that is meant to represent the world "as it is," MyLifeBits represents the world "as I see it." Both Xanadu and Mirror Worlds imagine a fixed, public, and networked information system into which people connect; in MyLifeBits the system is at least in principle private and personal. Like Xanadu, and Memex, MyLifeBits connects information through trails of associations. Spatially, Mirror Worlds operates upon a cartographic and spatial model; we look at the world as if from above. In contrast, Project Xanadu, and Memex before, appeal to an image very much like the one that was embodied in the curiosity cabinet; it is an image wherein the user is in the world. Indeed, it seems to me that MyLifeBits embodies what can only be described as a complex, hybrid, and perhaps self-contradictory understanding of space. It is an understanding that draws upon elements of the cartographic view of Mirror Worlds, while at the same time appealing to the associations central to Memex and Xanadu.

One common critique of MyLifeBits is that it might better be named "BitsOfMyLife." After all, and like every archive, it involves a tremendous amount of selection and censorship. Not every state of every edited document is saved. Computer keystrokes are not logged. Photographs are taken episodically. And even assuming a system in which audio and video *are* constantly recorded, there remains censorship. Bathroom visits, sex, illness. Some things cannot be recorded because of legal restrictions. And people sleep. Are dreams recorded?

This critique surely points to problems with the system. But it seems clear that there are deeper problems with it, ones connected with its spatial hybridity. We might divide the difficulties with MyLifeBits into two parts, the first of which concerns naming. Here it will be useful to refer back to an argument articulated by Arthur Danto. Danto asks us to imagine someone who

> *knows whatever happens the moment it happens, even in other minds. He is also to have the gift of instantaneous transcription: everything that happens across the whole forward rim of the Past is set down by him, as it happens, the way it happens. The resultant running account I shall term the Ideal Chronicle (Danto, 1985).*

What would be missing from that ideal chronicle—or from MyLifeBits? As Danto points out, statements of the form of "The forty-third President of the United States was born today" would be impossible. And this is a problem, because as we look at the past we make statements like that all the time. We are, that is, constantly rethinking, recategorizing, and renarrativizing the past. We are attributing causal efficacy to events. And this suggests that what we get when we "rewind the tape" in MyLifeBits will seem far more discontinuous with the present than we might think. In an important sense, we will get not information, but mnemonics, bits and pieces that remind us of how we now think of that which we have partly forgotten, partly re-remembered.

Even assuming the possibility of dealing with the problem of naming, there remains a deeper problem with MyLifeBits, one related to the ways in which the systems conceptualize space, time, and experience. Put most simply, the associations that are at the heart of MyLifeBits and of Memex (and indeed, though in a different way, like the generalizations that are at the heart of Mirror Worlds) are unable to capture the experience of necessity and certainty that attends much of everyday life.

Here we will find it useful to think of the last several hundred years as divisible into three rather different periods. This is in fact a wild generalization, but here a useful one. The first period extended from the sixteenth to the eighteenth centuries. I have already suggested that in this era the curiosity cabinet provided at least one model for thinking about and experiencing the world; Foucault famously spoke there about a world organized in terms of similitudes (Foucault, 1973). Not coincidentally, this was also the era in which what for some time was counted as the paradigmatic geographic form, the region, was invented (Kimble, 1951). As I have suggested elsewhere, there is a connection between this formulation of the region and the curiosity cabinet; the regional or chorographic understanding of geography is in effect based on a principle of similitudes (Curry, 2005).

The nineteenth century ushered in a second way of thinking, geographically, about the world. Here Zygmunt Bauman (2004) has described it as the century during which the concept of identity, where a person could be reduced to a type (weaver, shopkeeper, Democrat), became fully developed. This development was accompanied by what Ian Hacking (1982) termed an "avalanche of numbers," and of the formalization of a geometrical model of space on the landscape. If the region retained a kind of currency, it was a region that was beginning to lose its sense of being natural; the region, increasingly, was to be described in terms of statistical models and generalizations useful to the state.

At the same time, the nineteenth century was an era in which, in philosophical work, a way of thinking about language and about meaning and reference, and in a certain way a silence about the individual (or the particular) and about the proper name, began to take on a new form. It was in 1843, in the decade of Hacking's avalanche, that John Stuart Mill published the first of many editions of his System of Logic (1872 [1843]). And 1892 saw the publication by German logician Gottlob Frege of his of seminal "Sense and reference" (1952 [1922]). Both dealt directly with the question of the individual, and their work in a sense defined the landscape of Anglo-American philosophical discourse over much of the twentieth century.

Frege argued that a proper name has a connotation (or as he put it, a sense), and claimed that it is the sense of a proper name that allows us to "fix" its reference. I can pick out Bill Clinton because I know things about him. But he was quick to note that there is a rub: I may be able to pick out an individual or object even in cases where almost everything that I know about it is untrue. If that is true, what is the source of the certainty that I feel when I speak about my friends Samuel or Frances? Here, philosophers were quick to notice that this seemed a wishy-washy account of how reference works.

But as the twentieth century progressed, an alternative began to emerge, and it emerged, in part, as an attempt to remedy the central failing of the earlier alternatives, their inability to make sense of the relationship between identity and classification, and between identification and certainty. An early sense of an alternative began to emerge in the 1930s, in work by Wittgenstein (2001). But it emerged in a stark and now-familiar way in Saul Kripke's 1972 *Naming and Necessity* (Kripke, 1972; quotations below are from the revised reprint, Kripke, 1980). There Kripke offered an alternative analysis of reference, one that suggested that people like Frege and Russell had gotten it all wrong, and one that in the popular press was acclaimed as containing the first new ideas in philosophy since Aristotle (Branch, 1977). Criticizing the view that reference is fixed by appeal to some cluster of descriptions, he dismissed that view as having nothing to do with what really happens. Rather, he suggested,

> *Someone, let's say, a baby, is born; his parents call him by a certain name. They talk about him to their friends. Other people meet him. Through various sorts of talk the name is spread from link to link as if by a chain. A speaker who is on the far end of this chain, who has heard about, say, Richard Feynmann, in the market place or elsewhere, may be referring to Richard Feynmann even though he can't remember from whom he first of Feynmann or from whom he ever heard of Feynmann....*

He doesn't have to know details about Feynmann,

> *But, instead, a chain of communication going back to Feynmann himself has been established, by virtue of his membership in a community which passed the name from link to link, not by a ceremony that he makes in his study (Kripke, 1980, 91).*

My point in mentioning Kripke is not to suggest that he somehow "got right" what others had not. Rather, the point is that he attempted to understand the way in which reference works in the case of actual people, that he concluded that central there was the role of communities of language users, and that he pointed to the need to recognize identification as operating within a context in which the history of the use of a word is right at the heart of its proper use. In using a name we imagine that it ought in principle to be possible to "play the tape backwards," back to the initial baptism of Richard Feynmann, the carbon atom, you, or me. We go back, there, then.

Kripke is responding to what I suggested at the outset to be a particular anxiety, one that did not exist in the same way in the nineteenth century. This turns out to be just the anxiety to which Bell's MyLifeBits responds. It emerges from a desire to feel secure in a mobile and networked world. It is

a world in which the stable region seems to have come unglued, and in which the only possible curiosity cabinet would be a constantly changing kaleidoscope—like, perhaps, the World Wide Web. At the same time, it is a world in which the apparent alternative to the modern Wunder-kammer, to Bush and Nelson, has been the more than a little unnerving Mirror World, a world that seems all too much like a Benthamite Panopticon.

But how might one in the contemporary world retain the sense of certainty of identification that one finds in Kripke, and the hope for an extinction of forgetting that one finds in Bell? If a now-lost, routinized everyday life was the source both of certainty and of memory, does the demise of such a life mean the demise of memory and certainty?

For Bell there remains the hope that technology will come to the rescue. But what is lacking in MyLifeBits is the glue that Kripke believed would tie together the links in the causal chain. For Kripke recognizes that it is not enough for the use of a particular term to be continued through time by a certain person. There is a community that "passe[s] the name from link to link," and this passing is a social action.

Kripke, alas, is not at all clear what he means by "community," but here we can perhaps profit from recent discussions of performativity by Derrida (1977) and Butler (1999; 1997). Both refer to what they term "citationality," to the ways in which individuals use language and engage in actions through a process of appropriation and imitation. And both speak of these uses as "iterative," where the copy is in perhaps subtle ways different from the original.

One can see chains of users and actors as constituting communities just to the extent that individuals can see themselves as agreeing in what they do. So on this view, the solution to the problems of memory and reference lies in citation and iteration. Recall, though, that as Danto suggested memory and reference both undergo changes as the past is recast in terms of the present. Or as Butler and Derrida would put it, what both promises and prevents social change is just the openness and closedness of citationality and iterability; and both follow inexorably from the fact that action and speech are social.

On this view, what either dooms or makes dangerous MyLifeBits is that it is not an intrinsically social system, one whose meaning or truth is guaranteed by what Kripke referred to as the community, and also, perhaps unfortunately, as "the marketplace." If MyLifeBits operates outside of a community it creates merely a solipsistic and increasingly irrelevant set of what are at best mnemonic devices and at worst trivia. On the other hand, if it operates within a marketplace there is perhaps more to worry about, at least to the extent that we are talking about a real marketplace, with its monopolies, oligopolies, corruption, and, increasingly, obsession with image. There, those who have the resources to create and manage their lifebits might very well acquire just the sort of power that Project Xanadu, with its goals of Computer Lib, Dream Machines, and New Freedoms through Computer Screens, hoped to prevent.

References

Bauman, Z. (2004). Identity: Conversations with Benedetto Vecchi. Cambridge: Polity Press.

Bell, G., & Gemmell, J. (2007). A digital life. Scientific American, 58-65.

Branch, T. (1977, August 14). New frontiers in American philosophy. The New York Times Magazine, 12 ff.

Bush, V. (1945). As we may think. The Atlantic Monthly, 101-108.

Butler, J. (1999). Gender trouble: Feminism and the subversion of identity (10th anniversary ed.). New York: Routledge.

Butler, J. P. (1997). Excitable speech: a politics of the performative. New York: Routledge.

Caplan, J., & Torpey, J. (Eds.). (2001). Documenting individual identity: The development of state practices in the modern world. Princeton: Princeton University Press.

Cole, S. A. (2001). Suspect identities : a history of criminal identification and fingerprinting. Cambridge: Harvard University Press.

Curry, M. R. (2005). Toward a geography of a world without maps: Lessons from Ptolemy and postal codes. Annals, Association of American Geographers, 95(3), 680-691.

Danto, A. C. (1985). Narration and knowledge. New York: Columbia University Press.

Derrida, J. (1977). Signature event context. Glyph, 1, 172-197.

Findlen, P. (1994). Possessing nature: Museums, collecting, and scientific culture in early mod-

ern Italy. Berkeley: University of California Press.

Foucault, M. (1973). The order of things: An archaeology of the human sciences. New York: Vintage Books.

Frege, G. (1952 [1922]). On sense and reference (P. Geach & M. Black, Trans.). In Translations from the philosophical writings of Gottlob Frege (pp. 56-78). Oxford: Basil Blackwell.

Gelernter, D. (1992). Mirror worlds: Or the day software puts the universe in a shoebox: How it will happen and what it will mean. New York: Oxford University Press.

Hacking, I. (1982). Biopower and the avalanche of printed numbers. Humanities in Society, 5, 279-295.

Kimble, G. H. T. (1951). The inadequacy of the regional concept. In L. D. Stampp & S. W. Wooldridge (Eds.), London essays in geography (pp. 151-174). London: Longman.

Kripke, S. (1972). Naming and necessity. In D. Davidson & G. Harman (Eds.), Semantics of natural language (pp. 253-355). Dordrecht: Reidel.

Kripke, S. (1980). Naming and necessity. Cambridge: Harvard University Press.

Microcosms: Cabinets of curiosity. (2001). Retrieved 27 May 2007, from `http://microcosms.ihc.ucsb.edu/essays/002.html`

Mill, J. S. (1872 [1843]). A system of logic (8th ed.). London: Longmans Green Reader and Dwyer.

Nelson, T. H. (1974). Computer lib/Dream machines: new freedoms through computer screens--a minority report. Chicago: Available from Hugo's Book Service.

Wittgenstein, L. (2001). Philosophical investigations, the German text with a revised English translation (G. E. M. Anscombe, Trans. Third ed.). Oxford: Blackwell.

Matt Ratto:

Ethics of Seamless infrastructures: Resources and Future Directions

Abstract:

The argument of this paper is that the rhetoric of "seamlessness" and its embodiment within certain information infrastructures may be ethically problematic due to the way it articulates a particular kind of passivity and lack of engagement between people and their actions and between people and their social and material environment. The paper describes "seamlessness" as a socio-technical value, details its use in context, and outlines three areas of scholarship that can provide necessary perspectives and methods for research on "seamlessness" and other tropes of ubiquitous computing.[1]

Agenda

Author:

Dr. Matt Ratto:
HUMlab, Umeå Universitet, 901 87 Umeå, Sweden.
☎ + 46 - 90 – 786 9286, ✉ matt.ratto@gmail.com, 💻 www.criticalmaking.com/mattratto

[1] The author would like to to thank the HUMlab at the University of Umeå and the Kempe Foundations for their support during the writing of this article.

ISSN 1614-1687

As the call for this special issue notes, there is an increasing potential for novel ubiquitous and embedded computational technologies to be invisible and to construct passive subjects. The call also notes that due to the emergent quality of ubiquitous computing, it is difficult to evaluate and discuss its ethical qualities or to begin to hypothesize whether not the above potential will be realized. This being said, more and more aspects of what might eventually be a ubiquitous computing infrastructure are coming online. This means that while we may be unable to fully evaluate the ethics of ubiquitous computing currently, we certainly can debate some of its more important aspects. One of these, the focus of this paper, is the notion of "seamless infrastructure" that currently dominates many discussions about online infrastructures.

While the notion of "seamless infrastructures" may be taken in different ways, the aspect addressed in the paper is the way seamlessness emphasizes the deliberate "making invisible" of the variety of technical systems, artifacts, individuals and organizations that make up an information infrastructure. This work actively disguises the moments of transition and boundary crossing between these various parts in order to present a solid and seemingly coherent interface to users.

There are often good technical and usability reasons for seamlessness and it may be more or less appropriate, depending on the purposes to which the infrastructure is put. However, I want to argue for increased theoretical and design-oriented thinking on this issue, in order to overcome the ethical problematics this paper will detail. Therefore, my goal is to relate existing positions on information infrastructures and extend them in two ways; first, by pointing to the ethics involved in articulating seamlessness as a value; and second, to begin to describe a clearer idea of the kind of agential relationship that seamlessness works to create. This latter extension requires attention to new thinking on notions of interactivity and agency, and I will conclude by pointing to some resources in this area.

Finally, I should note that while the call for this special issue focuses on the role and usefulness of using applied media ethics to critique and examine ubiquitous computing, I rely instead on similar scholarship in science and technology studies and the philosophy of technology. What unites this work to the concerns of media ethics is two similarities; first an emphasis on pragmatic application as well as theoretical exploration (an empirical philosophical approach,) and second, attention to the issues of visibility, transparency, and accessibility to the moments and institutions of production, that engender the possibility of substantive critique and resistance to bias.

Seamlessness

It is important to differentiate "seamlessness" as a design goal from the notion of "end-to-end" that is another descriptive term used in relation to technical infrastructures. (Gillespie, 2006) While the latter aims to link separate systems "end-to-end" in order to create a total infrastructure solution, the former emphasizes the erasure of the marks and boundaries between separate systems thereby creating an infrastructure whose individual parts blend transparently – without seams. The quotes below demonstrate the pervasiveness of this notion.

> *"While self-sufficiency and satisfaction are important to learning and to structuring library services that support learning, the importance of seamlessness is crucial, and possibly the dominant trend for the future of libraries. According to the OCLC report, in today's society: "The traditional separation of academic, leisure and work time is fusing into a seamless world aided and supported by nomadic computing and information appliances that support multiple activities." (Martin, 2004)*

> *"Wouldn't it be nice to have one device - better yet supported by one seamless infrastructure - that could do it all, everywhere, at the fastest speed possible, for a reasonable initial investment and monthly cost, that didn't require a rocket science degree to learn how to use, and that didn't become obsolete in less than a year? Enter a research group at UCSD affiliated with Calit² doing its part to address the "seamless infrastructure" part of this problem. Their project is called "Always Best Connected." (Calit2, 2003)*

These two quotes, one from information service (e.g. librarianship) context, and one from a information development context (e.g. computer science), point to the ubiquity of the rhetoric of seamlessness in current discourse around information infrastructures. While the author of the first quote notes that other aspects of the user experience are important, he describes seamlessness as the crucial need for library systems today. He also references a report by the Online Computer Library Center, a nonprofit organization dedicated to helping libraries provide access to information through the development and

implementation of technology resources. This quote emphasizes that it is not just that information infrastructures should be seamless to the user, but that the world itself is becoming increasingly seamless. This is mirrored in the second quote, this one from a technical group at the California Institute for Telecommunications and Information Technology, (Calit2), a team whose very name focuses on the ways in which information technology can help with the convergence of the world – Always Best Connected.

It would be easy to dismiss these quotations as mere rhetoric in arenas of technical work that have, for many years, focused on issues of information convergence, usability, and the reduction of complexity. Seamlessness seems to fit easily into this context alongside other claims of interface transparency and the "backgrounding" and invisibility of information devices and resources (e.g. Norman, 1998). However, it is important to note that seamlessness is no longer a technical dream, but has begun to move into the network, insubstantiated in many of the infrastructures that are part of a Web 2.0 internet. Probably the clearest example of this (and its greatest success,) is the development by Apple Corporation of the iTunes/iPod media infrastructure.

Services and seamlessness

The most famous example of the success of a "seamless" approach to design is the iPod and iTunes system developed by Apple. In an oft-quoted presentation (since published online) Peter Merholz of Adaptive Path, a US-based product design company, has made the product/system link explicit:

> *"The iPod is a product, but it succeeds only because of how it works within a system…The iTunes software is the key to the success of the system. It allows the iPod to be a successful product, because it offloads the bulk of functionality to the PC, which is better suited to handle it…But it doesn't stop there. Apple truly cinched the deal when it opened the iTunes Music Store. Now you could fill your iPod with all manner of media, listening or watching it wherever you wanted to. The iPod device isn't a product in and of itself so much as it is an interface to this larger system." (Merholz, 2006)*

It is important to note how successful this infrastructure has been. By conjoining purchase, distribution, and consumption of media, Apple has revolutionized access to media and created increasingly high revenue streams for itself. However, it is important to note the other necessary parts of the infrastructure that are often ignored when the iTunes/iPod service design is described. This service is not just made up of media servers, personal computers, and consumer electronics, but also includes the Digital Rights Management (DRM) software and protocols that allow Apple to extend control to the media files themselves, and the legal regimes (such as the Digital Millennium Copyright Act in the United States) that provide the means for Apple to discipline those that break their controls. What makes the infrastructure function is a conflation of social, technical, and legal regimes, that, in addition to the technical objects themselves, work to create and maintain a coherent and seamless experience for users.

