

# Chapter 1

## Evaluating the Context Aware Browser: A Benchmark for Proactive, Mobile, and Contextual Web Search

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### ABSTRACT

*The authors discuss the evaluation of highly interactive and novel context-aware system with a methodology based on a TREC-like benchmark. We take as a case study an application for Web content perusal by means of context-aware mobile devices, named Context-Aware Browser. In this application, starting from the representation of the user's current context, queries are automatically constructed and used to retrieve the most relevant Web contents. Since several alternatives for query construction exist, it is important to compare their effectiveness, and to this aim we developed a TREC-like benchmark. We present our approach to early stage evaluation, describing our aims and the techniques we apply. The authors underline how, for the evaluation of context-aware retrieval systems, the benchmark methodology adopted can be an extensible and reliable tool.*

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## INTRODUCTION

The diffusion of mobile devices and real-world mobile users have moved the static world of classical and Web Information Retrieval (IR) towards a dynamic and evolving context-based world. The notion of *context* (roughly described as the situation the user is in), and the information it conveys, is gaining increasing importance for the development of new IR systems. The concepts of context and awareness convey to the dynamic nature of the user needs, to the complexity of the information available, and of the relevance of this information.

When combined with context-awareness, IR has been named Context-Aware Retrieval (CAR) (Brown, 2001). Starting from considering only a low number of contextual features (location and time), current CAR systems entail such an amount of data that a new challenge for IR is how those data can enhance user satisfaction. How to evaluate the strategies and techniques that CAR systems use for this purpose is another challenge.

CAR systems imply a high amount of interactivity with the user, and a user study seems the most sensible approach. But our approach is to evaluate highly interactive and novel context-aware systems on the basis of a TREC-like benchmark methodology. This paper describes our methodology, presents the results obtained, and discusses the general approach.

The present work is related to the Context-Aware Browser (CAB for short), a novel context-aware retrieval application. CAB allows a proactive context-aware Web content perusal by means of mobile devices. Since several alternatives for the retrieval process exist, it is important to compare their effectiveness to find the best approach. With this in mind, we propose an evaluation benchmark, discuss its limits, and test it. Although we focus on the needs of CAB, the problems to solve are typical of any proactive context-aware retrieval system.

We first briefly survey evaluation methodologies in IR and in CAR systems (Sect. *Related Work*), introducing our case study application. We then present our early evaluation approach (Sect. *Experimental Evaluation*) describing aims, techniques, and results. We discuss the reliability and usefulness of our methodology in Sect. *Discussion*, while in Sect. *Lessons Learned* we present the lessons learned. Finally in Sec. *Conclusions* we draw some conclusion and present future work.

## RELATED WORK

### Context-Aware Retrieval

With the spread of the concepts related to context-aware computing, Information Retrieval has gained new and increasing importance. The newborn field of CAR, instead of concentrating only on topicality, incorporates contextual information into the retrieval process, aiming at discovering “*the query behind the context*”: to retrieve what the users need, even if they did not issue any query (Mizzaro, 2008). CAR systems are concerned with the acquisition and understanding of context, and with a behavior based on the recognized context. Thus the CAR model includes, among the elements of the classical IR model, the user’s context. This context is both used in the query formulation process and associated with the documents candidate for retrieval.

Typical CAR applications present the following characteristics (Jones, 2004): a mobile user, i.e., a user whose context is changing; interactive or automatic actions, if there is no need to consult the user; time dependency, since the context may change; appropriateness and safety to disturb the user. Although CAR applications can be both interactive and proactive in their communication with the user, we concentrate on the proactive aspects, since they are more relevant to our proposal. Besides, we concentrate on the association between CAR and mobile application, as they

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