

Identifying, Tracking and Tracing: From Geographic Space to Cyberspace and Back

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The technological vision of making information instantly accessible anywhere and anytime (Pervasive Computing, Hilty et al., 2004) has become true nowadays by the combination of the smartphone with the Internet. An increasing part of everyday activities related to work, social interaction or entertainment can be carried out independent of geographic location – in a virtual space.

Despite this development, however, location has never lost its profound meaning in social relationships. This is demonstrated, for example, by the observation that one of the most frequent questions asked on a mobile phone seems to be “Where are you?”. With the diffusion of localization technologies – all technologies suitable to track or trace the geographic position of a device or a person – the believed transition towards a social existence in cyberspace has now found its counter-trend.

An increasing amount of technologies are being used that involve information on the location of objects or persons. In addition to the widely known geolocation by satellite via GPS, today at least 12 more technologies are being used that make it possible to determine the location of devices, and indirectly that of their users, such as GSM/UMTS, WLAN, RFID, optical or even acoustical technologies (for details see Hilty et al., 2012). This may happen in real time (tracking) or after a delay depending on the technology (tracing); it may happen with a degree of precision ranging from a few kilometers to a few centimeters, and either with or without the knowledge of the persons affected. The mix of technologies in use today bears greater privacy risks than the relatively manageable RFID technology, which created a public debate some years ago (Oertel et al., 2005).

Because tracking and tracing can be technically implemented with increasing convenience and decreasing cost, more and more location data are being generated and stored. When the results of many positioning processes are combined, movement profiles, or even relationship profiles, can be done on persons. In addition to navigation, there are numerous other application areas of localization technologies: location-based services, micromarketing, calculation of fees and insurance premiums, surveillance of individuals (for health reasons or in law enforcement), emergency missions, documentation, and forensic evidence.

From the standpoint of the person being located, this happens often as a side-effect of another function the person wants to use:

- All mobile devices with an integrated GPS receiver (such as smartphones) can determine their position with a high degree of precision; many apps build upon this; the user is not always conscious whether her localization data are visible to third parties when she uses an app or service.
- Mobile phones that do not even feature a GPS receiver can also be localized by mobile providers. Just knowing in which cell the device is operating provides a rough localization. A more precise localization of mobile phones without GPS is also possible by triangulation.
- When a user is accessing information on the Internet, the server can roughly estimate the location of the user. Whenever Internet access is via a WLAN hotspot, an even more precise localization is possible.
- When buildings or fee-based zones are accessed using electronic identification or when electronic payments are made, data are also generated that document the location and movement of persons.

- Images showing persons or vehicles may document locations. More and more digital cameras are equipped with GPS receivers and mark digital image data with geotags that specify time and location; video surveillance cameras are becoming more powerful and less conspicuous. Parallel to this development, image processing algorithms are being improved so as to enable authorities to mine collections of images automatically for faces or license plate numbers.

Localization technologies are in the process of taking a dominant position in our lives just as well-accepted as the telephone or the Internet. These devices are becoming an “external location memory” that records for more and more of our acts when and where we performed them.

In the future it will become difficult to imagine everyday mobility – both that in individual and that in public traffic – without localization systems. Likewise acting in social networks on Internet platforms will be associated increasingly with the physical location of the user. New location-based business models will result from that. Advertising focused on location, time and the individual will become normal. Whether this will lead to business processes that adapt better to people’s needs, or inversely will manipulate persons, cannot be predicted without making far-reaching assumptions and evaluations.

Localization technologies offer many societal opportunities, e.g. for promoting public transportation (easier to find connections and to pay for them), for emergency and rescue operations, for personal security and orientation at unfamiliar locations, for meeting friends and perhaps even for making friends among strangers. They may even provide a technological basis for the vision of a sustainable information society that has been around for a decade (Dompke et al., 2004; Som et al., 2009).

