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A Survey on User Personalization using Ontology

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Abstract: ***The goal of user personalization is to provide personalized services based on user's interests and preferences, thus allowing for more efficient information access. The ability to adapt fast to the current user's interests is an important feature of user model. Responsibility of a search engine growing like never before to fetch and provide not only meaningful results for the given query but also personalized the results uniquely to each and every user of the search engine. For user's input query, user wants relevancy in obtained results. A concept of Ontology is been introduced in search engines to get more meaningful and relevant results with respect to the user's query. Ontology describes the concepts in the domain and relationships between those concepts. The most recent development in standard ontology languages is OWL (Ontology Web Language). OWL makes it possible to describe concept to its full extent and enables the search engines to provide accurate results to the user. Our proposed system takes search engine concept for some limited domain like ACM Computing Classification System (CCS). CCS can be used as simple domain ontology which is providing a hierarchical structure to describe the various research area fields in computer science by using this hierarchical relation we can create Ontology. Our proposed system is Ontology based User Personalization search system and experiments by this approach we can get Computer Science Research Paper.***

Keywords: User Personalization, Ontology, OWL, Protégé, ACM.

1. Introduction

Rate at which World Wide Web (WWW) grows it dumps millions of web pages into the internet. The current web is largely unorganized and there is a rapid growth of digital information volumes. Responsibility of a search engine growing like never before to fetch and provide not only meaningful results for the given query but also personalized the results uniquely to each and every user of the search engine. Users looking for relevant information find themselves presented with an excessive amount of available information, which makes it very difficult to retrieve useful and relevant results [SAM].

The User Model is the formal description of the information about the user and it is widely used in many domains such as search engines, e-commerce and e-learning [LDDS]. Users looking for relevant information find themselves presented with an excessive amount of available information, which makes it very difficult to retrieve useful and relevant information. Personalized services aim at giving the individual user optimal support in accessing, retrieving and storing information. Recently, ontology-based user personalization approaches have been proposed to take advantage of the knowledge contained in ontologies instead of attempting user model acquisition [SAM].

User models contain system beliefs about users generated from evidence collected about users, from different sources, in a domain or context. An important problem is the process taken to update the user model with new evidence. We want this process to be simple enough to be able to explain it easily to users, and also flexible enough to allow customization to match user preferences or interaction styles [PHD].

Ontology is essential part of the semantic Web. Ontology defines the terms used to describe and represent knowledge about some domain. Ontology is used by many aspects that need to share domain information. The ontology allows machine to understand the meaning of word as well as we can. This provides a well-defined semantics for the defined term. [MTDM] One of the most common ways to represent a user model is an *overlay model*, where components in the user model are mapped to a domain model [1][2]. The user model is typically an unstructured bag of concepts, each having a value representing user knowledge. In this proposed work, we are interested in creating overlay models where light-weight ontologies are used as domain models. This way, the ontology can be exploited for both scrutability of the user model and also reasoning about users.

Our solution is the development of a toolkit which consists of key structures that support the user personalization process. It incorporates light-weight ontologies to fulfill a number of roles: aiding in metadata creation, providing structure for large user model visualization, and as a means to reason across granularities in the user model.

In conjunction with this, our model also features a novel structure which performs a dual role of ontology and user model visualization, supporting the process of ontology creation, metadata annotation, and user model visualization. We evaluated our approach at each stage with small user studies, and conducted a large scale integrative evaluation of these approaches together in an authentic learning context by the end user.Our proposed model attempts to bring a short and a brief survey of the way experts define Ontology. And here we also go to attempt to design ontology in its one of the best form.

In our proposed model we are attempting to design and develop Domain Ontologies based on ACM Web Service. Where OWL has a richer set of operators - e.g. intersection, union and negation. It is based on a different logical model which makes it possible for concepts to be defined as well as described. Complex concepts can therefore be built up in definitions out of simpler concepts. Furthermore, the logical

model allows the use of a reasoner which can check whether or not all of the statements and definitions in the ontology are mutually consistent and can also recognize which concepts fit under which definitions. The reasoner can therefore help to maintain the hierarchy correctly. This is particularly useful when dealing with cases where classes can have more than one parent.

