

Privacy in the house of the future

Aleksandar Cetkovic

How will the architecture of our most private of all places, our home, change when the Ubiquitous House, with its ubiquitous sensors and activators to control all kind of daily functionalities, gets hooked to the net and its information about us, placed at disposal of large companies? Will we take different roles in real life, in order not to give away our real identity? Or will the notion of privacy, as we know it, simply disappear?

The house of the future is usually portrayed as the Ubiquitous House. Derived from Ubiquitous Computing and House the term describes a house in which its technologies are interlinked (LAN, Wireless) and communicate with each other to create a smart environment and control the different functionalities of the house. The main focus of such an environment is the inhabitant. The scanners observe the inhabitants in order to control the different aspects of space, including lighting, air conditioning, heating, humidity etc. The development efforts go into the direction of creating an intelligent house – intelligent in the sense that it learns by observing the user's reactions to specific situations or deploys resources intelligently. This might sound very sophisticated and reasonable but at the same time, it means that the privacy of the user is analyzed and digitally stored. If the gathered data stays in the user's possession it is not an issue, but could become very troubling if it gets into wrong hands.

The subject of privacy in a ubiquitous house has been intensely debated, being crucial for the general acceptance of the whole idea in the private realm. In this paper, I do not intend to add to any of the technological solutions already provided or proposed to keep the collected data private; instead I want to analyze the social and architectural aspects of the idea and to compare them with some of the privacy issues on the Internet.

Privacy

We all understand the term privacy, yet when discussing privacy there are different definitions and views depending on the discipline and the context in which the term is used. Merriam's Dictionary defines privacy as: "the quality or state of being apart from company or observation: seclusion," but the dictionary definition seems vague.

For computer science and ubiquitous computing privacy is all about storing personal information in digital form and who has access to it and when. As Katie Shilton puts it: "Privacy – the ability to understand, choose, and control what personal information you share, with whom, and for how long." [1]

Then again, for the architect, privacy is all about the place of intimacy and where we can express our private selves. As discussed in Juhani Pallasmaa's *Phenomenology of the Home*:

We have private and social personalities, and home is the realm of the former [...] The secrecy of private lives concealed from the public eye structures our social life. Home is the place of intimacy where we hide our secrets and express our private selves. Home is our place of dreaming and resting in safety. [2]

Therefore, the debate around privacy is not only about the home being a private place, but also about the consciousness of being in a private area, where we can express ourselves as we are.

“Privacy is necessary for people to become properly moral thinkers and persons. We need to reflect on the things we want to do, and the space for reflection is typically private.” [3]

The question arises if the awareness of being observed by different gadgets in our own four walls still makes us feel 'at home' or will we be more careful about the way we express ourselves?

Another aspect of privacy or the notion of private space is that the interpretation may change over time, depending on factors such as culture, crowding, context or amount of room around us, as Edward Hall pointed out in his classic *The Hidden Dimension*. [4]

Architecture and Ubiquitous Computing

The future technology involved in the Ubiquitous House will be difficult to grasp as a phenomenon. Most probably, it will not enter our homes as one all-embracing product, but gradually, in small portions, in form of distinct systems that control different aspects of our house. The sum of all these systems will build up to constitute the Ubiquitous House. Even if the systems will not communicate with each other (probably at the beginning), the objective of their surveillance and analysis will be the same – the user in the home.

In the Ubiquitous House, the user needs to be surveyed to accommodate and automate his needs and wishes; the house is supposed to become a machine anticipating desires. To achieve this, the technical environment measures every movement and action, embeds the situation in an environmental description of the moment, and stores the data together with the intentions of the user (in the form of activated functions) to analyze them over time and predict future needs and actions. The combination of all the collected and combined data creates a digital image of the user, a digital alter ego corresponding to the measured actions he or she repeats over time in the house.

What is disturbing is that this digital representation is omnipresent and very intimate in its nature. Each recording (for example, turning on and off the light, entering a room, opening a window) might be harmless and trivial when singular, as it describes only the activation of certain functions. However, in the combination of different recordings and spread over time it provides a picture of our habits.

