Designing for Accessibility

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Abstract. Involving a wide variety of end users and in particular those with a disability or who are older when designing web pages and apps requires a good understanding of how to involve those end users, assistive technology, and evaluation methods. This course will introduce the basics of assistive technologies built into using mobile phones and describe major barriers in web pages, and how to analyze them with end users. It will also outline a range of appropriate tools to use in this work.

Keywords: Accessibility · Users with disabilities · Older users · Tools for accessibility

1 Introduction

Accessibility has been identified a sibling category to Human-Computer Interaction in the ACM 2012 classification, but many HCI people do not know about user needs and preferences if these users have a sensory, physical or mental disability, nor do they know specific evaluation methods suitable for these target groups. Often this is because specific forms of communication are needed such as a Sign Language, BLISS symbols or Braille. As current assistive technologies bridge the gap between developers and users, the main effort is to understand how to include these users and their assistive technologies in the development of interactive systems.

Learning Objectives
Participants will understand the difference between principles of universal design on the one hand and assistive technology on the other hand.

Given a particular technology, participants will be able explore and understand how the widest possible range of users can use it and what barriers they will experience in using it.

Participants will explore the assistive technology built into smartphones and its use for completing tasks specific to a particular disability by adding specific apps.

Participants will understand the accessibility issues most commonly found in static web pages and forms.

Participants will understand the importance of evaluation with disabled users as well as the use of web accessibility testing tools.

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2 Contents of the Course

Principles of universal design have been established to guide the design of environments, products and communications in a broad sense. These principles focus on designers as the matchmakers between technologies and the needs and preferences of users. In contrast, assistive technology focuses primarily on products and services solving information and communication problems.

This course covers some of the main assistive technologies addressing sensory disabilities such as magnification, false color presentation, Braille displays, screen readers, hearing aids and captioning. People with motor impairments benefit from scanning keyboards, trackballs, eye tracking or speech input to name a few common technologies. These are designed to replace keyboard and mouse input, while reducing the manual effort in general and use of hands more specifically. Participants will discuss how these technologies can be interfaced with existing off-the shelf computers.

Many consumer devices apart from off-the shelf computers also contain a user interface, but are less easily adapted to take assistive technology into account. Some of these can be designed for use by sensory disabled people such as the television, which now can provide captions for people who are Deaf or hard of hearing and audio description for people who are visually disabled. Participants will discuss tools for preparing captions and approaches to enhance time-based contents by audio descriptions, transcripts or a summary. Other devices such as the electronic whiteboard serve as an example for the need for collaboration by people with and without a disability in education and meetings and allow a more general discussion of the appropriateness of efforts to overcome barriers in the education system. Figure 1 shows a non-standard keyboard as it is typically used for speech-to-text transcription during live oral presentations for people with a hearing impairment.

Fig. 1. Keyboard for speech-to-text transcription

Smartphones are commonplace nowadays but only a few people are aware of the accessibility features built into Android and iOS versions of these devices. Smartphones address sensory and physical disabilities in various ways. Moreover, they can provide

access to services needed by people with mental impairments, if caregivers become involved appropriately. Participants will become familiar with the screenreader in their mobile phone in the language as it is configured by the manufacturer and learn about the design of a gestural user interface for both the non-visual and visual use of the phone.

Several apps extend the basic assistive technology of a smartphone and thereby add more functionalities addressing other user needs in addition to making voice calls, texting or keeping one's diary. Apps may receive audio descriptions or captions in a public space such as in the cinema. Someone with low vision or with a hearing impairment will not be stigmatized for using an off-the-shelf smartphone or headset while still being able to contribute to the discussion of the movie with their friends.

Participants will understand the need for many different specific functions such as an app for identifying colors by blind mobile phone users and during the discussion they will encounter the need for elicitation of such requirements from end users systematically.

Colour identification serves as an example to learn more about the ability of a blind person to capture an image by a smartphone and will allow participants to discuss the design of a capturing device for reading important documents such as bills or even performing OCR on a menu or on a door label. Participants will be requested to ask their neighbor to become involved in a quick Wizard of Oz study on how they would focus on an object they cannot see and what the feedback should be like. An example for app developers interested in specific software technologies is navigation apps aimed at pedestrians with other needs than finding the shortest route but the best one to become able to avoid noisy, unsecure, or disorienting places. Participants will be pointed at further work on algorithms specifically needed for computing non-standard route calculations.

Smartphones and tablet computers are also suitable for browsing the web. This course coves some of the main barriers encountered in static web pages such as lack of headings, insufficient color contrast, too many links, or unusable forms. Sample web pages help to demonstrate what effort is needed to improve such HTML code. These web pages will become available to participants for their use during the course for exploring them with their mobile phone with or without a screen reader of screen magnifier enabled.

Participants will learn about appropriate guidelines allowing for the detection of such specific barriers and will discuss their ability to perform an assessment of barriers without using assistive technology. Tools for manual inspection as well as automatic analysis of web sites will be mentioned as well as the need for test cases to understand the quality of such tools.

Evaluation with disabled users as well as the use of web accessibility testing tools is much discussed in the community in order to develop services for professional assessments at a high quality. Participant will discuss some of the common approaches to support user tests with above mentioned heuristic approaches. The number of assessors, selection of appropriate web pages through identification of tasks will be contrasted and enable participants to collaborate with an existing professional service or continue their professional education to perform their own assessments.

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