2. Types of OWL

OWL ontologies may be categorized into three species or sub-languages: OWL-Lite, OWL-DL and OWL Full.

OWL – Lite: OWL-Lite is the syntactically simplest sub-language. It is intended to be used in situations where only a simple class hierarchy and simple constraints are needed. For example, it is envisaged that OWL-Lite will provide a quick migration path for existing theory and other conceptually simple hierarchies [MTDM] [PHD].

OWL –DL: OWL-DL is much more expressive than OWL-Lite. OWL-DL and OWL-Lite are based on Description Logics (hence the suffix DL). Description Logics are a decidable fragment of First Order Logic and are therefore amenable to automated reasoning. It is therefore possible to automatically compute the classification hierarchy and check for inconsistencies in an ontology that conforms to OWL-DL.

OWL-Full: OWL-Full is the most expressive OWL sub-language. It is intended to be used in situations where very high expressiveness is more important than being able to guarantee the decidability or computational completeness of the language. It is therefore not possible to perform automated reasoning on OWL-Full ontologies.
In our work we build ontology of ACM hierarchy using protégé tool. Then by integrating OWL file smartly with our application we capture user evidence to enhance the user personalization system.
The rest of the paper is organized as follows. Section 2 discusses related work and section 3 presents the design of our approach. The details of the results and some discussions we have conducted on this approach are presented in section 4 as Results and Discussions. A section 5 provides hints of some extension of our approach as future work and conclusion.

3. Related Work

User Personalization having different approaches overlay user personalization, stereotype based user personalization, keyword based representation of user models and ontology based user model.

Overlay user personalization is the oldest approach to the user model representation; it was employed by different kinds of AES for personalization student knowledge as a subset of domain expert knowledge. Benefit of the overlay user model having good precision and having flexibility [2]. Keyword based user personalization is originated from information retrieval and filtering, where contents of the document are usually represented in the form of vector terms or keywords found in the information. This approach can be compare in deep way with overlay user personalization where concept dimension can be used. In the context of adaptive information retrieval on the web it became very popular. Number of examples has been given by Letizia and WebMate in their respective papers as in Adaptive Web system model of a user uses the information of a user like interest, hobbies or what user have browsed or requested from different documents. A big advantage of this model approach is the automation of the model over content based on well-developed Information Retrieval techniques for text analysis, which will be helpful for open corpus adaptation [2].

Stereotype user personalization adaptive systems is best to its behavior for the individual user's characteristics. Stereotype based personalization does not update every single facet of the user model directly [1][2].

Ontologies and User Personalization is concerned with the use of ontologies, in particular light weight ontologies in user personalization. We are interested in ways to create ontologies easily, and have them readily usable to both structure user models and also play a role in defining or describing domain content as well as reasoning about the user. Ontologies provide a crucial link between the domain content, user models and adaptation. For example in information retrieval, ontologies can aid in the provision of more personalized results based on individual interests and knowledge based on information in a user model [1] [3].

Ontologies and the Semantic Web [5] is a vision that aims to imbue machine understandable meaning into content on the WWW, where software agents can roam web content and perform useful tasks for humans. One effect of the Semantic Web vision is that it has promoted the use of ontologies and new standards to support automated reasoning and interoperability between web applications and agents.SKOS, The Simple Knowledge Organization System (SKOS) [11] is a standard for the specification of knowledge organisation systems such as thesauri and taxonomies. SKOS centers on the idea of having a collection of defined concepts with relationships providing semantics to further define and link them. Topic Maps, XML Topic Map (XTM) standard [9] provides another method for knowledge structures to be serialized and exchanged on the web, similar to both OWL and SKOS. Topic Maps have been compared to a structure similar to an index in the back of a book: the index lists *topics*, and each topic lists page numbers which are *occurrences*. This metaphor gives an indication of the way, Topic Maps can be used to organize and retrieve information, by finding the desired topics in the Topic Map and then examining their occurrences. The additional semantic information provided through *association* relationships mean that we can find related topics with ease as well. SKOS has been used in several systems to represent domain ontologies. In Existing User Personalization Frameworks Ontology based approaches have number of advantages as compare to other user personalization techniques. Some examples where ontology based approach have been used. General User Model Ontology (GUMO) an example of the application of OWL in user personalization [16]. It forms an upper level ontology for user models to facilitate exchange of user model data between different