Creating such experiences is not entirely new. In his overview of service design, Merholz describes Kodak's development of the box camera in the late 19th century as another example. Instead of the 15-20 steps previously required to take photographs, the box camera, the roll film it was designed to take advantage of, and an increasing network of photographic equipment distributors and developers, simplified the process of taking pictures. Here, the technical knowledge required to print photographs (before requiring technical knowledge, chemical supplies, and one's own darkroom,) was replaced by the seamless integration of film and camera manufacturing, retail, and, eventually, the mail delivery system, making photography available to the masses.

It is certainly obvious, if not from the iTunes/iPod successes, then from the example of Kodak, that the development of infrastructures that connect and blend multiple social and technical systems can be both economically and socially productive. It is equally obvious that while there is value in such infrastructures (for example in providing increased access to information resources and practices,) there are also problematic aspects. In order to call attention to these, I turn now to three areas of research that are useful for carrying out information infrastructure critiques.

Technology and ethics

A standard ethical concern regarding technologies has been the issue of determinism, that technologies and their uses pre-suppose history and social

life by actively working to construct and organize social relationships. This thematic work was most strongly examined in the theories and analyses of bureaucratic technologies in the 1950's and 1960's (e.g. Ellul, 1964), with the most sophisticated versions of this argument found in the work of the Frankfurt School. Marcuse, in particular, addresses how technology in modern culture is constitutive of dominant social relations as well as their reproduction. (Marcuse, 1941; 1964) For Marcuse, technologies are more than merely material devices, instead they create a "mode of organizing and perpetuating (or changing) social relationships" and thus become "an instrument for control and domination."(Marcuse, 1941:414).

Information systems and values

This mode of substantive technological critique has lost favor in recent years, due, in part, to the overwhelming philosophic, historical, and sociological work demonstrating the complex relationships between technology and society. Information systems have been particularly addressed, and work from diverse disciplines and subfields such as Science and Technology Studies, Philosophy of Technology, Computer Supported Collaborative Work, and others have demonstrated the various ways in which individual activity and social organization are co-constructed with scientific choice, technical decisions, and the resultant material information practices.

One thread of this work focuses on how values are embodied through design activity in technical infrastructures and objects. (e.g. MacKenzie and Wajcman 1985; Feenberg, 1991; Latour 1992, Hughes 2004). These authors (among others) also provide an explicit critique of the determinist theories mentioned above, noting in particular, that the instrumental values of functionality, rationality, and hierarchy that were a particular concern of previous scholars, are often choices, rather than naturally-occurring and inherent properties. Equally, many of these scholars note that other types of substantive values may also be embodied in technical systems, including notions of liberty, freedom, autonomy, and trust. Recent work by such scholars as Helen Nissenbaum and Batya Friedman, among others, has emphasized the necessity (and difficulty) in taking values into consideration during the design of technical systems but also in analyzing designs after the fact. (Friedman and Nissenbaum 1996; Friedman and Kahn, 2003; Nissenbaum 1998; 2001; 2004). The growth of this area of research, often called "value-sensitive design"[1] or "values in design"[2], tends to focus on issues of human dignity and welfare, inclusivity, and the furthering of individual agency. This scholarship makes visible the ways in which values are embodied within technical systems and how design-oriented approaches constitute, articulate, and often negotiate these values. Such work reveals the contingency of technical values and the possibility of alternative approaches.

Infrastructure Studies

Another useful perspective comes from the study of infrastructure. A cross-cutting set of scholars from information studies, science and technology studies, communication, and other disciplines has been engaged in studying the effects infrastructures have on both individual and social behavior (e.g. Star and Ruhleder 1994; Bowker, 1994; 1996; 1998, Bowker and Star, 1999; Eschenfelder, 2003; Hanseth and Monteiro, 1997; Slaton and Abbate, 2001). This area of research, recently named as "Information Infrastructure Studies" (Bowker, Baker, Millerand, and Ribes, forthcoming), provides a rich critical perspective on many of the trends that are the focus of this paper. Of particular importance is the rich definition of infrastructure that emerges from this context. This definition emphasizes the complexity of infrastructure, defining it as *pervasive enabling resources* (Bowker, Baker, Miller and Ribes, forthcoming). Infrastructure scholarship also provides insight about the interweaving of technical and social systems – wires, tubes, computers, optical cables but also legal and political regimes, organizations, and individuals – that constitute infrastructure. Infrastructures, based on this definition, consist of the connecting of different systems, in order to articulate a coherent whole. Often mundane, they have the tendency to become backgrounded to other aspects of life and therefore require techniques such as "infrastructural inversion" (Bowker, 1994; Mackenzie, 2005) to make their various parts and functionings visible. This area of research is useful in critiquing the "seamlessness" that is the focus of this paper in at least three important ways; first, by broadening the definition of infrastructure beyond the purely technical; second, by defining the "seams" of infrastructures as the boundaries be-

[1] *http://projects.ischool.washington.edu/vsd/*

[2] *http://www.nyu.edu/projects/valuesindesign/*

tween systems; and third, by articulating a method for revealing infrastructures through analytic work.

"Seamful" design

Finally, an important critique of the notion of "seamlessness" comes from within design and computer science itself. (Chalmers and Galani, 2004) This analysis focuses on how the desire for seamlessness comes about as an attempt to make information tools and resources "…weave themselves into the fabric of everyday life until they are indistinguishable from it" (Wieser, 1991). Relying on the ideas of "ready-to-hand" and "present-at-hand" from Heidegger's hermeneutic approach to tool use, Chalmers and Galani describe how the former consists of a non-rationalizing and pragmatic form of use, while the latter is a reflexive and abstracting process. They note that while having information tools "ready-to-hand" may be a desirable goal, having access to information tools as "present-at-hand" is essential to the adoption and, if necessary, adaptation of them for differing users and contexts. Without this access, the circular process of interpretation seen by Heidegger and later hermeneutic scholars as necessary for human development and self-expression, fails. Chalmers criticizes the notion of "seamlessness" as reducing the ability to reflect and repurpose information infrastructures, and articulates an alternative strategy:

> *"We are particularly interested in seamful systems whose underlying infrastructural mechanisms are "literally visible, effectively invisible", in that everyday interaction does not require attention to these mechanisms' representations—but one can selectively focus on and reveal them when the task is to understand or even change the infrastructure." (Chalmers and Galani, 2004: 253)*

This seems a valid and important critique of seamlessness due to the way it clearly articulates what is at stake. While Chalmers focuses on the pragmatic aspect of this issues (e.g. whether or not "seamless" infrastructures will function appropriately,) it is not difficult to extend this problem to the ethical realm. Chalmers and Galani's analysis provides a way for us to understand how seams may work to provide access to a particular mode of engagement with information technology. For them they function as a means for transitioning between reflexive and unreflexive modes of use.

Ethics of seamlessness

Together, the above perspectives clearly articulate some useful definitions and perspectives with which to critique and understand the ethical issues associated with "seamlessness." As the "values in design" literature demonstrates, values are not necessarily inherent to technologies but are the result of complex negotiations that happen in both design and use. "Seamlessness", understood as a choice, rather than a purely rational value, should be compared to other types of values (such as inclusion and justice) just as previously happened with values of technical rationality and efficiency. Information Infrastructure Studies provides a clear definition of what infrastructures are and how they work, providing some methods for picking apart the seams and understanding the social, legal, and institutional systems by which they are typically constituted. Finally, Chalmers and Galani's focus from within computer infrastructure on "seamful" design, and their use of hermeneutic philosophy gives us some additional tools. However, we still remain divided between seamlessness as positive, in that it may (as in the iTunes/iPod and the Kodak box camera cases) open up information access to non-expert users, and as negative in that it may reduce the resources necessary for objection and critique. For this final issue we need to rethink some of the standard ways of conceptualizing agency and technology.

Agency, infrastructure, and seamlessness

It is perhaps obvious that the previous ways of understanding the structuring effects of technology and the ways in which it reduces agency and constructs subjects are not entirely useful in this context. Equally, the separation of modes of engagement with tools between unreflexive and reflexive modes requires some additional attention. Chalmers (2004) puts forth the idea of purposive "coupling" of media forms in the design of "seamful" ubiquitous computing systems, seeing the support of movement between forms as helping bridge the gap between reflection and use. Equally, Cultural Historical Activity Theory, has a rich literature that addresses a similar hermeutic circle, using the conjoined relations of "objects" (reflexive) and "tools" (unreflexive) and focusing explicitly on the social resources that make such transitions possible. (e.g. Engestrom and Escalante, 1996; Nardi, 1996.) While these perspectives provide some purchase, we still require a better way of understanding the kinds of engagements that seamlessness may work to create. In this, it may be that the binary relations

between "ready-to-hand/tool" and "present-at-hand/object" that are used (however analytically) to examine information infrastructures, limit our ability to analyze and understand. While a deeper analysis of this issue is beyond the goals (and word limit) of this paper, recent work in Game Studies on the concept of interaction and the relations between structure and agency may prove useful (e.g. Aarseth, 1997; Murray, 1997; Wardrip-Fruin and Harrigan, 2004).

Recent scholarship in Feminist Science Studies and Epistemology is also directly applicable to these issues, in particular the work of Thompson on "ontological choreography" (Thompson, 2005) and Barad on "agential realism." (Barad, 1999; 2007). While directed towards ontological and epistemological questions about discourse and realism, such perspectives provide a novel way of understanding how agency is negotiated beyond the binaries articulated above. Thompson (particularly in Ch.6) demonstrates the way the agency of women IVR patients includes the (necessary) ability to transition themselves between an object and a subject position in relation to the medical techniques they were experiencing. Equally, Barad posits the notion of "intra activity" to describe the 'within" rather than the "between" of the constitution of subject/object relations. For her, agency is constituted in negotiations within subjects and objects, rather than something that is exchanged between them.

Such perspectives require much more attention in order to help us differentiate and understand the kinds of agencies constructed by infrastructures. Still, one thing is clear, while most information infrastructures are 'interactive" in the sense that they allow us action, many are not "intra active" in the sense that we are allowed to negotiate when and how we take control. Ultimately, this may be the true ethical issue with seamlessness – by hiding the seams between systems, we are not allowed the ability to decide when and how we engage with them.

Conclusion

One important ethical question that faces ubiquitous computing in general is not just what kinds of subjects do these infrastructures construct and maintain, but also what possibilities are left for individuals and non-normative social groups to resist these enfoldings and characterizations in order to allow for difference? Here it is important to note, as Paul Dourish and Genevieve Bell have recently remarked, that ubiquitous computing, in the ways in which it predicts the future, also has much to say about current normative social relationships. (Bell and Dourish, 2007.) In other words, it is not just individual identities that are constructed within ubiquitous infrastructures but also the ways individuals organize to form social wholes. It is not just that individual identity is "torqued", to borrow a term from Bowker and Star's sophisticated analysis of infrastructure, but that social life itself may be twisted to fit the standards and categories of embedded technical systems.

What might we then say about the problematic of seamlessness? While there may be other strategies, it appears that the seams between systems provide the most opportunity for extending, troubling, and repurposing infrastructures. Without self-knowledge of these seams and if the infrastructures themselves hide these seams from view, we are left with little recourse to the kinds of actions. Behaviors, and identities infrastructures presuppose. Moreover, and more importantly, without knowledge of the boundaries, users may be left with little ability to negotiate the moments of switching between active and passive roles. Yes, seamless infrastructures may remain "interactive" but it is an interactivity on their own terms. By removing our knowledge of the glue that holds the systems that make up the infrastructure together, it becomes much more difficult, if not impossible, to begin to understand how we are constructed as subjects, what types of systems are brought into place (legal, technical, social, etc.) and where the possibilities for transformation exist.

Seamlessness as a value for current and future information infrastructures, including the ubiquitous computing infrastructures that are the focus of this issue, may be ethically problematic for the reasons noted above. This is not to say that resources for critiquing and pragmatically informing alternative values do not exist. Some of the resources have been noted above, in particular the social analysis of information technologies as including embodied values, and the methods for articulating and making infrastructures visible. However, the questions of agency and transparency raised by information infrastructures, seamlessness, ubiquitous computing and similar visions such as pervasive and ambient intelligence, remain a concern. Again, the difficulty here is in linking conceptual work on action and agency to the empirical and material contexts of information infrastructure development.

More optimistically, we might also note that despite the best efforts of many developers, seamless and

ubiquitous computing remain, as Bell and Dourish illustrate, "…characterized by improvisation and appropriation" and by "…flex, slop and play." (Bell and Dourish, 2006: 11). Still, if nothing else, we can critique the clean, orderly, and homogenous future that is at the heart of these modernist visions of ubiquity and use these critiques to better understand the ethical dimensions of our increasingly socio-technical world.

References

Aarseth, E (1997) Cybertext: Perspectives on Ergodic Literature, Johns Hopkins Press.

Barad, K. (1999). Agential realism: Feminist interventions in understanding scientific practices. In The science studies reader, ed. Mario Biagioli. New York: Routledge.

Barad, K. (2007) Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning, Duke University Press.

Bell, G., Dourish, P. (2007) "Yesterday's tomorrows: notes on ubiquitous computing's dominant vision" Pers Ubiquit Comput 11: 133–143.

Bowker, G. (1994) "Information mythology: The world of/as information." In L. Bud Frierman (Ed.), Information acumen: The understanding and use of knowledge in modern Business (pp.231-247).London: Routledge.

Bowker, G. (1996).How things change:The history ofsociotechnical structures.Social Studies of Science 26: 173-182.

Bowker, G. and Star, S.L. (1999), Sorting Things Out: Classification and Its Consequences, MIT Press, Cambridge, MA.

Bowker, G.C., Baker, K.S., Millerand, F. & Ribes, D. (forthcoming). Towards information infrastructure studies: ways of knowing in a networked environment. In J. Hunsinger, M. Allen, L. Klasrup (Eds). International Handbook of Internet Research, (forthcoming) Springer Verlag.

Calit2 (2003) "The ABCs of Connectivity: Always Best Connected," web article online at http://www.calit2.net/newsroom/article.php?id=233; retrieved Nov. 28, 2007.

Chalmers, M. and Galani, A. (2004) Seamful interweaving: heterogeneity in the theory and design of interactive systems. In, Symposium on Designing Interactive Systems, 1-4 August 2004, pages pp. 243-252, Cambridge, Massachusetts.

Ellul, J. (1964) The Technological Society, J. Wilkinson, trans., New York: Vintage, 1964.

Engestrom Y. and Escalante V (1996) Mundane Tool or Object of Affection? The Rise and Fall of the Postal Buddy, in in B. Nardi Ed Context and Consciousness: Activity Theory and Human Computer Interaction. Cambridge, MA.:MIT Press, pp. 325-374.

Eschenfelder, K.R (2003) "The Customer is Always Right, but Whose Customer is More Important? Conflict and Web Site Classification Schemes" Information, Technology and People, 16(4): 419-439.

Feenberg, A. (1991) Critical Theory of Technology, Oxford: Oxford University Press.

Floridi, L. (1999) "Information Ethics: On the Theoretical Foundations of Computer Ethics", Ethics and Information Technology 1.1, 37-56.

Friedman, B. & Nissenbaum, H. (1996). Bias in computer systems. ACM Transactions on Information Systems, 14(3): 330-347.

Friedman, B., & Kahn, P. H., Jr. (2003). Human values, ethics, and design. In J. A. Jacko and A. Sears (Eds.), The human-computer interaction handbook (pp. 1177-1201). Mahwah, NJ: Lawrence Erlbaum Associates.

Gillespie, T (2006) "Engineering a Principle: 'End-to-End' in the Design of the Internet," Social Studies of Science, 36(3): 427-457.

Hanseth, O. and Monteiro, E. (1997), "Inscribing behavior in information infrastructure standards", Accounting, Management and Information Technology, Vol. 7 No. 4, pp. 183-211.

Latour, B. 1992. Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts. In Shaping Technology/ Building Society, edited by W. Bijker and J. Law, 225-258. Cambridge, MA.:MIT Press.

MacKenzie D. and Wajcman. J. (1985) The Social Shaping of Technology, Milton Keynes: Open University Press.

Mackenzie, A. (2005) "Untangling the Unwired: Wi-Fi and the Cultural Inversion of Infrastructure," Space and Culture 8(3): 269-285

Marcuse, H. (1941) "Some Social Implications of Modern Technology" Studies in Philosophy and Social Science 9(3): 414–39.

Marcuse, H. (1964) One-Dimensional Man. Studies in the Ideology of Advanced Industrial Society, Beacon Press.

Martin, R. (2004) "Libraries and librarians in the 21st century: Fostering a learning society," C&RL News, 65(11). Online at http://www.ala.org/ala/acrl/acrlpubs/crlnews/ba

ckissues2004/december04/librariesin21.cfm; retrieved Nov. 28, 2007.

Merholz, P (2006) Stop Designing Products, http://www.adaptivepath.com/blog/2006/09/29/stop-designing-products/, retrieved Nov. 28, 2007.

Murray, J (1997) Hamlet on the Holodeck:The Future of Narrative in Cyberspace, Cambridge, MA.:MIT Press.

Nardi, B (Ed.) (1996) Context and Consciousness: Activity Theory and Human Computer Interaction. Cambridge, MA.:MIT Press.

Nissenbaum, H. (1998). Values in computer system design: Bias and autonomy. In Ethics and information technology (Proceedings of the Conference on Computer Ethics, Linkoping Sweden. June, 1997). Delhi: New Academic Press. 35-42.

Nissenbaum, H. (2001). How Computer Systems Embody Values. IEEE Computer, March 2001.

Nissenbaum, H. (2004) "Information Technology and Ethics", Berkshire Encyclopedia of Human-Computer Interaction, Great Barrington, MA, Berkshire Publishing Group, pp. 235-239.

Norman, D. (1998) The Invisible Computer: Why Good Products Can Fail, the Personal Computer Is So Complex, and Information Appliances Are the Solution, Cambridge, MA.:MIT Press.

Pinch, Trevor and W. Bijker. (1992) "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other." Shaping Technology/Building Society. Ed. W. Bijker and J. Law. Cambridge, MA: MIT Press, pp. 17-50.

Slaton, A. and Abbate, J. (2001), "The hidden lives of standards: technical prescriptions and the transformation of work in America", in Allen, M.T. and Hecht, G. (Eds), Technologies of Power, Cambridge, MA.:MIT Press, pp. 95-144.

Star, S.L. and Ruhleder, K. (1996), "Steps toward an ecology of infrastructure: design and access for large information spaces", Information Systems Research, Vol. 7 No. 1, pp. 111-34.

Suchman, L. (1993), "Do categories have politics? The language/action perspective reconsidered", in De Michelis, G. and Simon, C. (Eds), Proceedings of the Third European Conference on Computer-Supported Cooperative Work (ECSCW '93), Kluwer Academic Publishers, Dordrecht, pp. 1-14.

Thompson, C. (2005) Making Parents: The Ontological Choreography of Reproductive Technologies. MIT Press.

Wardrip-Fruin, N. & Harrigan, P. (Eds.) (2004) First person: new media as story, performance, and game. Cambridge, Ma.: The MIT Press.

Weiser, M. (1991) The Computer for the Twenty-First Century, Scientific American, 94-110, Sept. 1991.

