Search Interfaces for Handheld Mobile Devices

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Abstract

Users who access the Web from handheld devices (PDAs, web-phones etc) need search engines that will help them find information quickly and easily. Given the much reduced screen space on these devices, the conventional list output of search results will lead to poor user performance and satisfaction. We are extending our handheld Web browsing tool, WebTwig, to consider more effective ways of enabling users to interact with search results. An initial prototype is presented here along with a discussion of potential other alternatives.

Keywords: User interface, mobile Web, searching.

Introduction

Handheld computers, Web-phones and other mobile devices will be key components in the ongoing trend towards a pervasive Web. To meet the needs of the many millions of users who might access the Web using these devices effective interfaces need to be developed. Handheld browsers have very different interaction characteristics to their desktop counterparts and these have to be considered by those working on the standards and content for the platforms.

In earlier work [4] we proposed some design features for navigating a site using small screen devices and demonstrated their efficacy with a prototype tool [5]. This tool is now being extended to consider the issues related to searching.

An analysis of user behavior we carried out [3] suggests that good direct search-based methods of finding information will be vital to handheld users. We looked at the impact of the sorts of screen size found on handheld machines on users' Web interaction. Small screen users showed a significant preference for direct access methods: they selected 'search' options much more frequently than large screen users and did not follow long browsing paths.

Most conventional search engine interfaces present search output as scrollable lists. Users finds these sorts of display difficult even on large screens; scrolling a long list within a very small screen is likely to lead to ineffectiveness and errors.

There is a need, then, to develop ways of visualising and manipulating the output of search in the limited display areas available. Below, we discuss our attempts showing

how we are integrating the new work within our existing tool, WebTwig.

WebTwig

WebTwig [4] presents an outline view of a Web site (see figure 1). The aim was to improve users' ability to find topics of interest by reducing the cost of exploring a site: users can identify potentially useful areas of a site without having to negotiate page-after-page. Our initial evaluations suggested potential gains [5] and these results have been recently amplified by work done by another group [1].

Figure 1 - WebTwig view of a Web site - note the structured display of topics and the arrow icons that allow users to expand/ collapse topics.

Visualising Search Output

Search queries typically return hundreds of potential hits. Making sense of such output is difficult. Various methods of visualising search results have been proposed. Many of the approaches (for a review see [2]) which include WebBook and Forager which uses a 3D display to organise information and TileBars which uses graphics to communicate relevance and structural information are inappropriate to the handheld environment. These methods rely on display capabilities that are not viable with handhelds.

As we demonstrated with our earlier WebTwig work, though, it is possible to present helpful, structural information using a text-based display. The first version of WebTwig (figure 1) provides a framework for one sort of direct access: users can focus on information by repeatedly expanding nodes in the tree view.

In our new prototype, we have maintained the outline-view approach to present the results of an explicit search process. Users enter their search terms and when the search is completed, the top-level nodes of the portions of the tree that contain the hits are shown to the user. Users can then progressively open up these views to explore the alternative hit possibilities (see figure 2). The outline view not only limits the amount of scrolling required to make sense of the search results but provides context information which should help users make decisions about which alternatives to pursue.
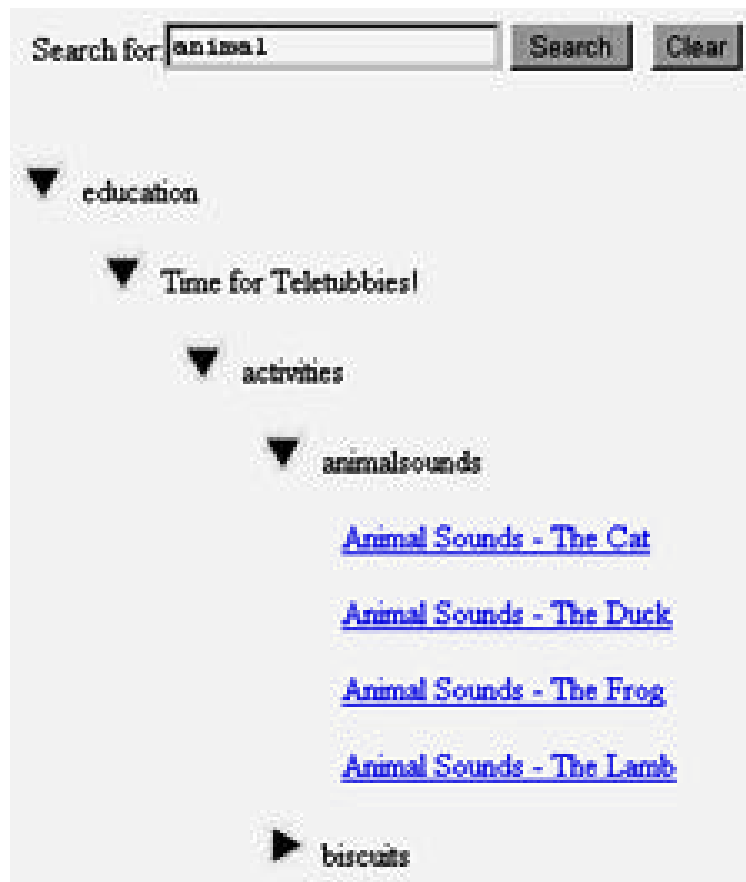

Figure 2. WebTwig prototype search interface for handheld browser. User entered search term "animal sound". User was then presented with list of top level nodes that contained hits (e.g., 'education'). By expanding nodes that contain hits, the user can progressively gain information on the context of hit. The prototype also allows the full path to a hit to be shown with one click.

Ongoing Work

We are in the process of evaluating our new search facilities to see whether they actually improve users' performance and acceptance. In addition we are looking at an alternative method. Our outliner view of search results will fail if the site does not have a meaningful structure that can be automatically extracted by WebTwig. There are several clustering algorithms (e.g. [7]) that could be used to organise search results in these

cases; limited trials indicate that for large screen displays there may be some usability benefits [6]. We are implementing a clustering algorithm and will compare a cluster-based interface for handheld interaction with the outline view for a range of Web site types.

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