I-POT: A NEW APPROACH UTILISING VISUAL AND CONTEXTUAL CUES TO SUPPORT USERS IN GRAPHICAL WEB BROWSER REVISITATION

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ABSTRACT

With a quarter of the world's population now having access to the internet, the area of web efficiency and optimal use is of growing importance to all users. The function of revisitation, where a user wants to return to a website that they have visited in the recent past becomes more important. Current static and textual approaches developed within the latest versions of mainstream web browsers leave much to be desired. This paper suggests a new approach via the use of organic visual and contextual cues to support users in this task area.

KEYWORDS

Web browser, organic revisitation, re-finding, bookmark management, user interface design.

1. INTRODUCTION

With over 1.7 billion current users of the WWW (25% of the world's population) and immense data flows, the area of web browser revisitation tools and strategies has been overlooked (Group 2010).

According to Milic-Frayling et al. (2004), there are two general ways of user browsing i.e. search (finding a website where the user has never visited before) and revisitation (returning to a website where the user has visited in the past. The issue of search is relevant to search engine technology, whilst revisitation concerns web usage and browser history mechanisms. The support for revisitation is normally through a set of functional built-in icons e.g. History, Back, Forward and Bookmarks. Nevertheless, for returning web users, they normally find it is easier and faster to re-launch an online search again, rather than spending time to find a particular web site from their personal bookmark and history records. Tauscher and Greenberg (1997) showed that revisiting web pages forms up to 58% of the recurrence rate of web browsing. Cockburn and McKenzie (2001) also stated that 81% of web pages have been previously visited by the user. According to Obendorf et al. (2007), revisitation can be divided into four classifications based on time: short-term (72.6% revisits within an hour), medium-term (12% revisits within a day and 7.8% revisits within a week), and long-term (7.6% revisits longer than a week).

2. BACKGROUND RESEARCH

Revisitation is supported by several features of web browsers, such as Back, Forward, History, Bookmarks, Auto Completion of URLs, and the Address Bar menu. The Back or Forward button is often used to return to

recently visited pages (within about four page impressions). The Bookmarks function (or Favorites) is used for regularly visited pages, and the History function is for further distant pages (generally up to three weeks). Nevertheless, these features have their natural limitations to support revisitation. For example, the function of Back is associated with short-term revisitation and is unable to support long-term revisitation over multiple browsing pages (Cockburn et al. 2002; Milic-Frayling et al. 2004).

2.1 Usage of Back, Forward, History, and Bookmarks

The Back and Forward functions are standard features in all web browsers. Various researches have shown that the Back button is frequently used. Catledge and Pitkow (1995) stated that the Back function accounts for 41% of all browsing activities, and is only second to using hyperlinks (52%). Tauscher and Greenberg (1997) also confirmed that the Back function makes up 30% of all navigation events, and is second only to Open URL (50%). In contrast to this, the Forward function accounts for only 1-2% of all navigation actions.

The structure of the Back function can also refer to "hub and spoke" navigation. "Hubs" mean the branching points, and "Spokes" represent the navigation tree branches (Milic-Frayling et al. 2004). The Back function is popular in that it allows rapid return to recently visited pages based on the stack model, it is robust in that people can use it even with a naïve model of the way it works, it is "ready to hand" and has little overhead in accessing because it is on a constant display, it consumes minimal screen space, and possesses cognitive understanding in that users can backtrack through pages using a simple "click until the desired page is recognized" strategy (Cockburn and Greenberg 2000). The stack model not only pushes and pops pages onto and off the list, but also allows pruning that removes unwanted pages (Tauscher and Greenberg 1997). Greenberg and Cockburn (1999) stated that the stack model is so poorly communicated to users through the interface that users often find the wanted pages missing. They came up with another alternative implementation called the temporal model of the Back button that doesn't prune recently visited pages, including a complete temporal history list of the pages that the user had visited (Greenberg and Cockburn 1999).