Woolgar, S. (1991), "Configuring the user: the case of usability trials", in Law, J. (Ed.), A Sociology of Monsters: Essays on Power, Technology and Domination, Routledge, London, pp. 58-99.

Christoph Hubig:

Ubiquitous Computing – Eine neue Herausforderung für die Medienethik

Abstract:

Ubiquitous Computing – A New Challenge for Media Ethics

We have to distinguish three types of media ethics: Applied ethics which focusses situations and raises normative questions depending on a particular situation; application-centered ethics, which supports or warns users, and the classical ethics of autonomy which gives new spheres for actions. For ethical challenges of UbiComp the third type is most important. UbiComp reduces the intentions of the user by decontextualizing the context of action. The actor is confronted with an "informed" reality. It is a problem, when there is no explicit delegation of services to the system and the media "clues" are disappearing and we don't see that reality is augmented. It is the first commandment of media ethics to show the clues of media via which it is possible to reconstruct the spheres which give possibilities for action. Concerning UbiComp, media ethics has to demand compensatory institutions like the concept of parallel communication, which allows for negotiating metacommunicatively on the communication processes delegated to smart systems.

Agenda

Author:

Prof. Dr. Christoph Hubig:

Universität Stuttgart, Seidenstraße 36, 70174 Stuttgart, Germany

☎ + 49 – 711 -6858 - 2491, ✉ christoph.hubig@philo.uni-stuttgart.de, 🖳 http://www.uni-stuttgart.de/philo/index.php?id=31

Relevant publications:

Die Kunst des Möglichen I – Technikphilosophie als Reflexion der Medialität. Bielefeld: Transcript Verlag 2006, 300 p.

Die Kunst des Möglichen II – Ethik der Technik als provisorische Moral. Bielefeld: Transcript Verlag 2007, 263 p.

ISSN 1614-1687

Überblickt man die Entwicklung praktischer Ethik in neuerer Zeit, so wird man feststellen, dass entsprechend der Ausdifferenzierung der Hochtechnologien sich auch die „Bindestrich-Ethiken" differenzieren: Die Technik-Ethik, die man im weitesten Sinne auch als Medienethik begreifen kann, weil Technik insgesamt seit Francis Bacon ein Medium unserer theoretischen und praktischen Weltbezüge geworden ist (Hubig 2006), weist inzwischen Ausprägungen auf, z.B. als Nanoethik, Genethik, Ethik der Energiebereitstellung, Verkehrsethik, Umweltethik, „Kybernethik" oder Medienethik im engeren Sinne als Ethik der Informationstechnologien, die neue Möglichkeiten der Gestaltung des Umgangs mit Informationen bereitstellen. Mit Blick auf die IuK-Technologien finden wir Informationsethik, Computerethik, Netzethik, Kommunikationsethik u.v.a. mehr. Da solche Unterscheidungen im Wesentlichen an unterschiedlichen Gegenstandsbereichen orientiert sind, deren Gestaltung und Nutzung unterschiedliche normative Fragen aufweisen, werden die Übergänge fließend: Denn die einschlägigen und prominenten Probleme (z.B. Veränderungen der Arbeitswelt, Globalisierung und Virtualisierung individueller Kommunikation, Umgang mit Simulationen, Informatisierung der Handlungsumgebungen etc.) sind oftmals einem Zugriff geschuldet, der unterschiedliche Technologien gemeinsam in Anschlag bringt als „Converging Technologies", was seinerseits dadurch ermöglicht wird, dass diese Technologien zunehmend als Ermöglichungstechnologien unspezifisch werden bezüglich einer konkreten Zweckbindung oder einer Bindung an spezifische Problemlagen. Wäre mit Blick auf eine bestimmte Problemlage, z.B. das Gesundheitswesen und neue Therapieformen, eigens festzulegen, welche Argumentationslinien aus der Bioethik, der Genethik, der Nanoethik, der Wirtschafts- und Unternehmensethik (bezüglich der Rationalisierungsprobleme und der Rationierungsprobleme) sowie der Informationsethik und Kommunikationsethik (Schutz, Überwachung, Aufklärung, risikoadäquate Belastung der Prämienzahler etc.) in Betracht zu ziehen sind? Solche Fragen betreffen auch die Medienethik im engeren Sinne, wenn es um die neuen Systeme des Ubiquitous Computing geht, welches seinerseits je nach Akzentuierung der Entwicklungslinien Elemente des Mobile Computing oder Ambient Computing, des Pervasive Computing oder des Context aware Computing aufnimmt, umfasst oder unter diesen Titeln behandelt. Angesichts dieser verwirrenden Problemlage scheint mir zunächst eine kurze grundsätzliche Klärung des Anliegens praktischer Ethik angebracht.

Angewandte Ethik, anwendungsbezogene Ethik und Ethik der Systemgestaltung

Worin liegt die Spezifik praktischer Ethik, wie sie sich in den „Bindestrich-Ethiken" manifestiert? Ich schlage vor, drei Typen der Spezifizierung zu unterscheiden – hier für eine Medienethik i.e.S. –, die gemeinsam, aber in jeweils unterschiedlicher Weise, normative Probleme der Gestaltung und Nutzung von Elementen eines bestimmten Gegenstandsbereichs - hier: des Ubiquitous Computing - in einschlägigen Handlungsvollzügen betreffen.

Der erste Typ praktischer Ethik wäre eine Angewandte Ethik. Ob ich unter Nutzung eines Informations- und Kommunikationsmediums lügen darf (mit allen Konnotationen: täuschen, etwas vorgaukeln, etwas beschönigen, etwas stark vereinfachen, etwas unvollständig berichten, etwas unbegründet in Aussicht stellen, etwas verzerren, um Aufmerksamkeit zu erregen etc.) – in welcher Weise ist dies überhaupt eine spezifisch medienethische Frage? Hier kommt zum einen das in allen allgemeinen Ethiken, so unterschiedlich ihre Rechtfertigungsstrategie sein mag, prinzipielle Verbot des Lügens und der Täuschung zum Tragen. Allerdings wird auch in hoher Übereinstimmung konzidiert, dass „Ausnahmen die Regel bestätigen", also in bestimmten Situationen Lügen zulässig sei, z.B. wenn es in einem unabdingbaren Interesse des Kommunikationspartners steht (etwa der Erzielung eines physischen oder psychischen Placebo-Effekts, seiner Sicherheit, des Erhalt seiner Lebenskraft und Motivation etc.) oder das Leben oder ein Minimum an Wohlfahrt eines Dritten gewährleistet, in diesem Sinne sogar kantisch wenn nicht als moralische, so doch als pragmatische „uneigentliche" Pflicht erachtet werden kann. Der Umgang mit solchen Ausnahmen ist äußerst heikel; er macht das eigentliche Problem der Anwendung allgemeiner ethischer Direktiven aus. Er setzt ein umfassendes Wissen über mögliche Konsequenzen der Entscheidung sowie im Idealfall eine vollständige Erfassung der Problemlage voraus, auf deren Basis dann zu entscheiden ist, wie die „Anwendung" allgemeiner ethischer Prinzipien qua Subsumtion des Einzelfalls in ihren Definitionsbereich von statten zu gehen hat, ohne den Sinn dieser Prinzipien zu unterlaufen oder zu verzerren und ohne durch strikte „formale" Befolgung eines Prinzips möglicherweise andere gegebenenfalls höher stehende Prinzipien zu verletzen; es wird ein Bezug analog dem „qualitativen Rechtsgehorsam" hergestellt. Die Spezifik einer solchen praktischen Ethik besteht in der von der Urteilskraft vollzogenen Bezugnahme allgemeiner

ethischer Prinzipien auf Situationen. Das Surplus gegenüber einer allgemeinen Ethik ist dabei selbst kein *ethisches* Surplus, sondern eine gut begründete Beurteilung der Situation. Streng genommen wirft also die Frage, ob ich unter Nutzung eines Informationsmediums täuschen darf, kein spezifisch medienethisches Problem auf, sondern ein Beurteilungsproblem bezüglich der Situation. Dennoch sei weiter hier von einem ersten Typ spezifischer Medienethik die Rede. Es wird sich nämlich zeigen, dass gerade für das Ubiquitous Computing die Beurteilung und Modellierung von Situationen normative Fragen aufwirft.

Ein zweiter Typ der Spezifik einer Medienethik kann dahin gehend spezifiziert werden, dass eine solche Ethik als „Anwendungs*bezogene*" Ethik modelliert wird. Allgemeine Ethik wird hier nicht strikt angewandt, sondern es wird ein Bezug hergestellt zu möglichen (und für nicht-möglich erachteten) Anwendungen, über die die Gestalter und Nutzer der medialen Systeme disponieren. Eine solche Ethik erfasst mögliche Optionen der Gestaltung und Nutzung mit Blick auf mögliche Ziele und mögliche Mittel zu ihrer Verwirklichung. Sie entfaltet ein Tableau, vergleichbar mit einer Landkarte, auf deren Basis die Gestalter und Nutzer ihren Standort, mögliche Ziele und mögliche Wege zu deren Realisierung im Zuge von Mittel-Zweck-Verknüpfungen identifizieren können, wobei unterschiedliche normative Hypotheken des Gelingens der Zielrealisierung vorgestellt werden. Eine solche Spezifizierung der Ethik ist nicht rein analytisch-deskriptiv, denn sie fasst das Gelingen nicht bloß instrumentell-technisch auf, sondern diskutiert es im Lichte eines Gelingens überhaupt, also der Vorstellung, dass singuläre Vollzüge mit ihren Gratifikationen nicht das Streben insgesamt nach einem gelingenden Leben beschädigen. Das ist gemeint, wenn von „normativer Hypothek" der unterschiedlichen Handlungsoptionen die Rede ist, wobei auch unter der Konzession der Verschiedenheit einzelner Lebensentwürfe der Individuen darauf abgehoben wird, dass diese das Gesamtziel ihres Strebens nicht beschädigen. Es ist dies das Feld der Klugheitsethiken aristotelischer Provenienz, die in ihrem Liberalismus bezüglich der inhaltlichen Ausfüllung „des Guten" dennoch harte Kriterien zu formulieren wissen, unter denen bestimmte Handlungsoptionen ausgrenzbar sind, sofern sie eben jenes Handlungsvermögen beeinträchtigen. Freilich bewegt sich eine solche Anwendungsbezogene Ethik im Modus von Ratschlägen, weil sie ihre Adressaten nicht nötigt oder verpflichtet, sondern allenfalls zu unterstützen oder zu warnen sucht unter der schwachen Unterstellung, dass diese Subjekte die erreichten Gratifikationen – insbesondere die Entlastung durch Delegation von Problemdiagnose und Problemlösung an die ubiquitären Systeme – später nicht bereuen.

Neben diesen beiden Typen spezifisch praktischer Ethik, die wir noch genauer im Feld der Medienethik angesichts der Herausforderung durch die Ubiquitous Computing-Technologien aufsuchen werden, lässt sich noch ein dritter Typ finden, der aus meiner Sicht der wichtigste ist, wenn es darum geht, die Spezifik praktischer Ethik gegenüber einer allgemeinen Ethik zu bestimmen. Großtechnische Systeme eröffnen uns neue Möglichkeitsräume des Handelns, sowohl im Sinne einer Erweiterung in räumlicher und zeitlicher Hinsicht für traditionale Vollzüge, die bisher an Grenzen oder Barrieren stießen, als auch im Sinne einer Neustrukturierung, die qualitativ andere, bisher nicht realisierbare Vollzüge erlaubt. Zugleich wird aber in der Regel auch für manche klassische Handlungstypen der Vollzug erschwert oder gar unmöglich; überkommende Handlungsweisen werden ersetzt, verdrängt, geraten in Vergessenheit (Hubig 2003). Dieser normale Wesenszug jeglicher Kulturentwicklung, der Kulturkritiker und Kulturpessimisten auf den Plan ruft, ist daraufhin zu reflektieren, ob mit dem Verlust von bestimmten Handlungsschemata nicht auch die einschlägigen Kompetenzen, die hierbei herausgebildet, fortgeschrieben und perfektioniert wurden, verloren gehen. Hier eröffnet sich, wie ich meine, ein genuin spezifisches Themenfeld für einen neuen Typ der Ethik, der freilich eine alte Wurzel hat: einer Ethik, die am Prinzip eines selbstbestimmten Handelns anhebt und als Pflicht formuliert, dass dieses selbstbestimmte Handeln sich nicht selbst aufheben, nicht mit sich selbst in Widerstreit geraten soll. Es ist die klassische Ethik der Autonomie, die prinzipiell auf die Vermeidung jeglicher Heteronomie als Zwang, der diese Grundfreiheit einschränkt, abhebt. Selbstverständlich begeben wir uns immerfort unter Herrschaft (die nicht mit Zwang verwechselt werden darf), sofern diese uns positive Handlungsfreiheiten gewährleistet – das Prinzip der Institutionalisierung. Die notwendigen Einschränkungen durch die Systeme, insbesondere die technischen Systeme, finden ihren Sinn darin, dass sie Handlungsoptionen eröffnen, die ohne sie nicht gegeben wären – also einen Beitrag zur positiven Freiheit leisten. Insofern ist, wie Max Weber herausgearbeitet hat, Herrschaft immer hypothetisch. Als „Chance, Gehorsam zu erzielen", hängt sie davon ab, ob die von ihr versprochenen Gratifikationen willkommen oder die in Aussicht gestellten Sanktionen gefürchtet sind. Ein solches Anerkennungsverhältnis setzt aber eine Transparenz der Systeme voraus, aus der sich – wie wir sehen werden – wichtige Konsequenzen für eine

Ethik der Systeme und hier im Speziellen: eine entsprechende Medienethik ableiten lassen. Grundrechte wie dasjenige der informationellen Selbstbestimmung heben auf diese Wahrung der Autonomie im Bereich der Informations- und Kommunikationstechniken ab. Eine solchermaßen gefasst „Ermöglichungsethik" macht den Kern einer Medienethik aus (wie auch analog z.B. einer Wirtschaftsethik, die sich mit *Systemen* der Arbeitgeber-Arbeitnehmer-Beziehungen oder der Gestaltung von Handelsbeziehungen im globalen Markt befasst: Ob ich beim Handel betrügen darf, ist demgegenüber ein eher einfach zu klärendes Problem allgemeiner Ethik als angewandter Wirtschaftsethik). Für eine Medienethik angesichts der Entwicklung ubiquitärer Systeme ist daher unter diesem Typ praktischer Ethik zu fragen, inwieweit die Systeme basale Voraussetzungen des Handelns, nämlich die Identität der Subjekte und ihr bewusstes Entscheiden zu fördern oder einzuschränken vermögen. Die Akzeptabilität dieser Systeme, schwach gefasst als Akzeptanz*fähigkeit*, wäre eben nur dann gegeben, wenn die Anerkennung bestimmter Herrschaftsformen bewusst vollziehbar oder beendbar bleibt und so sowohl Gestalter wie Nutzer ihren Subjektstatus als gesichert erachten können. Dieser dritte Typ einer Medienethik als Ermöglichungsethik ist mit Blick auf das Ubiquitous Computing nun genauer zu verfolgen.

Gestaltungsprobleme des Ubiquitous Computing

Ubiquitäre Systeme heben darauf ab, unsere Handlungsumgebungen oder Elemente der Handlungsumgebungen in einem Sinne „smart" oder „intelligent" zu machen, damit sie die Fähigkeit zur Problemdiagnose und zur Problemlösung erlangen oder dem Nutzer ein Angebot zur Problemlösung machen (SFB 627, Bericht 2005/05). Dass wir den Vollzug von Teilschritten eines Problemlösungsprozesses (als technischem Handeln) an Apparate delegieren, ist nicht neu. Auch haben wir solche Teilschritte in kulturell verfestigten tradierten Schemata objektiviert, so dass bestimmte äußere Einrichtungen uns von der Aufgabe entlasten, Probleme zu identifizieren und eine Lösung zu suchen: Ein simpler Trampelpfad in unwegsamem Gelände, dem wir folgen können, gibt uns die Sicherheit, dass problematische Passagen vermieden und umgangen werden und er uns zu einem, beispielsweise durch einen Wegweiser indizierten Ziel „führt". In metaphorischer Rede kann man davon sprechen, dass dieser Pfad „informiert" ist (analog einem sachkundigen menschlichen Begleiter) und uns über bestimmte Verfasstheiten zu informieren vermag. Er kann als eine Institution im Kleinen begriffen werden, die auf einer Bewährtheitstradition aufruht und Herrschaft ausübt, sofern man die Sanktionen des Herrschaftsentzugs fürchtet und auf die Gratifikationen der Herrschaft aus ist. Worin liegt der Unterschied zu ubiquitären Systemen?

Die smarten Dinge unserer Handlungsumgebung nehmen über ihre Sensorik Daten auf und bilden über die Sensordatenfusion ein Modell unseres Handlungskontexts. Es ist ein Beobachtungskontext, der sich von dem ursprünglichen Kontext dahin gehend unterscheidet, dass nur diejenigen seiner Wesenszüge in das Bild aufgenommen werden, die über die Sensorik erfassbar sind. Dieser Kontext ist also gleichsam in einem ersten Schritt „dekontextualisiert". Entsprechend den implementierten Strategien wird, angereichert durch Informationen, die aus dem Internet bezogen werden, dieser Kontext als so und so geartete Situation „interpretiert": Und entsprechend der jeweils identifizierten Problematik wird eine Situationsveränderung entweder angeboten oder gleich veranlasst. Es ist dies ein zweiter Schritt einer Dekontextualisierung, die nun einen Kontext erstellt, in dem das „Offensichtliche" getan werden soll – „Context awareness".

