Adapting Web Page Tables on Mobile Devices

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ABSTRACT

The usage of PDA and mobile devices has dramatically increased recently. However, mobile devices and PDA devices have a limited screen size, which makes it frustrating to browse tabular data on mobile devices since users have to frequently scroll up and down to find the information of interest. This paper presents an efficient means to present HTML-based tables on mobile devices. Based on the column and row headers, the authors adapt a HTML-based Web table into two adaptive styles. The first style displays all information of a table into a single narrow page to avoid horizontal scrolling; and the second style distributes information to different sub-pages, each of which approximately occupies the whole mobile screen, and thus eliminates scrolling. The approach is empirically evaluated using a controlled experiment. The main conclusions derived from the empirical study are: (1) the adaptive layout styles improves the browsing efficiency for individual subjects as compared to HTML web page style, (2) the single narrow adaptive layout resulted in the improved browsing efficiency compared to the multi-page adaptive layout for one-dimensional HTML web page tables, and (3) the multi-page adaptive layout was more efficient than the single narrow adaptive layout for two-dimensional HTML tables.

Keywords: Adaptive Interface, HTML, Mobile Browsing, User Study, Web Page Tables

1. INTRODUCTION

During the past decade, mobile communication devices have increasingly become more significant in the lives of people. Mobile devices provide great convenience in communicating with people and in accessing information and computing resources anytime and anywhere.

Most Web pages are designed and developed for viewing on normal computer screen sizes. An HTML table that requires a little horizontal or vertical scrolling on a desktop may need much more scrolling on a mobile device with a small screen. A study on Usability of Mobile Web browsing (Shrestha, 2007) experience was evaluated in comparison
to desktop Web browsing in which the users’ performance was poor on mobile devices due to the problems caused by a small screen, such as locating the content in the Web page with extensive scrolling.

This paper describes approaches that we have developed for browsing HTML Web page tables in an effective and user-friendly manner. Our approach adapts an HTML table into a hierarchical structure based on the row-column headers, which are also used as an overview that provides navigation links to different sections in a table. We provide two adaptive layouts, and the user has the choice of selecting the one that he/she wishes to use, depending upon their personal preferences. The first layout displays all information of a table in a single narrow page to avoid horizontal scrolling; and the second layout distributes information to different sub-pages, each of which approximately occupies the mobile screen, and thus eliminates scrolling. In the first adaptive style, all the information in an HTML table is accessed within one single page. When the user clicks on a hyperlink, the corresponding data is displayed in the same page. In the second adaptive style, the information in a table is presented in different pages that are connected through navigational links. Since the information displayed in each page approximately occupies one screen, this style can minimize the scrolling. A navigational link is created for each <td> tag, and directs the user to the actual contents.

This paper presents an empirical study to investigate the usability of these two types of adaptive styles in comparison to browsing simple HTML tabular data on mobile Web browsers. A controlled study with university students was performed to determine if students using adaptive layout styles were more efficient (i.e., spent less time finding information) than the students using HTML web page layout while browsing the information contained in different types of HTML web page tables.

This paper is organized as follows. Section 2 discusses related work. Section 3 presents the detail of our approach. Section 4 illustrates a comprehensive user study on our approach. Section 5 presents evaluation results. Section 6 discusses the results, followed by conclusion and future work in Section 7.

2. RELATED WORK

Displaying the Web pages on small screen devices such as PDAs and mobile devices has been discussed and analyzed through different methodologies and approaches. In each case, the goal is to effectively manage and organize the Web pages for displaying on the small screen devices. Methods employed include using a special browser or summarizing the Web pages (Buyukkokten, Garcia-Molina, & Paepcke, 2001a). Suggested approaches for viewing and summarizing Web pages and HTML forms include the Power browser, End-game browsing and tree structures (Buyukkokten et al., 2002; Buyukkokten, Garcia-Molina, & Paepcke, 2001b). In our work we present a new approach in which the table row-column headings are in list format and have anchor tags used for navigating the actual contents of the table. The table format was restructured into a tree format that displays the actual table contents in the same page or in a different page.

The special browser developed at the Stanford’s digital library is used to access the Web pages from PDAs and mobile devices. The Power browser (Buyukkokten et al., 2000) uses a different approach to view the Web pages; it displays an entire page and just links the anchor tags of pages to be displayed. The Power Browser only shows the links that are contained in each page. The idea of displaying the table column headings as the links that point to the actual table contents has evolved from the Power browser implementation. This idea of implementing the table header links that point to the corresponding content of the table eventually reduces the navigation time as well as the scrolling.

The Hybrid method (Ahmadi & Kong, 2008) deals with the basics of developing a Web page as its layout is divided into different panes like left pane, right pane, center pane, top pane,
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