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Web History Tools and Revisitation Support: A Survey of Existing Approaches and Directions

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Abstract

Millions of web pages are visited, and revisited every day. On average, every second page loaded was already visited before by the same user — individual means for recurrence rates range between 20% and 72% (cf. p. 24). People revisit pages within a session or between parallel ones, they reuse web-based tools habitually, monitor specific content or resume interrupted sessions, and they want to re-find content after longer periods of time. Current history tools that support such revisits show unique and severe shortcomings. Often, revisits are cumbersome, more than necessary.

This survey summarizes existing knowledge about revisitations on the web, and surveys the potential of graphic-based web history tools. A taxonomy of revisit-types distinguishes between short-, medium-, and long-term revisits, but also intra- and inter-session revisits. Assisted by a clear nomenclature this provides more clarity to the current discussion. The potential use of graphic-based tools is analyzed and discussed with respect to the found categories. The value of the current, mainly

non-graphical history tools, such as back button, bookmarks, history list, search engines, and search bars is examined and related to the potential offered by graphic-based tools.

The survey provides summaries of key studies and bodies of research for those who are interested in improving the web users' experience by simplifying the processes of going back to resources visited seconds, minutes, hours, weeks, or even months ago. It is meant for developers and researchers, browser and search engine producers, web usability professionals, and those who feel an irresistible urge to creatively innovate the web. The time has come to design and offer more appropriate history support. This survey aims at providing a foundation, as well as valuable ideas for doing so.

Contents

1

Introduction

Presumably man's spirit should be elevated if he can better review his shady past and analyze more completely and objectively his present problems. He has built a civilization so complex that he needs to mechanize his record more fully if he is to push his experiment to its logical conclusion and not merely become bogged down part way there by overtaxing his limited memory.

Vannevar Bush, 1945 [52, p. 46]

To accomplish our targets, to reach our goals, and also to manage the small things in day-to-day life, we spend a great amount of our time looking back, establishing back references, and remembering. To build the new, we seize the existing. To do research, we re-search the known. To progress technology, we examine the past. This is a basic human principle.

In order to free our memory, we use external aids. We do not remember all that we read. Instead, we re-consult a book. To make such

back references successfully, we must be able to rely on the used aids and tools. This applies for books just as well for e-mails, and web pages.

When using the web, people often revisit earlier visited web pages. Such revisits appear in almost every web-based activity [256]. They vary in character and motivation — they appear in the short- and long-term, they refer to single or multiple pages, they are motivated by reviewing same or modified content. In our study, [213] showed that web users switch back and forth between parallel sessions, resume suspended sessions, re-utilize or monitor specific information, and try to re-find information found long ago. This results in short-, medium-, or long-term revisitations.[1]

What all these behaviors have in common is that one or more web pages are being revisited. A big variety of history tools and techniques like the back-button, browser tabs, bookmarks, and personalizable search engines already support such revisits. However, most of these techniques still show substantial shortcomings and several important situations both of short- and long-term revisitation lack adequate support, thereby absorbing an unnecessary amount of time and cognitive capacities. Two of the most severe usability problems already in its early ages were *finding* and *re-finding* of information [119]. The situation has changed considerably since then, in terms of content and usage, but much too little in terms of usability (cf. [117, 210, 203]). This adds up to a massive global productivity loss [69]. Improved revisitation support could still make the daily work experience of millions of web users easier.

Examples for current weaknesses are the support of short-term revisits back to a recently visited sub-branch or to a page hidden in the short-term history of another browser tab or window, the long-term revisitation of several topically related pages across different web sites, the quick resumption of earlier web sessions after several days including all the related meaningful pages, the communication of web

[1] A more detailed distinction of short-, medium-, and long-term revisitations is presented in Section 2.2.2. Long-term revisits are further detailed to very long-term revisits. To refer to the broad temporal spectrum of revisits in general, the text often mentions only short- and long-term revisits.

tasks with other users, and long-term revisits to specific information hidden in the depth of a site.

The results of these weaknesses range from detractions from the current activity, small but cumulating concentration and productivity losses, up to major problems caused by the inability to re-find specific important content. Most frustration and troubles coming along with such deficiencies seem to be avoidable. Instead of having to concentrate on the technology, people should be able to spend their precious resources on the actual tasks they are engaged with. This could save valuable time, free cognitive capacities, and increase the subjective satisfaction — on a global dimension.

One promising direction of tools that aim at filling the existing gap are graphic-based history tools, the pros and cons of which are further examined in this survey. The survey also explores situations of revisitation, in which such tools might support the user more appropriately than current tools. The results may be used as design implications to re-think existing techniques and to develop new and better suited ones that assist the user more appropriately. While history approaches in other contexts were thoroughly surveyed already long ago [116], this survey reviews history tools and their usage in the context of the web.

This work is in part based on the author's dissertation [185], the related development and examination of the *SessionGraphs history approach*, which is also briefly summarized here (p. 2), and partly on the findings gained in a collaborative study of web usage (p. 24f).

This survey concentrates on the analysis of 2D graphical history tools and aims at founding a broad basis for improving all the different kinds of revisitations by combining current technology with such graphical approaches in the future.

1.1 Overview Over the Sections

Section 2 describes why adequate revisitation support is crucial to a functioning web. It names the two most important reasons for revisitations: the web's hypertextual structure and the repetitive and interrupted character of the users' tasks. It introduces a consistent

nomenclature to enable a clear discussion and summarizes empirical insights into actual revisitation behavior.

Section 3 presents today's history support as integrated in common browsers (back, bookmarks, URL auto-completion, etc.) and as available in search engines. It defines the most important shortcomings that should be addressed in future history tools. Subsequently, several research projects are presented that has already aimed at improving the situation. The focus is on visual history support.

Section 4 summarizes design implications for future history tools and dares to presume likely future directions of the web, including their effects on revisitation behavior and necessary support.

Finally, Section 5 concludes the major issues of this survey.

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