The Evaluation of Intelligent User Interfaces to Information Retrieval Systems

Giorgio Brajnik, Stefano Mizzaro, Carlo Tasso

Dipartimento di Matematica e Informatica
Università di Udine
Via delle Scienze 206 — Loc. Rizzi
Udine — Italy
Fax: +39 (432) 55.8499
e-mail: {giorgio|mizzaro|tasso}@dimi.uniud.it

Sommario

An intelligent user interface to *Information Retrieval* (IR) systems is a front-end program which interacts with the user and controls an underlying information retrieval system accessing information resources. Its goal is to empower the user with the capability to operate effectively without the need of an experienced human intermediary.

Designing good interfaces for IR systems is a complex activity. First, a rich set of interrelated functionalities needs to be implemented and the man-machine boundary has to change dynamically, in terms of abstraction level and machine involvement. Second, the criteria to be used to assess the quality of such interfaces are not very well understood and established. Evaluation methodologies adopted for IR systems tend to address a restricted formulation of the problem, often not considering the user's information seeking behavior and the interaction with the system.

In this work we present and experimentally evaluate different types of support that an interface to IR systems may provide to its users. More specifically, we distinguish the following *kinds* of help:

- *technical* help, enabling the user to develop an accurate and useful model of the interface. For example, to highlight the role of a certain control option.

- *conceptual* help, enabling the user to develop an effective conceptual model of the information seeking process. This kind of help can be further distinguished into:

   - *terminological* help, enriching the vocabulary the user adopts when formulating his problem. For example, to suggests lists of synonymous terms or more appropriate index terms.
   - *strategic* help, enabling the user to improve the effectiveness in conducting a search session. For example, to help the user to overcome an adverse situation, such as when zero items are retrieved by a query.

Different help *modalities* can be adopted:

- *contextual vs. generic* help, according to whether the help depends on the specific user behavior and user situation.

- *prompted vs. unprompted* help, according to the agent (user or interface) that starts the help dialogue.

- *user- vs. system-controlled* help, according to the agent that controls the evolution of the help dialogue.

Based on FIRE (*Flexible Information Retrieval Environment*), a knowledge-based interface to an IR system developed in our laboratory, we performed an experiment aimed at evaluating (*i*) the added value of the system-controlled, contextual and prompted terminological support implemented in FIRE and (*ii*) the importance of the different kinds of support and the best modalities for providing them. Forty-five computer science university students have been trained, organized into appropriate subject groups and asked to solve two information problems under various experimental settings (different kinds of support and different modalities). A rich set of objective data (including search effectiveness and user behavior) and subjective information (including user satisfaction on the quality of retrieved information, on effectiveness of the search environment, and on the received support) was collected through automatic logging, videotape and questionnaires.

The analysis of such data leads to the following general conclusions:

- Terminological help is useful if the strategic problem of identifying appropriate search concepts has been solved.

- Terminological support should be contextual and prompted.

- Strategic support should be unprompted and specifically oriented towards conceptualizing the query, enlarging the set of documents it retrieves and diagnosing ineffective or inconsistent user behaviors.

- Technical support is also needed to improve the usability of interfaces and the effectiveness of search. It should be either prompted or unprompted and contextual, depending on the particular case.

- User-controlled interaction is highly preferred. The interface should support users in interleaving different activities, in exploring the space of information items (relationships between terms, terms and documents, document content, etc.), and in developing an adequate search strategy.