

Privacy and Location Technologies

Jens Pedersen

Department of Design and Use of IT,
IT University of Copenhagen,
Rued Langgaards Vej 7, Copenhagen 2300
Denmark
jensp@itu.dk

Abstract. Location technologies challenge user's privacy, wherefore several technical solutions have been proposed to mitigate real and potential problems. To adequately deal with the complexities of privacy, I suggest that a greater analytical understanding and conceptual clarity is needed as well. I discuss briefly how privacy could be conceptualized more productively; how ICT in general influences privacy and some specific problems arising from use of location technologies. Finally, a usability evaluation criterion for location technologies in terms of privacy is proposed.

1 Introduction

It is clear that a user's privacy can be challenged by location technologies. Being able to track wherever we move with great precision around the clock is close to an Orwellian nightmare. Location technologies do not have to be employed in scenarios like that – they can be used without challenging privacy noticeably. Still, the bare idea of location tracking seems to evoke a basic fear in many people – feeling unable to escape the gaze of others.¹ Consequently, quite a lot of work has gone into different technological solutions securing pseudonymity or anonymity when using various location systems (see e.g. [2, 3]). These projects are valuable and promising and are no doubt part of the solution to some of the privacy problems location technologies introduce. However, there is still a need for a better conceptual and analytical understanding of privacy and information and communication technologies (ICT) in general [4] and privacy and location technologies in particular. In fact, it can be argued that the notion of privacy itself needs a more thorough conceptual clarification as to be useful in design of location technologies as well.

Therefore to improve the analysis of the consequences of location technology on privacy we need to take three steps:

1. A clarification of the notion of privacy. How can privacy be appropriately conceptualized?

¹ Foucault's [1] discussion of the panopticon is a strong argument against the devastating effects of intense surveillance.

2. How does ICT in general affect privacy?
3. How do location technologies differ from other types of information technology? And how do location technologies blend with and challenge existing privacy regulation mechanisms?

This paper is work in progress and is an early attempt to suggest possible answers to the above questions hoping to make it easier to analyze the impact of location technologies on privacy.

In this space it is impossible to talk about any of the questions in great length though. I'll discuss privacy briefly, list some general consequences of ICT on privacy, discuss how location technologies can influence privacy, and finally suggest a criterion for evaluating the usability of location systems.

2 Privacy

Privacy is often seen as protection and control of personal information. This is a definition that is valid and usable in many situations – especially when dealing with sensitive data. But approaching privacy more broadly, a state of privacy is but one possible configuration of a social practice. In other words, in many situations people are not particularly interested in privacy, rather they seek various types of social interaction. Consequently, Altman [5] has suggested that privacy is best understood as a dialectic process between openness and closedness – and not just as shutting oneself off from others. Other authors have defined privacy along the same lines. Samarajiva [6, p.283] states: "[p]rivacy is the capability to explicitly or implicitly negotiate boundary conditions of social relations", and Palen and Dourish [4] following Altman frame privacy as a dialectical process between privacy and publicity.

It is not just a matter of words how privacy is defined. Seeing privacy more as an ongoing achievement than a fixed state draws attention to the *mechanisms* by which privacy is regulated and the need for shifting levels of privacy at different times and at different places. In fact, it can be argued that being private is more the exception than the rule [7]. As social beings we are constantly engaged with each other both out of necessity and pleasure. This is not a neglect of the value of privacy but an emphasis on the complexities involved in understanding and regulating privacy.

How privacy is negotiated is rather subtle. Altman [5] lists several different mechanisms: verbal, bodily, environmental and cultural, i.e. the way we talk, our bodily position and posture, the physical arrangements we inhabit, codes of conduct, etc. To exemplify: Talking intimately or superficially, turning our back on a person or talking face-to-face, open or closing the door, verbally demand or reject privacy, etc. Written in the seventies Altman doesn't consider information technology based mechanisms for regulating privacy but they are evidently important. The same goes for various privacy laws that can be seen as resources for negotiating and stipulating privacy.

Typically, the different mechanisms are used in concert. Altman [5, 8] and Westin [9] cites several telling ethnographic studies that show how physical arrangements influence psychological and social privacy regulating mechanisms. One such study is by Clifford Geertz who has studied people living in Bali and Java. In Java people live in thin bamboo walled house with no fences or walls around them. This influences the family relationships. As Geertz cited in [9] write: "Relationships even within the household are very restrained; people speak softly, hide their feelings and even in the bosom of a Javanese family you have the feeling that you are in a public square and must behave with appropriate decorum." On the contrary, people in Bali live in houses surrounded by high stone walls and you only enter through a narrow doorway. But inside the house the Balinese home is characterized by: "...a tremendous warmth, humor, [and] openness..." Geertz suggest that these differences in the physical layout of houses are reasons for the differences in social behavior and privacy seen among Javanese and Balinese families.

