

## INTRODUCTION AND OVERVIEW

# Search User Interfaces: Best Practices and Future Visions

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This Perspectives section is the culmination of a collaborative effort by many noted researchers and practitioners in the area of user interface (UI) design for search. The authors of the articles included here were recruited from a select group who attended a workshop at the Conference on Human Factors in Computing Systems (CHI 2003), Ft. Lauderdale, FL (April 5–10, 2003) to share their knowledge and experience from academia, industry, and consulting. The authors were invited to submit a paper outlining their contributions to search user interface design in the form of best practices. The styles used by these authors reflect their diversity of experience and the focus of their work. While the application areas highlighted in the article represent a limited subset of the search UI domain, the concepts can be extended to the design of search UIs in any area. The articles are divided into four areas: *the structure of the corpus* (i.e., knowledge base), *user context and task requirements*, *user interface design*, and *mobile devices*. In the first article, as facilitators of the CHI workshop and the editors of this Perspectives issue, we present an overview of the search user interface domain and summarize some of the best practices that were identified at the CHI workshop.

### Structure of the Corpus

The Internet is composed of a wide assortment of content, each site organized according to its own structure and organizational schema (Lazonder, Biemans, & Wopereis, 2000). Search engines that target the entire Internet thus cannot assume much in the way of structural consistency among different sites. However, when the corpus to search is from a specific domain, users can be assisted in ways that are

not feasible in an Internet-wide search. Davis (2006, pp. 788–791) presents the search interfaces for the Digital Library for Earth Science Education (DLESE), which contains information specifically for earth science education. This allows a set of trained librarians to review the work for quality and create metatags that increase the power of the search interface and facilitate getting the user to the appropriate content faster and more reliably. Conveying this power to the user requires creating a transparent system that reflects the needs of the DLESE users. The methods used to develop a user interface that achieves this goal are described in her article.

Sacco (2006, pp. 792–796) also considers the design of a domain-specific corpus. He presents a dynamic taxonomy structure that creates metadata classifications dynamically from the structure of the connections between items. The interface allows the user to zoom within the corpus structure to reduce the taxonomy and view only parts that match his or her needs. This iterative process allows the user to navigate around the corpus rather than submit independent queries. The structure is generalizable to any structured domain.

### User Context and Search Task

Rose (2006, pp. 797–799) takes the perspective that search engines should be designed to match the user's innate strategies rather than forcing users to accommodate to the search UI. He asserts that if search engines provided unique search interfaces for each kind of task, they would provide richer searching experiences. He also discusses several aspects of culture that can affect a user's search needs. While considering user context may be intuitive to many practitioners of human factors, Rose suggests a few best practices on how to do it effectively. Hopefully, his work will provoke others to develop more ideas.

Hendry (2006, pp. 800–802) looks further into the future. He agrees that search interfaces must match user contexts and needs. He sees future search as imbedded into client-side application environments rather than stand-alone systems. To get there, he suggests an evolutionary adaptation of information workspaces using cognitive models of context-dependent problem-solving and decision-making.

One aspect of context that has long been missing from search system analysis is the search history. Because the search process itself is rarely the goal of the task, users may not develop expertise in creating queries because of past attempts. This limitation is true of general searching skill learning as well as understanding the structure of a specific corpus. However, providing a history of past queries can allow experience to inform future searches nonetheless. Komlodi, Soergel, and Marchionini (2006, pp. 803–807) present an interface for presenting search histories and describe a user test to validate its effectiveness. Their Table 1 (p. 804) presents a set of general design guidelines for this purpose.

### User-Interface Design

In preparation for a redesign of America Online's (AOL) ecommerce site, Gremett (2006, pp. 808–812) conducted a user test of the navigation in Amazon's ecommerce searching and browsing interface. He illustrates the common user challenges that he observed and presents simple but effective design alternatives to overcome them. A follow-up study of the new design verified the improvements. As with any iterative design process, additional challenges were identified; however, these were deemed of low severity. Not only do the design ideas represent search best practices for a combined search–browse interface for ecommerce but the user testing can also be considered a best practice for verifying such an interface.

Kalbach (2006, pp. 813–818) delves into the emotional aspects of search. He decries the lack of consideration for emotion in most cognitive frameworks that have been used to model search tasks. He uses Kuhlthau's (1993) Information Search Process (ISP) model to add emotions to the analysis of the search user interface. He uses two real Web sites to illustrate the best practices that he feels can alleviate uncertainty and confusion and lead to confidence in the search task. He uses the ISP model to demonstrate why simple ideas such as redundancy and clarity can make searching a more emotionally secure activity.

