

Browsing vs. Search: Can We Find a Synergy?

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ABSTRACT

This panel seeks a synergy between two common user interface approaches for information access: browsing and search. Panelists from a variety of backgrounds including information retrieval and hypertext will give short presentations suggesting what the synergy might be from their individual perspectives. The panelists and the audience will then jointly discuss how to achieve an overall synergy.

KEYWORDS: information access, browsing, search, querying, navigation, information visualization

INTRODUCTION

Much has been written about the potential benefits of information technology for transforming business, science, medicine, engineering, and education. However, this potential will not be realized if users cannot access online information easily and efficiently. Two common user interface approaches for information access are browsing and search. Broadly speaking, *Browsing* involves navigation through an information collection, and *search* involves specification of queries to retrieve information from a database [4]. Neither approach appears to be entirely adequate for accessing the information becoming available on the Internet.

For example, consider accessing the World-Wide Web [1], a very large network-based hypertext system, with Mosaic, a popular browsing-oriented user interface to the Web. One problem with browsing the Web is that there are so many places to explore that the user may never find the desired information. On the other hand, web-crawler databases provide searchable indexes of Web documents. However, formulating queries to retrieve the desired information from such databases can be quite difficult. Most researchers believe these two approaches complement each other. The open question is how to combine them synergistically.

This panel brings together a diverse collection of researchers

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who are familiar with these two user interface approaches for information access. The panelists represent a variety of communities, including hypertext, information retrieval, psychology, cognitive science, and visualization. Each panelist will give a short, informative presentation describing how they believe browsing and search can be combined synergistically. The panelists and the audience will then discuss and compare the different views, working toward a combined approach that addresses all of the issues.

PANELIST STATEMENTS

Polle T. Zellweger: Hypertext navigation paradigms

I will review a variety of navigation and structuring paradigms that have been used in the hypertext community, from pure unstructured browsing along author-created links, to the use of query-based information retrieval techniques to create virtual links to items of current interest. The Mosaic interface to the World-Wide Web uses both techniques in permitting users to navigate the web. Browsing raises traditional problems of disorientation and cognitive overhead [2], but has value in information serendipity. Additional structuring techniques such as maps and paths can make browsing more effective while retaining some of the unfolding nature of the browsing paradigm.

Polle Zellweger received a Ph.D. in computer science from UC Berkeley in 1984. She has been a researcher at Xerox PARC since 1981. As manager of the Active Documents group at PARC, she has led research into architectures, uses, and user interfaces for documents with dynamic content. Her particular focus has been structures for hypermedia documents, including path mechanisms and synchronization of multiple media.

Gerard Salton: Text structure analysis

In the foreseeable future, large masses of machine-readable text will be made available to a wide variety of potential users. Methods must then be available to help users find their way through the collections in flexible ways.

Procedures are described for automatically analyzing the structure of full-text collections, and for using structural characteristics to identify text themes and design browsing and selective text traversal strategies.

Gerard Salton has been a professor of computer science at Cornell University for nearly 30 years. He has designed advanced text analysis and retrieval tools, such as the Smart system, and

has written extensively about text-based search and retrieval. His most recent book is "Automatic Text Processing", Addison Wesley, 1989.

Mark Chignell: User-centered information systems

Designers of information exploration systems appear to be stuck on the horns of a dilemma. Information retrieval is difficult and requires considerable skill (including knowledge of indexing policy), while browsing requires considerable authoring effort in building the link structure. I will propose the use of user-centered designs that provide tools that allow users to mix and match browsing and retrieval. The presentation will be based on research that we have carried out on graphical querying in the past few years. In this approach, the user forms queries by marking up text. This approach simplifies the task of building Boolean queries. In addition, other tools can help the user find interesting terms for exploration. One of the features of this approach is that techniques such as visualization can be added to it as they become available. The idea is to surround users with powerful tools and a customizable user interface and then let them construct the information exploration environment that suits them best.

I will briefly illustrate the use of this approach with the ST-PatTREC system that we have developed. I will show how this approach was used to search for information in a 300 megabyte subset of the TIPSTER database. Advantages and disadvantages of the user-centered approach will be discussed.

Mark Chignell is an associate professor of Industrial Engineering at the University of Toronto. He has a Ph.D in Psychology and an MS in Industrial and Systems Engineering. He has research interests in the areas of user interface design and information technology. His current research focus is on multimedia information systems and electronic books.

George W. Furnas: Navigation-by-query, query-by-navigation, and other tricks to try

Navigation and querying are the contrasting interaction components underlying what in this panel are called "browsing" and "search". They differ regarding, for example, semantic representation, vocabulary problems, structuring costs, and meta-knowledge requirements. Many synergistic designs are possible, including:

- *Navigation-by-query.* User navigates over a structure, deciding where to go next at each step by sending out queries to all the out paths and choosing those that have many answers to the query.
- *Query-by-navigation.* User navigates over a structure, and selects certain parts to submit as a query to an independent word-based retrieval system.
- *Post-query-navigation.* User queries a corpus and the return set is structured automatically. The user explores the return set by navigating over this new structure.
- *Query-initiated-navigation.* User query gets a starting point in a structure for subsequent navigation and browsing.

Examples of these and other approaches will be sketched. An important question is whether the benefit will outweigh the combined cost (e.g., from having to build both a search engine and a navigation structure).

George Furnas is currently Director of Computer Graphics and Interactive Media research in the Computer Science department at Bell Communications Research. He has worked for almost 15 years in human-computer interaction, specializing in areas related to information access and visualization, and was the keynote speaker at the 1993 IEEE visual languages conference. His specific contributions include work on statistical semantics, adaptive indexing, latent semantic indexing, generalized fisheye views, graphical deduction systems, high dimensional visualization, and multitrees.

Jock Mackinlay: Embedding queries in visualizations

Visualization does not easily extend to large, remote databases, such as the ones envisioned for the national information infrastructure, because slow access limits high-bandwidth interaction. I will describe a set of user interface techniques for creating *Organic User Interfaces for Information Access*, which help users manage their information retrieval searches [3]. Organic User Interfaces combine search and browsing through link-generating queries that are automatically explored by semi-autonomous agents. Visualization techniques are used to provide the user with intuitive control of these agents to direct the search toward desirable information without wasting resources. Metaphorically, the user becomes a gardener who trims and fertilizes an information landscape that is being grown by embedded search processes.

Jock D. Mackinlay joined Xerox PARC after receiving a Ph.D. in 1986 from Stanford University on the automatic design of graphical presentations of relational information. For the last five years, he has been collaborating with Stuart Card and George Robertson on the Information Visualizer (IV), an information visualization application based on 3D graphics and interactive animation.

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