

Chapter 12

Mapping Input Technology to Ability

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ABSTRACT

Accessibility is a critical aspect of health care system design, particularly E-health systems. Ability to access services may change as ones abilities vary, by situation as in the use of a cell phone while driving, by condition, as during an illness or as a result of an accident and in the process of aging. As the European population becomes increasingly skewed towards elders, the ability to communicate with and via computers will become more and more important. Communication consists of two processes: presenting information in an accessible manner and receiving input from the user in a mode that fits the users skills and needs. This chapter describes the design process in providing an alternative to a keyboard for input by persons with motoric disabilities.

INTRODUCTION

As Europe becomes greyer and thus more reliant on health support, smart healthcare applications will play an increasingly important role in day-to-day life. These technologies will both deliver significant improvements in health care and simultaneously have higher requirements of user interactivity. This will involve both careful and attentive presentations of information and appro-

priate and efficient affordances for user input. Key to the use of these technologies is the ability of the end-users to communicate their needs, wants and internal states both to the support systems and with the technology itself.

From this perspective we can assert accessibility as a parameter in health care system design. In a larger context, more than just interacting with health care systems and providers is the issue of accessibility in an increasingly ‘wired’ world. So accessibility to computers implies providing support for disabled to communicate needs and

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internal states to supporting aids – both via persons and directly with environments. In this case environments could mean both health support systems and Quality of Living (QOL) environmental controls. Looking to the near future, smart healthcare will need to be situated in the context of independent living in environments of ambient intelligence (AmI) (Aarts, 2002), and although AmI research incorporates many novel forms of interaction ranging from gesture to speech recognition, there will continue to be a need for end users to also use more traditional forms of interaction in the forms of screens, keyboards and pointing devices.

A rough mapping can be made between computer input and motoric ability and output and sensory ability. Because of this basic division it can become too easy to focus on one or the other set of adaptations to solve accessibility problems of specific persons. Unfortunately, and especially often in persons with developmental disabilities and those experiencing the decline of abilities that accompanies aging, sensory and motoric disabilities often manifest in comorbidity¹. Because of this, the range of needs and abilities is very large, thus an end user in need of accommodation becomes a universe of one (Erikson, 1958) such that no ‘standard’ solution exists on the shelf. This makes the choosing and integration of AT into an individual’s life an especially difficult task to do properly. Therefore implicit in the discussion of accessibility is the AT professional as a critical stakeholder (Marcia J. Scherer & (Editor), 1996).

In this chapter we will discuss input adaptation based on motoric dysfunctions. First, we will initially present the problem that the design is based upon. The attributes of the potential end users and discussions with motorically afflicted persons take the design space from dry technical specifications to a more informed and nuanced understanding of the problem space. Next we present a discussion of current literature and the state of the art in commercial offerings. Following this is a presentation of the process of the design of the novel input

system, *Etsedi* and the different applications for this design. Finally we present the system itself, first as a high level description of the system, then as individual components and finally its integration into the operating system and use. Following this is a brief description of evaluation by users and a discussion of work to follow.

THE DESIGN PROBLEM

Most accessibility system designs for people with different disabilities focus on how to give the information to the user. For example, considering the size of the letters or the voice to read the information for the people with visual impairments. But, how can a user manage this information if she cannot access the inputs of the system? People with motor impairments, especially those with disabilities in the hands and arms often cannot access the devices because they do not have enough control to use keyboards, mice and other external controls. Thus what follows is a study of computer input accessibility problems and the development of an alternative system.

The Target Population

People suffering from what we have categorized as motoric disabilities demonstrate a wide range of different kinds of problems in using devices which require precise control. In the case of paralysis, those afflicted cannot move some parts of their body, and may require the use of augmentative devices to control new technologies using eyes, head, or mouth in the place of hand movements. Some neuron diseases cause loss of strength in the muscles, so people afflicted may have problems initiating movement in their limbs and often cannot hold things or press controls or buttons. One of the functional problems of some diseases is spasticity, a problem involving relaxing specific muscles and causes movements which cannot be controlled. A person with spasticity often cannot

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