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User Expectations in Intelligent Environments

Issues and Opportunities in the Interaction of Intelligent Users and Intelligent Environments

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Abstract. The definition of Intelligent Environments has always been focused around their *users*, aiming at helping them in a smart and transparent way, and avoiding bothering them or acting against their will. The complexity of IEs, whose technologies range from sensors to machine learning, from distributed architectures to tangible interfaces, from communication protocols to data analysis, challenges researchers from various fields to contribute innovative and effective solutions. In this quest for technical solutions to the myriad requirements of an intelligent environments, user expectations are often left behind, and while researchers tend to focus on niche technical aspects, they risk of losing the big picture of an IE "helping users in their daily life".

Keywords. usability, user expectations, user modeling, interaction

Introduction

Every definition of Intelligent Environment (IE) [1], Ambient Intelligence (AmI) [2], Smart Environment (SmE) [3], since the early inception of these disciplines and the key seminal works, puts a strong emphasis on the *users* living, working or otherwise exploiting the smart space. All researchers agree that the benefit for the users, the help that the system may provide them in their daily lives and activities, the usability of their interfaces, and the ability to serve, understand, and anticipate their needs and desires, should be the primary goal of every IE being designed, and its true *raison d'être*.

If this is the primary goal of our research area, we should question how well we, as a research community, are pursuing it, and investing in its direction. Even a cursory look at the literature on the relevant journals and conference proceedings reveals that a really limited number of works directly involve end users, or their needs, in research objectives or methods. The complexity of Intelligent Environments, in fact, requires significant advances in several research areas, including sensors, wireless communications, localization, power optimization, communication protocols, device-to-device interoperability, intelligent distributed platforms, big data storage and analysis, prediction and recommendation capabilities, just

to name a few. There is no surprise, therefore, that the width of this interdisciplinary field attracts research from many different specialized disciplines, aiming at providing a useful contribution to the many issues raised by IE and AmI systems. During the talk we will analyze from the qualitative and quantitative points of view the contributions of past papers to the different disciplines.

However, the lack of focus on user needs, user behaviors, and actual interaction of real end users (who are provably anthropologically different from researchers and engineers) is at the basis of many failures, both at the research level (where interesting results fail to be applied) and at the market level (where technically advanced products fail miserably [4]). Some illustrative examples will be analyzed, and some learned lessons will be discussed.

The reflection stemming from this analysis can be summarized by analyzing the difference between a *enchanted* house (or castle, if you prefer) and a *haunted* one: both mansions are autonomous in performing some actions (playing music, controlling doors and windows, providing food and entertainment, etc.) and thus could be powered by similar intelligent systems. The main difference lies in the user perception: the actions of an enchanted house are *expected*, *desired* and *welcomed* by the user, that lives in a proactively friendly environment. On the other hand, the haunted space will execute actions contrary to the will of the user, who will feel trapped by an hostile entity.

To ensure that the IEs that our research community is developing will be of the enchanted kind, and not of the haunted one, we will finally discuss some design criteria [5] or design methods [6] that could and should be incorporated in our research agendas.

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