Search Without Keywords

John McCarthy
Dept. of Computer Science
University College London
London, UK. WC1E 6BT
+44 (0)20 7679 3644
j.mccarthy@cs.ucl.ac.uk

Patrick Bergel
L6 Research Ltd
34 Glendale Road
Essex, UK. CM0 8LY
patrick@l6research.com

Keywords
Search, browse, mobile, search engine, user interface, search scenarios of use.

INTRODUCTION

There are many everyday activities that involve search. Yet discussions of search on both desktop and mobile devices [11,12, 2,6,7,13] tend to focus on keyword-list interaction - where users type in a query and are presented with a list of results that match the query. This is just one of many modes of search – and the available evidence suggests that (i) there are serious user problems with keyword-list search and (ii) it is not the mode that users prefer on mobile devices.

We first examine the problems associated with "keyword-list" interfaces and suggest design improvements, before reviewing search activities that extend beyond this paradigm.

PROBLEMS WITH KEYWORD-LIST INTERFACES

Glance [7] outlines three problems for users of Internet search engines:

1) Specifying a need in the form of a query
2) Finding items relevant to the need as expressed by the query
3) Judging the quality of relevant items returned by the search engine.

User-centered problems arise at stage (1) and (3). A recent survey showed that 70% of users said "they become frustrated whether they are successful or not"[5]. This result is important, indicating that the search interaction, rather than just the search result, is an important determinant of user satisfaction.

The problem is that users do not make queries in a form appropriate for the search engine. Queries tend to be very short, usually just a single word [14]. On top of this users make lexical errors in spelling or typing, syntactic errors in the formalization of the input, and semantic errors - when they express their needs in a way that is incompatible with the system representation [9]. A recent study of digital library search revealed that almost 50% of all failed searches occurred because of semantic errors [9].

In desktop systems a number of methods have been applied to elaborate on the user's query and provide more targeted results. Fitzpatrick and Dent [6] semantically expand user queries by drawing on similar queries made by previous users. Wen et al. [14] report a method for clustering queries based on the documents user's select. In agreement with Raghavan and Sever [10] they show that using documents to identify the relationship between queries is more effective than identifying similarity between queries alone. When using keyword search query refinement is an extremely sensible approach, especially for non-technical users. It is equivalent to the conversational "Do you mean X, Y or Z?", motivating the user to be more specific, checking that the engine really "understands" the request and delivering more accurate results [1].

At stage (3) there are design issues relating to user preference. In a review of 80 mobile search interfaces [2], the majority (50) used a keyword-list format while the remainder used a searchable-directory. Despite this bias in favor of keyword-list interface a survey of users indicated that they actually preferred searchable-directories [2]. One reason for this preference might be that directories support a wider range of search activities.

To investigate the relationship between search activities and interfaces we constructed a taxonomy to describe search activities performed both with and without computers. The taxonomy is used to focus discussion on which interfaces are appropriate for which tasks.

A TAXONOMY OF SEARCH ACTIVITIES

Spence [13] takes a user-centered approach to distinguish between the activities of browsing and searching. Browsing is defined as an assessment of content where the goal is not clearly defined. Search is an assessment of content weighted by a specific goal. With keyword search, words relating to the goal must be explicitly formulated, whereas with directory search the query can also be selected from the options on screen.

These are two important dimensions of user activity, the degree of goal formulation, and the requirement to explicitly specify a keyword query. They are related, in that it is obviously impossible to formulate a specific query if you're not sure what you're looking for. In these circumstances an interface that does not rely on keywords is more appropriate.

