CAIS Poster: The Disappearing Semantic Web; an Examination of 54 Semantic Search Tools

Abstract:
Following years of development of the Semantic Web, we identify and examine 54 semantic search tools: the majority (49) are not free and accessible (e.g.: abandoned, vaporware, or commercial) or don't search general Web documents, while three are opaque in their operations, and two are unused and feature poor.

Over a decade of scholarly studies report on academic progress towards realizing the Semantic Web (SW), including the development (Berners-Lee *et al.* 2001; Maedche *et al.* 2001; Mamou and Sagiv 2003; Lausen *et al.* 2005; Mäkelä 2005; Wei *et al.* 2008; Renteria-Agualimpia *et al.* 2010; Madhu *et al.* 2011), classification (Mangold 2007), and evaluation (Uren *et al.* 2007; Andago *et al.* 2010; Strasunskas and Tomassen 2010; Morato *et al.* 2013) of semantic search tools like Web sites and mobile applications. These tools aim to improve upon traditional information retrieval through improvements ranging from modest, like smarter indices, to drastic, like answering questions sufficiently to preclude the need to look through surrogate documents for the desired information (Rocha *et al.* 2004; Castells *et al.* 2007). Publications including The Times and Search Engine Journal have confirmed the commercial application of SW technologies in several Web-based semantic search engines (Helft 2007; Farber 2008; Radhakrishnan 2009; Menzel 2010; Messieh 2010; Nicholson 2011; Efrati 2012; Ha 2012) and the resulting intentions to compete with Google by means of a semantic search (Boulton 2008; Messieh 2010; Dishman 2011). In sum, such literature suggests that the SW has arrived, and one could reasonably expect to navigate to such tools right now.

Our study explores the state of semantic search on the Web, focusing in particular on tools that are free to use and search over general Web documents using SW technology, such as formally annotated data, ontologies, knowledge modeling, or natural language processing. In the first of three phases, tools were identified in scholarly and news articles giving indication that they were, at least at some time, semantically enhanced: for example, self-reported or described by others as semantic in a press-release, 'about' page, news article, or scholarly work. Second, a sufficient amount of details were collected about the tools to filter those which did not qualify as free, functional, browser-based, English language tools for searching general textual documents on the Web. Third, we collected and analyzed further data about the five remaining tools to describe the available features and reported semantic technology utilized, thus identifying two groupings.

We found 54 tools described as performing semantic search. 33 tools were unavailable or unready for free and public access; these had been abandoned and removed, acquired by competitors for removal or incorporation into other products, become only commercially available, were still in states of transition or development such as prototyping or beta, or had abandoned the attempt to implement semantic technologies. Nine tools did not search over general Web documents, restricting their scope to recipes or mathematical, medical, or proprietary data sets. Five tools were only supported on mobile platforms, and two were not supported in English. Five remaining tools were examined further and became

clearly divisible into two groups: Google, Bing, and Ask are established, widely used, feature-full tools that claim to implement semantic search but are not forthcoming about how or when they do this, while Cluuz and SenseBot are clear about the semantic technologies they implement but are new, unused, feature-lacking tools. The full inventory of the tools identified and their further properties are detailed in figures.

Given that most semantic search tools identified did not meet our basic criteria, and that the few remaining candidates are either not-clearly-semantic or unused prototypes, it seems that the SW has not yet become the visibly dominant paradigm on the Web. Morato *et al.* (2013) may have identified an explanation for this: "many of the resources of semantic document retrieval lack the minimum of functionality in order to popularize their use" (p.653). This hasn't stopped developers from trying, but our results imply that the majority have failed. Further challenges were identified for future attempts at determining the impact of SW technologies. First, it is difficult to identify semantic search tools more accurately than we have done here, as there is no consensus on how to define semantic search, and no typology of Web-based search tools currently exists. Second, there is no established framework for implementing a semantic search engine, and search engines' operations are opaque, thus making it difficult to determine the extent of semantic technology utilized. Third, it is unclear how to perform comparisons of real-world SW tools against traditional engines; a tool may change approach on a query-by-query basis or implement both approaches simultaneously, and results relevancy may be an otiose measure in cases where the information need may be met with a single precise answer.

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