Die Typisierung, die zu dieser Situation führt, kann auf zweierlei Weise vorgenommen werden: Erstens beruhen die systemischen Strategien, unter denen die Typisierung und anschließende Aktionen ausgelöst werden, auf seitens der Entwickler oder Anbieter vorausgesetzten Nutzerstereotypen als Adressatenprofilen, die wesentliche Merkmale des Kontext zusammenfassen bei unterstellten Nutzerpräferenzen, die ein Interesse an diesen Merkmalen begründen sollen. Darüber hinaus wird oftmals auf der Basis dieser Präferenzen auch abgeleitet, welches Interesse an Kooperationen mit anderen Präferenzenträgern oder einer Koordination der Präferenzenverfolgung gegeben ist. Zweitens können die Stereotype auch gewonnen werden durch ein adaptives Verhalten der Systeme, welche wiederkehrende Nutzungsansprüche als Routinen modellieren und dann entsprechend reagieren. Aktionen wie Einkaufen, Nutzung eines Verkehrsmittels in Verkehrssystemen, Accident-Management in Notlagen, Suche nach einem Zusammentreffen oder Vermeidung eines Zusammentreffens mit bestimmten Personen, Erhalt von zusätzlichen Informationen – auch aus der Vergangenheit – über Örtlichkeiten und Gesprächspartner etc. können auf diese Weise unterstützt und optimiert werden. Früher war zwar auch die Situation gegeben, dass der Handelnde sich Kontexten gegenüber sah, in denen kulturell verfestigte Strukturen und Schemata angetroffen wurden, die mit einer hypothetischen Zweckbindung verse-

hen waren. Jedoch konnte sich der Handelnde zu ihnen jeweils in ein positives oder negatives Verhältnis setzen (zumindest im Prinzip). Jetzt findet er sich in einer Handlungsumgebung wieder, in der die Dinge oder Ereignisse nach einer bereits herausgebildeten Zweckbindung prozessieren, die ein solches Sich-ins-Verhältnis-setzen zu ihr wenigstens erschwert oder in manchen Fällen gar unmöglich macht. Während der „klassisch" Handelnde – die holzschnittartige Unterscheidung sei erlaubt – sich mit jedem Vollzug seine eigene Wirklichkeit schaffte und durch Erlebnisse des Misserfolgs und der Enttäuschung an der Widerständigkeit dieser Wirklichkeit oder an sich selbst im Weiteren arbeitete, sieht sich der Akteur in ubiquitären Systemen bereits einer verfertigten „informierten" Wirklichkeit gegenüber. Dieser Effekt ist solange kein Problem, als er auf der Basis einer expliziten Delegation von Leistungen an das System zustande gekommen ist. Ubiquitäre Systeme haben aber nun gerade die Eigenschaft, diese Delegation zu erübrigen und die Entlastung auf eine Entlastung von der Delegation selbst auszuweiten. Das „Verschwinden der Computer" (Marc Weiser) findet hier seine Krönung, was durchaus willkommen sein kann in dem Sinne, dass eine Technik, die geräuschlos im Hintergrund ihren Job vollzieht, als die perfekteste erscheinen mag. Eine solchermaßen aufgewertete „Augmented Reality" oder „Mixed Reality" oder „Wirkliche Virtualität" (Fleisch 2003) wird jedoch dann problematisch, wenn eine selbstbestimmte Nutzung der Systeme unter jeweils individuellen Interessen eingeschränkt wird.

Zunächst kann eine solche Einschränkung ersichtlich werden, wenn der Nutzer auf der Basis einer Irritation nicht mehr in der Lage ist, auf die Ursache dieser Irritation zurückzuschließen: systemische Strategien, die nicht adäquat erscheinen, oder Ergebnisse einer Koordination in Abhängigkeit vom Verhalten Dritter, die das System mit ihm zusammen nutzen und ihre eigenen Präferenz verfolgen; oder eigenes Fehlverhalten im Umgang mit dem System; oder Selbsttäuschung über bisherige Handlungsroutinen, die das System registriert hat; oder die erst im Misserfolg bewusst werdende Einsicht über neue, abweichende Interessen (ein üblicher Effekt der Selbstvergewisserung über einen Interessenwandel angesichts einer Unzufriedenheit mit Ergebnissen, die bisher fraglos hingenommen wurden)? Irritationen eines zweiten Typs können entstehen, wenn die Nutzer – reibungsloses Funktionieren adäquater Dienste der Systeme seien vorausgesetzt – in Zweifel geraten, wer, was, wann und wo Informationen über eine spezifische Nutzung der Systeme aufnimmt, speichert oder weitergibt. Denn damit die Systeme funktionieren, also ihre Leistungen im gesellschaftlichen Leistungstausch verortbar und die nötigen Investitionen amortisiert werden können, muss der Zugriff auf Systemleistungen explizit sein (Schutz des Anbieters), müssen andererseits Kontextinformationen dem Anbieter und dem Provider übermittelbar sein, damit die Systemleistung adäquat wird, muss drittens die Leistungsinanspruchnahme abrechenbar sein (Schutz des Providers), und es muss dennoch in dem gewünschten Maße die Privatheit des Nutzers gewährleistet bleiben. Aber nicht nur in dieser negativen Hinsicht ist Privatheit ein zu schützendes Gut vor Zugriffen, sondern, dem Prinzip der informationellen Selbstbestimmung folgend, gehört dazu, dass für den Nutzer die angebotenen Optionen oder die ausgelösten Prozesse als solche in einem Tableau oder einem Katalog möglicher Optionen transparent bleiben, damit dem Nutzer klar bleibt, ob dies die einzig möglichen sind, oder ob ihm weitere Optionen vorenthalten werden. Angesichts eines vom System übermittelten Rates, sich so und so zu verhalten, ist dann die schlichte Frage, warum der Ratschlag erfolgt, nicht mehr einfach zu beantworten: Wird dies geraten, weil ich mich bisher in solchen Situationen üblicherweise so verhalten habe, oder weil das System bei unterstellten Präferenzen meinerseits ein Defizit oder eine Versorgungslücke identifiziert hat, oder weil ein Lenkungs- oder Koordinationseffekt im Interesse Dritter intendiert ist, oder weil sich Systemelemente amortisieren müssen, oder weil das System möglicherweise einseitig und unvollkommen informiert ist, oder weil das System nicht auf abweichendes Verhalten ausgelegt ist etc.? Selbst wenn die Systeme erlauben, entsprechende Datenspuren zu verwischen oder die Nutzung zu anonymisieren oder in bestimmten Kontexten die Nutzung zu verweigern, hinterlässt dies auch Spuren, aus denen Dritte Informationen ziehen können. Im Ganzen gesehen sind diese Probleme eines Informationsmanagements, an dem die Entwickler, die Anbieter, die Provider, die Nutzer und die Kontroll-, Überwachungs- und Haftungsträger beteiligt sind, wobei unterschiedliche Interessen gegeneinander stehen. Die medienethische Frage hierbei ist nicht primär, wie solche normativen Konflikte aufgelöst werden können oder sollen, sondern vielmehr, inwieweit die mediale Verfasstheit des Informationsmanagements in ubiquitären Systemen überhaupt die Möglichkeit eröffnet, solche Konflikte auszutragen. Es scheint hier der anfangs erwähnte dritte Typ praktischer Ethik besonders einschlägig zu werden für die Modellierung einer Medienethik, die auf Systeme des Ubiquitous Computing zu spezifizieren ist: Die Ermöglichungsethik, innerhalb derer dann Fragen des Anwendungsbezugs (welche Leistungen sollten

unter welcher Informationspreisgabe an die Systeme delegiert werden) und schließlich Fragen der direkten Anwendung (wie sollen die Situationen typisiert werden, für die die Anwendungen greifen?) behandelt werden können.

Medienethik als Ethik der Ermöglichung des Umgangs mit und in ubiquitären Systemen

Für jegliche Medialität gilt, dass sie einen Möglichkeitsraum gibt für die Wahl von Mitteln und mithin die Realisierung von Zwecken. Dieser Möglichkeitsraum ist strukturiert, d.h. er weist unterschiedliche Eigenschaften in seinen Elementen und deren Binnenrelationen auf, die in unterschiedlicher Weise nutzbar sind. Im Zuge der Nutzung werden diese Elemente und Relationen als Mittel aktualisiert, und ihre Eigenschaften schreiben sich fort in die Gestalt der realisierten Zwecke, die auf diese Weise gegenüber ihrer geplanten Verfasstheit ein Surplus erhalten, das positiv oder negativ bewertbar ist und an dem sich die „Spuren" der Medialität zeigen. Dies gilt auch für Informationsmedien im engeren Sinne, deren Möglichkeitsräume (z.B. die Verfasstheit der Kanäle) den Einsatz von Informationen zum Zweck der Kommunikation ermöglichen, begünstigen, erschweren oder verunmöglichen können. Nun sind in ubiquitären Systemen Informationsaufnahme, -austausch und -nutzung jedweder Art zu weiten Teilen an die Apparate delegiert, so dass metaphorisch davon gesprochen wird, dass „die Dinge kommunizieren und sich (selbsttätig) informieren". Die medialen Voraussetzungen von der Sensorik über die Art des Datentransfers, die Strategien der Fusion und Modellierung, die Modi der Anreicherung durch Zusatzinformationen und die Algorithmen der Informationsweitergabe und Veranlassung weiterer „kommunikativer" Prozesse sind intransparent, so dass die Nutzer (und bisweilen die Entwickler) mit Ergebnissen konfrontiert sind, die als Zwecke für sich den Vergleich mit konkret intendierten Zwecken nicht mehr erlauben, weil die Ausgangsbasis lediglich noch allgemein unterstellte Präferenzprofile/Nutzerstereotypen sind. Aufgrund der fehlenden Erfahrung einer Differenz zwischen konkret intendierten und realisierten Zwecken entfällt die Einsicht in die Differenz zwischen beiden und somit die Erfassung von Spuren einer Medialität, über die sich allererst eine Einsicht in die medialen Voraussetzungen etablieren kann. Das bringt zwangsläufig Kompetenzverluste sowohl der Entwickler als auch der Nutzer mit sich, da sich ein Medium nur über seine Widerständigkeit als solches zeigt. Reale Möglichkeiten sind immer nur durch Extrapolationen ex post erschließbar.

Beharren wir auf dem aus dem Autonomiepostulat abgeleiteten Prinzip der informationellen Selbstbestimmung, so wäre das oberste Gebot für eine Medienethik angesichts ubiquitärer Systeme, dafür zu sorgen, dass Medien Spuren hinterlassen, über die Rekonstruktionen der Möglichkeitsräume, in denen sich das Systemgeschehen abspielt, möglich werden. Erst dann könnte im Sinne einer Anwendungsbezogenen Ethik über Nutzensoptionen und im Sinne einer Angewandten Ethik über Situationstypisierungen normativ gestritten werden. Während im klassischen Modell des Handelns vorausgesetzt wird, dass wir uns bei der Wahl von Mitteln und der Wahl von Zwecken in ein bewusstes Verhältnis zu institutionellen Vorgaben setzen, auf die wir angewiesen sind, deren Angebote wir aber abzulehnen oder in modifizierender Weise zu nutzen vermögen, geht mit dem Einsatz ubiquitärer Systeme in gewisser Hinsicht eine Deinstitutionalisierung einher, solange die Schemata, auf denen das Systemgeschehen beruht, nicht über entsprechende Spuren rekonstruierbar sind. Angesichts der durchaus willkommenen Leistung, dass die Effekte ohne weiteres Zutun im Hintergrund gezeitigt werden („Heinzelmännchen-Effekt") und einer geradezu willkommenen Entlastung gegenüber dem „klassischen" Handeln, sich eben nicht mehr bei jeder Entscheidung zu entsprechenden institutionellen Schemata in ein Verhältnis setzen zu müssen, wäre zu fordern, dass die Spuren der Medialität auf andere Weise produziert werden müssen.

Wenn man also beides haben will – Entlastung und Beibehaltung einer Option, über die Spuren, die die Systemleistungen hinterlassen, sich über deren Medialität zu vergewissern –, ist eine kompensatorische Lösung erforderlich. Diese wäre dadurch erreichbar, dass neben der Mensch-System-Kommunikation, in der der Mensch seine Entlastung sucht, Ebenen einer *Parallelkommunikation* eingerichtet werden, in denen die Systeme ihre Spuren freilegen und in denen über die Medialität dieser Systeme normativ geurteilt werden kann bzw. entsprechende Urteile in einen Abgleich zu bringen wären. Prima facie bieten sich hierfür drei Ebenen einer Parallelkommunikation an.

Auf einer ersten Ebene der Parallelkommunikation wären zwischen Entwicklern, Dienstleitern, Providern und Nutzern – am besten mit Blick auf Pilotprojekte – die Architekturen der Sensorik, die Strategien der Bildung von Nutzerstereotypen, die Optionen abweichenden Verhaltens relativ zur Typik von Situationen, die Grenzen einer notwendigen Preisgabe von

Privatheit und die Verfahren einer Transparenthaltung der Nutzeroptionen offenzulegen und dabei soweit zu optimieren, dass neue kulturelle Schemata einer „normalen" Nutzung ersichtlich und damit Chancen und Risiken einer generellen Nutzung für die Adressaten disponibel werden.

Auf einer zweiten Ebenen wären in die Systeme Ebenen einer Parallelkommunikation einzuziehen bzw. vorzusehen für den Fall, dass im Verlauf der Nutzung Irritationen auftreten, sei es seitens der Nutzenden, sei es aber auch seitens der Systeme bezüglich der Frage, ob die in den Systemen modellierte Erwartungserwartung über die Nutzererwartung noch adäquat ist. In solchen Situationen der Irritation wäre on demand offenzulegen, unter welchen Informationen, gleich welcher Herkunft, unter welchen Strategien der Typisierung von Situationen und Problemlösungen die Systeme agieren bzw. für welche Verfasstheit der Nutzenden die Systemleistungen überhaupt adäquat sind. (Beispiel: Die Nutzung von Assistenzsystemen kann zu Kompetenzverlusten, etwa dem Sinken von Vigilanzschwellen, führen, die das System über seine Sensorik registriert und dann einen Dialog parallelkommunikativer Art über die Mensch-System-Kommunikation, die bisher stattgefunden hat, anbietet. Umgekehrt müsste der Nutzer in der Lage sein, bei irritierenden Systemleistungen deren Gründe zu erfahren, um dann über eine weitere Nutzung des Systems, eine modifizierte Nutzung oder einen punktuellen Ausstieg aus der Systemnutzung zu disponieren.) Erweitert auf andere und umfassende Bereiche würde eine solche Parallelkommunikation on demand während der Mensch-System-Kommunikation erlauben, sich in ein explizites Verhältnis zu der Systemverfasstheit zu setzen, wie es analog in den „hergebrachten" Handlungsvollzügen gegenüber den diese tragenden institutionellen Schemata möglich war und ist.

Schließlich wären auf einer dritten Ebene über Monitoring und Diskursverfahren Foren einer gesellschaftlichen Parallelkommunikation zu etablieren, in der über Bewährtheitsstandards und in deren Lichte über Bewährtheit oder Misslichkeit der kollektiven Systemnutzung zu beraten ist. Solche Foren sind erforderlich, weil die individuelle und anonyme Systemnutzung, insbesondere aber auch die Effekte einer anonymen Vergemeinschaftung auf der Basis der Koordinationsleistungen der Systeme, nicht mehr erlauben, aus einer Beobachterperspektive die Verhältnisse der Einzelhandlungen zu den ehemals institutionalisierten Schemata und Strukturen zu registrieren, um von dort aus die Schemata zu modifizieren. Abweichungen, Nutzensverweigerungen, aber auch allgemein begrüßte Nutzungsstereotypen würden auf diesen Foren explizit gemacht und damit Spuren der Medialität rekonstruiert, die im individuellen Handeln nicht mehr ersichtlich werden: Denn durch das Explizitmachen jener Umgangsweisen mit den Systemen wird zugleich explizit gemacht, inwieweit (a) die von den Subjekten intendierten Zwecke, (b) die in den Systemen als intendiert unterstellten Zwecke, (c) die Zwecke der Entwickler, Dienstleister und Provider mit den tatsächlich realisierten Effekten übereinstimmen oder sich hiervon unterscheiden.

Medienethische Erwägungen zielen also angesichts dieser Problemlage in den gegenwärtigen Diskussionen (1) auf die Forderung nach kompensatorischen Institutionen, in denen metakommunikativ über die an die smarten Dinge delegierten Kommunikationsprozesse verhandelt werden kann, (2) auf den Erhalt des Grundvermächtnisses der Selbstständigkeit und derjenigen Strukturen der Kompetenzbildung, die ihre Entwicklung gewährleisten, also den Erhalt von „Spuren" der Aktionen informierter Umwelt, (3) auf die Wahrung höherstufiger Präferenzen (neben der direkten optimalen Präferenzerfüllung), die sich auf den Erhalt von Entscheidungsoptionen, weitest möglichen Handlungsspielräumen eines Sich-ins-Verhältnis-setzens zu Systemangeboten beziehen und (4) den Erhalt eines institutionellen Vertrauens, welches sich auf die Einhaltung von Regeln bezieht, die als solche gewusst werden und vergleichbar sein müssen mit ihrer Realisierung qua Befolgen durch Subjekte oder entsprechend eingerichtete Systeme, an die die Subjekte ihre Aktionen delegiert haben.

Dies kann insbesondere dadurch erzielt werden, dass die Systeme über ihre Aktionen und die Bedingungen, unter denen diese Aktionen stattfinden und vom System als funktional „erachtet" werden, zu geeigneten Zeitpunkten auf jener zweiten parallelen Ebene Auskunft geben und damit *explizit Spuren ihrer Medialität produzieren*. Zur Sicherstellung einer intentionalen Nutzung der Systeme gehört, dass die denkbare und in bestimmten Bereichen mit konkreten Realisierungsoptionen versehene Aufhebung der Trennung von Online und Offline bewusst beschränkt wird auf diejenigen Bereiche, für die die Aufhebung dieser Trennung durch die jeweils in Interaktionen befindlichen Subjekte vorausgesetzt werden kann. Wenn das im Internet inzwischen verbreitete Agieren von Software-Agenten über eine entsprechende Sensorik in weite Bereiche der Handlungswirklichkeit der Subjekte implementiert wird, formt sich deren Wirklichkeit ohne ihr Zutun in einer Weise, die vielleicht bestimmte Handlungen als Einzelhandlungen optimal erfolgreich werden lässt, gegen den Optionswert des Handelns überhaupt aber verstoßen kann. Die Akzeptabilität von Ubi-

Comp-Systemen wird in the long run davon abhängen, ob sie in ihrer Entlastungsfunktion den Optionswert des Handelnkönnens nicht verletzen, kurz: ihren Charakter als Medien trotz der von ihnen selbst vorgenommenen Formung der Wirklichkeit über kompensatorische höherstufige Architekturen zu erhalten vermögen. Dass wir – wie wir seit Marshall McLuhan (1968) wissen – jedes Medium insofern als „Message" begreifen müssen, als es in der Kommunikation genauso seine Spuren hinterlässt wie der Emittent einer Nachricht, bleibt nur solange wahr, als die Medien tatsächlich ihre Spuren hinterlassen. Entfällt dieser Effekt, so tritt der Verlust einer wie auch immer vermittelten Kontrolle ein, der unser Handeln dann nur noch zu einem bloßen Agieren werden lässt. Unser zunächst scheinbar „ausgefaltetes Gehirn" (Negroponte 1995) würde dann von den Systemen dahin gehend zur Kenntnis genommen und registriert, dass auf diese Weise die Systeme ihr Eigenleben unter den Systemdirektiven perfektionieren können. Stammen diese Direktiven von Subjekten, die im Verborgenen zu bleiben suchen, ist dies noch der minder gravierende Fall. Verlieren diese Subjekte aber zauberlehrlingshaft selbst die Kontrolle über die Systemdynamik, wie man es bereits jetzt beim Handeln mit Derivaten und ihren höherstufigen Produkten im IT-gestützten Börsenhandel beobachten kann, geraten wir in eine kritische Situation. Für die menschliche Kompetenz und ihre Erhaltung bezüglich einer Interaktion mit Medien muss daher gefordert werden, dass die Vorfindlichkeit von Spuren des Medialen, an denen sich die Fähigkeiten der Subjekte abarbeiten und dadurch entwickeln, bewähren und fortschreiben können, gegeben sein muss. Dieses Gegebensein lässt sich medial organisieren über die erwähnten Prozesse von Metakommunikation und Transparenzbildung, für die die neuen Systeme *auch* ein Medium abgeben können.