However, as localization technologies become more readily accepted, society is becoming more dependent on them. They are becoming new critical infrastructures the malfunctioning or collapse of which can have far-reaching consequences comparable with a breakdown of the telephone network. Manipulated localization information may have even more serious consequences than a lack of information, because it can misguide vehicles, persons and freight.

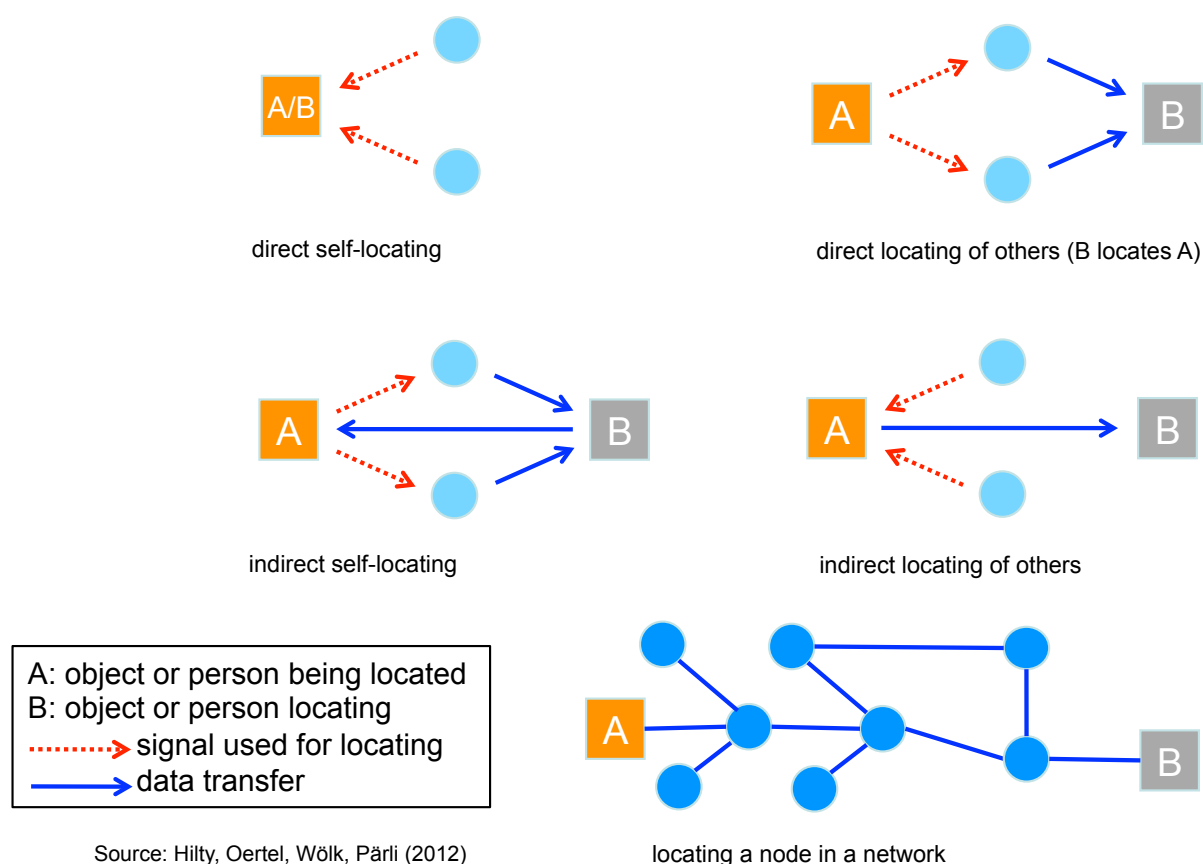


Figure 1: Basic types of determining the location of objects or people (Hilty et al., 2012)

It is mainly the combination of two factors which make considerable societal risks develop in addition to the obvious advantages and opportunities afforded by localization technologies. The factors are:

1. *A drop in the voluntary nature of our use of localization technologies:* If a person does not wish to be located even today, she has to do without a mobile phone and many Internet functions, in extreme cases even without electronic access and payment systems – thus becoming excluded from many aspects of personal and professional life.
2. *The increasing amount of personal data in circulation* due to the increasing generation, transmission, storage and processing of localization data: the public or private-sector offices that process such data can combine them into tracking and relationship profiles. Far-reaching profiles of persons and groups can be assembled by combining that with other data, in particular geographic data.

