Chapter 8
Adaptive Information Retrieval Based on Task Context

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ABSTRACT

This chapter discusses using context in Information Retrieval systems and Intelligent Assistant Agents in order to improve the performance of these systems. The notion of context is introduced and the state of the art in Contextual Information Retrieval is presented which illustrates various categories of contexts that can be taken into account when solving user queries. In this framework, the authors focus on the issue of task-based context which takes into account the current activity the user is involved in when he puts a query. Finally they introduce promising research directions that promote the use of Intelligent Assistant Agents capable of symbolic reasoning about users' tasks for supporting the query process.

INTRODUCTION

Since the 1950s, information retrieval has been a science dedicated to the storage, indexing and retrieval of information. Information retrieval systems aim to retrieve relevant documents to a user who expresses his need via a query. To date, their performances are mainly estimated with traditional precision and recall measures i.e. the

Cranfield paradigm (Cleverdon C. W., 1960). With the growing of the Internet applications and services, this domain has become crucial, and search tools have to propose more and more intelligent interfaces together with efficient indexers.

Because of the heterogeneity of the platforms, tools and interfaces, with the increase of users' mobility and ubiquitous services, information is now accessed in various situations or contexts that are characterized by: available hardware and

software tools; spatio-temporal position of the user; user's preferences and (in)capabilities, and user's activities etc. Not taking into account these new conditions lead to one-size-fit-all answers.

At the same time, users are reluctant to think deeper into formulating their queries (Jansen et al., 2000), they prefer very simplistic interfaces, such as Yahoo™ or Google™. Hence one cannot rely on the explicit cooperation of the user to elicit (with key-words or through a dedicated Graphical User Interface) the contextual parameters that would be useful in building more precise queries. This is the reason why current information retrieval research focuses on the elicitation of the various kinds of contexts in which the queries are put and try to develop more adaptive information retrieval systems that exploit contextual information.

Finding just-in-time information has raised new theories and new evaluations to manage the complexity of the situations and to anticipate or predict the needs of the users. In the domain of information retrieval, tremendous changes have to be done and it is now recognized that there is a paradigm shift from the Cranfield paradigm that was well adapted to general information retrieval systems, to a user-centered paradigm (Fisher et al., 2005).

Many definitions have been proposed to define the notion of context (Bazire and Brézillon, 2005). Among them, system configuration and user location are the most studied. User's preferences and capabilities are more related to the research area of adaptive personalized interfaces but they can be considered as part of the contextual information, especially when they interact with the system configuration and/or user location (in cases of user's disabilities, for example).

However one of the most promising features of contextual information is related to the current activity the user is involved in when he puts a query, namely the task at hand and more precisely the current stage within the current task. Knowing what the user is aiming at and knowing the current stage provides crucial cues to enrich information retrieval queries. The focus of our work is to present the latest works on using the context of a task in reformulating queries and to propose a framework for assisting the user that takes into account the profile of the user and the context of the current task (Asfari et al., 2009).

Task-based contextual information retrieval requires to be informed about the task and about its current status. While other contextual features can, not so easily, be extracted from various existing hardware and/or software devices (system configuration parameters, user physical location etc.), task-context data requires at least two extra resources: a symbolic model of the task at hand together with its current status; reasoning capacities upon the model in order to situate the query according to the model (Leray and Sansonnet, 2007). This work can be achieved by intelligent assistant agents that are endowed with two missions: first, perform rational symbolic reasoning over the task model and second provide conversational capabilities in order to dialogue with the user in a natural way when more help is required (Allen et al., 2001).

This chapter aims to:

- Present the background in the domains of contextual information retrieval. The survey will focus on the definition and the use of context in interactive, adaptive and personalized search;
- Discuss issues of handling interactivity and natural language in question answering, information retrieval and assistant agents. We present a task model and agent architecture as a solution to improve the performance of information retrieval systems;
- Provide some future directions and perspectives for integrating approaches coming from information retrieval and assistant agents.

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