LITERATUR

Fleisch, Elgar/Dierkes, Markus (2003): „Betriebswirtschaftliche Anwendungen des Ubiquitous Computing", in: Friedemann Mattern (Hg.), Total vernetzt. Szenarien einer informatisierten Welt, Heidelberg-New York: Springer, S. 145-157

Hubig, Christoph (2003): Selbstständige Nutzer oder verselbstständigte Medien. Die neue Qualität der Vernetzung", in: Total vernetzt. Szenarien einer informatisierten Welt, Heidelberg-New York: Springer, S. 211-230

Hubig, Christoph/Heesen, Jessica/Siemoneit, Oliver/Wiegerling, Klaus (2005): Leben in einer vernetzten und informatisierten Welt. Context Awareness im Schnittfeld von Mobile und Ubiquitous Computing. SFB 627 „Nexus", Bericht Nr. 2005/05

Hubig, Christoph (2006): Die Kunst des Möglichen, Bd. I: Technikphilosophie als Reflexion der Medialität, Bielefeld: transcript

Hubig, Christoph (2007): Die Kunst des Möglichen, Bd. II: Ethik der Technik als provisorische Moral, Bielefeld: transcript

McLuhan, Marshall (1968): Die magischen Kanäle., Düsseldorf-Wien: Econ-Verlag

Negroponte, Nicholas (1995): Total digital. Die Welt zwischen 0 und 1 oder die Zukunft der Kommunikation. München: Hanser

Adam Swift:

Locating 'Agency' Within Ubiquitous Computing Systems

Abstract:

The final shape of the "Internet of Things" ubiquitous computing promises relies on a cybernetic system of inputs (in the form of sensory information), computation or decision making (based on the prefiguration of rules, contexts, and user-generated or defined metadata), and outputs (associated action from ubiquitous computing devices). My interest in this paper lies in the computational intelligences that suture these positions together, and how positioning these intelligences as autonomous agents extends the dialogue between human-users and ubiquitous computing technology. Drawing specifically on the scenarios surrounding the employment of ubiquitous computing within aged care, I argue that agency is something that cannot be traded without serious consideration of the associated ethics.

Agenda:

Author:

Dr. Adam Swift:

Creative Industries Facult, Queensland University of Technology.

☎ + 64 211 – 657089, ✉ a.swift@qut.edu.au

Relevant publications:

Swift, A. (2006) Mapping posthuman discourse and the evolution of living information. Thesis submitted for the degree of Doctor of Philosophy, 2006, Creative Industries Faculty, Queensland University of Technology

ISSN 1614-1687

Introduction: Ubiquitous computing and the aging population

The aging of the population is one of the major transformations to be experienced by global populations throughout the 21st century. The Australian Bureau of Statistics (ABS) writes that the proportion of older Australians is expected to increase over the coming years, with the population aged 65 years and over projected to increase from 2.5 million in 2002, to between 6.1 and 11.7 million in 2101.

The potential need for support among the frail aged – for example in the areas of assisted housing, health, and disability services -- suggests that the associated costs to care for this cohort will be significant. We can assume that it is better both socially and economically to care for older people in their own homes or in accommodation joined to other family dwellings to delay the requirement for institutionalisation. Ubiquitous computing systems have both a unique opportunity and an important role to play in keeping the elderly in the home environment, or at least out of institutional care.

A range of scenarios have been outlined in which ubiquitous computing systems are employed to assist in the management and care of an aging population. These range from the technological gadgets that might help an elderly person go about everyday tasks, including safety devices, dementia aids and people locators, to the systems that enable easy access to medical experts and expert systems, improve in the early diagnosis of diseases associated with age, improve the tracking of disease, and provide a range of measures associated with record keeping. Medical information could be gathered via direct sensor-based monitoring through ubiquitous computing devices located in the body through implant technologies, incorporated in smart fabric clothing or other wearable devices, or embedded anywhere within the smart home[1]. Ubiquitous computing systems might also incorporate software that allows alternative input through gesture, voice, hand and head movements, remote control, or feedback from other haptic devices. Attached to or embedded into walls, appliances, beds, vehicles and other household applications, ubiquitous computing systems could enable the elderly to maintain everyday life within the home with greater levels of ease and comfort. Ubiquitous computing could also facilitate the automation and maintenance of systems associated with shopping, transport, medication, health-care routines, or the often difficult scheduling of complex familial occasions and other social and cultural network opportunities.

As Emile Aarts and Stefano Marzano[2] have argued, the goal of ubiquitous computing is to go anywhere and be everywhere, effectively rendering time and space invisible and inconsequential. The consequence of such a vision is that established relations of power and control may be similarly rendered inconsequential. While the political implications surrounding agency within ubiquitous computing systems has a reach largely beyond the scope of this paper, it is important to articulate some basic questions and concerns around issues of power, control, and agency that arise due to the employment of ubiquitous computing systems within the everyday life of an aging population.

In this paper I argue that the surrender of a certain degree of agency to ubiquitous computing systems is a trade that should not be taken lightly or without deeper inquiry. Adam Greenfield[3] outlines an interesting argument, drawing on McLuhan's *Understanding Media*[4] to suggest that the employment of ubiquitous computing systems will, like all technologies, involve a kind of "willed surrender". When McLuhan argues that every technological 'extension' of human faculties corresponds with an 'amputation', he is suggesting that while our reliance on new technological systems may relieve some of the burdens of everyday life, our organic faculties are likely to "atrophy to a corresponding degree" (the automobile may take us further but we might, for example, exercise less). Within the context of elderly care, patients, family, and health-care professionals need to be able to clearly justify what it is about the nature of 'everyday life' that can be effectively 'improved' through the augmentation and supplementation that ubiquitous computing systems provide. In other words, as these technologies

[1] Burgelman, Jean Claude and Punie, Yves: Information, Society and Technology. 29

[2] Emile Aarts and Stephano Marzano: The new everyday: Views on ambient intelligence.

[3] Greenfield, Adam: Everyware: The dawning age of ubiquitous computing. 148-150.

[4] McLuhan, Marshall: Understanding Media: The extensions of man

become ordinary and pervasive aspects of everyday life, it becomes increasingly important to be certain about what it is, exactly, that is exchanged through the amputation/prosthesis process ubiquitous computing systems provide. As Greenfield writes:

> *"If a reliance on ubiquitous systems robs us of some of our faculties, it may also cause us to lose faith in the ones that remain. We will find that [ubiquitous computing systems] are subtly normative, even prescriptive – and […] this will be something that is engineered into it at a deep level"*[6]

My argument throughout this paper is based on the assumption that ubiquitous computing systems within aged care should be tailored towards supplementing and augmenting faculties and facilities that are considered to have atrophied (physical movement, cognitive functions), and not impinge upon faculties and facilities that are still a functional, important, and trusted attribute to the elderly. The example here of aged care highlights the important role artificial agency plays in the broader employment of and the ethical considerations associated with ubiquitous computing systems.

Locating agency within ubiquitous computing systems

Before returning to the role and location of 'agency' within such intelligent systems, I would suggest that, in order to achieve the aims in the aged care scenarios I have outlined above, ubiquitous computing systems must be tailored to:

- Accommodate static and fixed user profiles within dynamically changing contexts by exhibiting an element of functional and automatic adaptability, flexibility, and the capacity for continuous learning. For example, ubiquitous computing systems must be able to support the use of different personal identities (personas) so that elderly users can facilitate seamless communication within a variety of everyday, health-care, familial, social, and cultural contexts, regardless of changes within the given system.
- Support communication and interaction with other human and non-human users in real-time in a range of useful settings, such as browsing the web, sharing static content, establishing or facilitating user-discussions, or developing new social projects.
- Gather, process, and interpret data from a range of input devices in the same way the user does (or in a way that is at least 'useful' to the user).
- Inform users, user-networks, and user-applications of new opportunities, occurrences of interest, and relevant context changes that might otherwise escape the attention of the interested parties.
- Provide and facilitate adequate automated support for off-line, disconnected use so elderly users may continue to interact and work with other users on the network asynchronously.
- Provide users and user-networks with an extensive selection of simple open-source tools and software, so that they may create, add, or change functionality as needed.

These are very big asks for any software application, yet the intelligent agents behind ubiquitous computing are expected to suture together a wide spectrum of information for elderly and often cognitively and physically frail users within a technologically complex environment in a way that should seem 'seamless'. However, for the user to be freed from the acts associated with the location, transportation, interpretation, and transformation of the information that sutures various 'user positions' and information-augmented applications together, ubiquitous computing devices must continuously access (and respond to) a range of network services to accomplish predefined user and/or agent tasks, *regardless of whether the human-knows that such access is taking place*. In other words, in order to enjoy the seamless integration ubiquitous computing promises, the elderly are asked to forego and re-assign certain levels of autonomy to agent technologies.

One immediate and important ethical question that must be addressed in any such consideration is, then, where does accountability and responsibility for autonomous agent decision and action lie? Agents, as their name suggests, should act on behalf of somebody and not of their own accord. Yet as these devices continue to become invisible, seamless, and backgrounded – the grail quest for ubiquitous computing systems – the familiar and tried boundaries that exist between human-user,

[5] Greenfield, Adam: Everyware: The dawning age of ubiquitous computing. 150.

network, intelligent agent, and computational technology continue to blur, bend, and disappear.

Through all manner of popular, news, industry, and research media we are becoming increasingly familiar with intelligent media output devices within aged care such as robotic aids, remote-sensor operated surveillance and tracking devices, self-monitoring medicinal inventory and stock control machines, personal portable devices, 'smart clothing' that incorporates wearable technologies or that is constructed of smart fabrics and fibres for the monitoring of bodily functions, and a range of micro technologies adapted for the 'smart room' or 'smart home' that assist mobility and enhance patient comfort. Yet as ubiquitous computing technologies and the intelligent agents behind them continue to interact with other ubiquitous computing technologies and agents, human-users, and the broader object-based environment in which they are located, new relationships and user-patterns will develop.

History has shown us that the introduction of new technologies into a given socio-cultural environment usually generates within that environment a degree of greater complexity, often resulting in an increasing array of new opportunities that, in turn, promote and enable the continued development and diffusion of ever newer technologies. Ubiquitous computing technologies are no different, and the introduction, development, and diffusion of these technologies suggests that, ultimately, the relationship between the human-user and ubiquitous computing technologies can only extend already existing (and already complex) techno-social arrangements. This should not be read as a reiteration of the theses of Technological Determinism, but rather, a suggestion that any relationships that come to exist between human-users and ubiquitous computing systems cannot be deemed entirely causal in its structure or outcomes – regardless of the centrality one or the other 'actor' plays in a given relationship (for example, the act of coding or programming on behalf of the human, the act of collation and filtering on behalf of the intelligent agent, or the subsequent action on behalf of a ubiquitous computing device), one cannot conclude that the *entire* enterprise is one of direct determination or competition on behalf of either. Ultimately, human and ubiquitous computing interaction will deliver a more complex environment that encompasses ever tighter degrees of interconnectedness between agents, human-users, digitised information, and the external object-based world, and designers of ubiquitous computing systems for the elderly carry the added burden of introducing complex technology to an environment that is often already very fragile.

We must also accept that as ubiquitous computing systems become increasingly capable of reconfiguring real-world objects and relations, they will inevitably start to impinge upon certain configurations that are valued within the human subject. This raises a range of important questions. For example, what happens when those values and attributes that have traditionally 'belonged' to the human subject (such as 'choice', 'uncertainty', or 'novelty') are deemed to be at odds with newly configured environments, economic incentives, and operational variables that constitute ubiquitous computing? A nightmare sci-fi scenario might see elderly users unable to opt out of a ubiquitous computing system without violating or voiding health insurance. Conversely, if the intelligent agents behind ubiquitous computing preference human values at the expense of their preferred initiatives or incentives, will their outputs be read as affecting the human-technology relationship for better or for worse? If an elderly user chooses to preference 'budget', for example, will the ubiquitous computing system exclude visiting computation agents representing 'better'? These examples, banal as they are, suggest that for an ethics of ubiquitous computing the foremost question that must be addressed concerns the implications that arise when computational intelligences provide agency within the object world of the biological human actor.

The first step in addressing this question is to develop a conceptual and discursive space in which claims regarding the 'success' of ubiquitous computing are not simply measured in terms of increased competency, effectiveness, proficiency, productivity, complexity, and so forth. We must remain cautious in determining 'success' in those innovations that propel the quest for a more 'efficient' form of human automation, and stand committed to the axiom that 'faster', 'closer', 'longer', 'finer' etc. does not necessarily secure a formula for wellbeing amongst human and non-human actors, and may do little, if anything, to assist the elderly. These are value-laden measures steadfastly focused on economic outcomes and concerns, and I argue that, instead, an evaluative position must be established in which ubiquitous computing technologies are able to convince us that they have a genuine utility value within existing and new human social relations. To this end, human-users *and* ubiquitous computing technologies must be capable of negotiating the relationship that exists between them. While such a negotiation is inherently political (and therefore,

inherently human-focused) the discussion must extend beyond analyses of human *engagement* with technological componentry, and into a conceptual space that qualifies human-technology relationships.

This leads me to suggest that the advantage of accounting for and accommodating 'agency' within ubiquitous computing systems is that it would allow us to recognise that the functional processes (for example, the processing of sensory input, subsequent computational decision-making, the creation, collation, and broadcasting of information, and the enunciation of ubiquitous computing action) can *also* be recognised as an act of communication, or discourse production. In order to address the computational decision-making and subsequent action behind ubiquitous computing as a discursive act, three distinct categorical levels can be identified in which intelligent agents are seen to supplement, supplant, or supersede human agency.

In the first instance, the intelligent agent supplements the human-user by providing high levels of aid to established cognitive processes and tasks. In this instance, the human user would retain control of the outcomes of a particular process, and the computational agents and ubiquitous computing technologies merely extend the scope or scale of the human-users decision-making, kinetic capabilities, or other facilities. In the second instance, the intelligent agent supplants existing processes and tasks, by making decisions according to predefined human mandates. Here, computational action could occur in absence of the human subject, but only insofar as the human had allowed such action to take place. And in the final instance, the intelligence would supersede certain human-based facilities by making decisions and undertaking actions autonomously and unbeknownst to the human. Here, the intelligent agents behind ubiquitous computing are left to act in complete absence of the human-subject, having been commissioned to act according to predefined, or newly emergent and self-defined goals.

One implication that can be drawn from the relinquishing of agency to computation intelligences and ubiquitous devices is that the human-user can no longer be constituted or accepted as *the* most dominant actor/producer of subjective decisions. Agency and action, in this regard, can be related to existing power-knowledge nexuses that exist within human-technology relations. Within ubiquitous computing systems, agency and action can be seen as a defining force that positions, constitutes, represents, sustains, empowers – or prohibits – both its human and non-human subjects. Nevertheless, relocated to a computational intelligence, agency becomes amenable to technological interference and manipulation, reorganising, reformulating, and recontextualising embodied action according to the machine-based laws of the system in it is represented. As suggested above, such actions could have very real effects upon the actual and embodied human subject for whom the agent acts, and any accidental or malignant manipulation, partial or incomplete representation, or misrepresentation of agency may alter the direction, flow, or effect of subsequent action. As seamless as the computational functions of a ubiquitous system may seem, the subsequent results within the object world, and the impact these may have upon the lives of the elderly remain important considerations for designers of ubiquitous computing systems.

Conclusion

I have argued that in order to accommodate agency within ubiquitous computing, intelligent agents and agent operations must be contextualised within a broader conceptual discursive space. This suggests that if the diffusion and adoption of ubiquitous computing is to be negotiated in light of the outcomes that add favourably to human-technology relationships, then the shared history and culture of humans and technology must ultimately contribute to such negotiations. It can be argued that every new instance or application of ubiquitous computing effectively increases human-technology communication. That is to say, the action and interaction of human-users, ubiquitous computing technologies and devices, the intelligent agents that facilitate ubiquitous computing actions, and the operational environments (informational or object-world based) in which these actions are based would result in the production of new communicative, or 'discursive' arrangements.

I have suggested that the first step in evaluating ubiquitous computing beyond the socio-economic measures that are usually employed in discussion of technological 'success' is to develop a sustained and negotiated dialogue in which both ubiquitous computing and human actors participate. To this end, code structures that draw on established symbolic and semiotic representations should be erected in order to distinguish and differentiate between the biological, the social, and the technological. These should be configured in order to provide a structure of governance with clear and universally applied definitions and guidelines regarding the obligations

and requirements of both humans and ubiquitous computational technologies, in the form of protocols, guidelines, policies, and laws. Existing examples of such governmental structures already employed within computational industries include the structures and laws surrounding digital surveillance, encryption, information filtering, and client authentication.

While the example of aged care has been used within this document to locate and discuss the role agency plays within ubiquitous computing systems, the issues that have been raised suggest that agency is something that cannot be traded without serious consideration of the associated ethics.

References

[1] United Nations Department of Economic and Social Affairs, Population Division: World Population Ageing: 1950-2050, 2002, http://www.un.org/esa/population/publications/worldageing19502050/ (Accessed 16 November 2007)

[2] ABS: Scenarios for Australia's aging population, 2004, http://www.abs.gov.au/ausstats/abs@.nsf/0/9560b5d7449b135ca256e9e001fd879?OpenDocument (Accessed 16 November 2007)

[3] Burgelman, Jean-Claude and Punie, Yves: 'Information, Society and Technology'. In E. Aarts and J.L. Encarnação (Eds.) True Visions: The Emergence of Ambient Intelligence*, New York, Springer, 2006, pp17-33.*

[4] Aarts, Emile and Marzano, Stephano (Eds.): The new everyday: Views on ambient intelligence*, Rotterdam, 010 Publishers, 2003.*

[5] Greenfield, Adam: Everyware: The dawning age of ubiquitous computing*, Berkley, CA, New Riders, 2006. 148-151.*

[6] McLuhan, Marshall: Understanding Media: The Extensions of Man*, 1st Ed. McGraw Hill, NY; reissued by Gingko Press, 2003*

[7] Greenfield, Adam: Everyware: The dawning age of ubiquitous computing*, Berkley, CA, New Riders, 2006. 150.*

Wolfgang Hofkirchner, Manfred Tscheligi, Robert Bichler, Wolfgang Reitberger:

Ambient Persuasion for the Good Society

Abstract:

In this paper we argue for a pro-active, technology-driven as well as social problem-driven technology assessment (TA) of Ambient Persuasion technologies. Our starting point for assessing ICTs regarding ethical aspects is the vision of a Good Society (Bradley 2006), which is a Global Sustainable Information Society (GSIS). Such a society is on the way to sustainability, strongly supported by Information and Communication Technologies. Using ICTs for persuasion at the same time imply opportunities and risks. We identify two contrary persuasive strategies; the first one is mainly based on negotiated persuasion, while the second approach is a more behaviouristic one. To tap the full potential of both approaches we propose a dialectic understanding for Ambient Persuasion by presenting promising, already existing examples.

