

An Empirical Study of Web Interface Design on Small Display Devices

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Abstract

This paper reports an empirical study that explores the problem of finding a highly-efficient, user-friendly interface design method on small display devices. We compared three models using our PDA interface simulator: presentation optimization method, semantic conversion method, and zooming method. A controlled experiment has been carried out to identify the pros and cons of each method. The results show that of the three interface methods, the zooming method is slightly better than the semantic conversion method, while they both outperform the optimizing presentation method.

1. Introduction

With the rapid advance of the Internet technology, an increasing number of people use wireless devices such as Web-enabled cell phones and PDAs (Personal Digital Assistants) to go online. There are significant differences between a desktop computer screen and a small display. First, a small display device has a limited number of input facilities, processor power, memory and bandwidth [1]. The display form also introduces several new constraints for human computer interaction design. Second, there are various kinds of viewing conditions when surfing the Internet, such as varying screen sizes, style preferences, and different device capabilities [2]. For example, consider the case of a user viewing a diagram representing an organizational structure on the Web, the fully expanded diagram is of considerable complexity and may be unsuitable for small displays. Thus, if the diagram is to be viewed on the screen of a mobile device such as PDA, the original layout may not be appropriate. Furthermore, the standard components of traditional graphical user interfaces, such as scrollbars, buttons and menus, which on a desktop only take a small percentage of the available screen estate, take up a considerable percentage of screen estate on a PDA.

In order to adapt to different clients, we need an efficient mechanism to browse the content of the Web. There are increasing demands for the ability of efficient browsing to

meet the client side requirements. Present browser technologies for mobile devices can be characterized into three categories [3]: presentation optimization, semantic conversion, and scalable (zooming) methods. We designed a simulator to implement these three methods and compare their pros and cons by a controlled experiment. This paper reports our findings and experience.

Section 2 introduces the aforementioned three interface design models. Section 3 briefly describes the goal and procedure of our experiment. Section 4 reports the results of the experiment, and Section 5 compares these three methods. Section 6 discusses related work, followed by the conclusion and future work in Section 7.

2. Three Interface Design Methods

Chen and Mohapatra proposed the method of scalable browser [3] and argued that this method is a new way to design PDA interfaces. There is however no data or experimental evidence to support this method over other prevailing methods such as presentation optimization and semantic conversion. In order to compare these three methods objectively, we have simulated the methods and implemented a controlled experiment to compare them. Below, we first describe the three design methods that have been simulated.

2.1. Presentation Optimization

Presentation optimization represents a broad range of technologies whose objective is to optimize the rendering process so that the contents to be displayed on the screen are maximized and users' navigation complexity is minimized. For instance, the embedded version of Microsoft Internet Explorer has the functionality of fitting the contents into the screen size. This technology can properly adjust the width of the displayed area such that users are relieved from scrolling horizontally to locate the desired contents [3]. Using this method, we fit the contents of a document to the limited size on a small screen. The disadvantage is that the semantics cannot usually fit the style well and users cannot easily locate their desired content parts within the document.