

Chapter 23

A Semantic-Based Dynamic Search Engine Design and Implementation for Electronic Medical Records

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ABSTRACT

In the current technology driven world, information retrieval activities are in almost every aspect of daily, as society uses popular web search engines like Google, Yahoo!, Live Search, Ask, and so forth to obtain helpful information. Often, these popular search engines look for and obtain key information; however, not all of the retrieved items are relevant in context to the search target a. Thus, it is left for the user to filter out unwanted information, using only a few information items left from the search results. These popular web search engines use a first generation search service based on “static keywords”, which require the users to know exactly what they want to search and enter the right keywords. This approach puts the user at a disadvantage. In this paper, the authors investigate and design a dynamic, question-answer search engine that enables searching by attributes for more precise and relevant information in Electronic Medical Record (EMR) field.

INTRODUCTION

Today the World Wide Web is extensively used by everyone for information retrieval and e-commerce. It has become a global medium for publishing various documents and information

items. The problem found from this technology approach is that the information items found from the search results are not all related to each other and to the search user's purpose.

The objective of this paper is to design and implement a semantic-based dynamic search engine, which can enable search for more precise

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and relevant information items. The search engine enables the users to search by attributes and not to worry about finding and using appropriate ‘keywords’. The search engine is a question-answer type of search engine and it can provide helpful and meaningful user-context information (Iskold, 2006; Zheng, 2002).

Semantic Web solution could be the answer to all the challenges faced by the current World Wide Web. The Semantic Web architecture is appropriate in designing this semantic-based search engine tool. To feed this semantic-based search engine, creating a couple of ontologies is necessary. This demonstrates the ability and the effectiveness of this search engine tool.

The search engine poses unique questions to the user one at a time. Based on the user’s response of a ‘yes’ or ‘no’, the search engine then mines through the data structure to get the precise and relevant information. If a contextual match is found, the results are then displayed to the user. If additional information is required by the search engine, a new question is generated and posed to the user to help further mine the data. If no match is found, then the search engine tool terminates the search. The user can then provide brief feedback about the user’s objective in their initial search. This feedback can then be used for further analysis.

RELATED TECHNOLOGIES USED

The semantic-based search engine uses the Microsoft’s ASP.NET 2.0 Framework to create a web based system. This web system runs on Internet Information Services 5.1. AJAX (Asynchronous JavaScript and XML) extension is used for making this application more interactive and faster. The programs of the system are written in C# language.

The ASP.NET framework provides a rich set of controls. AJAX uses asynchronous data transfer between the browser and the server. It is faster and user interactive. The data source is in

the form of a Resource Description Framework (RDF) (Resource Description Framework, 2007; RDFS, 2008). A .NET based RDF parser is used and RDF-XML instances are used as the data source. The RDF instances will be based on two ontologies which are defined as a part of this project. The domains used for creating the ontology are in the space which is currently lacking a structure and which could greatly benefit from having one defined. One of the domains chosen is health field which is a very critical area. It is the target field of the approach. The other field is animal kingdom, mainly for illustration or explanation purposes of the approach.

Currently, major software companies like Microsoft Inc. and Google Inc. are heavily invested in Universal Health Care. US Health Care is lacking a standardized way to organize and share patient health records. As a solution to this, a minimal ontology is created to define Electronic Medical Records (EMR). And the second ontology is for the Animal Kingdom which is important for educational reasons. Apart from the two mentioned, some existing ontology like Friend Of A Friend (FOAF) used for social networking is also used to demonstrate the power of this search engine. The instance of these ontologies forms the data source for data mining (Lacy, 2005).

A .NET based RDF parser is used to support mining of the information. Microsoft Web Services is used to retrieve these RDF instances from remote data stores or local data stores. It enables loose coupling and interoperability. The server provides deep XML integration and security enhancements giving tremendous flexibility.

The architecture for the semantic-based dynamic search engine web application follows a simple N-tier based architecture. This is as shown in Figure 1 below. The following diagram shows the various components and the flow of requests and data exchange between them.

The above architecture can be broken down into essentially three sub systems. The search engine is the core subsystem of this application.

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