The need for and the regulation of privacy is then dependent on a host of different factors including physical, psychological, social and cultural conditions. To capture that complexity of privacy I suggest that we frame privacy as a continuum between *non-participation and participation* in a social practice. That has several advantages: First, talking about social practice attention is drawn to both material, social and cultural aspects of privacy. Second, a social practice comprises more than the immediate situation both temporarily and spatially. Palen & Dourish [4] point out that privacy depends on what is said and done earlier and privacy issues, where technology is involved, fast escape the immediate environment. Finally, talking about participation and non-participation emphasizes the trade-off potentially inherent in every privacy regulation, namely that being private cuts off social relations and opportunities for working, playing, learning, etc.

This short analysis of privacy suggests several aspects to take into account when a technology affecting privacy is employed. First, privacy is a complex phenomenon. It's a concept that involves interrelated psychological, social and cultural regulation mechanisms. Second, regulation of privacy is flexible and not fixed. Third, privacy is in many situations not the preferred state of affairs.

Therefore when employing location systems it might be fruitful to study existing privacy regulation practices to gain an understanding of the actual complexity; to get an idea of the level of privacy that is appropriate from a user's perspective and figure out how new regulation mechanisms blend productively with existing ones.

3 Privacy and ICT

Naturally, it is not possible to exhaustively list all consequences of ICT on privacy especially not when framed in terms of participation in one or more social practices. But there are still some general trends that can be singled out. One important way ICT changes the privacy equation is as Grudin [10] points out

by "desituating action". The ability to transmit, process, and store information blurs the borders of the current situation we are in. Stated in different terms, ICT has the ability to make the time-space boundaries of a situation more diffuse and porous. When for example information published on the web is accessed immediately across the internet or several years later by a simple web search, the user has lost control over information that – depending on the situation – can result in favorable or adverse effects.

ICT changes the balance between ephemerality and persistence. When ICT mediates action, fleeting and informal moments cannot be counted on to the same extent as earlier [10]. Information and communication technologies mediate privacy different than the physical environment [4] and more generally they challenge the balance of traditional privacy regulating mechanisms.

So when ICT mediates actions the scope of accountability extends in sometimes unforeseen ways. We might have to answer for part of our selves in situations that we didn't imagine while we were acting. In terms of participation and non-participation we can say that we come to participate in situations that we didn't predict.

However, ICT can also function as a privacy enhancing technology. Different security technologies can protect information in forms of encryption or limited access. The same goes for technologies that protect and limit access to a certain part of a building by certain people for example. Therefore, information and communication technologies can be used both to situate and desituate people's actions.

Again, to understand the consequences of location technologies on privacy it might be beneficial to look at the properties of ICT in general. Issues about privacy and location information stem to a large extent from the general ability to transmit, process, and store that information.

4 Privacy and location technologies

Location systems have several advantages. By knowing where an actor is, it is possible to tailor information to that specific location and for example adjust the user interface to the situation at hand. This is relevant in many types of activities. In the domain of labor examples are hospital work, construction work, fire fighting, control of industrial plants, etc. [11–14]. Other useful domains for this type of technology are for example tourism, gaming and shopping.

In one sense, location technologies do not in terms of privacy differ much from information and communication technologies in general as noted above. The crucial question is how much the current activities of an actor are desituated. How much are the boundaries of the situation blurred due to the use of location technologies? Depending on the kind of location technology in question it differs. Using a GPS device that knows its position, but doesn't communicate that information to anyone else than the user, does not blur the situation. On the contrary, if a user is being tracked because the base-station that his or her mobile phone communicates with is known to a greater audience all the usual

problems of privacy and information technology are relevant. How far is that information communicated in time and space? How is it possible to control the flow of information? Who knows what? Is the user aware of being monitored, etc?

But in another sense location technologies differ from more traditional information technologies. In terms of scope, location technologies can vastly increase the number of contexts where ICT and privacy matters and second, because of the greater scope the user might not understand what the actual level of privacy is – it might not be clear that actions are being technological mediated. Taking a cue from conventional privacy evaluation and regulation mechanisms, users could believe the level of privacy is different from what it really is.