The combination of these two aspects – the drop in the voluntary nature and the increasing amount of data – holds a potential for societal conflict because the difficulties of the individual that exist today in getting her right to informational self-determination respected might later intensify to a critical mass. The lack of transparency in the processing steps used, which are frequently not associated with a person until after the fact, is increasing the risk of personal and data protection violations.

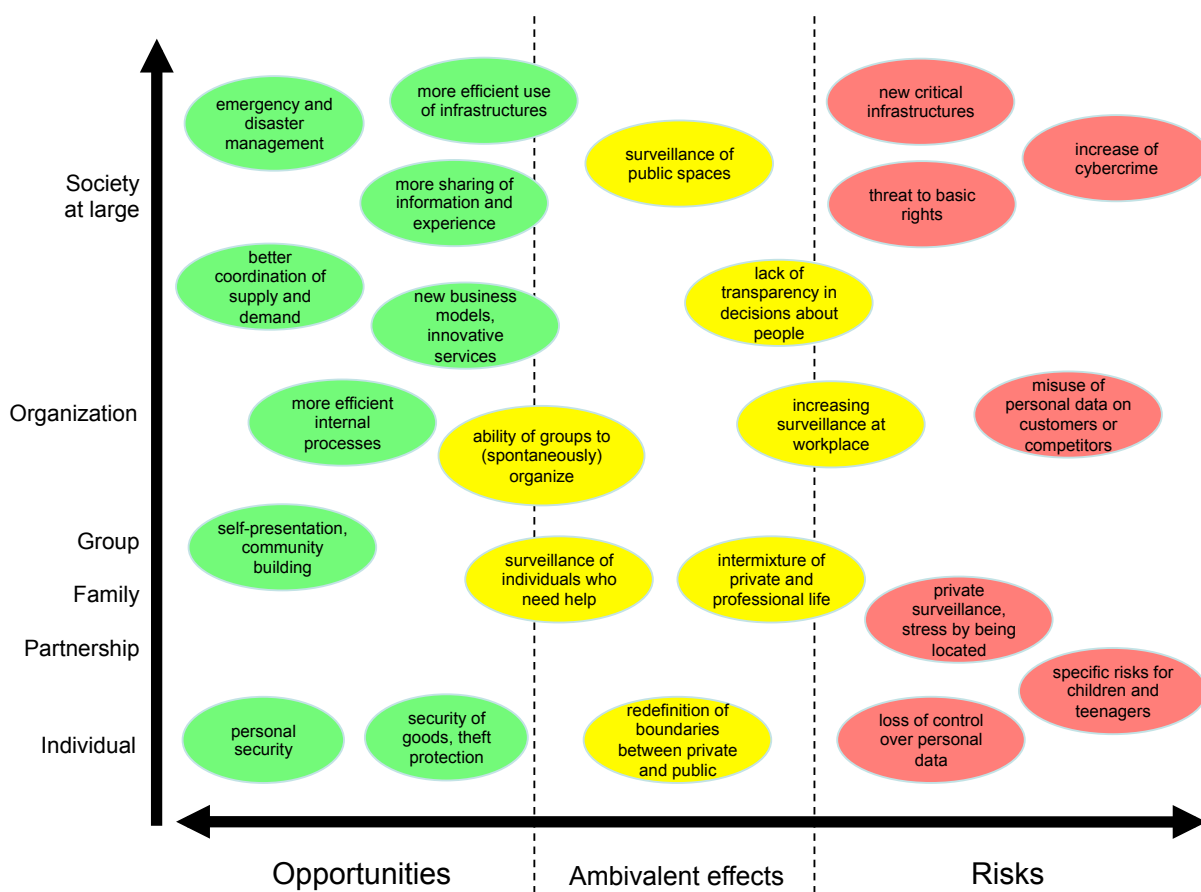


Figure 2: Opportunities and risks of positioning technologies found in expert interviews (Hilty et al., 2012)