Another variable is the time frame of the goal - as the need may not be immediate. For example, a user may be looking to buy a new house in 12 months time, but in the meantime, they would like to develop their knowledge about the

market. Such users don't have an immediate information need that must be fulfilled, but rather one that persists over a period of time. Under these circumstances an alerting system or channel subscription model may be more appropriate. Table 1 illustrates how the three dimensions are used to classify search activities with and without computer interfaces. The taxonomy relates user activity to an appropriate interface, as well as offering a description of novel interfaces, such as RSVP [4] and Google Viewer[1], that support different degrees of goal formulation. Table 1 also illustrates the relationship between the current taxonomy and the four types of search described by Rosenfeld and Morville [8].

Table 1: Taxonomy of search activities.

		GOAL - vague	GOAL - specific	QUERY - select	QUERY - formulate	NEED - persistent	NEED - immediate
COMPUTER INTERFACE	Directory	◆	◆	◆	◆	◆	◆
	Keyword - List		◆		◆		◆
	Alerts		◆		◆	◆	
	Map	◆	◆	◆	◆	◆	◆
	RSVP [4]	◆	◆	◆		◆	◆
OTHER INTERFACES	Window shop	◆		◆		◆	
	Ask for directions		◆		◆		◆
	Look at a tourist map	◆	◆	◆			◆
	Browse product reviews	◆	◆	◆		◆	
	Find a cool radio station.	◆		◆		◆	◆
Rosenfeld & Morville [8]	*Known Item Searching*		◆	◆			
	Existence Searching		◆		◆		
	Exploratory Searching	◆			◆		
	Comprehensive Searching (research)	◆			◆		

An important point to note is that the current scheme does not distinguish between the Rosenfeld & Morville [8] categories of *Exploratory Search* and *Comprehensive Search*. The essential difference between these two is that with comprehensive search "*users want to know everything available on a given topic*" whereas with exploratory search "*a few pieces of good information will do fine for now*". This could signal the requirement for a fourth dimension, such as **AMOUNT** or **SCOPE,** to indicate the quantity of information required, but we would question the assumption that any user would really want to know "*everything available*".

CONCLUSION

We have presented evidence of the limitations of the keyword-list interface on both PC and mobile platforms. These problems are associated with the need to explicitly formulate a query. Even between people, explicit query formulation is difficult. For example, try describing what your mother or father looks like, to a friend, so that they can find them in a crowd.

To tackle these issues we advocate the development of interfaces that support query selection rather than query formulation. Figures 1 shows an example in the domain of enterprise database search. Here keyword query formulation is augmented with query selection methods to reduce semantic errors in subsequent search.

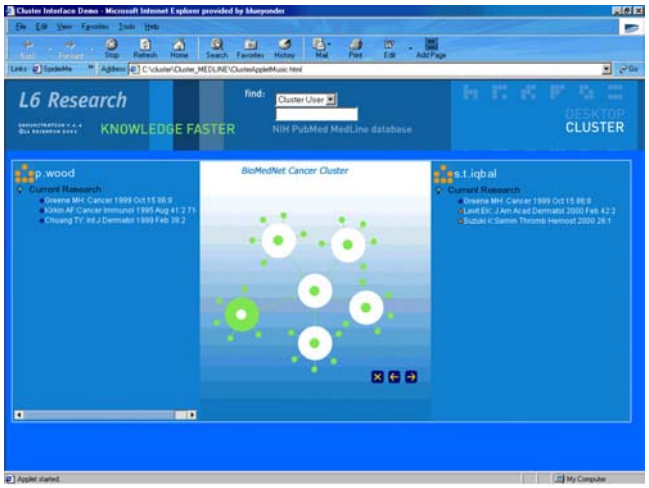

Figure 1 (above): Desktop search without keywords.

Figure 2 illustrates a consumer scenario on java enabled mobile devices. In both cases, no keywords are required to search the information space. Complex queries are constructed by selecting from on screen elements. This approach offers an elegant solution to tackle problems associated with keyword-list search, on an interface that works across different form factors.