Agenda

Authors:

Prof. Dr. Wolfgang Hofkirchner

- ICT&S Center - Advanced Studies and Research inInformation and Communication Technologies & Society,University of Salzburg, Austria
- ☎ +43 662 8044 4821, ✉ wolfgang.hofkirchner@sbg.ac.at,
  💻 http://www.icts.uni-salzburg.at/hofkirchner

Prof. Dr. Manfred Tscheligi:

- ICT&S Center - Advanced Studies and Research inInformation and Communication Technologies & Society, University of Salzburg, Austria
- ☎ +43 662 8044 4811, ✉ manfred.tscheligi@sbg.ac.at
  💻 http://www.icts.uni-salzburg.at/tscheligi

Mag. Robert Bichler:

- ICT&S Center - Advanced Studies and Research in Information and Communication Technologies & Society, University of Salzburg, Austria
- ☎ +43 662 8044 4822, ✉ robert.bichler@sbg.ac.at
  💻 http://www.icts.uni-salzburg.at/bichler

DI (FH) Wolfgang Reitberger, M.Sc.:

- ICT&S Center - Advanced Studies and Research in Information and Communication Technologies & Society, University of Salzburg, Austria
- ☎ +43 662 8044 4812, ✉ wolfgang.reitberger@sbg.ac.at
  💻 http://www.icts.uni-salzburg.at/reitberger

ISSN 1614-1687

In the following paper we focus on a part of ubiquitous computing, that is to say, the intersection of ubiquitous computing and persuasive technology. We will argue that in spite of the danger of anthropomorphising artifacts, which would yield inhumane consequences, there is a well-definable area of Ambient Persuasion applications that are useful and socially acceptable.

The Ethos of the Great Bifurcation

The paper presented here aims at contributing to a pro-active, technology-driven as well as problem-driven (VDI 2000) technology assessment (TA) of Ambient Persuasion technologies. This assessment is both technology- and problem-driven, since it focuses on both a technology and societal or social problems to be solved by means of that technology. It is pro-active, since the technology it deals with is just emerging and solutions to the problems are yet to be found. The course of research and development might still be influenced by that kind of TA.

Not only decision makers in business, government and civil society in general are addressed. But also engineers, in particular, are expected "to acquire and strengthen their ability to play an active part in such technology assessment" and "to analyse and weigh controversial views through discussions that cross borders of disciplines and cultures" (VDI 2002, 6), since they are said to be "responsible for their professional actions and the resulting outcomes" (VDI 2002, 4).

Technology is not value-free. Technological action – that is, design as well as usage of technologies, irrespective of the level on which design and usage may occur (the micro-level of the individual, the meso-level of groups, organisations, institutions, and the macro-level of society at all) – is constantly forced to select ends and means and the selection needs criteria, which are related to values.

Value systems build hierarchies and, according to societal conditions, values can be in conflict with each other. E.g., the guidelines of The Association of Engineers in Germany VDI 3780 concerning TA name eight basic value clusters (VDI 2000).Starting point for assessing ICTs regarding ethical aspects is the vision of a Good Society (Bradley 2006) which is a Global Sustainable Information Society (GSIS). By that we define a society that, on a planetary scale, is set on the path of sustainable development by the help of ICTs. A GSIS fulfils the requirements for a breakthrough at a point in human history when the development of societies is confronted with a possible breakdown – a situation we termed the Great Bifurcation elsewhere (Hofkirchner/Maier-Rabler 2004).

A GSIS fulfils the requirements for social acceptance in respect to social, environmental and technological compatibility. That is, we suggest that the overall value be sustainability that denotes a society's ability to perpetuate its own development. We, furthermore, suggest that sustainability be broken down into (1) social compatibility which is inclusiveness and fairness – to be broken down, in turn, into cultural equality, political freedom and economic solidarity – (2) environmental compatibilty and (3) technological compatibility – to be broken down into usefulness, usability, effectivity, reliability, security and other values. Thus there is a never-ending need to make more specific values comply with more universal values.

Designing ICTs – in technical respect as well as concerning the social context – is normative and ought to be guided by the vision of the GSIS.

Persuasion

Weiser (1991) has shaped the vision of Ubiquitous or Calm Computing (UbiComp), where computers are not bound to a fixed location but are unobtrusively integrated into the environment. The computer loses its predefined place as desktop computer and can be found in new contexts and application methods. The grey box on the desktop is replaced by a magnitude of connected embedded devices. Another important feature of UbiComp is natural interaction, i.e. enabling the use of gestures, speech, gaze and movement to communicate with the system and with other users.

Fogg defines persuasive technology as "any interactive computing system designed to change people's attitudes or behaviors" (2003, 1). Ubiquitous interfaces, which comprise a particular class of interactive systems, have the capability to unobtrusively surround the user at any given moment and place. This enables a persuasive intervention just at the right time (IJsselstein et al. 2006). This opportune moment is also referred to as kairos (Fogg 2003). Fogg discusses several strategies for persuasive technologies, of which social acceptance, connectivity or facilitation is the most powerful persuasion strategy (Fogg 2006). Other persuasive strategies are persistence and simplicity. Persistence means

that the system confronts the user with the persuasive message at several occasions whenever an opportune moment arises. Simplicity means that the interactive system makes it easy for the user to understand the persuasive cue and to perform the desired action.

As with the terms "interaction" and "communication", the usage of the term "persuasion" in relation to computers is best be taken metaphorical. For each of them supposes social actors, and the computer seems not to be one. It can be argued that it is a category mistake to ascribe socia(bi)lity or (social) agency to computers as actor-network-theory approaches insinuate and an anthropomorphic fallacy (Atkinson 2006).

Recognising the metaphorical meaning is consequential for the evaluation of ethical aspects of "persuasive technology". Persuasion has been dealt with by rhetorics, communication studies, psychology and psychotherapy before or independently of the advent of computers (Borchers 2002, Fotheringham 1966, Jowett/O'Donell 1999, Jabusch/Littlejohn 1990). "Persuasion", etymologically, goes back to the Latin verb "persuadere". Though the root syllable "suadere" had the meaning of "to advise", "suasio" the meaning of "recommendation" and "suasor" the meaning of "counselor", there is a latent ambiguity with the term "persuadere" which is prevalent up to now. This ambiguity is obscured in the English notion of persuasion but shows up clearly in the German distinction between "Überzeugung" and "Überredung". While the first term has a positive connotation, the second one has a negative one. The first one is related to an interaction and communication style of social actors that appeals to rationality by the provision of (logical) arguments, but does, at the same time, not violate the autonomy and freedom of choice of the "persuadees". The second, however, might be characterised by the application of non-, a- or irrational techniques by the "persuaders" which might be deemed ethically questionable (comp. Petty et al. 1996) and not in accordance with the humane vision of a GSIS.

We apply a three-level model of communication (Hofkirchner 2002), taking advantage of semiotic concepts. On the lowest level, we identify the syntactical aspect of communication, which is about the code that has to be shared by both the communicator and the communicant. The second level is the semantic level. Here communicator and communicant refer to something which is the content they discuss. It is on the uppermost level where persuasion enters the scene. The pragmatics of communication is about the social relationship of the participants in the communication process, it is about the intention and motivation which is the reason why communicator and communicant choose a certain content to talk about, it is about the values underlying the communication process. Having said this, the intention of the persuader is to make the persuadee share the same values. One option – the one that seems ethically sound – is, on the semantic level, to look for agreements as many as possible on facts that, on the pragmatic level, are compatible with, and do not contradict, the values the persuader wants the persuadee to share. It is important to remark here that values cannot be derived from facts and that hence the persuadee cannot logically be enforced to adopt values. There is still a leap in quality and it is up to the decision and free choice of the persuadee to adopt certain values or not. The other option – which is contested from the point of view of humanism – is to put weight on the pragmatic level only without resorting to arguments on the semantic level in their own right.

Persuasion strategies with the help of computers

When transposed to the computer, the problem arises which of the two styles and techniques shall and can be transferred. It is clear that it is the first style that ought to be selected. However, it is doubtful whether it is applicable, since the computer cannot argue in the same way a social actor is able to do and the persuadee cannot argue with the computer in the same way he would do with another social actor. Therefore the application of computers as means of persuasion is limited. What computers can do, is, by providing cues, to support the inviolable right of humans to decide on their own. They can raise the awareness of certain problems, but it seems inappropriate to design them for doing more than that.

The temptation to resort to models that remind of behaviouristic-style approaches when ICTs enter the stage is big. The bulk of psychological investigations, however, seems to already prioritize the second way of persuasion (comp. Wood 2000). These two different persuasive strategies are similar to the ones laid out in the Elaboration Likelihood Model (ELM) (Petty et al. 2005). The central route to persuasion involves the presentation of arguments, which are central to the issue at hand and require careful thinking and deliberation on the side of the

recipient or persuadee. On the contrary, the peripheral route requires much less cognitive processing and relies more on aspects like the attractiveness of the source, the message length or the presence of positive or negative stimuli in the context in which the message was presented.

Generally speaking, using the central route to persuasion can lead to long-term attitude and behavioral change. Also, the attitudes formed this way can be easily called to mind, which is key for rational decision-making. The peripheral route leads to a significantly different outcome: The achieved attitude change is much less sustainable, and the attitudes are less accessible to the conscious mind.

Based on our ethical concerns and also out of pragmatic considerations it would seem that the central route is the far superior approach. What could be better than persuading someone with rational arguments and achieving long lasting results at the same time? The problem is that in order to utilize the central route several preconditions have to be met. The persuadee has to have ample time for considering and thinking about the arguments presented, he has to be sufficiently motivated to do so and he should not be distracted while doing so. Since this is not always the case when a persuasive argument is brought forward to a user, we propose a dialectic approach for Ambient Persuasion.

The first persuasive argument regarding a particular issue is presented via the central route of persuasion when the user is undisturbed and has ample time for consideration. When the user agrees that he wants to change his behavior based on the arguments presented, peripheral cues are presented to him during his everyday live in the right situation in order to guide his behavior towards the desired goal.

An example for an application built on this new paradigm for Ambient Persuasion is the perFrames approach. perFrames aims to persuade users towards better sitting habits while working at a computer. The process in which the application is used is twofold. First, the user is presented arguments about the danger of bad posture and about proper sitting. When he agrees an ambient display is placed on his desk in order to provide cues about the sitting posture in order to adjust the users behavior. The user has decided based on the rational arguments presented to him. The peripheral route is only used after the conscious decision of the user in order to reinforce the desired behavior and to lead to a more sustainable behavior change.

Persuasive Interfaces that aim to improve health and well being have the advantage that people are often already motivated to lead healthier lives. They just need some support in order to make the first step towards a behavioral change or to follow through with a healthier lifestyle for an extended period of time. This is where persuasive interfaces can be utilized successfully. One category of these interfaces aims to make users exercise more. Often, they use a feedback mechanism to show the user the effect of her behavior. Examples include the Polar fitness watches or the Nike + iPod Sport Kit.

Another category of these interfaces aims to help the user to quit smoking. Important elements for the success of these interfaces are the intervention at the right time in the withdrawal process and also the combination with other medical and therapeutical modalities. Whereas current interfaces in this area usually focus only on specific parts of human health and wellbeing, future ubiquitous persuasive interfaces could be based on gathering a wide range of user data in UbiComp environments. Based on this data, the system can find the potentially most successfully approaches to improve the health of a specific user and tailor a persuasive strategy to help the user reach his individual health goals.

To give another example, UbiComp interfaces have employed persuasion successfully in order to change people's behaviors regarding environmental sustainability. Many of these interfaces aim to alter user's behavior by making them aware of the effect their actions during their everyday life have on the environment. They include a power cord which visualizes the electricity that flows through it (Gustafsson et al. 2005), persuasive appliances with integrated energy feedback (Mccalley et al. 2006) and an application showing users the impact their mobility behavior has on pollution (Obermair et al. 2006, Tscheligi et al. 2006).

Persuasive Interfaces for the environment face the problem that they do not address an issue about which most people are motivated intrinsically. Thus, they can be improved by offering the user an individual benefit on top of saving the planet. In the case of the interface for sustainable mobility, users also get timetable information and the opportunity to buy a bus ticket from their mobile phone. Another strategy to motivate users is to introduce an element of social connectivity. For example, this can be allowing the users to compare their efforts to conserve energy with their peers as a competitive and game-like feature.A future interface in this area could show the users their entire CO2 footprint, i.e.

their contribution to global warming, with ambient technology. This footprint is generated in real time based on the users' everyday actions. Additionally, the system could learn from the users behavior and offer alternatives that demand less CO2. Through connecting the users of this application with some of their peers (friends, family members), an element of social facilitation can be introduced. This could further increase the persuasive potential of this ubiquitous persuasive interface.

Conclusion

This paper has shown that Ambient Persuasion technologies, on the one hand, inhere the risk of subdueing the individual to heteronomy exercised by technology or – mediated via technology – by other social subjects, if the persuasion strategy chosen is oriented towards depriving the individual of its autonomy. On the other hand, they inhere the potential of helping alleviate social (e.g., health and well-being) and societal (e.g., environment) problems. In order to realize this potential, underlying values of different persuasion strategies have to be made explicit and, from the engineer to the manager to the stakeholder to the politician, decisions have to be made that are in accordance to the GSIS vision of a sustainable future for humanity.

References

Atkinson, B.M.C. Captology: A Critical Review. Proc. PERSUASIVE 2006, Springer (2006), 171-182.

Borchers, Timothy A. (2002): Persuasion in the Media Age. McGraw-Hill, Boston.

Bradley, G. Social and Community Informatics - Humans on the Net. Routledge 2006.

Fogg, B.J. Persuasive technology: using computers to change what we think and do. Morgan Kaufman, San Francisco, CA, 2003.

Fogg, B.J. The Six Most Powerful Persuasion Strategies. Proc. PERSUASIVE 2006, Springer (2006), 6.

Fotheringham, Wallace C. (1966): Perspectives on Persuasion. Allyn & Bacon, Boston.

Gustafsson, A. and M. Gyllenswärd. "The power-aware cord: energy awareness through ambient information display." In CHI '05 Extended Abstracts on Human Factors in Computing Systems (Portland, OR April 2005). CHI '05. New York: ACM Press, 1423-1426.

Hofkirchner 2002 Projekt Eine Welt: Kognition – Kommunikation – Kooperation. Versuch über die Selbstorganisation der Informationsgesellschaft. In: Kornwachs, K. (Hg.), Technikphilosophie, Bd. 9, LitVerlag, Münster.

Hofkirchner, W., Maier-Rabler, U. The Ethos of the Great Bifurcation. In: IRIE, Vol. 2, Nov. 2004.

IJsselsteijn, W., Kort, Y.d., Midden, C.J.H., Eggen, B., and Hoven, E.v.d. Persuasive Technology for Human Well-Being: Setting the Scene. Proc. PERSUASIVE 2006, Springer (2006), 1-5.

Jabusch, David M./Littlejohn, Stephen W. (1990): Elements of Speech Communication. Collegiate Press, San Diego.

Jowett, Garth S./ O'Donnell, Victoria (1999): Propaganda and Persuasion. Sage Publications, Thousand Oaks, London, New Delhi.

Mccalley, L.T., F.G. Kaiser, C.J.H. Midden, M. Keser, and M. Teunissen. "Persuasive appliances: Goal priming and behavioral response to product-integrated energy feedback." In Persuasive 2006 Proceedings Berlin, Germany: Springer.

Obermair, C., Ploderer, B., Reitberger, W., and Tscheligi, M. Cues in the environment: a design principle for ambient intelligence. Ext. Abstracts CHI 2006, ACM Press (2006), 1157-1162.

Petty, R., Cacioppo, J. (1996): Attitudes and persuasion: Classic and contemporary approaches. Westview Press, Boulder, CO.

Petty, R. E., Cacioppo, J. T., Strathman, A. J., Priester, J. (2005). To think or not to think: Exploring two routes to persuasion. In Brock, T., Green, M. (Ed.), Persuasion: Psychological Insights and Perspectives Thousand Oaks, California: Sage. 81-116.

Tscheligi, M., Reitberger, W., Obermair, C., and Ploderer, B. perCues: Trails of Persuasion for Ambient Intelligence. Proc. PERSUASIVE 2006, Springer (2006), 203-206

VDI (Verein Deutscher Ingenieure). Technology Assessment: Concepts and Foundations. VDI Richtlinien VDI 3780. Beuth Verlag, Berlin (2000).

VDI (Verein Deutscher Ingenieure). Fundamentals of Engineering Ethics. VDI, Düsseldorf (2002).

Weiser, M. The Computer for the Twenty-First Century, Scientific American (1991), 265 (3), 94-104.

Wood, W. Attitude Change: Persuasion and Social Influence. Annu. Rev. Psychol. (2000), 51, 539-570.

IRIE
International Review of Information Ethics Vol. 8 (12/2007)

Jessica Heesen and Oliver Siemoneit:

Opportunities for privacy and trust in the development of ubiquitous computing

Abstract:

This article deals with the technical genesis of ubiquitous computing and the opportunities for social participation in the development of technology. In this context, the ability of the system to protect the private sphere is identified as one of the most important criteria for a socially acceptable constitution. On the basis of the relationship between privacy and freedom, it is shown that the trust necessary for the social establishment of global IT networks is only developed through the preservation of the freedoms of choice and action.

Agenda

Authors:

Dr. Jessica Heesen

Institut für Philosophie, Universität Stuttgart, Seidenstrasse 36, D-70174 Stuttgart
☎ +49- 711 - 6858 2491; Fax: +49 - 711 - 6858 2492; ✉ jessica.heesen@philo.uni-stuttgart.de .

Dipl.-Kfm. techn. Oliver Siemoneit

Institut für Philosophie, Universität Stuttgart, Seidenstrasse 36, D-70174 Stuttgart
☎ +49- 711 - 6858 2491; Fax: +49 - 711 - 6858 2492; ✉ oliver.siemoneit@philo.uni-stuttgart.de

ISSN 1614-1687

Introduction

The topic of ubiquitous computing is a matter that, nowadays, is foremost in people's minds and enjoys a great deal of attention from research and professional practices. Above all, the media and consumer protection agencies have urged the risks and problems of the so-called RFID chips (Radio Frequency Identification) to the foreground of the discussion by treating them as forerunners to the technological vision. Many promoters and developers of this new technology are, therefore, complaining that social discussions exhibit a tendency to overemphasize the negative aspects and to extensively suppress the utility values. For many technical developers, it is, therefore, quite clear that a relationship of trust with selected user groups needs to be consciously developed so that the perception of this problem can be influenced and changed. The goal of the article at hand is to exhaustively discuss the desirability, possibilities, and limitations of this concept of trust management.

Technology development and social participation

Disputes about technology development are common practice in our modern society. This usually results in big, public debates about the manifested i.e. anticipated possible resulting consequences of technical artefacts and systems. From these debates, it is clear that not only the assessment of the consequences of mechanization but also the evaluation of its concrete technical advantages and induced social and socially structured effects diverge widely from one another. What counts as a contribution to the modernization of society for the one, is seen for the other as a step towards cultural decadence, massive unemployment, social coldness, and ecological catastrophe. Most of the controversies about technology are primarily not only about the technology itself but, above all, about the question of the development perspectives of the society in which we live: What kind of world do we want? What are our values, goals, and ideals? Which developments are extracted from these, and which are acceptable?

