Challenges for the Realization of Ambient Intelligence
(Extended Abstract to the Keynote on)

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Abstract. A decade after the ISTAG report, Ambient Intelligence is still not a concept which is widespread in industry and even less in society. This is not a surprise, nobody working in this area claimed it will be a trivial process or that can be achieved in a couple of years. There are still formidable challenges to be tackled by the scientific community and there is no guarantee we will solve all of them, but the more progress we make on some of those the closer we will be from a stage where some of the initial aims are adopted. This talk will highlight those challenges, explain why they are important and put forward the idea that we can possibly do significant progress exploring those avenues for innovation.

Keywords: Ambient Intelligence, reliability, interaction, privacy.

1 Introduction

For centuries humans have witnessed scientific and technological leaps that changed the lives of their generation, and those to come, forever. We are no exception. In fact, so many of those advances are occurring now, in a more or less unperceived way. Slowly and silently technology is becoming interwoven in our lives in the form of a variety of intelligent devices which are starting to be used by people of all ages.

Advances in miniaturization of microprocessors have made possible a significant development for Ambient Intelligence. Computing power is now embedded in many everyday objects like home appliances (e.g., programmable washing machines, microwave ovens, robotic hovering machines, and robotic mowers). Intelligence travels with us outside the home (e.g., mobile phones and PDAs), and they help guide us to and from our home, safely and economically (e.g., car suspension and fuel consumption and GPS navigation). The greening of Information Technology has delivered computers that require reduced power, virtualization of servers, cloud computing and network protocols that actively manage power to conserve energy (e.g. Bluetooth 4.0). These technological developments have merged with advances in the areas of ubiquitous and pervasive computing which in turn were complemented by other existing areas of computing (for example artificial intelligence, HCI, and networking) into one new and exciting area which aims at providing digital environments which support people in their daily lives by assisting them in a ‘sensible’ way [1].

James J. (Jong Hyuk) Park et al. (eds.), Human Centric Technology and Service in Smart Space, LNEE 182, pp. 65–69, DOI: 10.1007/978-94-007-5085-2_9,
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Having the necessary technology, however, is not enough for an area of science to flourish. Experiences of people with computers over recent decades have created an interesting context where people’s expectations of these systems are growing and their fear of using them has decreased. Concomitantly with this difference in the way society perceives technology there is also a change in the way services are handled. Technology is being adopted by all generations, now including older people, exemplified by the ‘baby boomers’ who have begun to embrace new technological advances.

More than a decade after the European Commission took a visionary step in requesting analysis of the potential of Ambient Intelligence [2]. In the intervening decade the area of Ambient Intelligence and related concepts like Smart/Intelligent Environments have been explored to assess the extent they can be successfully deployed and integrated into our society [3–6]. The realization of Ambient Intelligence requires the engineering of technological solutions which are helpful to people, transparent, reliable and affordable.

This article provides an overview of the Keynote offered at HumanCom2012 which is focused on a critical analysis of the area focusing on potential barriers for the realization of Ambient Intelligence. We believe this will help to focus efforts on the elements that will have a higher impact on realizing the concept of Ambient Intelligence into ‘real, deployed’ applications which change positively the way people interact with technology in their daily lives.

2 Inherent Challenges

The very nature of the area means we need to accept a number of serious challenges which make our work at the same time difficult and interesting. This section lists some of the most important and core challenges.

2.1 Users

The areas which have developed under the names of ubiquitous computing, pervasive computing, people centred computing, ambient intelligence, smart environments and Intelligent Environments are all closely related, arguably with more in common than differences. One of those common aims of all these areas is that one of putting humans at the very centre of the system and on empowering them:

“...the human is the master and the computer the slave and not the other way round.” [7].

These systems should be able to help people of all ages and educational backgrounds (crucially those who do not have IT knowledge). So many of the systems built on labs today are more for the personal gratification of the ego of the researchers than to provide real support to real people or to answer a request from users. Unobtrusiveness and transparency of services were advocated from the very beginning [8] as core