Privacy and ethics aspects in the context of technology

C-Brain#94

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- Data protection and privacy
  - when translating facts of the real world into bits of information that can be stored for later retrieval
- Role of Technology
  - fields of computer networking, batabases, and information retrieval
- Ubiquitous computing (UbiComp)
  - miniature sensors, cheap microchips, and wireless communication, computer technology can penetrate our everyday lives in a completely unobtrusive manner

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An overview of the activities – leads to privacy problems

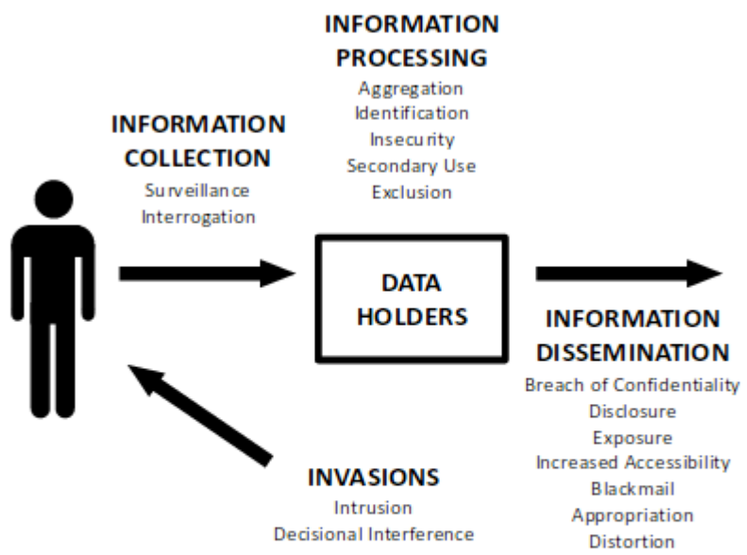

Figure 4: Solove's Privacy Taxonomy [5]
© 2006 D. Solove. Figure reprinted with permission. Also appears in [6]

Reference: Solove, Daniel: A Taxonomy of Privacy. University of Pennsylvania Law Review 154(3), 477-560 (January 2006)

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Privacy concerns in UbiComp raised by

- Ubiquity – user changes locations (such as home, office, to public places)
- Invisibility – disappearence nature of devices, from view & attention of user
- Sensing – privacy breaches, particularly when coupled ubiquity & invisibility
- Memory amplification – recording every action in the environment (captured, amplified, and exchange as other digital information)

Reference: M. Langheinrich, "Privacy by design—principles of privacy-aware ubiquitous systems," 2001.

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Common UbiComp privacy challenges

- smart spaces
  - data collection
  - trust users
  - disseminating context information
- Location information
  - particular place (home, office, restaurent, school, etc.,.)
  - often implies an activity (visisting family, library, restaurent etc.,.)
  - personal interest

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Privacy Challenges

Collection and Treatment of Big Data

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Privacy Issues in Big Data

‘Big Data’ refers to large amounts of different types of data produced from various types of sources, such as people, machines or sensors

Some important privacy issues in the context of big data:

1) How to protect privacy when the data is stored in a single site?

2) How to protect privacy when the data is stored in multiple sites?

3) How to protect individual privacy efficiently?

4) How to protect individual privacy when data changes over time?

Wing Wong, R. C.-. (2012). Big Data Privacy. Journal of Information Technology & Software Engineering, 2(5), 7866. http://doi.org/10.4172/2165-7866.1000e114

Value and Threat

Big data may involve personal data

- Visa Payment Centre ~ 45 billion card transactions(worth $2.4tn)/yr
- Wal-Mart keeps about 20 million sales transactions per day
- Octopus system had over 7 million transactions per day in 2003

Some real life events that demonstrate the problem:

1) AOL published search logs in 2006 through which individuals could be identified based on their search queries

2) Netflix released data to public for Neflix Prize competition through which 96% of subscribers could be uniquely identified

Wing Wong, R. C.-. (2012). Big Data Privacy. Journal of Information Technology & Software Engineering, 2(5), 7866. http://doi.org/10.4172/2165-7866.1000e114

Advanced Data Collection

- Surveillance Technology
  - CCTV

- Ubiquitous Computing
  - RFID, GPS, Cookies

- Biometrics
  - DNA, Retinal, Facial

- Nanosensors

Study, C. (2010). WORKING PAPER o . 1 : The challenges to European data protection laws and principles. Framework, 2010(January).

Privacy Challenges

	Technology	Size	Intercon-nection	Data collection	Thing Interaction	System Interaction	Lifecycle
2000	RFID	Millions	Wired, stationary	Identifier	None	None	Ownership transfer
2013	Sensors, phones, cloud	Billions	Wireless, mobile, H2M	Sensory, limited areas, active humans	Buttons, touch, displays	Smartphone, gestures, speech, web interfaces	Ownership transfer
2020	ICT inside things, new technologies	Billions to trillions	E2E, All-IP, M2M, interop-erability	Increasing coverage, passive humans	Haptic, web interfaces	Haptic, using the environment	Product history log, exchangeable

- Awarenes of privacy risks imposed by smart things and services
- Individual control over collection and processing of personal information of the data subject
- Awareness and control of subsequent use and dissemination of information to any outside entity

Ziegeldorf, J. H., Morchon, O. G., & Wehrle, K. (2014). Privacy in the internet of things: Threats and challenges. Security and Communication Networks, 7(12), 2728–2742. http://doi.org/10.1002/sec.795

Data Processing

Privacy Preserving Data Mining techniques use some form of transformation on the data to reduce the granularity in order to perform privcy preservation.

Some expamles of such techniques are as follows:

- Randomization method
- K-anonymity model and l-diversity
- Distributed privacy preservation
- Downgrading Application Effectiveness

Aggarwal, C. C., & Yu, P. S. (2008). A General Survey of Privacy-Preserving Data Mining Models and Algorithms. Privacypreserving Data Mining, 11–52. http://doi.org/10.1007/978-0-387-48533

Conclusion

- Big Data is massive information stored over distributed sites
- Protecting privacy is important to preserve sensitive knowledge
- Technological developments are increasing the challenge
- Application of privacy preserving data mining techniques on big data applications need to be furthe explored and implemented


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