The TA-SWISS study “Localized and Identified – How Localization Technologies Are Changing Our Lives” (Hilty et al., 2012) examined the technologies, applications and Swiss legal framework conditions of localization technologies, including the situation in the EU whenever relevant. In keeping with the themes of *Mobility* and *Social networks* the possible impacts (both the opportunities and the risks) are discussed and evaluated as regards their societal relevance. By using a qualitative risk assessment approach developed in an earlier TA-SWISS study (Hilty et al., 2004; Som et al. 2004) the project team identified the need for political action in the following areas:

- For the technical surveillance of people in dependency relationships, especially employees, persons needing protection and children;
- In Child Protection Measures pertaining to the participation of adolescents in social networks with a localization function;
- In defending the informational self-determination of the individual vis-à-vis the state and private-sector enterprises; this is a matter of maintaining control over one’s own data and avoiding the thoughtless surrendering of basic rights;
- In limiting the retention of localization data, because in many cases it can be associated with persons after the fact, possibly jeopardizing their rights to privacy (“right to be forgotten”);
- As regards the permissibility of the Terms of Service (ToS) used by the providers of software packages and services with localization functions, some of which violate current law;
- Taking seriously the model function of government offices in implementing data protection principles, whenever they use localization technologies to perform their own duties more efficiently;
- To recognize the security of localization systems as a new critical infrastructure and to protect the populace against those forms of cyber-criminality that are facilitated by localization technologies.

From this list, a set of recommendations was derived.

The *general recommendations* aim to develop further the legal framework: There is an urgent need for introducing more efficient ways to sanction violations in the data protection rules intended to effectively prevent the misuse of personally identifiable data (in particular, the localization data of persons). Furthermore, measures are needed to improve the enforcement of data protection principles in the international context. Localization systems are developing into critical infrastructures for the Swiss population and must therefore be protected from malfunctions, breakdown or destruction. Many people have difficulty understanding the operation of software products and services that process localization data; this inability makes a certification necessary, so that software products become more reliable and transparent. The widely discussed “right to be forgotten” for personal data is of special importance in the case of localization data; therefore a legal anchoring of this right should be investigated thoroughly. Empirical social science research is needed so that the real handling of localization technologies in everyday life and the social development dynamics of sharing relations and dependencies can be better understood. Such an understanding is the basis for effective regulation.

In addition to the general recommendations that aim to establish legal guideposts for the on-going development and use of localization technologies in compliance with basic law, we next articulate *special recommendations* for special areas: improving the public’s understanding of the Terms of Service of social networks; directions and a clearer regulation of the permissibility of localization at one’s place of work; integration of the topic of localization in measures to promote the media literacy of adolescents; the introduction of effective ways to establish the legal age of users of Internet services with localization functions; the accession of Switzerland to the Council of Europe Convention on the Protection of Children from Sexual Exploitation and Abuse; exercising the model function that governments have in the application of localization technologies; bringing the use of crowd sourcing (cooperation of many volunteers) in road traffic into compliance with data protection principles; a uniform regulation of video localization; the extension of the principle of the so-called Robinson List (“don’t send me any advertising”) to digital media, especially location-based marketing.

The recommendations of this TA study are not intended to hamper the use of localization technologies or to underplay their many advantages; instead we aim to help recognize and minimize the risks of these fascinating technologies at an early stage – only then will we succeed in the long run in exploiting the opportunities of localization technologies to the advantage of society and in deriving sustainable benefit from them.

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