The History function in web browsing can be regarded as a record that allows the user to track their previously visited web pages. The techniques used by commercial and open source web browsers are varied. Internet Explorer uses a "temporal chunks" mechanism, in that the pages can be recalled based on their distance in chronological order (up to three weeks), alphabetical order of web sites, and alphabetical order of page titles (Cockburn and McKenzie 2001). In Internet Explorer 8, the History feature is combined with the Favorites and the RSS feed, whereby the user could sort History lists up to three weeks by site name, most visited sites, order visited today, and date. Similarly, in Mozilla Firefox 3.5.4, History can be viewed by Site, Date, Date and Site, Most Visited and Last Visited order. Nevertheless, this visual display of linear History lists has its drawbacks. The user may experience frustration when the desired web pages could not be found within the History list or they were unable to retrieve a website visited a month before.

Over the last 15 years, there have been many suggestions for the use of a branching History display that would provide a two dimensional visualization of web browser sessions. WebNet proposed by Cockburn and Jones (1996) used nodes and lines to present a view in hierarchical structure (Cockburn and Jones 1996). Other systems have been proposed, such as PadPrints that shows a graphical History map of visited pages (Hightower et al. 1998) and Footprints that used site maps and paths to present visual histories (Wexelblat and Maes 1999). It is said that the major limitation of the work on web site revisitation schemes is the lack of empirical evaluation (Cockburn and McKenzie 2001).

The Bookmarks function allows the user to save and organize their desired websites for future reference. The management of Bookmarks depends on the capability of an individual to categorize and tag information. Nevertheless, users often find it time-consuming to retrieve web pages in their personal collection of Bookmarks, and some would rather start a new search again rather than store and categorize. This is due to the fact that bookmark management systems rely heavily on directory or keyword (tagging) mechanisms for labeling bookmarks. If the directory or keywords are not properly organized or, even worse, the directory or keywords are forgotten, the retrieval of the information can be a very daunting task.

2.2 New Metaphors and Designs

As discussed in the previous sections, various researchers around the world have put a great deal of effort into redesigning the visualization and improving the techniques used within web browser features and the overall look and feel of the interface. Furthermore, there have been a few design suggestions for enhancing and integrating features to support revisitation. Nagel and Sander (2005) presented HyperHistory to fix the web browser's History function drawbacks and enhance bookmark organization in supporting navigation and information retrieval (Nagel and Sander 2005). Similarly, Tabard et al. (2007) developed PageLinker that allows users to create and present links on specific pages or set of pages on bookmarks for biologists (Tabard, Mackay et al. 2007). Other commercial and open source products are available, such as BrowseBack where the user can search the web history through keywords and view thumbnails of web pages; MindRetrieve which is a search engine that indexes web pages, these can then be viewed offline and are ranked by relevance (BrowseBack 2009; MindRetrieve 2009).

Users tend to build large bookmark collections with the result that current interface schemes become unwieldy (producing extremely long textual menus), forcing users to re-organize their bookmark structure (Cockburn and McKenzie 2001). To solve this problem, we propose a new method which makes use of an analog of growing plants, hence the term i-Pot, to manage and organize information in bookmarks. This new i-Pot visualization aims to increase information retrieval making it more efficient and effective.

3. THE I-POT CONCEPT

Based on the literature review, we are able to obtain relevant knowledge and generate insights into the development of web browser features and their functionality. In terms of re-finding and revisitation, the current generation of web browser relies on the individual's capability and willingness to organize his or her bookmarks and history. Therefore, the crucial element is how to assist the user with visual management of data. Blanc-Brude and Scapin (2007) found that the file location, file type, keywords, associated events (such as emails and phone calls) and visual elements are the best remembered recalled attributes by the users (Blanc-Brude and Scapin 2007). Furthermore, several studies have suggested that the use of thumbnail previews is helpful in search engines (Czerwinski et al. 1999; Kaasten and Greenberg 2001). Dziadosz and Chandrasekar (2002) conducted an empirical evaluation of the use of thumbnail previews in web search results. The results showed that the combination mode of text summaries and thumbnail previews is better than text-only summaries and thumbnail previews only. These research results are valuable for forming the design of the i-Pot user interface.

