INTRODUCTION

The purpose of this chapter is to present practical guidelines for running tests in a laboratory environment when using an eye tracking device in the test. These tests can range from very informal first trials (‘diagnostic tests’ (Dumas & Reddish, 1999) aimed at finding flaws in new interface design ideas) to more formally conducted research experiments aimed at publication as empirical research studies. We point out some potential pitfalls and caveats in test design that are introduced by eye tracking, and we give examples of the various test settings used in design projects for systems that apply gaze interaction.

In the early phases of design projects, all user feedback on the design ideas is valuable, even in situations where the interaction method is not fully functional. Especially in the case of applying a novel interaction technique such as gaze interaction, the developers of software applications often need to collect informal feedback on...
their ideas very early in the process, so that they better understand the implementation challenges involved in meeting user needs. Because of the Midas touch (Jacob, 1991) and other problems with using eyes for control, evaluation and design iterations are needed in every development project. The small details of how to react to the user’s gaze and how to give feedback on the eye movements that seem to control the system are hard to design correctly (i.e., in a way that works for the user) in the first iteration. As Jacob and Karn (2003) point out, designing systems that respond (and not over-respond) to eye movement input is much more challenging than designing for traditional, intentional mouse-based input.

Currently, no standard interaction techniques for gaze-based systems have emerged, but designers are still trying to find the techniques that seem most natural for the eyes. For users, the challenges of first-time use are much bigger with a novel technology such as eye tracking than, for instance, with a mouse-based design.

The goal of the system developer is objective evaluation of whether the suggested interaction technique is usable by the test participants. In this chapter, we discuss practical usability evaluation guidelines for system designers who are considering adopting gaze interaction techniques in their software either as the only modality or as one of the modalities with which the system is used.

Our emphasis is on the guidelines for running usability tests for gaze interaction; that is, the input from the user’s eyes is not aimed at post-test usability analysis but is used already during the test to control the functionality of the software system. Many usability studies discuss collecting eye gaze data for usability evaluation of Web sites or other software systems. The practical guidelines for tests that we present in this chapter apply to such tests too. Still, our focus is mostly on the usability evaluation of the interaction techniques themselves.

It is outside the scope of this chapter to discuss how to design gaze-interaction-based applications or Web sites that are highly usable and accessible, but we want to point out that these issues are extremely important for users with disabilities if they are to use the same resources as other users, with the aid of their assistive tools. While some of the assistive tools (for instance, screen readers such as Jaws) are not related to gaze control in any way, assistive tools that are used with an eye tracker have been developed for those special user groups who access Web content with their eyes only. Examples range from systems like MyTobii P10 (2011) to special browser extensions such as the Accessible Surfing Extension, a Firefox 2.0 browser extension (ASE, 2009) described by Castellina and Corno (2007). Their functionality is described by Skovsgaard, Räihä, and Tall in this volume. For these assistive tools to work, it is important to follow the standards of the World Wide Web Consortium (W3C) when creating Web sites, since assistive tools transform the appearance of the Web site into a more gaze-control-friendly format through the mark-up language of the site. The assistive tools rely upon adherence to standards in the mark-up, but still the actual content of Web sites should be designed with usability and accessibility in mind, too.

It is also beyond the scope of this chapter to discuss the evaluation of the actual technology used to track eye gaze. However, one should note that eye tracking devices vary quite a lot in their design and implementation. Only some of the various eye trackers have been empirically compared (Cheng & Vertegaal, 2004; Špakov, 2008). In reality, the usability of the device itself is a key concern for increasing adoption rates.

GAZE RESEARCH AND USABILITY EVALUATION

In this section, we offer definitions for the term ‘usability’ and discuss the issue of utilising a usability test to analyse the usability of gaze interaction. We also address the issue of how well the results gathered in a laboratory compare to real-world use.