On the one hand, they could give a fascinating picture of us, our everyday practices, and personal and cultural conventions by which we live; on the other hand, however, expose our irrational acts, reveal unconscious personalities or even unveil oddities and eccentricities. In its objectivity, the recordings would not be too picky about the details. The house could help us control our health, pre-empt diseases, calculate and order food and household goods. It could even listen to our interpersonal conversations to interpret our intentions, moods and social interaction to be able to intervene appropriately (dim the light, turn on soft music in case of a romantic mood, or shut the windows and doors if a loud discussion is not intended for the ears of the neighbors).

What is interesting is that not only our habits or our conversations can be analyzed but also our behavior can be predicted. Researchers analyzing social habits in social networks, such as Facebook, MySpace, LinkedIn and so forth, were able to predict which individuals were to become couples by observing how intensely one person was checking another person's profile. [5] Social networks have become a popular source for Sociology and Social Psychology. Collecting data in the house would provide even more comprehensive measurements of homo sapiens. Masses of data, allow us not only to analyze the individual,

but can even lead to define patterns of behavior attributed to social groups or even mankind in general. The user becomes fully transparent (der gläserne Mensch) when the recordings in the house are combined with the digitalized thoughts, interests and discussions of the individual on the Internet. The general behavioral patterns discovered by the researchers, allow then interpreting the behavior of the individual more easily.

It is precisely this kind of information that the researchers hope to reveal and to adapt the house and its technology to our needs and predict our desires: the house of total comfort, ease and no-brainer.

On the other side, it reveals our private side. There would be no hidden sides that we could live out in private, irregularities that make us different, no intimacy. Privacy as we know it would disappear.

Our reaction today to such a radical cut in our privacy is uncertainty, fear, distrust and rejection of any such system. Of course, nobody plans to take away our privacy or break into the serenity of our home. Most of the researchers and visionaries in the field of ubiquitous computing are also confident that the data collected would stay private. Beside the research on how to realize the Ubiquitous House, there is a consensus that this could be only achieved by keeping the data private; research to make such systems intrusion-free is in progress. Apart from traditional security measures denying access to digital data, different strategies for keeping data secret have been presented: anonymizing data; introducing special personal access keys; [6] storing relative as opposed to absolute data; [7] determining privacy settings that can be negotiated with the sensors. [8]

Many aspects of the technology will make it inevitable in our houses. In Japan, which is confronted with a demographic problem of over aging, huge efforts have been invested in Gerontechnology – the use of technology for the aid of the elderly. Many fascinating ideas have been produced, proving that introducing ubiquitous computing in the house is worthwhile, like the iPot, [9] a kettle for the elderly living alone, that sends out signals how often it is used, thus telling the relatives indirectly that all is well. It is a good example of combining cultural aspects, such as the continuous use of hot water in Japanese households, with a discrete but aware element of surveillance.

The changing patterns of human-technology interaction have an influence on how the built environment is perceived, especially in a surveyed environment that interacts to our needs and environmental conditions. Even the term privacy and what can be labeled as private is undergoing a dramatic change.

This shift in the understanding of privacy can partially also be seen in architecture.

Architecture and Privacy

In his book *The Un-Private House* [10] Terence Riley analyzes the changes recently undertaken in the private house. Examples he gives describe the new tendency of the residents to expose themselves to the public, as displayed in different strategies of housing. For instance the public gaze can enter more or less unobstructed in the house (Michael Bell's *Glass House*, Shigeru Ban's *Curtain Wall House*, Neil Denari's *Massey House*), the public is mediated in the house (Lupo/Rowen's *Lipschutz/Jones Apartment*, Herzog & de Meuron's *Kramlich Residence*, Hariri & Hariri's *Digital House*) or the house is designed as a reception for the public (Michael Maltzan's *Hergott Shepard Residence*). These are only some examples in a trend of opening the house to the public.

Modern architecture has provided us with lofty and open rooms; glazed facades that let the light in and at the same time open the inner life to the gazes outside. Winy Maas from the architecture and design practice MVRDV said:

Putting the inside, even your own, on display seems a very modern topic. It might be perverse but it has similarities with the mixture of privacy and publicness these days: walking on the zebra crossing and listening to the love conversation of the neighbor who is phoning his girlfriend, the way people show their privacy on the television in order to attract attention. In such a condition the ancient limitations between privacy and publicity seem to be irrelevant.