[1] http://labs.google.com/gviewer.html

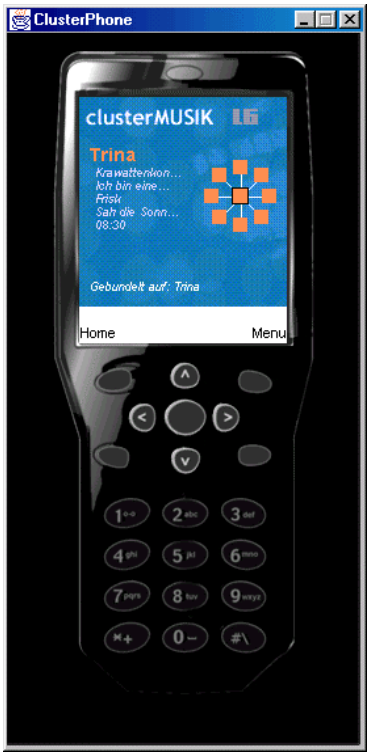

Figure 2: Mobile search without keywords.

ACKNOWLEDGMENTS

We thank the people at www.myrtle.co.uk for their encouragement and input in formulating these concepts.

REFERENCES

1. Bruza, P., McArthur, R. and Dennis, S., Interactive Internet Search: Keyword, directory and query reformulation mechanisms compared, in *Proceedings of SIGIR '00* (Athens, Greece, 2000), ACM Press 280-287.
2. Chan, D.L., Luk, R.W.P., Leong, H.V., Ho, E.K.S. and Lu, Q. A Preliminary Study of User Interface Design Issues for Mobile Web Access, in *Proceedings of the WWW02 Workshop on Mobile Search* (Honolulu, Hawaii, 2002). Available at http://www.haifa.il.ibm.com/Workshops/www2002-MobileSearch/WorkingNotes.pdf
3. Conger., S., and Loch, K.D. (eds.). Ethics and computer use. *Commun. ACM 38*, 12 (entire issue).
4. de Bruijn, O., Spence, R. and Chong, M.Y. RSVP browser: Web browsing on small screen devices, in *Proceedings of HCI with Mobile Devices Workshop* (IHM-HCI, Lille, September 2001)
5. Dennis, S., Bruza, P, and McArthur, R. Web Searching: A process-oriented experimental study of three interactive search paradigms. *Journal of the American Society for Information Science and Technology, 52, 2,* (2002), 120-133
6. Fitzpatrick, L. and Dent, M. Automatic Feedback Using Past Queries: Social Searching? *In Proceedings of SIGIR '97 (*Philadelphia, 1997), ACM Press 306-313
7. Glance, N.S. Community Search Assistant, in *Proceedings of 6th International Conference on Intelligent User Interfaces, IUI '01* (Santa Fe, 2001), ACM Press, 91-96.
8. Rosenfeld, L. and Morville, P., Searching Systems in *Information Architecture for the World Wide Web,* 99-129, O'Reilly & Associates, 1998.
9. Nordlie, R. "User revealment" – a comparison of initial queries and ensuing question development in online searching and in human reference interactions, in *In Proceedings of SIGIR '99* (Berkley, 1997), ACM Press 11-18
10. Raghavan, V.V. and Sever, H. One the reuse of past optimal queries, in *Proceedings of SIGIR '95* (Seattle, 1995), ACM Press 344-350.
11. Soffer, A., Maarek, Y., and Chang, B.W. WWW02 Workshop on Mobile Search. Available at http://www.haifa.il.ibm.com/Workshops/www2002-MobileSearch/WorkshopSummary.pdf
12. Sonera MediaLab, Mobile Search Engine White Paper (November 2002). Available at http://www.medialab.sonera.fi/workspace/MobileSearchEnginesWhitePape.pdf
13. Spence, R. A Framework for Navigation. *International Journal of Human Computer Studies*, 51, 5, (2002) 919-945.
14. Wen, J,, Nie, J. and Zhang, H. Query Clustering Using User Logs. *ACM Transactions on Information Systems*, 20, 1 (2002), 59-81