Sometimes, it is equally illustrative to know what did not work as it is to know what did. Mochel (2006, pp. 819–824) accomplishes this by describing the evolution of a search interface for AOL's ecommerce site that followed an iterative, user-centered process. In addition to presenting the design ideas that worked, he describes the design ideas that were discarded and explains the rationale for doing so. He also describes aspects of the design that were modified based on the results of the user test. One interesting finding was that users wanted support for combined search–browse. They were not searching or browsing; they were shopping

and wanted an interface that supporting this regardless of the method they were using at any particular time. He also found that when the results set was of low relevance across a wide range of categories, users preferred to see fewer categories and still get product abstracts so that they could determine the nature of the categories that were presented. Many best practices for search design can be identified in this article, both for ecommerce sites in particular and search-user interfaces in general.

Wildemuth (2006, pp. 825–828) presents compelling evidence for the benefits of helping users formulate more effective queries. She describes several practices for improving a user's query through expansion and focus. Using these design ideas, search interfaces can support more natural search strategies and facilitate the retrieval of better results. Her research involves the domain-specific content of a medical corpus but the practices described can be used in any domain or in an Internet-wide search.

What if a browser could predict which pages the user would like to see and retrieve them without being asked? While this may not be feasible for all search situations, Beale (2006, pp. 829–833) presents Mitsukeru, a system that resides in the background of the browser. It attempts to predict which of the pages linked to the current page are most likely to be of interest and provides feedforward using dynamic hypertext markup language (DHTML). The system is based on keyword matching as well as navigation history. A user test verified that the algorithm is effective and that users respond positively to the assistance. The future of search is likely to be full of ideas like this one that model the user, the task, and the context, and use this information to improve navigation.

### Mobile Search

Roto (2006, pp. 834–837) illustrates the complexity of designing for the small screens found on mobile phones. Her user test contradicts conventional wisdom that interfaces should avoid the need for users to input text on a mobile phone. Instead, users preferred to input text into a search field. However, this was only effective when using the best practices for designing the interface described in her article. She also presents some of the additional functionality that mobile search can offer—namely location-based search. She describes two types: finding nearby locations such as a restaurant using an existing database and identifying who or what is nearby by querying other mobile devices.

Mobile does not only refer to wireless Internet access. Jones, Buchanan, Cheng, and Jain (2006, pp. 838–842) present an idea for a “laid back” search tool where users can input their queries offline at the moment that the need is identified and fresh in their minds. At this point, the system's only task is to help the user turn his or her information need into a functional query. The authors describe several methods for accomplishing this. This assistance provides the main advantage over traditional methods such as writing the idea on a scrap of paper. Later, when Internet access is available, the

query can be transferred into a search system for analysis. If the user again has little time to concentrate on the search task, he or she can offload the results to the same mobile device and deal with them later. The authors also describe some design ideas to format Web pages for viewing on a small screen.

The extensive use of search systems for the Internet at-large and within specific domains demonstrates the importance of search user interface design. The challenges identified in the following articles highlight the challenges that remain. The collaboration of search user interface researchers and practitioners that instigated this Perspectives section hopefully will set a standard for future work in this area.

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**Russell Beale** has been involved in research into search and browsing for about 10 years. He focuses on using artificial intelligence (AI) approaches coupled with highly usable design, building intelligent architectures to support information access for both mobile learning and visualization.

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**Matt Jones** is helping to set up the Future Interaction Technology Lab at the Department of Computer Science, University of Wales, Swansea. A member of the New Zealand Digital Library Group, he has been working on handheld, mobile information access issues for the past 8 years tackling both conventional text-based information search and media such as images and audio. **George Buchanan** is a Research Fellow affiliated with the New Zealand Digital Library Group and now in University College in the Interaction Centre. He has been developing a novel spatial hypertext system for digital libraries. **Tzu-Chiang Cheng** and **Preeti Jain** were honors-level students who helped build various parts of the laid-back infrastructure. Preeti has left the University but Tzu-Chiang continues his graduate-level studies in digital library usability.

**James Kalbach** holds a degree in library science from Rutgers University and a master's in music theory and composition. Currently a human factors engineer with Lexis-Nexis he designs search interfaces for the company's global products. Previously, he served as head of information architecture with Razorfish Germany developing large-scale Web sites and applications.

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