With new media, television and radio, the telephone and especially the computer, the public has entered the home. The interconnectivity with the computer has made the far-away present in the house more than ever, with the web-cam allowing the presence of a public that in physical sense would never have been able to fit in the home. There are individuals that expose their private sphere readily 24/7 on the Net; the first and quite well-known was jennycam (Jennifer Ringley) who attracted a large community that consumed this sort of exhibitionism.

Privacy and Internet

The discussion about private and public has long left the focus of the house/street discussion and shifted to the Internet. Yet, this shift allows us to observe the way private data is harvested on the Internet, to give a glimpse of strategies that could be used to collect digital personal data, for different reasons, in the real world. There is an ongoing debate on the ethical and juristic consequences of collecting data in the public – where most of us believe that an individual disappears in the masses or is hard to trace in the amount of data produced. However, the latest developments in surveillance technology have shown that to stay anonymous in public, precautions have to be made.

Internet strategies – such as those of large companies offering free mail accounts, free chat and VOIP-communication in return for data such as addresses, links, opinions and other information that can be extruded out of Internet habits – could be shifted towards information harvesting in the city and its buildings. Already big companies such as Google, Apple and Microsoft collect information based on our location and what actions are linked to that place – for what purpose is yet to be seen. The studies on Internet privacy [11, 12, 13] are not as much intrigued with how privacy is carelessly exposed, but to what extent it is willingly given. There is, of course, much ignorance, disbelief or just plain naivety in respect of the capabilities of consumer companies to collect information about individuals or their capabilities to harvest such details out of the sheer flood of data. The existence of companies that just handle – not collect – data on the Internet contributed to people or companies show the extent of development in this field. Experts are already discussing the market of such data, data-banks and exchange markets (like stock markets) for such collections of data as the next big expansion-possibility once the money-markets get more regulated. [14]

However, what is really surprising about diminishing privacy on the Net is the behavior of certain parts of the new generation, which has grown up with the Internet. On the Net we find individuals who see their private-data as a value or means to exchange for online-services. For instance, individuals who use the Internet to propagate themselves: in the run to avoid the trivial and anonymity, all aspects of life get published. Thus, not only to impress the (virtual-) friends, but also in the hope to become famous: the Net sieves the information to find some poignant and exciting aspect that is worth propagating. That

this strategy can backfire is one of the lessons yet to be learned, as the Internet will not forget, even if we as individuals might change over time.

Internet strategies applied to the Ubiquitous House

In a thought experiment, I would like to employ strategies from the Internet for collecting user data in the Ubiquitous House.

Big food companies could offer household appliances such as free fridges in return for our consumption information. Whenever milk, butter or eggs would be used up, the company would automatically deliver the goods directly to the fridge. This would bring the advantage of time-saving and continuously fresh supplies for the consumer and for the company the guarantee of consumer-loyalty/dependency relation and ease of just-in-time logistics of food supplies through availability of consumer data. Furthermore, the collected data of user behavior can be sold on the information market. Combining different information sources, allow creating a precise user profile. The consumer habits in the house can be combined with search information and order habits from the Internet. This profile could be used to create new marketing strategies and produce product desires tailored specifically for the user. Moreover, new services that would make life easier in the house would be provided to the user, again 'free' of charge, so that the user gets tempted to deliver more crucial information about his or her behavior. Life in the house becomes a commodity. Our actions, our consumption habits (material but also energy, free-time, social and other immaterial habits) our cultural and religious habits, even our health-data – all can be swapped for seemingly free services that would allow companies to design products tailored to our needs.