As mentioned earlier, several metaphors have been employed to aid recall and cognizance, such as the two dimensional dog-erring and three dimensional pile metaphors. We would rather not pursue this path, but to focus on the garden metaphor that people are more familiar with and are easier to build on top of the existing web browser APIs. It is said that the selection of an appropriate metaphor in interface design could be beneficial to user interaction. The current standardized office metaphor of the desktop may not prove to support all users from different cultural backgrounds. For example, Indian users are more familiar with the concept of bookshelves, books, chapters and pages, rather than files, folders and multiple pages (Marcus 2001). The garden metaphor as proposed by Shen et al. (2006; 2009a; 2009b) shows great potential. The i-Pot prototype will be based on the garden metaphor to aid web browser revisitation.

3.1 Major Goals of the Research

The i-Pot visualization will be designed to support two main activities, i.e. scanning pages for search terms and reading page content in bookmark management. Firstly, the i-Pot design will offer a series of suitable and recognizable visual representations. The visual prototype will be designed primarily through sketches and digital tools, and will then be evaluated by formative user studies and iterative usability testing including recall and recognition tasks. Based on a three year plan, the i-Pot prototypes will be developed in a reasonable timeframe, whereby a certain level of user satisfaction is achieved. Iterative usability evaluation will be necessary and the researchers are keen to find relevant scanning impacts and cognitive affects. Secondly, the i-Pot is designed to render as much page content as possible at a readable size for users. To

enhance readability, the use of scaling techniques will be employed to create a certain degree of flexibility in or between pages.

The suggested components of i-Pot include the following:

• A plant *patch* to represent the name of the tree or family. This name will be the project description.
• The *roots* which link various projects to one another that have a common topic for example.
• A plant *pot* which represents the primary folder. In this way a hierarchy is more apparent.
• *Branches* which represent the levels and connections.
• *Leaves* which symbolize data files.
• *Flowers* or *fruits* which represent a Favorite location or special file.

Other components that are to be considered include: seeds which symbolize a new project, reproduction, replication, duplication, multiplication. The "freshness" to a recent file may be colour coded. Flowers or fruit can be colour coded to symbolize completion or importance or favorites. Insects may play a part in moving or compressing files. To indicate a type of project or a family relationship a plant species could made visual.

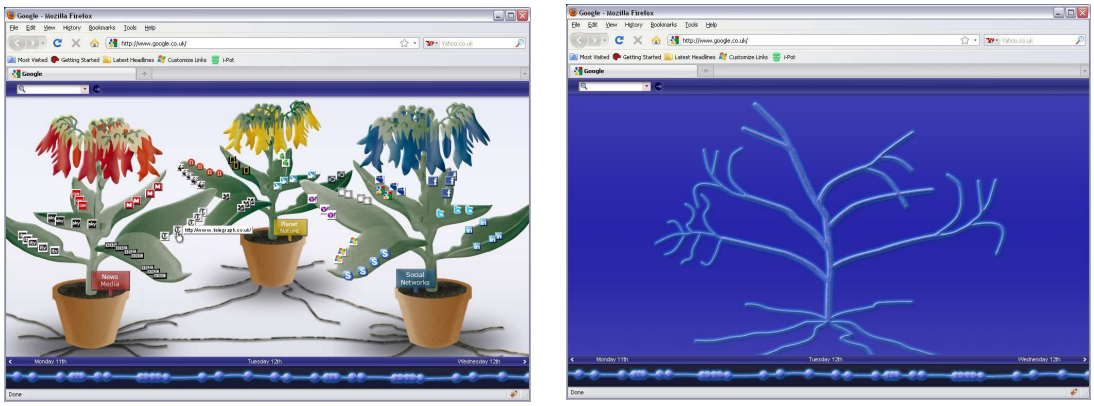

Figure 1. Organic graphical representation of the i-Pot revisitation function.

4. CONCLUSION

Based on the cited research into revisitation patterns, clearly there is a need for a short-term memory system which could display information in a more useful graphical means rather than the current system of textual lists. The i-Pot system with its philosophy and relationship to the natural world appears to offer potential for a more user friendly and accessible domain for information retrieval and temporal management. It has also been stated that Bookmark maintenance is one of the top three usability problems on the web.

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