A Semantic Search Approach to Task-Completion Engines

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ABSTRACT

Web search is a human experience of a very rapid and impactful evolution. It has become a key technology on which people rely daily for getting information about almost everything. This evolution of the search experience has also shaped the expectations of people about it. The user sees the search engine as a wise interpreter capable of understanding the intent and *meaning* behind a search query, realizing her current context, and responding to it directly and appropriately [1]. Search by meaning, or *semantic search*, rather than just literal matches, became possible by a large portion of IR research devoted to study semantically more meaningful representations of the information need expressed by the user query. Major commercial search engines have indeed responded to user expectations, capitalizing on query semantics, or *query understanding*. They introduced features which not only provide information directly but also engage the user to stay interacting in the search engine result page (SERP). Direct displays (weather, flight offers, exchange rates, etc.), rich vertical content (images, videos, news, etc.), and knowledge panels, are examples of this recent evolution trend into *answer engines* [10].

Our notion of *semantics* is inherently based on the one of structure. Given the large portion of web search queries looking for entities [11], entities and their properties—attributes, types, and relationships—are first-class citizens in our space of structured knowledge. Semantic search can then be seen as a rich toolbox. Multiple techniques recognize these essential knowledge units in queries, identify them uniquely in underlying knowledge repositories, and exploit them to address a particular aspect of query understanding [2]. Query recommendations are another remarkable approach, whose suggestion feedback points to provide hints for improving the articulation of the search query.

This research focuses on utilizing techniques from semantic search in the next evolution stage of search engines, namely, the support for *task completion*. Search is usually performed with a specific goal underlying the query. This goal, in many cases, consists in a nontrivial task to be completed. Indeed, task-based search corresponds to a considerable portion of query volume [5]. Addressing task-based search can have a large impact on search behavior [3], yet the interaction processes behind performing a complex task are very far to be fully understood [12]. Current search engines allow to solve a small set of basic tasks, and most of the knowledge-intensive workload for supporting more complex tasks is on the user. The ultimate challenge is then to build useful systems "to achieve work task completion" [13]. Rather than modeling explicitly search tasks, we strive for extending and enhancing solid strategies of semantic search to help users achieve their tasks.

One component we focus on in this research is *utilizing entity type information*, to gain a better understanding of how entity type information can be exploited in entity retrieval [7, 9]. The second component is concerned with *understanding query intents*. Specifically, understanding what entity-oriented queries ask for, and how they can be fulfilled [8]. The third component is about *generating query suggestions to support task-based search* [4, 6]. The search goal, often complex and knowledge-intensive, may lead the user to issue multiple queries to eventually complete her underlying task. We envisage the capability of the three identified components to complement each other for supporting task completion.

CCS CONCEPTS

•**Information systems** →*Retrieval models and ranking; Query intent; Query suggestion;*

KEYWORDS

Semantic search; Query understanding; Task completion

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