Adaptive Link Services for the Semantic Web

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Abstract. There are shortcomings in using the Web to publish information which are information overload and lost in hyperspace. The aim of the research is investigating how the Semantic web, open hypermedia, and adaptive hypermedia can enhance the adaptation, interoperability and sharing of knowledge components of various hypermedia systems, especially in the medical discipline. It also investigates how to create and manage adaptive web services by using ontologies and semantic properties for adaptation. The adaptive link services for the semantic web is proposed.

1   Introduction

There are shortcomings in using the Web to publish information which are information overload and lost in hyperspace. Adaptive hypermedia systems can deliver personalized views of hypermedia document to users [Brusilovsky 2001]. The principles of the link service approach are that links are first class entities manipulated separately from hypermedia documents and stored independently in link databases. The advantages are that links can be created, added, edited without affected to the original document [Carr, *et al.* 2001]. The Semantic Web is developed to represent information which is understandable by human and machine processable [Berners-Lee, *et al.* 2001]. The Semantic Web can represent knowledge, including defining ontology as metadata of resources. Therefore, the ontology can be used with open hypermedia to create the links of resource or documents over the Web. In addition, adaptive hypermedia can be used with the Semantic Web and link services to produce the relevant information for a particular user's knowledge, background or experience.

2   Aim, Approach, Architecture

The aim of the research is investigating how the Semantic Web, open hypermedia, and adaptive hypermedia can enhance the adaptation, interoperability and sharing of knowledge components of various hypermedia systems, especially in the medical discipline. It also investigates how to create and manage adaptive web services by using ontologies and semantic properties for adaptation.

The virtual orthopaedic European University provides tools for clinicians supporting the learning of information and clinical skills. Seven web services for specific purposes in the domain are implemented. There are library service, dynamic review journal service, surgical logbook service, virtual classroom service, discussion fora service, personal profile service, and, lastly, admin service. In addition, there are other web services for providing visualization documents to particular users' need and for maintaining user model.

In order to provide relevant information, including create and manage the content and structure of documents on the fly, suitable for particular users' needs, link services, the semantic web and adaptive hypermedia techniques are applied in the system. The system composes of ontology/knowledge based, composition engine, search/inference engine and rule based, and repository.

Ontology, represented in Web Ontology Language (OWL) and Resource Description Framework (RDF), is the backbone of the system. Most of the information is related by using ontology. Ontology is used to define specification of

1. User model: personal profile, history, preference, knowledge level.
2. Presentation model: is used for describing structure for presentation to users. It uses the Fundamental Open Hypermedia Model (FOHM) [Millard, *et al.* 2000].
3. Domain model: defines all the concepts and their relationships in a domain.
4. Metadata model: defines data about data.

Composition engine is used for creating and invoking services and transform the documents, using XSL/XSLT, to the users.

The Dynamic Link Resolution Service (DLRS) [Carr, *et al.* 2001], a link service, will generate on the fly the structure and annotated content of documents relevant to users' personal profile.

To handle adaptation, machine learning is used to form the models of user's situation. The stereotype and overlay techniques is also used.

To integrate the Semantic web technology, adaptive hypermedia and link services, the adaptive link services for the semantic web can generate the semantic augmented HTML documents which are relevant for particular users' needs.

References

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