Chapter 8.10

Leveraging Semantic Technologies Towards Social Ambient Intelligence

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ABSTRACT

These times, when the amount of information exponentially grows on the Internet, when most people can be connected at all times with powerful personal devices, we need to enhance, adapt, and simplify access to information and communication with other people. The vision of ambient intelligence which is a relevant response to this need brings many challenges in different areas such as context-awareness, adaptive human-system interaction, privacy enforcement, and social communications. The authors believe that ontologies and other semantic technologies can help meeting most of these challenges in a unified manner, as they are a bridge between meaningful (but fuzzy by nature) human knowledge and digital information systems. In this chapter, the authors will depict their vision of "Social Ambient Intelligence" based on the review of several uses of semantic technologies for context management, adaptive human-system interaction, privacy enforcement and social communications. Based on identified benefits and lacks, and on their experience, they will propose several research leads towards the realization of this vision.

INTRODUCTION

These times, when the amount of information exponentially grows on the Internet, when most people can be connected at all times with powerful personal devices, users suffer from the growing complexity of the information society. Our use of technology is moving towards the vision of

"Ambient Intelligence", derived from the vision of "Ubiquitous computing" in which "the most profound technologies are those that disappear" (Weiser, 1991) . Thus, access to information is no longer limited to personal computers and the web browsing paradigm. This vision brings many technological and psychological challenges (Streitz & Nixon, 2005) that are considered in several research domains, including:

- Context-awareness: how to take one's context into account to improve his communication ?
- Multimodality: how to span user interfaces from a terminal into separate modal interfaces ? (e.g. various screens, input controllers, microphones, phones)
- Social networking: how to enhance and leverage social communication ?
- Privacy & Trust: how to ease one's life without delegating human control to machines ?

There is one transversal question yet to answer: is there a unified approach that could answer these challenges in a global way and that makes sense? Actually, a common approach exists that is considered in all these research domains, and in most corresponding works and has been shown as very promising. This approach is the use of semantic technologies.

In this chapter, we propose a review of research works relying on semantic technologies towards what we call "Social Ambient Intelligence", a social extension of ambient intelligence. The intention here is to identify the key technologies, approaches and issues that may be blended in order to build an optimal platform for a widescaled ubiquitous system that can support social applications. After defining the foundational terms of this chapter in the Background section, we will review several research works to identify their key technologies, approaches and issues in the State-of-the-Art section, then we will propose

several research leads towards our vision of "Social Ambient Intelligence" in the Future Trends section, to finally conclude this chapter.

In this section, we propose and discuss the underlying definitions needed to set the foundations of this chapter: ubiquitous computing, context-awareness and semantic technologies.

Ubiquitous Computing, Ambient Intelligence and Context-Awareness

The phrase "ubiquitous computing" was proposed by Mark Weiser while working for the Xerox Palo Alto Research Center (PARC), to qualify a possible evolution of computers. "The Computer for the 21st century" (Weiser, 1991) has become a foundational paper for following works in this area. Indeed, it introduced a vision, in which "ubiquitous computers" are simple communicative devices and appliances that are suited for a particular task and are aware of their surrounding environment while fading into the background. For example, paper sheets could be replaced with flexible screens, bringing any information of the web as an independent element of a real desktop, an element that one could stack into piles, stick on a wall, lend to a colleague or take for lunch.

As depicted on Figure 1, the generation of ubiquitous computers has already arrived, as powerful and communicative computers are spread in many devices like watches, mobile phones, portable media players, game consoles, PDAs (Personal Digital Assistants), ticket machines, bike renting beacons and kids toys. Even though Mark Weiser's vision of interoperable and shared ubiquitous computers has not been reached yet, a significant research effort is done towards the vision of "Ambient intelligence". As such, "Ambient Intelligence" is considered as an evolution of "ubiquitous computing" in which networked devices can also be integrated in the environment (and thus not expecting any user intervention), can sense the environmental, personal and social situation to adapt the experience, and can anticipate

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