Chapter 29
Possibilities of Ambient Intelligence and Smart Environments in Educational Institutions

Peter Mikulecký
University of Hradec Králové, Czech Republic

Kamila Olševičová
University of Hradec Králové, Czech Republic

Vladimír Bureš
University of Hradec Králové, Czech Republic

Karel Mls
University of Hradec Králové, Czech Republic

ABSTRACT
The objective of the chapter is to identify and analyze key aspects and possibilities of Ambient Intelligence (AmI) applications in educational processes and institutions (universities), as well as to present a couple of possible visions for these applications. A number of related problems are discussed as well, namely agent-based AmI application architectures. Results of a brief survey among optional users of these applications are presented as well.

INTRODUCTION
The vision of Ambient Intelligence (AmI) offers the conception of environment that will be sensitive and responsive to the presence of humans. The AmI vision builds on advanced results of interdisciplinary research. The development of AmI applications is a complex task and all their features and functioning can be hardly predefined or forecasted because of different emergent or synergic effects.

We believe that educational institutions in general, and especially universities are one of promising application domains where experiment-
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ing with AmI solutions could be quite fruitful. This is a knowledge-rich environment, where an intelligent support from the side of the environment can be very beneficial for all types of expected users, and users (students, lecturers, and other staff) are expected to be open to new technologies and approaches.

In this chapter, written by a group of scholars from the University of Hradec Kralove, Czech Republic, the authors wish to present some ideas supporting the vision of smart environments for university education. More precisely, this vision aims at envisaging a truly intelligent environment for education where the access to relevant knowledge or information will be as easy as possible, relevant to the level of students’ skills and suitably supporting the teachers’ lectures or practices. In such an environment, any kinds of information- and knowledge-related problems would be solved immediately using an appropriate support from the environment, and where studying will be a real pleasure.

The organization of this chapter is as follows. Ambient Intelligence, Net Generation and Homo Zappiens concepts are explained firstly. Then the AmI vision for universities is described through three application visions. Possible AmI application agent-based architectures for these visions are suggested. The results of a brief questionnaire are presented. The objective of the questionnaire survey was to obtain feedback from the expected users of the proposed applications, namely from students, teachers and administrative staff of the university.

AMBIENT INTELLIGENCE

As it is well known, the concept of Ambient Intelligence (AmI) was introduced in the ISTAG report (ISTAG, 2001) and interpreted e.g. by (Alcaniz and Rey, 2005; Remagnino et al, 2005; Bohn et al, 2005; Snijders, 2005) and others. This concept provides a vision of society of the future, where the people will find themselves in an environment of intelligent and intuitively usable interfaces, ergonomic space in a broad sense, encompassing better, secure and active living environment around them, capable of aiding them with daily chores and professional duties by recognizing the presence of individuals, reacting to it in a non-disturbing, invisible way, fully integrated into the particular situation. Nearly synonymous concepts of disappearing computing or calm computing express the technology diffused into everyday objects and settings (Russell et al, 2005). From the technological point of view, AmI bears ship to the conception of ubiquitous computing (UbiComp), the term firstly used by Mark Weiser in 1998 (Alcaniz and Rey, 2005; Bohn et al, 2005). The UbiComp is defined as the use of computers everywhere and is determined by interactions that are not channelled through a single workstation.

The AmI environment is characterized by merging of physical and digital space. It means that tangible objects and physical surroundings are acquiring a digital representation (Kameas et al, 2005). The AmI environment is considered to host several UbiComp applications.

The AmI artefact (also smart object, smart device) is an element of the AmI environment that has got following properties and abilities (Kameas et al, 2005):

- information processing,
- interaction with environment,
- autonomy,
- collaboration,
- composeability,
- changeability.

The building of an AmI artefact from any common object consists of two phases: embedding hardware modules into the object and installing software. Hardware components are especially batteries, sensors, processors, wireless modules and screens. Software components are those of hardware drivers, networking subsystems, oper-