Development of a Semantic-Based Searching System in Inoculation Knowledge

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Abstract

The semantic web technology provides an opportunity to integrate children's inoculation knowledge spreading over the Internet. In this study, we attempt to provide people semantic-based inoculation knowledge searching. To procure semantic searching, we created ontology of inoculation with Protégé v3.2.1 in Web Ontology Language (OWL). Jena Java API was used to get synonyms and related terms in the ontology. We search annotated web pages of inoculation information constructed beforehand and obtain proper information for public. A semantic-based children's inoculation website and ontology of inoculation has been constructed. Three kinds of searching method were provided, including semantic search, personal inoculation records browsing, and keyword searching. Inoculation ontology written with semantic web standards, OWL, formalized domain knowledge allows reuse by enabling people to merge them with other specific domain ontology. The semantic technology can be utilized to search inoculation information and get more exact information.

Keywords：Semantic web, ontology, inoculation, vaccine

Introduction

In this study, we applied semantic technology on children's inoculation knowledge searching to provide an integrated inoculation knowledge searching platform for public. Inoculation knowledge includes vaccines, inoculation time sheet, reaction of inoculations, related diseases and so on. The problems of key word searching include: Firstly, the results of searching may shows words that is the same as user's query word but not the same as user's idea; Secondly, information that have the same meaning of query word will not be found. Therefore people need a better searching method to find integrated knowledge about children's inoculation instead of key word searching.

Furthermore, current children's inoculation records for public is kept in paper-based Children Healthcare Handbook, it is liable to be damaged. The system we constructed will keep each member's children inoculation records. It not only allow people look up their own inoculation records at anytime but also remind them the proper inoculating time by email beforehand.

Materials and Methods

At first, we collected inoculation information for public from Centers for Disease Control (CDC), Taiwan. To procure semantic searching, we started with constructing a children's inoculation ontology with Protégé v3.2 in OWL. We extracted terms from above-mentioned documents manually to found inoculation ontology. To complete the ontology and conform to the normal, we also include synonyms about vaccines and diseases in acknowledged medical vocabularies knowledge base, United Medical Language System (UMLS), and refer to the relations in UMLS Semantic Network. Moreover, the ontology was verified and recruited by experts from vaccine-experts and pharmacists.

A children's inoculation information website was established. The static web pages in the site is formed and annotated with XML. The content of each page is acquired automatic from MS SQL Server. The annotated information contains page title, keywords.

There are three main kinds of search methods in the system. The first one is semantic search where it will get user's query word from web page, then analyze the structure of this word in the inoculation ontology (synonyms and related terms) and show the structure. The semantic search engine will compare the terms and the annotated data of each web page, then select the related web pages from our own inoculation website according to these terms and display them in an integrated way.

The second one is supposing the visitors are willing to keep their personal information in the system. The system will figure out their own children's inoculation time sheet based on their birthday for each person. When users browsing their own inoculation time sheet, each vaccine name will link to the proper information standing on the searching time at present and the time this one should have inoculation of certain vaccine. If the present time is earlier then the inoculation time, the vaccine name will link to information need to know before having the inoculation, such as introduction to vaccine and prevented disease, the better inoculation time and things need to be attention before inoculation. On the other hand, if the present time is exceeding the inoculation time, the vaccine names will be linked to information like reaction of inoculation, how to take care of the reactions and so on. The third one is in the case of no result for semantic-based searching; users could choose the key word searching to get information from Google.

Results

We construct a children's inoculation website with semantic-based searching for public. Besides, the system provides function of inoculation records management. People can enter and browse the records on the web at anytime. In order to accomplish the semantic search, we constructed a children's inoculation ontology. Semantic-based searching results will display not only the information comprising the query word but also the information related to it. For example, one user may enter "BCG" to be the query word. The system will display the structure of BCG in the ontology, and select the proper web pages from the website.

Discussions and Conclusions

A survey will be done to evaluate the users' satisfaction and usability. Ontology of inoculation has been constructed and verified. It can be utilized to semantic inoculation data searching to get more exact information and easy to be expanded to include more terms or combined to other ontology of different domain.

The government may have different policy on inoculation every year. The system could be easy adjusted to the policies such as the focal inoculation every year. Furthermore not everyone knows all synonyms of vaccines or diseases, and relations between them. If we using semantic-based searching to provide a convenient way to get integrated knowledge about inoculation, that will be very useful for public.

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