Toward the end of the 1980s and the beginning of the 1990s, the sociological research of technological genesis contributed significantly to destroying the idea of a traditional, uninfluenceable, quasi-self-propagating technological development and to replacing it with the model of „technology as social process". Technological genesis is conceived of as a process that takes place in several different phases which, at each stage, is carried out by a different constellation of agents. In accordance with a theory of a self-organized social network, strategic, social agents associate their plans of action with one another so that stable, cooperative relationships that facilitate the production of socio-technological innovations are produced. With statements like, „In the future, our world will be equipped with a multitude of the smallest sensors and wireless communicating ICT-Systems„, and „the introduction of RFID has reached a point of no return", the promoters of a technology create, similar to a self-fulfilling prophecy, a guideline for an individual action to which the aura of a certain inevitability attaches and which pushes towards its own realization and, in a structure building and altering manner, acts on social relationships.

Technological development as a social negotiating process is, according to Johannes Weyer, characterized by varying agent constellations and lines of confrontation, specific challenges and difficulties:

☐ Genesis phase: A group of loose, combined individuals create a technological vision through the free play of imagination and without consideration of the structures in demand. Concrete users are not yet in sight here.

☐ Stabilization phase: The transition from the building stage to systematic technological exploration is reached through the addition of strategic, social agents who, despite their different orientations, have a common interest in carrying through the advised technological project. Through the coupling of diverse, heterogeneous plans of action, a stable, social network is created which makes the development of prototypes and further research possible.

☐ The implementation phase: In the delicate phase of the implementation of a technology, the functioning applications under laboratory conditions need to show that the technology also functions outside of the support networks. Through extensively applied pilot attempts and demonstration projects, the new technology should prove its effectiveness and concern itself for the credibility and acceptance by its users. Thus, the implementation phase proves itself to be especially delicate because a variety of conflicting interests need to be integrated through the expansion of the relevant agents with potential users and concerned parties. The

neuralgic point here is to identify a specific number of useful implementation classes for technology users which lift the project above a critical threshold beyond which a technological development with its own momentum is possible and it is possible to speak of a success or breakthrough or perhaps an effective, technological innovation.

In recent years, a certain technology in its implementation stage is especially making headlines: the so-called 'Radio Frequency Identification' technology, in short: RFID technology, whose history began in the industry under the banner of Transponder Technology toward the end of the 1980s but whose origins can actually be traced back to the 1940s in the military realm. But only the rapid progress in material-, nano-, and microsystem technology in the past years made Transponder dwindle to a manageable magnitude and to approach an affordable mass-application. Especially in the course of discussions on the so-called ubiquitous and pervasive computing and also the ambient intelligence which propagates a dramatic integration of information and communications appliances, in short ICT-Systems, in our world, RFID technology enjoys high attention as an important enabler and forerunner of this vision.

The implementation phase of RFID technology proves itself, above all, to be difficult in the final consumer stage and is met with considerable controversy by users, data security engineers, and citizen organizations. Thus, the implementation phase, as the critical phase in the life cycle of a new technology, determines its future success: pilot projects should immediately put the performance of a new technology to the test, push through an integration of this new technology in the existing market and create new infrastructures of demand. The large-scale pilot projects and demonstrations have, however, not carried this out but, rather, have let loose an enormous shared refrain and fomented massive concern regarding its social desirability given the damage to jobs or the threat to data security and consumer sovereignty in the form of the creation of consumer and movement profiles, individual pricing and intensive advertisement, and one-to-one marketing. The social negotiation process of the technological configuration that has gotten underway threatens to tip over, from the perspective of the promoters of the RFID technology, so that the critical threshold which makes a self-perpetuating market possible is not longer reached. This in turn threatens a restriction in the area of commodities-logistics because the especially lucrative market of the final consumer realm cannot be made available due to these objections against the technology.

As already discussed, technical controversies during the introduction of a new technology are unavoidable because, exactly at the implementation phase of a technology, varying interests of social groups conflict with one another and need to be reconciled in a social negotiation process. The current discussions on the social tolerance of RFIDs and of ubiquitous computing are, from this perspective, typical of the phase and are to be deemed welcome because, alongside the uncontroversially present utility potentials, the important side-effects and negative consequences are now also coming to light. The safeguarding of personal freedom rights but also the protection of other so-called option- and liability values create, through this, the main focal point of contention. In this context, a key position accepts the protection of the private sphere, which is valued differently in the realm of this discussion: statements like „Forget privacy" or that privacy constitutes a repetitive, content-less concept in the western societies of the 21st century – are definitely extreme positions but they are, nevertheless, positions which, in the course of uncertainties due to international terrorism in recent times, are nurtured and are considered absorbing to discuss.

The changing and safeguarding of the private

The determinings of the private realm are results of the social development process which are fundamentally open to the practice of social discourses and of a general decision-making. The use of the applications of Context-Aware and ubiquitous computing demands the preparation of personal data and many applications aim at the protection of everyday activities and, through this, of the information-technological permeation of the private sphere. A social acceptance of these technologies is, due to their utility value, thus pitted against the problem of acceptability based on higher ranking ideals such as personal autonomy and the ability to take action. Liberal social orders ascribe a high significance to the protection of the private sphere, especially because the safeguarding of a private sphere is a necessary precondition for the protection of a freedom to take action. The private sphere offers, furthermore, the possibilities for personal retreat, rebound, for leisure as well as for the experience of

individual unreachability. Only in a realm that is extensively protected from heteronomous conditions can that spontaneity and unbiasedness of behavior be cultivated which is tied to the concept of freedom of action.

Three different forms of privacy are commonly distinguished. a) Decisional privacy which refers to the level of freedom of decision. b) Local privacy which has to do with the protection of living quarters and of residence information but also with the safeguarding of corporal integrity. c) Informational privacy which describes the protection and control of person-related information. Consequently, the effects of ubiquitous computing on the understanding and protection of the private are structured into these three parts.

Decisional privacy: ubiquitous assistance or control through ubiquitous computing?

The integration of sensors, PDA's (Personal Digital Assistants) and internet connections in our everyday life provides our surroundings, at least in our psychological perception, with the character of a social counterpart. The context appears as the generalized Other which confronts us as partner, assistant but also as spy. In the further development of network communications as „Internet of Things" , this effect of ubiquitous observability is turned into something positive and is considered acceptable as a ubiquitous assistance. Out of the connection between control and assistance in an intelligent environment, parasocial interaction-forms of media users are to be expected which not only induce discipline-effects but also bring about behavioral changes in a „positive" way, through free choice. This means that technologically anthropomorphic behavioral patterns increase and that a medialized, intelligent environment appears as a virtual reference group according to which the individual models his or her behavior. For the level of the freedom of decision (decisional privacy), this means that decisions are increasingly made as a reflection of the reaction to a technological system.

Local privacy: the severance of the local

Drawing borders between public and private residence areas is becoming increasingly difficult. Locator services (such as „Friend Finder") allow the discovery of individuals in the most diverse situations. Residence areas do not proffer a clear separation between private and public spheres anymore.

Ubiquitous computing scenarios make plain that, in this context, the trend is towards the further penetration of a more public private and professional world. The awareness of geographical independence in the undertaking of a job and of the never-actually-effected, temporal ending to a work-day can call the perception of the private sphere as an autonomous and unreachable component of human life into question. At the same time, strategies to pull oneself out of the immediate communication-context while simultaneously satisfying one's need for availability/communicability are already familiar. The new communication (online) relationships make possible a proxy representation of the individual (the digital Me, the avatar), which helps to manage a part of the communication problem. The ideal of constant reachability is modified into a realization of a spatial and temporal internet presence. „The telematic networks release us from the pressure of existence by their existence alone" claims Stefan Münker.

The residence also changes its persona as the embodiment of the local private sphere in the age of everyday information technology. The intelligent house technology connects the home with the World Wide Web and also with the supermarket around the corner. Smart-Home scenarios conceive of the private residence area as a place of integration in the extra-domestic realm (the home as the center of integration) . Thus, the scenarios outline a concept for living, that distinguishes itself from several conceptions that have been passed down, about the role of the house for the psycho-social experience. Until the middle of the 20th century, the house was perceived as a decidely not-public and as a familiar realm. The maintenance of local privacy corresponded with the image of the individual as someone who was divided into a public and a private person. But these role definitions are becoming increasingly invalidated. Even the concept of one's body as the most intimate locale of private availability can, in ubiquitous computing, become a component of data transfer. Health information and so-called vital statistics are becoming controlled and institutionally utilized to a large extent, in accordance with scenarios for the information-technological future optimization of public health. Thus, the domestic environment offers innumerable possibilities for automatic health tests and recommendations (measurements through the lavatory and the mirror, control of the purchase of food products, etc.).

Informational privacy: own data protection as a report

From the acceptance and dissemination of private homepages, cell phones, and other utility options from the Web 2.0 as well as from the widespread lack of concern in the realm of data security, it can be understood that the traditional protection of the personal private sphere has, in general, lost all meaning. As has already become clear with respect to local privacy, the separating line between public and private depends increasingly on the responsibility of the concerned persons (own data protection).

The free and individualized relationships with informational and media technologies frequently stand in contradiction to the right of the individual to privacy and informational self-determination. The realization of a right to informational self-determination seems hardly possible given the flood of personal data whose collection and transmission are indisposable for the functionality of applications. Precisely because, within the perspective of the guiding idea of ubiquitous computing, the individual is supposed to be the focal point, personal data are of high relevance in several applications. The maintenance of social relationship networks stands at the center of many considerations for a networked world. But exactly this connection between interactive user possibilities and the organization of relationship networks and self data protection produces new problems with respect to informational privacy.

Community platforms and information systems facilitate the uncomplicated and constant absorption of contacts for people from specific social relationship networks or also for strangers who learn about one another only through their shared interests. In this context, the locator service is of prominent importance. It gives information about the residence areas and, thus, about very sensitive data over which the concerned individuals, in claim of their right to informational self-determination, want to have autonomous control. A necessary precondition to this self-determination is, however, the assessment, classification, and indirect, external evaluation of the relationship qualities within the respective information systems. For individuals from familiar, friendly or professional relationship networks, the glimpse into their residence areas is protected in accordance with personal system pre-settings or is denied and is restricted to specific areas (for instance, the location within the office sphere could be allowed but queries beyond that be rejected). Through the protection or restriction of location queries, the concerned individuals in a personal relationship network indirectly leave behind a representation of their personal network relationships – the social subtext of their user settings – which itself has a reciprocal effect on the formation or establishment of relationships.

Also generally acknowledged in information technology imbued worlds: even technologies for the „anonymisation" or „pseudonymisation" of identities don't prevent strategies of personal data administration from becoming an essential component of external or individual safeguarding. Self/Own data protection is already a problem in anonymous communications networks in view of the competence of the individual to protect herself and also with regard to the technical and legal implementations of such strategies. In social networks, however, the own data protection can become problematic insofar as it reports ex-negativo on the behavior and preferences of the respective user.

The maintenance of optionality as a precondition for trust

From the preceding remarks, it is clear that: only the formation of utility options which allow the individual to freely decide about the form and extent of the private sphere can build a proportion of trust which is the precondition for the acceptable and enduring social use of ubiquitous computing applications. Such utility options expand into three preconditions: 1. The preparation of mature systems for the guarantee of data protection and security, 2. the increasing of user-autonomy through the enhancement of user-competence (transparency on demand, parallel communication), 3. the option to not participate in the use of comprehensive IT systems but, nevertheless, to not be closed off from relevant service facilities and information.

The idea of a directed trust management is to be rejected from a technological-ethical perspective. In any case, trust is hardly intentionally producible: trust is not implementable, and cannot be bought, ordered, learned or taught – but, rather, can only be supported as the characteristic of an attitude. Trust is not something that can be produced monocausally („Trust!"), cannot easily be summoned but is, instead, much like happiness, potentially „only" the valuable side-effect of actions which are undertaken for a different purpose. This does not mean that trust is not amenable to certain implementation technologies. Yet, the transition from „formally trustworthy" to „factual trust" is always a gift and,

due to its complex pre-conditions and conditions, is, in any case, hardly organizable.

References

Bohn, Jürgen, Coroama, Vlad, Langheinrich, Marc, Mattern, Friedemann, Rohs, Michael (2003): Allgegenwart und Verschwinden des Computers - Leben in einer Welt smarter Alltagsgegenstände, in: Grötker, Ralf (2003, Pub.), Privat!, Hannover, pp. 195-245

Feltes, Karin (2006): RFID-Chips: Geniale Erfindung oder Big Brother?, http://www.ard.de/ratgeber/special/rfid-chips/-/id=322978/nid=322978/did=320270/152dt16/

Fleisch, Elgar und Mattern, Friedemann (2005, Pub.): Das Internet der Dinge. Ubiquitous Computing und RFID in der Praxis: Visionen, Technologien, Anwendungen, Handlungsanleitungen. Berlin/Heidelberg 2005.

FoeBuD (2003): Positionspapier über den Gebrauch von RFID, http://www.foebud.org/rfid/positionspapier

Gesellschaft für Informatik (2005): Sachverständige der Gesellschaft für Informatik warnen vor möglicher Überwachung der Bevölkerung durch RFID-Chips, http://www.gi-ev.de/presse/pressearchiv/sachverstaendige-der-gesellschaft-fuer-informatik-warnen-vor-moeglicher-ueberwachung-der-bevoelkerung-durch-rfid-chips/

Heesen, Jessica (2007): Strategien für einen selbst bestimmten und freiheitlichen Umgang mit allgegenwärtigen Kommunikationsdiensten, in: GI (2007, Pub.): Informatik trifft Logistik. Beiträge der 37. Jahrestagung der Gesellschaft für Informatik e. V. – Proceedings 110 (2007), Band 1.

Hubig, Christoph (1995): Technik- und Wissenschaftsethik. Ein Leitfaden, Berlin/Heidelberg/New York 1993, 2. Version. Aufl. 1995.

Hubig, Christoph und Siemoneit, Oliver (2007): Vertrauen und Glaubwürdigkeit in der Unternehmenskommunikation, in: Piwinger, Manfred / Zerfaß, Ansgar (2007, Hrsg.), Handbuch Unternehmenskommunikation. Wiesbaden 2007.

Mead, George Herbert (1934): Mind, self and society. Chicago/London 1934.

Münker, Stefan (1997): Was heißt eigentlich: "Virtuelle Realität?", in: Münker, Stefan/Roesler, Alexander (1997, Pub.): Mythos Internet. Frankfurt a. M. 1997, 108 – 131.

Rössler, Beate (2001): Der Wert des Privaten. Frankfurt a. M. 2001.

Siemoneit, Oliver (2007): Context-Awareness und rationale Risikowahrnehmnung, in: GI (2007, Pub.): Informatik trifft Logistik. Beiträge der 37. Jahrestagung der Gesellschaft für Informatik e. V. – Proceedings 110 (2007), Band 1.

Spiegel (2005): Unweltschäden durch Funkchips?, in: Der Spiegel 50/2005, p. 150

Thiesse, Frederic (2005): Die Wahrnehmung von RFID als Risiko für die informationelle Selbstbestimmung, in: Fleisch, Elgar / Mattern, Friedemann (2005, Pub.): Das Internet der Dinge: Ubiquitous Computing und RFID in der Praxis: Visionen, Technologien, Anwendungen, Handlungsanleitungen, Berlin/Heidelberg 2005, 363 - 378

Weyer, Johannes (1997): Konturen einer netzwerktheoretischen Techniksoziologie, in: Weyer, Johannes (1997, Pub.), Technik, die Gesellschaft schafft: Soziale Netzwerke als Ort der Technikgenese, pp. 23 - 52

Wiegerling, Klaus (2007): Das Stuttgarter Konzept der Parallelkommunikation, in: GI (2007, Hrsg.): Informatik trifft Logistik. Beiträge der 37. Jahrestagung der Gesellschaft für Informatik e. V. – Proceedings 110 (2007), Band 1.

Ian Brown and Andrew A. Adams:

The ethical challenges of ubiquitous healthcare

Abstract:

Ubiquitous healthcare is an emerging area of technology that uses a large number of environmental and patient sensors and actuators to monitor and improve patients' physical and mental condition. Tiny sensors gather data on almost any physiological characteristic that can be used to diagnose health problems. This technology faces some challenging ethical questions, ranging from the small-scale individual issues of trust and efficacy to the societal issues of health and longevity gaps related to economic status. It presents particular problems in combining developing computer/information/media ethics with established medical ethics. This article describes a practice-based ethics approach, considering in particular the areas of privacy, agency, equity and liability. It raises questions that ubiquitous healthcare will force practitioners to face as they develop ubiquitous healthcare systems. Medicine is a controlled profession whose practise is commonly restricted by government-appointed authorities, whereas computer software and hardware development is notoriously lacking in such regimes.

Agenda

Authors:

Dr. Ian Brown

Oxford Internet Institute, University of Oxford, 1 St Giles', Oxford OX1 3JS, UK

☎ + 44 - 1865 – 287 210, ✉ ian.brown@oii.ox.ac.uk, 💻 people.oii.ox.ac.uk/brown/

Relevant publications:

Anderson, R.J., Brown, I., Clayton, R., Dowty, T., Korff, D. and Munro, E.: Children's Databases - Safety and Privacy. Wilmslow: Information Commissioner's Office 2006.

Brown, I. and Korff, D.. Striking the Right Balance: Respecting the Privacy of Individuals and Protecting the Public from Crime. Wilmslow: Information Commissioner's Office 2004.

Dr. Andrew A. Adams

School of Systems Engineering, University of Reading, 27 Westerham Walk, Reading RG2 0BA, UK

☎ +44 - 118 - 378 - 6997, ✉ A.A.Adams@reading.ac.uk, 💻 http://www.rdg.ac.uk/~sis00aaa/

Relevant publications:

ISSN 1614-1687

Adams, A.A.: Regulating CCTV. Proceedings of ETHICOMP 2007. 3—14
Adams, A.A.: Valid Protection or Abusive Control? DRM, Law and Technology. International Review of Law, Computers and Technology 20(3) 2007. 233—237

Introduction

Modern medicine is a highly technological field. No modern hospital is without its plethora of "machines that go ping". As these machines get smaller, cheaper and more powerful, they present some challenging ethical questions, ranging from the small scale individual questions of trust and efficacy to the societal issues of health and longevity gaps related to economic status. Thus the ethical issues raised by *ubiquitous healthcare* (see the next section for a definition) present particular problems in combining developing computer/information/media ethics with established medical ethics. The common ground between these areas includes:

- Confidentiality (medical ethics); privacy (information ethics)
- Responsibility (medical); liability and professionalism (information)
- Informed consent (medical); professionalism (information)
- Enforced treatment (public health); surveillance, censorship etc (information)

In addition, medicine is a controlled profession whose practise is restricted by government-appointed authorities in the developed world, whereas computer software and hardware development is notoriously lacking in such regimes. Medical technology, alongside drugs, must be individually approved for medical use, and is covered by much stricter liability laws than the average business computer.

Medical ethics is principally presented and studied as practise and outcome based,[1] with central authorities typically dealing with the hard cases and only time-sensitive decisions needing sole individual judgement, whereas information ethics tends to stress individual responsibility and judgement as the primary means to acting in a professional and ethical manner.