Hence using technologies that know a user's position is in on sense just a new piece of information about that user transported outside the use situation and the traditional considerations about privacy apply. On the other hand, location technologies have the potential to interweave with a much broader set of activities than is usually the case, which from a user's perspective can be confusing.

Finally, because location technologies often cross different contexts different levels of privacy will probably be demanded. That is a challenge designers of location systems need to take into account.

5 Design of location technologies

The previous discussion raises several design issues. For example how to design a location system that honor the complexity of privacy, is flexible and yet simple to use? That are difficult and important challenges that I only intend to raise and not answer here. I will suggest, though, an evaluation criterion for design of location systems that take into account issues about privacy.

A central aspect of knowing how to regulate our privacy is the ability to evaluate the present situation. In normal situations, i.e. where actions are not mediated by information and communication technology, people usually have a good understanding of the level of privacy they enjoy – by whom they are observed, how they are protected by physical structures, who can hear what they say, who can see their facial expressions, etc. This assessment is done more or less instantly securing frictionless action and interaction. One could say that the level of privacy is almost sensed. Is this a threatening situation? Is it safe? Is it dull? And so on. Privacy assessment entails in other words an element of embodiment. A design challenge would be to make the same more or less instant assessment possible for the user of a location system.

Bearing the previous discussion in mind, that privacy questions often escape the immediate situation, this design ideal is not a fully attainable goal in practice. But it could serve as one important yardstick for estimating the usability of a location system in terms of privacy.

6 Conclusion

In this paper I have argued that a thorough understanding of privacy is needed when developing location system. I have suggested that we learn from the management of existing privacy mechanisms, and that we are aware that privacy regulation always involves a trade-off between participation and non-participation. I have argued that location technologies generate unique privacy difficulties but do reproduce known privacy problems as well, and finally I have advocated that an important yardstick for the usability of a location system is the user's ability to swiftly evaluate the actual level of privacy for example in an embodied fashion.

References

1. Foucault, M.: *Discipline and punish : the birth of the prison*. Penguin (1979)
2. Beresford, A., Stajano, F.: Location privacy in pervasive computing. *Ieee Pervasive Computing* **2** (2003) 46–55
3. Al-Muhtadi, J., Ranganathan, A., Campbell, R., Mickunas, M.D.: A flexible, privacy-preserving authentication framework for ubiquitous computing environments. In: *Proceedings of the 22nd International Conference on Distributed Computing Systems Workshops*. (2002) 771 –776
4. Palen, L., Dourish, P.: Unpacking "privacy" for a networked world. In: *Proceedings of the conference on Human factors in computing systems*. (2003) 129 – 136
5. Altman, I.: *The environment and social behavior : privacy, personal space, territory, crowding*. Brooks/Cole Pub. Co., Monterey, Calif. (1975)
6. Samarajiva, R.: Interactivity as though privacy mattered. In Agre, P.E., Rotenberg, M., eds.: *Technology and Privacy: The New Landscape*. The MIT Press (1997)
7. Allen, A.L.: *Why privacy isn't everything : feminist reflections on personal accountability*. Rowman & Littlefield, Lanham, Md. (2002)
8. Altman, I.: Privacy regulation: Culturally universal or culturally specific. *Journal of Social Issues* **33** (1977)
9. Westin, A.F.: *Privacy and freedom*. Atheneum, New York (1967)
10. Grudin, J.: Desituating action: Digital representation of context. *Human-Computer Interaction* **16** (2001) 269–286
11. Bardram, J.E., Bossen, C.: Moving to get ahead: Local mobility and collaborative work. In Dourish, P., Fitzpatrick, G., Schmidt, K., eds.: *Proceedings of the Fifth European Conference on Computer Supported Cooperative Work (ECSCW2003)*, Kluwer Academic Publishers (2003) 355–374
12. Grønbæk, K., Kyng, M., Krogh, P.: Intelligent buildings and pervasive computing research perspectives and discussions. (2001) <http://www.pervasive.dk/publications/files/Intelligentbuildings.pdf> (verified 13 August 2004).
13. Jiang, X., Chen, N.Y., Hong, J.I., Wang, K., Takayama, L., Landay, J.A.: Siren: Context-aware computing for firefighting. In: *Proceedings of Second International Conference on Pervasive Computing (Pervasive 2004)*, Vienna, Austria (2004)
14. Nilsson, J., Sokoler, T., Binder, T., Wetcke, N.: Beyond the control room: Mobile devices for spatially distributed interaction on industrial process plants, Bristol, UK (2000) 30–45