Supporting Information Retrieval on Mobile Devices

Ernesto William De Luca
University of Magdeburg
Universitätsplatz 2
39106 Magdeburg, Germany
+49-391-67-18290
deluca@iws.cs.uni-magdeburg.de

Andreas Nürnberger
University of Magdeburg
Universitätsplatz 2
39106 Magdeburg, Germany
+49-391-67-18487
nuernb@iws.cs.uni-magdeburg.de

ABSTRACT
We present a search interface that has been designed for the use on mobile devices in order to provide improved navigation and visualization of result sets. Besides automatic context switching, the interfaces provide methods to store prior search results in a structured way and to annotate documents with respect to user interests and the query. These methods enable a user to retrieve documents with fewer interactions and less data traffic, which is especially important for mobile devices.

Categories and Subject Descriptors
H.3.3 [Information Storage and Retrieval]: Information Search and Retrieval - clustering, information filtering, query formulation, search process.
H.5.2 [User Interfaces]: graphical user interfaces (GUI), input devices and strategies, interaction styles, natural language.


Keywords
Document Classification, Ontologies, Sense Disambiguation.

1. INTRODUCTION
Information presented on a mobile device has to be presented in a different way than on a desktop computer. We have to consider that mobile devices are compact in size and have also different characteristics [6]. This is especially important if the user has to browse or interact with the information as in information retrieval applications, where the user is searching for specific content in a usually very large set of documents [3]. Furthermore, we have to consider problems such as transmitting and receiving huge amounts of data, the processing power, the limited battery life and the possible intermittent connection of a wireless device to a network. We present in the following an information retrieval interface, that has been especially designed for use on mobile devices.

2. ADAPTING RETRIEVAL SYSTEMS FOR MOBILE DEVICES
The need to obtain a good adaptivity to user needs in order to improve retrieval performance should be based on an appropriate user model in the retrieval system, since users expect individual information depending on their interests and knowledge. In order to achieve this, we need different user profiles that cover (almost) all user needs, including the relations between the users’ search words (content adaptivity), and the different user characteristics (depending on the user interests, knowledge, experience, language, culture, etc.). Besides the information describing a user, we have to consider certain hardware limits when implementing a user interface for a specific task, e.g., mobile device, and have to adapt the interface according to these limits [3, 6]. We also have to observe, that information has to be independent from the interface and has to be presented individually; this means that users should have a unique support depending on their needs as independent as possible from the hardware they are currently using.

2.1 The CARSA Retrieval Framework
Implementing our retrieval system, we decided to divide query results set processing (the information to be presented) from the interface design (information presentation) in order to simplify the development of retrieval systems for, e.g., different desktop as well as mobile devices. The central component of the retrieval system is a meta search engine providing methods to restructure and annotate result sets of user queries. Fig. 1 gives an overview of the system architecture of CARSA [2]. Search engines (e.g., Google, local searchers) and the user interfaces are connected to the system by Web services. Using this modular implementation, it is easily possible to extend the system by additional search engines or to integrate different interfaces.

2.2 Document Categorization
User studies have shown that categorized information can improve the retrieval performance for a user. Thus, interfaces providing category information are more effective than pure list interfaces for presenting and browsing information [5]. The authors of [5] evaluated the effectiveness of different interfaces for organizing search results. Users strongly preferred interfaces that provide categorized information and were 50% faster in finding information organized into categories. Similar results based on categories used by Yahoo were presented in [8].

The main idea of our approach is to provide additional disambiguating information to the documents of a result set retrieved from a search engine in order to enable the clients to restructure or filter the retrieved document result set. Thus, we support the user...
in choosing the relevant information by categorizing the documents using different classification techniques. So far, we have integrated two basic techniques in order to provide disambiguating information: Annotation based on information obtained from the users’ bookmarks (Intelligent Bookmarks) and classification based on the different meanings of a query term (Sense Folders). More details about these methods can be found in [1, 4, 7].

3. THE MOBILE USER INTERFACE

Since an information retrieval interface that is developed based on the meta search engine discussed above should help to accelerate the search process of a user, it is important to design the interface as user friendly as possible, considering the limitations of the mobile devices [6]. Based on the architecture of a desktop user interface [7], we developed an adapted version for use on mobile devices. Especially to provide an overview over available information, it is very difficult due to the limited screen size. We had to take into account that the user should not get lost in navigating the content, and also intuitively understand how to use the interface. In order to ensure an intuitive use, we implemented the functional groups of the desktop user interface in three separate views. Since therefore the information is presented (partially) on different screens, for example, the drag and drop functionality of the desktop system provided in order to store or restructure the bookmarks had to be revised.

The basic components of the system are based on three different views for searching, result set navigation and bookmark management. The views are shown in Fig. 2 and can be briefly described as follows:

a) Search and presentation of the search results in a tree-form.

b) Results window: Search results are annotated/categorized using different classification approaches and presented with the additional information as first information after the title.

c) The third component is used for the user specific (private) categories and contexts (bookmarks).

The user can type the query in the search window (Fig. 2a) using standard PDA text input methods. The system retrieves the documents presenting automatically the results by switching to the results window. The navigation in the result list can be done with a pen, which is very similar to the mouse interaction on a desktop system. If the user clicks on a document, the content can be shown as a normal web page in the window of the standard web browser of the device. The results are presented with the additional categorical information (Fig. 2b). This information is currently obtained by the Sense Folder and/or Intelligent Bookmark classification.

The Sense Folder and the Intelligent Bookmark approach help the user in searching the relevant information. This means that this additional information is directly accessible and describes the content with meaning (Sense Folder) and private associations (Intelligent Bookmarks) of the user. A user has direct access to the meaning and does not have to loose time in reading the corresponding web pages since he can directly choose documents that belong only to the desired document category. This is a very important task for adaptive systems that support a user in finding the relevant information, especially using small mobile devices. This solution gives the possibility to better navigate the content, without having to browse all documents, which would also require additional transmission bandwidth.

![Figure 2: Mobile User Interface: a) Search window, and b) Sense Folder” result list, c) “Intelligent Bookmarks”](image)

Buttons (Fig. 2) provide the possibility to switch between the views. In every view a user can switch to another view only by clicking on the corresponding button. The user can choose to search new content, browsing the results, saving the interesting results to the Intelligent Bookmarks (Fig. 2c) or viewing new results through the simple use of a pen.

4. CONCLUSIONS

In this paper we have briefly discussed problems related to mobile devices for information retrieval systems. We have presented an adapted user interface for mobile devices that shows how different classification approaches can be used for mobile devices and how they can enhance document collection navigation and visualization.

REFERENCES


