Web Page Transformation When Switching Devices

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Abstract. With network and small screen device improvements, such as wireless abilities, increased memory and CPU speeds, users are no longer limited by location when accessing on-line information. We are interested in studying the effect of users switching from a large screen device, such as a desktop or laptop to use the same web page on a small device, in this case a PDA (Personal Digital Assistant). We discuss three common transformation approaches for display of web pages on the small screen: Direct Migration, Linear and Overview. We introduce a new Overview method, called the Gateway, for use on the small screen that exploits a user’s familiarity of a web page. The users in an initial study prefer using the Gateway and Direct Migration approach for web pages previously used on the large screen, despite the common Linear approach used by many web sites.

1 Introduction

With network and small screen device improvements, such as wireless abilities, increased memory and CPU speeds, users are no longer limited by location when accessing on-line information. Rather, small screen devices have enabled users to access information, in particular the Internet, from any location with relative ease. In 2002, ComScore Networks Inc. [5] reported that 9.9 million American adults use their PDA (Personal Digital Assistant) or cell phone to access the Internet with news sites being the most commonly accessed web pages. With multiple devices, users can move between these devices while accessing the same information. Users could use a web page on their desktop at the office and use the same information on their PDA while commuting home.

Despite the technical and bandwidth enhancements, PDAs are restricted by the small size of the screen that limits the amount of information that can be displayed at one time. While some research on the effects of different line lengths for reading has found that the limited screen size has little effect on comprehending information, it has been shown to influence reading rates [8],[9]. The small screen can also affect the display of many common web information structures, such as graphs, tables and forms. Using the small screen to effectively access information is further influenced by the very nature of PDA’s: their portability. Users using PDAs “on the go” subject themselves to noisy environments with the high probability of interruptions and movement [11]. Similarly, this portability could negatively affect accurate selections on the screen and entering information.
There are two broad approaches for displaying web pages within the small screen constraints of PDAs. The first approach is based on generating static web pages specifically designed for small screen devices. The second approach utilizes some form of automated transformation of the original large web page. The obvious advantage of an automated transformation is the increased pool of accessible web pages for PDA users. However, many current automated transformation options do not consider features such as user task, familiarity with information, web page layout and mobility of the user, and their impact on the usability of the resultant transformed page.

In this paper, we will discuss three approaches to transform web pages to the small screen. We introduce a new method of automatically transforming existing web pages, called the Gateway, for use on the small screen that exploits a user’s familiarity with the page to reduce transformation volatility. Transformation volatility results from changes to the look, design, layout and even content when using the same web page on different devices. Finally, we will describe a user study comparing three different display approaches in this context.

2 Web Display Approaches for Small Screens

Many web sites provide a small screen version of their pages for their PDA users. Images may be removed for a text-only version or reduced in size to fit the screen. Font styles and sizes may be changed and reduced. Often the layout, display and sometimes even the content of the original web page are transformed to fit within the constraints of the small screen size. Internet browsers are now available that are better suited to web browsing on the small screens. For example, Windows CE IE has added word wrap and allows users to change the font size to better fit web pages within the screen constraints. Web page transformation, whether at the site or at the browser level, can be divided into three broad transformation categories: Direct Migration, Linear and Overview [14].

2.1 Direct Migration

For Direct Migration, there are no transformations made to the original web page. While this approach does not require human or system intervention, it does require more effort to navigate the page by the users. Users must navigate using both vertical and horizontal scrolling which can cause user frustration and reduce the usefulness of the information on the page as only a small part of the page is visible at one time [1], [9], [12]. Despite the negative points associated with this approach, Direct Migration does provide ready access to most web pages. It can be considered the default transformation for pages without small screen versions. Although browser upgrades have improved web page access on the small devices, these browsers are still limited by the inherent design structure of web pages, such as tables used for formatting and frames.