Chapter 2
Towards an HCI-Based Symbiotic Environment for Alzheimer's Support

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ABSTRACT

Alzheimer's Disease (AD), being the most common form of dementia diagnosed in people over 65 years of age, is a global problem with dramatic impact, as there is no cure for it and worsens as it progresses, eventually leading to death. As the sufferer declines s/he often withdraws from family and society, leading to a marginalized way of living. Considering the life expectancy rise, a looming global epidemic of AD is foreseen; hence, new approaches need to be considered regarding AD prevention, diagnosis, treatment, and confrontation. In this vein, an alternative approach (namely Symbiosis) towards a symbiotic Human-Computer Interaction (HCI) environment is presented in this chapter, as a means to facilitate, understand and incorporate the needs of the whole AD community (i.e., patients, caregivers and doctors), involving cutting-edge technology, special serious games and natural-user interfacing, embedded within an innovative design framework. Overall, Symbiosis acts as a technology-based mediator for AD's indoor and outdoor activities, fostering their social inclusion and increasing their quality of life in a symbiotic context.

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INTRODUCTION

Efficient Human-Computer Interaction (HCI) (Card et al., 1980), when applied to the field of assistive technology for special groups of people (e.g., patients, disabled, elderly), can significantly contribute to the elevation of their quality of life, as it could act as a facilitator for the maximization of the assistance provided by the system to humans in a more natural way. Although the user interface is the primary element between a user and the computer, HCI is a larger discipline that deals not only with the design of the screens and menus, but also with the reasoning for building the functionality into the system in the first place. It is also considers the consequences of using the system over time and its effects on the individual, group and company.

Even from the advent of the first computers (Abascal, 2002), there has been established a set of commonly accepted stereotypes and expectations about materialization of HCI through intelligent machines and robots that are able to fulfil the 'human gap'. Although nowadays, many of these wishes and predictions have reached a degree of reality (mainly in the context of performing many difficult tasks better, quicker and more accurately than humans can or producing new fields of their activities that render the HCI involvement a necessity), HCI maximizes its beneficial intervention when disability comes into foreground. The evolutionary trajectory of shifting from the massive computer-machine to a personal one, reaching the era of mobility with smartphones and tablets, has been influenced by technological, commercial and social parameters, followed, simultaneously, by the fight against social exclusions and discrimination, the people with disabilities were involved in. The conjunction of the technological evolution with the struggle of people with disabilities for autonomous and socially integrated life, set the horizon of new technological challenges and new research and marketing endeavors.

A basic novelty of HCI is the clear separation of the application level from the interface level, that plays a crucial role when HCI users have disabilities since a wide range of interfaces could be used for the same application (depending on the user's needs and abilities). In addition, the same interface could be used to gain access to different applications, avoiding unnecessary and/or confusing interface modifications. Intelligent-, adaptive-, affective mediation-, natural user-, and pervasive-interfaces involved in the HCI realization set a diversity of available interface choices to the users, especially to those with disabilities, as the former are well adapted to the latter's' specifications and needs.

With the intention to make accessible commercial equipment, the 'Universal Design' (UD) (also called 'Design for All (DfA)') design orientation was developed aiming to produce systems that are designed to be used by everyone, independently from the physical or cognitive skills. Pragmatically, this is almost impossible bearing in mind the diversity of the users' features, at least in the design phase, but it is possible to avoid unnecessary barriers to the accessibility that are frequently added. To this end, UD adopts the basic principles of: a) equitable use, b) flexibility in use, c) simple and intuitive, d) perceptible information, e) error tolerance, f) low physical effort, g) size and space for approach and use. In fact, UD enhances the usability of the product and is also extremely beneficial for non-disabled people when using the specific system under special conditions (Abascal, 2002).

DfA in the context of information and communications technology (ICT) is the conscious and systematic effort to proactively apply principles, methods and tools to promote UD in computer-related technologies, including Internet-based technologies, thus avoiding the need for *a posteriori* adaptations, or specialized design (Stephanidis, 2001; ETSI EG 202 116 V1.2.1 (2002-09)). Nevertheless, UD is not a panacea; as a liturgical beneficial combination for people with disabilities, UD should be combined