These apparently diametrically opposed approaches are not uncontroversial in their own fields[2][3] nor do they preclude the rich variety of ethical practice in both fields. However, the divergent norms in the two fields present extra difficulties in developing the necessary common understanding in the light of increasing reliance on computing technology for medical purposes.

In this article we present a practise-based ethics approach, raising the questions to which medical and computing professionals will be forced to face up, as they collaborate to develop and deploy ubiquitous healthcare systems.

Ubiquitous healthcare

Ubiquitous healthcare is an emerging field of technology that uses a large number of environmental and patient sensors and actuators to monitor and improve patients' physical and mental condition. Tiny sensors are being designed to gather information on bodily conditions such as temperature, heart rate, blood pressure, blood and urine chemical levels, breathing rate and volume, activity levels, and almost any other physiological characteristic that provides information that can be used to diagnose health problems. These sensors are worn on[4] or implanted in the body, or installed in patients' homes and workplaces. Actuators go further and trigger actions such as the release of small quantities of pharmaceuticals into the bloodstream or the electrical stimulation of brain areas (e.g. those implicated in conditions

[1] Frank, A. W.: Ethics as process and practice. 355—357

[2] Shildrick, M. and Mykitiuk, R.: Ethics of the Body.

[3] Hughes, C. and Thompson, C.: The International IT Professional Practice Programme.

[4] Roggen, D., Arnrich, B. and Troster, G.: Life Style Management using Wearable Computer.

such as Alzheimer's disease and Parkinson's disease[5] or those associated with depression[6]).

The main purpose of these sensors and actuators is to help patients and their carers monitor health status and design and implement interventions to improve that status. Initially, they are likely to be used by family doctors to remotely monitor patients, and provide general health advice while saving patients a trip to their offices. This is particularly useful for mobility-impaired patients, including many older people. In time, the technology is intended to support greater self-monitoring and care by all individuals, not just those with chronic conditions.[7] Less capable patients, such as young children and those with cognitive impairments, will need more intensive support from healthcare workers and family members. Ubiquitous healthcare technologies can monitor and advise on longer-term health factors such as diet and exercise, presaging a shift towards "well-being management" that incorporates social as well as physical and mental health.[8]

Technologies are also being developed to support the activities of healthcare workers, in hospitals and other critical care settings as well as primary care contexts. Examples include patient record systems that modify the information presented to hospital workers based on their current context;[9] support for improved information flow between nurses during shift changes;[10] and the collection and pre-transmission of information from accident scenes to hospitals.[11] Systems have also been developed to support the training of doctors.[12]

Finally, ubiquitous computing technologies are being used to improve the performance of patient support devices — such as helping cognitively impaired wheelchair users avoid impact with objects, and especially with other people in crowded areas,[13] and to provide feedback such as verbal descriptions of objects for visually impaired users.[14]

Ethical issues

How far should individuals be held directly responsible for the state of their body? Biological theories swing to and fro on how much of an individual's state of health is determined by nature (genetics) or nurture (lifestyle). Gradually, statistical norms are providing some of the answers, which are usually a combination of both genetic disposition and environmental factors that cause serious disease, whether that is heart disease, breast cancer or diabetes.

Health care in the industrialised world is generally provided on an insurance basis, but the funding mechanism for the insurance varies substantially: almost all public (e.g. UK), private/public (e.g. France) or almost all private (e.g. the US). Both public and private health insurance organisations

[5] Boockvar, J.A. and others: Long-term deep brain stimulation in a patient with essential tremor: clinical response and postmortem correlation with stimulator termination sites in ventral thalamus.

[6] Aouizerate, B. and others: Deep brain stimulation of the ventral caudate nucleus in the treatment of obsessive-compulsive disorder and major depression.

[7] Komninos, A. and Stamou, S.: HealthPal: An Intelligent Personal Medical Assistant for Supporting the Self-Monitoring of Healthcare in the Ageing Society.

[8] World Health Organization: Preamble to the Constitution of the World Health Organization as Adopted by the International Health Conference.

[9] Tantori, M., Favela, J. and Gonzalez, V.: Towards the Design of Activity-aware Mobile Adaptive Applications for Hospitals.

[10] Tang, C. and Carpendale, S.: Healthcare Quality and Information Flow during Shift Change.

[11] Massey T., Gao, T., Bernstein, D., Husain, A., Crawford, D., White, D., Selavo, L. and Sarrafzadeh, M.: Pervasive Triage: Towards Ubiquitous, Real-time Monitoring of Vital Signs for Pre-hospital Applications.

[12] Fishkin, K., Consolvo, S., Rode, J., Ross, B., Smith, I., and Souter, K.: Ubiquitous Computing Support for Skills Assessment in Medical School.

[13] Mihailidis, A., Elinas, P., Gunn, D., Boger, J. and Hoey, J.: Pervasive Computing to Enable Mobility in Older Adults with Cognitive Impairment.

[14] Coroama, V. and Rothenbacher, F.: The Chatty Environment - Providing Everyday Independence to the Visually Impaired.

face difficulties in dealing with the new information available about patients. While knowing genetic risk factors can allow public health insurance to focus preventive measures/diagnosis on those most at risk (early prescription of cholesterol lowering drugs for those genetically at risk of heart disease and regular scans for those most at risk of cancer) they also face calls for the freedom of those at risk of costing the publicly funded system large sums to be curtailed. Ericson and Haggerty[15] used Beck's[16] concept of the "Risk Society" to describe moves toward actuarial styles of policing and criminal "justice". Health care systems already use actuarial approaches a good deal more than policing has ever done. So, as more becomes known about disease factors and as it becomes easier to gather information about patients, what ethical questions are raised about the ubiquitous healthcare technologies discussed above?

Privacy

Who owns health information, and how restricted is access to it? Medical information is classed as "sensitive" by the EU Data Protection Directive,[17] and yet the UK government's National Health Service IT programme will place medical records onto a single system, much more vulnerable to mass access than the distributed data storage of today. Accessible by all medical personnel over the NHS' network and by the patient (and anyone capable of cracking into it) over the internet, it requires strong opt-out action to prevent every last detail being added from the relative security of a doctor's paper files and internal network, onto a system controlled at five regional centres. In collecting the massive amounts of health and lifestyle information gathered by ubiquitous healthcare systems, close attention will need to be paid to who controls what is gathered, who has access to it, and where/how/whether that information is stored.

Private health insurance companies often require a physical examination before insuring individuals. In the ubiquitous healthcare technology world would they be at liberty to require a trial period for gathering "total health information awareness" about patients before starting cover? Would they be allowed to require all patients to report all "risky" activity, backed up by monitoring showing exactly how much alcohol one had that last weekend before suffering a stomach ailment?

Agency

With great information comes the potential for behaviour modification. So thought Bentham[18] and Foucault,[19] at least. Will our bodies become our Panoptic prison, and our behaviour be dictated by health insurance limitations? Will technology gradually reshape and modify unhealthy behaviours?[20] Will mood-altering drugs (already appetite suppressant drugs are being marketed to both the obese and the anorexic) take this a stage further and "programme" our reactions to avoid disease? Will the robot nurse of the present Japanese old folks' home become the robotic Nurse Ratched of the future?

Equity

The health gap between rich and poor (and the associated life expectancy gap) is already significant in many developed countries. In the UK for example, life expectancy between rich and poor differs by 5% of lifespan[21]. Government responses have included suggestions to "force" the poor to take up healthier lifestyles to make up for their economic disadvantage. More advanced healthcare is already available if one has the money. Will the development of ubiquitous technologies exacerbate this trend and if so, should the lack of

---

[15] Ericson, R. V. and Haggerty, K.D.: Policing the Risk Society.

[16] Beck, U.: Risk Society: Towards a New Modernity.

[17] European Parliament and Council of the European Communities: Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[18] Bozovic, M.: The Panopticon Writings.

[19] Foucault, M.: Discipline and Punish.

[20] Intille, S.: Ubiquitous Computing Technology for Just-in-Time Motivation of Behavior Change.

[21] Shaw, M., Smith, G.D. and Dorling, D.: Health inequalities and New Labour: how the promises compare with real progress.

availability to all prevent those who can afford it from spending their money on the greatest prize of all — a longer healthier life?

Responsibility for errors

The largest payments in civil court cases in the US tend to be for medical mistakes, due to both the impact and need of patients put at great risk by faulty procedures, and by the reaction against "betrayed trust" when medical personnel get it wrong. The history of healthcare informatics is littered with examples of software failure producing grievous harm (e.g. the Therac 25 case[22]). If automated ubiquitous systems go wrong and harm results, who is to blame, and how will consequent costs be covered in already financially stretched systems? As technology becomes ever more complex, what will "informed consent" look like?[23]

Ethical Discussions

In this section, we consider first the most significant basic ethical principles which must inform the ethical debate about ubiquitous healthcare, and then some initial normative responses to the ethical questions raised above.

Relevant Principles

The two primary (though not the only) ethical principles applied in healthcare are beneficence and autonomy[24]. The progress made in the twentieth century in requiring informed consent to medical procedures is often characterised (or, it might be claimed over-simplified) as a battle between beneficence attitudes and respect for autonomy in medical settings. Of course this dichotomy (whether actual or only perceived) is far too simple to adequately describe real medical ethics in practice. It ignores broader questions of social justice that arise in a resource-limited system. It ignores questions of agency and their link to autonomy (from whether heavy drinkers should be provided with liver transplants to whether heavy smokers should have to pay for their anti-cancer drugs). The autonomy/beneficence dichotomy also ignores the balance of rights in the smaller sense such as is at stake with questions of family consent to organ donation or in questions of late term abortion. It ignores questions of the medicalisation of "difference" such as occurs with human hermapdroditism (one of a number of situations described in the medical literature as "abnormalities of sex determination"). There are many other issues at stake and the clean representation of an emerging ethics of ubiquitous healthcare as presented in this paper should be taken only as a starting point.

In Information ethics, autonomy has emerged as the primary principle in many areas. Privacy rights, for example, are justified on the basis of autonomy, when they are justified at all instead of taken as *sui generis* rights.

Social justice is beginning to emerge as a significant factor in discussion of digital divides[25]. Beneficence (or its more extreme cousin paternalism) is used as the justification for a variety of information policy decisions, particularly including decisions on what, how and from whom to censor access to information online.

Privacy

Information privacy guidelines, clearly based on the principle of autonomy, are one of the most well developed areas of agreement between information and medical ethicists. In general terms, information about an individual must be processed with clear respect for the individual. The beneficence principle is also at work, here, however, as may be seen in the statements of the UK Information Commissioner's response to the case of George and Gertrude Gates in December 2003. Following the claims of British Gas that the UK's Data Protection Act prevented them from passing details of the withdrawal of the couple's energy supply to social services, the Information Commissioner made it clear that the right to information privacy must be interpreted with due attention to a duty of care owed to customers, particularly those vulnerable to significant negative consequences without information sharing.

---

[22] Leveson, N. G. and Turner, C. S.: An Investigation of the Therac-25 Accidents.

[23] Faden, R. and Beauchamp, T.: A History and Theory of Informed Consent.

[24] *Ibid.*

[25] Baskaran, A. and Muchie, M.: Bridging the Digital Divide.

So, in developing appropriate ethical approaches to the massively increased volume and sensitivity of data that will be generated by ubiquitous healthcare devices, a balance must be struck between preserving the autonomy of individuals, and preserving their life and good health. In general terms, access to information should be under the control of the patient or their appointed guardian (for those deemed legally incompetent to make such decisions).

Further work is needed on the issue of access to information either for statistical research purposes, or where resources allocation questions are at stake (see normative responses on equity questions below).

Agency

Medical ethics is perhaps the one area of life in which beneficence is routinely allowed to override autonomy. Even the most liberal of governments have laws against extreme forms of self-harm (such as taking regular doses of highly addictive drugs). In most countries, even many relatively mild substances are heavily controlled in their application. Similarly, certain attitudes are generally taken as indicative of incompetence (the most obvious being suicidal tendencies). Medical ethics already struggles with the question of enforced treatment of those with personality disorders, and legal questions abound about the deprivation of liberty of those diagnosed with untreatable disorders who have yet to commit violent acts, but for whom this is regarded as (almost) inevitable by qualified personnel. These questions will become ever more difficult as ubiquitous healthcare develops, alongside related physical and chemical advances. Should a pessimistic individual be permitted to undergo the implantation of deep brain stimulation devices, or should these be restricted only to those with deep depression?

If one takes the current normative view of drugs, then such treatments are only to be used where the consequences of non-use are appalling. However, alcohol is almost universally and caffeine universally available. The definition of ability and disability, normality and abnormality, difference and deviance, are socially defined. As one might literally be able to "turn on the waterworks" or "turn one's frown upside down", society will have to struggle further with questions of allowed self-determination. When the self is effected by the treatment, in a deliberate and planned way, which self should decide on the initiation and/or cessation of treatment comes to the fore as the central question to be addressed.

Equity

The cost of new cancer drugs is bringing the stark realities of healthcare divides into the cosy world of the UK's NHS. Private insurance regimes in countries like the US have been faced with these dilemmas for longer, but have seemed powerless to prevent them growing ever larger, particularly with an ageing population coinciding with the demographic wave of the baby boomer generation reaching old age.

Ubiquitous healthcare will bring these questions into ever-starker relief. The exponential increase in computing power, combined with the linear decrease in the cost of hardware systems has not prevented a growing digital divide from opening up. So, although the ubiquitous healthcare divide may not be as wide as the cancer drug divide, and the length of time from development to affordability may be shorter, the diversion of resources from traditional healthcare to ubiquitous devices may severely exacerbate the difficulties already facing healthcare systems worldwide.

Preventing patents from becoming the usual profit-making centre of ubiquitous healthcare devices (either for hardware or software) would seem to be a priority for avoiding the kind of inequities in drug availability we are now seeing[26]. Using market forces to provide incentives not only for ameliorating the symptoms of the rich, but for curing the disabling health problems of all would seem a necessary (but not sufficient) step in reducing the contribution of ubiquitous healthcare to existing social inequities.

Responsibility for Error

It is clear that the warranty disclaimers of the software industry cannot easily be merged into the litigious world of medical (mal)practise. However, the demand for ever-greater health benefits from new technology may well force a less rigid standard of liability in ubiquitous healthcare markets. An acceptance of the fallibility of human action is already built into the professional standards of the medical profession, and the rapid pace of techno-

[26] Drahos, P. and Braithwaite, J.: Information Feudalism.

logical transformation may well force an even lower standard to prevail for ubiquitous healthcare technologies than is acceptable for other elements of health care. This, too, will remain an area in need of both ethical consideration and practical and legal application.

Conclusion

The ethical implications of ubiquitous healthcare are many and varied. They cannot be answered by medical ethics or information ethics alone. Nor can they be answered now, once and for all. They will require constant consideration, discussion, evolution and occasionally revolution.

Different social settings may produce different answers, just as a multiplicity of views exists today on questions of reproductive ethics and freedom of speech. The extreme globalisation required of information ethics is not (yet at least) required of ubiquitous healthcare ethics, bounded as it is by the physical embodiment of the patient. However, the impact of access to technology and self-diagnosis (even self-treatment) and a more internationally mobile population, require a more internationally aware approach in the ethics of ubiquitous healthcare than has been the case for medical ethics to date, where significant differences have been easily tolerated, even for close neighbours such as the UK and the Republic of Ireland (who have radically different reproductive ethics stances).

References

Aouizerate, B. and others: Deep brain stimulation of the ventral caudate nucleus in the treatment of obsessive-compulsive disorder and major depression. Journal of Neurosurgery (101) 2004. 682—686

Beck, U.: Risk Society: Towards a New Modernity. London, Sage 1992.

Baskaran, A. and Muchie, M.: Bridging the Digital Divide. London, Adonis & Abbey 2006.

Boockvar, J.A. and others: Long-term deep brain stimulation in a patient with essential tremor: clinical response and postmortem correlation with stimulator termination sites in ventral thalamus. Journal of Neurosurgery (93) 2000. 140—144

Bozovic, M.: The Panopticon Writings. London, Verso 1995.

Coroama, V. and Rothenbacher, F.: The Chatty Environment - Providing Everyday Independence to the Visually Impaired. Proceedings of UbiHealth 2003: The 2nd International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications. Seattle 2003.

Drahos, P. and Braithwaite, J.: Information Feudalism. London Earthscan 2002.

Ericson, R. V. and Haggerty, K.D.: Policing the Risk Society. Clarendon Press 1997.

European Parliament and Council of the European Communities: Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data. OJ L 281 2001. 31—50

Faden, R. and Beauchamp, T.: A History and Theory of Informed Consent. Oxford, Oxford University Press 1986.

Fishkin, K., Consolvo, S., Rode, J., Ross, B., Smith, I., and Souter, K.: Ubiquitous Computing Support for Skills Assessment in Medical School. Proceedings of UbiHealth 2004: The 3rd International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications. Nottingham 2004.

Foucault, M.: Discipline and Punish. Penguin 1977.

Frank, A. W.: Ethics as process and practice. Internal Medicine Journal 34(6) 2004. 355—357

Hughes, C. and Thompson, C.: The International IT Professional Practice Programme. British Computer Society 2007

Intille, S.: Ubiquitous Computing Technology for Just-in-Time Motivation of Behavior Change. Proceedings of UbiHealth 2003: The 2nd International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications. Seattle 2003.

Komninos, A. and Stamou, S.: HealthPal: An Intelligent Personal Medical Assistant for Supporting the Self-Monitoring of Healthcare in the Ageing Society. Proceedings of UbiHealth 2006: The 4th International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, Copenhagen 2006.

Leveson, N. G. and Turner, C. S.: An Investigation of the Therac-25 Accidents. IEEE Computer 26(7) 1993. 18—41

Massey T., Gao, T., Bernstein, D., Husain, A., Crawford, D., White, D., Selavo, L. and Sarrafzadeh, M.: Pervasive Triage: Towards Ubiq-

uitous, Real-time Monitoring of Vital Signs for Pre-hospital Applications. Proceedings of UbiHealth 2006: The 4th International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, Copenhagen 2006.

Mihailidis, A., Elinas, P., Gunn, D., Boger, J. and Hoey, J.: Pervasive Computing to Enable Mobility in Older Adults with Cognitive Impairment. Proceedings of UbiHealth 2006: The 4th International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, Copenhagen 2006.

Roggen, D., Arnrich, B. and Troster, G.: Life Style Management using Wearable Computer. Proceedings of UbiHealth 2006: The 4th International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, Copenhagen 2006.

Shaw, M., Smith, G.D. and Dorling, D.: Health inequalities and New Labour: how the promises compare with real progress. British Medical Journal (330) 2005. 1016—1021

Shildrick, M. and Mykitiuk, R.: Ethics of the Body. Cambridge, MA: MIT Press 2005.

Tang, C. and Carpendale, S.: Healthcare Quality and Information Flow during Shift Change. Proceedings of UbiHealth 2006: The 4th International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, Copenhagen 2006.

Tantori, M., Favela, J. and Gonzalez, V.: Towards the Design of Activity-aware Mobile Adaptive Applications for Hospitals. Proceedings of UbiHealth 2006: The 4th International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, Copenhagen 2006.

World Health Organization: Preamble to the Constitution of the World Health Organization as Adopted by the International Health Conference. New York 1946.