Multimedia Software Interface Design for Special–Needs Users

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INTRODUCTION

Most software engineering companies do not develop for special users, because they do not see the potential in this limited market. But 10% of the population worldwide are handicapped. In the United States, 14% of the population are estimated to suffer from a disability. In the population aged over 65, this figure becomes 50%. Disabilities are strongly linked with age, and our societies are facing a growing number of people aged 75 and more, who are more likely to have impairments or disabilities. This group will comprise 14.4% of the population in 2040, compared with 7.5% in 2003—almost a twofold increase (EU Commission, 2003). It is not a simple task to assess the effectiveness of multimedia for all users with disabilities. The question is more complicated if the users have special needs.

This article provides a minimal requirements list that every software engineer, computer scientist, and Web designer should take into account if they develop a new multimodal software or a new Web site with multimedia elements.

BACKGROUND

Universal usability is sometimes tried to meeting the needs of users who are disabled or work in disabling conditions. This important direction is likely to benefit all users. The adaptability needed for users with diverse physical, visual, auditory, or cognitive disabilities is likely to benefit users with differing preferences, tasks, skills, hardware, and so on (Schneiderman, 2003, p. 41).

The present middle-aged user group, now using the computer for work or entertainment, will soon move into old age. It is the time to realize the problem and prepare for the solution. We should keep in mind today what we will experience when we grow old. We should design such a world now that will help us in the future!

A critical component in designing multimedia software is the production of educational programs. Obviously, it is not a simple task to assess the effectiveness of a multimedia teaching system. There are some organizations that published techniques for the evaluation of multimedia teaching software (Sik Lányi, Bacsa, Mátrai, & Kosztyán 2005a; Sik Lányi, Mátrai, Molnár, & Lányi, 2005b; Sik Lányi, 2006).

The question is more complicated if the users have special needs. The literature is increasingly attentive to "Design for All" principles (NCSU, 2007). Several conferences run on the topic of how can computers and assistive technology help handicapped people. The most important ones are the following:

*   International Conference on Computers Helping People with Special Needs (ICCHP), recent and upcoming meetings in Linz in 2006 and 2008.
*   International Conference Series on Disability, Virtual Reality, and Associated Technologies (ICDVRAT), staged in Veszprém, Hungary in 2002; Oxford, UK in 2004; and Esbjerg, Denmark and Maia, Portugal in 2008.
*   The **Association for the Advancement of Assistive Technology in Europe (AAATE)**, in Dublin, Ireland in 2003; Lille, France in 2005; and San Sebastian, Spain in 2007; will be staged in Florence, Italy in 2009.

What is Multimedia?

Multimedia refers to the use of computers to present text, graphics, animation, and sound in an integrated way. Long heralded as the future revolution in computing, multimedia applications were, until the mid-1990s, uncommon due to the expensive hardware required. With increases in computer performance and decreases in price, however, multimedia is now commonplace.

The term *multimedia* describes a number of diverse technologies that allow visual and audio media to be combined in new ways for the purpose of communicating. Applications include entertainment, education, and advertising. In recent years, the term multimedia has taken on many diverse meanings for an ever-increasing audience. Some of us have a form of multimedia "narrowcast" through digital cable. Home DVD editing software can be categorized as multimedia, along with the latest generation of mobile phones, which are capable of taking and sending voice annotated photos. The term multimedia will continue to evolve and take on as many new meanings as the technologies and applications it is being used to describe. From our viewpoint, multimedia is a means of communication that combines text with graphics, sound, animation, full-motion video, and so forth—usually

in a highly interactive way, and it also includes the use of the Internet (Sik Lányi, 2006).

What Does the Attributive Noun "Multimodal" Mean?

A software or hardware instrument is multimodal if it uses at least two media elements, and one or both must be time dependent—for example video, sound, and animation files; we also call this mixed media.

The so-called multimodal interaction provides the user with multiple modes of interfacing with a system beyond the traditional keyboard and mouse input/output. The most common such interface combines a visual modality (e.g., a display, keyboard, and mouse) with a voice modality (speech recognition for input, speech synthesis and recorded audio for output). Multimodal user interfaces are part of a research area in human-computer interaction.

Why Is Human Computer Interaction So Important?

Human computer interaction (HCI) is the study of how humans interact with computers and programs (this also used to be called 'man machine interface'). HCI is a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use, with the study of major phenomena surrounding them. From a computer science perspective, the focus is on interaction and specifically on interaction between human(s) and computer(s).

HCI is also a growing academic discipline. More than a dozen research journals in HCI are compiling practical results and theoretical frameworks to guide designers. These success stories in HCI and user interface design are paralleled and emulated in university courses, but change often comes slowly. The resistance comes from technology-centered researchers who value mathematical formalism more than psychological experimentation (Schneiderman, 2003, p. 71.).

Special-Needs Users

Disability is such a qualitatively difference of a human capability from its normal feature, which might be in-born or if acquired, can develop backwards only very slowly, or can be permanent and irreversible. The kinds of disabilities are: physical impairment, sensory impairment, cognitive impairment, intellectual impairment, and cumulative impairment.

In 1980, the World Health Organization (WHO) published its classification of impairments, disabilities, and handicaps in a document called, "ICIDH (International Classification of Impairments, Disabilities and Handicaps)." In this docu-

ment, three levels of the impairments were distinguished. During recent years the ICIDH has been considerably revised. One of the main differences between the previous version and ICIDH-2, now called "International Classification of Functioning (ICF)", is that instead of *disability* and *handicapped,* new descriptions have been introduced. The ICF speaks about *activities* and *participation.* This means on one side that some more broad terms have to be used, and on the other that our attention must be focused on the still-available abilities instead of the disabilities (ICIDH, 1999). However different countries may use different terminology, we use 'special-needs user' in this article.

These people have special needs in daily requirements during all their life. Without assistive technology or special devices, they are not able to satisfy all their needs. The basic needs are eating, moving, communicating, and so on. This article deals only with using multimedia software for the above purposes, because most of the information and communication technology is based on it. If the handicapped users are not able to use these software (including the Internet) in average ways and means, their needs are special, so we call them 'special-needs users'.

Design for All, or Universal Design?

The concept of universal design is clear. Wikipedia (2007) gives the following definition of universal design:

"A relatively new paradigm that emerged from 'barrier-free' or 'accessible design' and 'assistive technology.' Barrier free design and assistive technology provide a level of accessibility for people with disabilities but they also often result in separate and stigmatizing solutions, for example, a ramp that leads to a different entry to a building than a main stairway. Universal design strives to be a broad-spectrum solution that helps everyone, not just people with disabilities. Moreover, it recognizes the importance of how things look. For example, while built up handles are a way to make utensils more usable for people with gripping limitations, some companies introduced larger, easy to grip and attractive handles as [a] feature of mass produced utensils. They appeal to a wide range of consumers. Universal design is a part of everyday living and is all around us. The 'undo' command in most software products is a good example."

But the author's opinion is a bit different; sometimes the everyday software products are not good enough and not easy to use by special-needs users.

Is the concept of Design for All (DfA) similar to universal design? Many specialists discuss the proper definition of DfA, but at the time of this writing, there was no consensus about a proper definition, therefore we give one for the sake of this article. DfA means design of products, services, systems (including information technology) to be accessible—that is,

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