

VDMs for Finding and Re-finding Web Search Results

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ABSTRACT

This paper presents Visual Data Mountains (VDMs), a tool intended to assist users to find relevant documents and discover varied topics among Web search results. The interface is also intended to improve how users re-find search results. A small-scale pilot study was conducted to evaluate the enjoyment of VDMs and its perceived effectiveness for finding and re-finding tasks on the Web.

Categories and Subject Descriptors

H.1.2 [User/Machine Systems]: Human factors, human information processing

H.3.3 [Information Search and Retrieval]: Search process, clustering

General Terms

Performance, Design, Experimentation, Human Factors

Keywords

Web information retrieval, visualization, techniques, visual clustering, re-searching, re-finding

1. INTRODUCTION

Involving aspects of visualization in the process of Web search can help users to navigate through search results and explore the relevancy among the retrieved documents. The use of visual clustering in presenting Web search results can help users to decide on the relevancy of search results through the topic overview provided in result clusters. To reduce the effort needed by users to perceive relevant search results, visualization and clustering techniques have been investigated [1].

Text-based presentations are more effective for finding new Web documents that a user has not seen before, while visualization presentations can be utilized in re-finding Web documents that the user have already encountered in past searches [7]. Re-searching the Web for re-finding particular documents is very important since 33% of Web search queries submitted by the same user are intended for re-finding [6].

This paper presents a prototype system intended for improving the presentation of Web search results. The system was built to improve how users recognize Web search results of interest. The use of clustering and visualization was meant to improve how

users gather and collect Web pages for tasks that involve searching for information that belongs to varied topics and can be found in different sources. This type of task is called ‘Information Gathering’ according to [2] and [4].

Moreover, re-searching the Web for re-finding search results is considered in the presented system. This is done by allowing users to preserve a subset of Web search results that the user may re-use in future sessions belonging to the same task. This feature is also intended to improve the effectiveness of users gathering information on the Web over multiple sessions.

The remainder of this paper is divided as follows. Section 2 provides an overview of some related work. The VDMs design is illustrated in Section 3. Section 4 provides the results of the evaluation study. The paper is concluded with a brief summary in Section 5.

2. RELATED WORK

Visualization and clustering have been utilized to improve how users find relevant search results. Alhenshiri et al. [1] showed that presenting features of Web pages such as the thumbnails and similarities (through clustering) helped users discover relevant documents among the search results more effectively. Moreover, visualization can further help with browsing Web pages. For instance, Robertson et al. [5] used a *Data Mountain*’s presentation of Web pages to allow users to view and arrange pages on the Web browser. They revealed that Data Mountain was much better than the interface of a regular browser. The approach allowed users to arrange their documents manually while browsing. However, the exploration of documents was sometimes frustrating.

Searching for information on the Web can be for either finding previously unseen results or for re-searching for Web documents that the user had located in the past. Re-searching for Web documents is an important topic that was discussed in the work of Teevan [6]. The importance of re-searching for information comes from: first, 33% of Web search queries submitted by a user have already been issued by the same user; second, information experienced by a user including Web pages previously viewed by that user is considered in one aspect ‘personal information’. Putting those documents under the umbrella of personal information necessitates investigating tools that would help the user in re-finding by re-searching Web search results of this nature.

3. VDMs DESIGN

VDMs is a prototype system that was designed using the *prefuse* visualization toolkit (<http://prefuse.org/>), and it relies on the Google search engine to derive search results. The interface attempts to better use the concept of Data Mountain in providing

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more effective presentations of Web search results. Visualization of search results should make it feasible for users to recognize Web pages of interest among the rendered hits. Therefore, snapshots of Web pages are presented on the VDMs' display. Figure 1 shows the interface of VDMs.

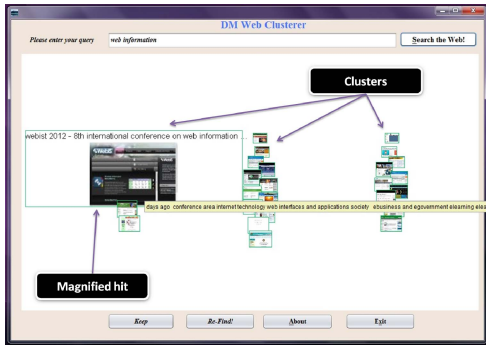


Figure 1. VDMs interface.

The results of a search query are arranged as mountains of thumbnails representing Web pages that are categorized into clusters. Each thumbnail is associated with the title of the page. Hovering over a thumbnail enlarges it and reveals the summary of the corresponding page to the user. VDMs provides zooming features so that the user can see more details of each thumbnail. VDMs provides features for keeping and re-finding Web search results.

When the user attempts to search the Web to re-find certain pages, sometimes, and due to the evolutionary nature of the Web and the continuous changes of the ranks given to Web pages, the user cannot re-find the same Web pages even if he/she submits the same query. Hence, VDMs gives the user the ability to keep a subset of the collection. The results are kept associated with the query and the user comments on the user's computer. VDMs gives the user the ability to add comments to the saved set of pages to make re-finding later easier by searching the user comments, the titles of the pages, or the list of labels given to each group of pages kept for re-finding.

4. EVALUATION

VDMs was evaluated using a pilot study to measure the engagement of the interface and provide indications about its possible effectiveness. The study had six pilots. The study revealed some important indications about the benefits of VDMs and its potential usability as an effective search interface for finding and re-finding Web search results.

As Figure 2 shows, five of the six pilots indicated that they were satisfied with VDMs with respect to the presentation of search results for finding relevant documents and also with respect to the keep-and-re-find feature. Most participants indicated that they believe that VDMs can be effective for presenting search results as clustered thumbnails.

Moreover, five participants thought that the keep-and-re-find feature was helpful. Users in the study left 13 comments regarding some of the interesting features that they liked in the VDMs.

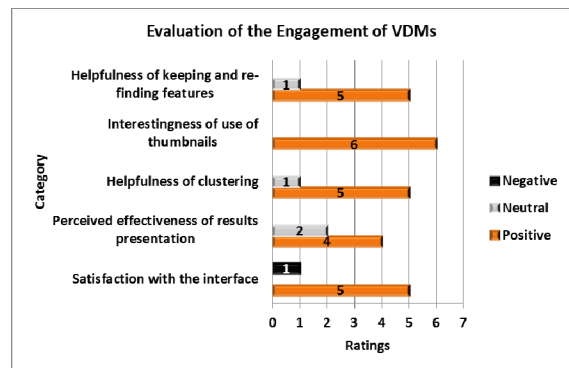


Figure 2. Study results.

The comments concerned the usefulness of the overview provided by the clustering scheme, the thumbnail view of Web pages, and the keep-and-re-find features. In addition, users left important comments regarding how the VDMs interface could be improved. User complained about some display issues such as the size of the thumbnail when the user hovers over the result hits. Some other comments regarded the need for cluster labels, making keeping easier by selecting what should be kept in a drag-and-drop fashion, and some efficiency issues.

5. CONCLUSION

This paper presented VDMs, a prototype system in which visualization and clustering were implemented to improve the presentation of Web search results. The VDMs prototype allows Web users to search, keep, and re-find Web search results during Web tasks. The prototype will be further improved by using more than one clustering criteria. A complete factorial user study will be conducted to evaluate the effectiveness of VDMs.

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