The role of architecture in privacy of a ubiquitous house

As Katie Shilton appealed to the designers of ubiquitous technologies not to abuse the privacy of the user and to store only relative data, I think it is up to the designers and architects designing ubiquitous houses to provide the users with a choice by showing the possibilities of the ubiquitous environment through transparent design. Maybe 'surveyed areas' and surveyed objects have to be distinguished, so people are aware of being registered by what sensor. Something like work by the artist group "made," who painted surfaces in public areas which were surveyed by CCTV cameras; distinguishing scanned areas so as to allow the public to choose if they wish to be registered or if they want to stay out. This visualization of the surveyed spaces and uncovering of the gadgets involved is clearly opposing the vision of ubiquitous computing in the house as originally defined by Mark Weiser, [15] who envisioned gadgets being pervasive but out of sight. I would state that uncovering or making sensors visible and areas that are observed obvious, would make the user feel more in control of what he is giving away and when; thus more at ease.

Another possibility is to create rooms or surfaces that are surveillance free, giving the user the certitude of private areas, and other parts of the home where the user is conscious of the possibility of being observed. Just like the modern open apartments where the dweller is conscious of the possibility of being observed in the living room by the odd passer-by and at the same time having the confidence of being unobserved if the blinds are pulled down. It is up to the user to choose.

Conclusion

With the paper I wanted to state that the problem of privacy in the Ubiquitous House is not necessarily only a technological one but could also be seen as a phenomenological problem. Looking at the strategies of data harvesting on the Internet today, it is more probable that the user of the Ubiquitous House would be giving parts of private data voluntarily as opposed to them being collected illegally, however the combination of different sources of data could then be quite revealing.

In contrast to conscious providing of information on the Internet, we don't know what is revealed in the Ubiquitous House as the data is produced through (unconscious) actions of everyday life. Awareness of the omnipresence of scanners in a house changes the role of the home for its user. If we cannot perceive the technology around us, but are nonetheless aware of it by registering the reactions to our presence or our actions, inevitably we will ask: "What information is being collected, when, and what happens with all the information?" Seeing where the sensors are and apperceiving the causality of reactions in the house to users actions, would not only propagate a sense of control but would probably allow creative interaction, turning the ubiquitous technology into a real tool.

Thus the option of integrating the visibility and awareness of surveillance in the design of the home of the future and giving the possibility to stay unobserved when desired are important parts of gaining the confidence of the user in the abilities of the Ubiquitous House and providing privacy in the house.

References and Notes:

1. Katie Shilton, "Four billion little brothers?" *Communications of the ACM*, no: 52 (2009).
2. Juhani Pallasmaa, "Phenomenology of Home," in *The New Private Realm, Studio '93-'94*, eds. Marijke Beek, Irene Curulli, Rafael Gómez Moriana, Roland King and Jan Peter Wingender (Rotterdam: 010 Publishers, 1995).
3. Beate Rossler, *The Value of Privacy* (Cambridge: Polity Press, 2004).
4. Edward T. Hall, *The Hidden Dimension* (New York: Doubleday & Co., 1966).
5. Eben Moglen, "Freedom In the Cloud" (speech, Internet Society, New York, February 5, 2010).
6. Scott Lederer, Anind Dey, and Jennifer Mankoff, "Everyday Privacy in Ubiquitous Computing Environments" (conference, UbiComp 2002, Göteborg, September 29 - October 1, 2002).
7. Katie Shilton, "Four billion little brothers?"
8. Marc Langheinrich, "A Privacy Awareness System for Ubiquitous Computing Environments" (conference, UbiComp 2002, Göteborg, September 29 - October 1, 2002).
9. "The Grey Market: Hey, Big-Spender," *The Economist*(December, 2005).
10. Terence Riley, *The Un-Private House* (New York: Museum of Modern Art, 1999).
11. Viktor Mayer-Schonberger, *Delete: The Virtue of Forgetting in the Digital Age* (New York: Princeton University Press, 2009).
12. Kieron O'Hara, and Nigel Shadbolt, *The Spy in the Coffee* (Oxford: Oneworld, 2008).
13. Terence Riley, *The Un-Private House*.
14. Matthias Bauer, Benjamin Fabian, Matthias Fischmann, and Seda Gürses, "Emerging Markets for RFID Traces," <http://arxiv.org/abs/cs/0606018> (accessed March 22, 2012).
15. Mark Weiser, "The Computer in the 21st Century," *Scientific American* 265, no. 3 (1991).