adaptive systems. GUMO focuses on typical dimensions about users that are modelled in adaptive systems, such as knowledge or beliefs. User Personalization Markup Language (UserML) the RDF based user model exchange language extends the XML structure able to be representing graph structure by means of two cooperative levels. The first one defines a simple XML structure for the user model entries and the second one are categories defined in the ontology. This approach is having useful, different ontologies can be used with the same UserML tools. UserML served as a base for the reusable user model ontology author uses level of activity and knowledge sharing as a dimension [18].

4. Proposed Method

our approach of Enforcing User personalization using Ontology will work on the basis of following steps as shown in the below figure.

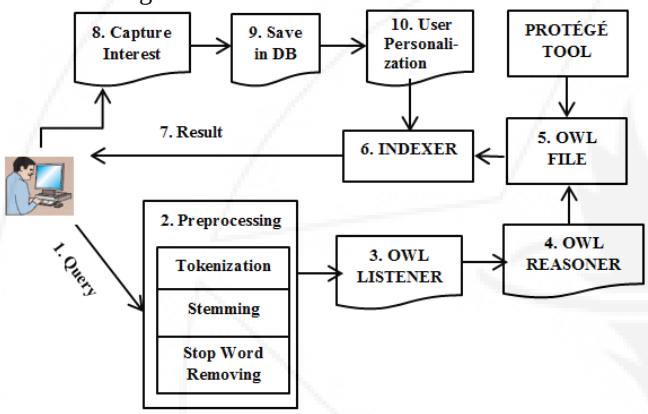

Figure 1: Overview of our Approach

Here in the proposed system Protege can be extended by way of a plug-in architecture and a Java-based Application Programming Interface (API) for building knowledge-based tools and applications. The Protégé platform supports two main ways of personalization ontologies.

The **Protégé-Frames** editor enables users to build and populate ontologies that are *frame-based*, in accordance with the Open Knowledge Base Connectivity protocol (OKBC). In this model, ontology consists of a set of classes organized in a subsumption hierarchy to represent a domain's salient concepts, a set of slots associated to classes to describe their properties and relationships, and a set of instances of those classes - individual exemplars of the concepts that hold specific values for their properties.

The **Protégé-OWL** editor enables users to build ontologies for the *Semantic Web*, in particular in the W3C's Web Ontology Language (OWL). "OWL ontology may include descriptions of classes, properties and their instances. Given such ontology, the OWL formal semantics specifies how to derive its logical consequences, i.e. facts not literally present in the ontology, but entailed by the semantics. These entailments may be based on a single document or multiple distributed documents that have been combined using defined OWL mechanisms".

OWL Lite uses only some of the OWL language features and has more limitations on the use of the features than OWL DL or OWL Full. For example, in OWL Lite classes can only be defined in terms of named super classes (super classes cannot be arbitrary expressions), and only certain kinds of class restrictions can be used. Equivalence between classes and subclass relationships between classes are also only allowed between named classes, and not between arbitrary class expressions. Similarly, restrictions in OWL Lite use only named classes. OWL Lite also has a limited notion of cardinality - the only cardinalities allowed to be explicitly stated are 0 or 1.

The following OWL Lite features related to RDF Schema are included in our approach.

- Class
- rdfs:subClassOf
- rdf:property
- rdfs:subPropertyOf
- rdfs:domain
- rdfs:range
- Individual

.

5. Conclusion and Future Work

Our model has explored the ways light-weight ontologies can be used to support scrutable user personalization. We have shown that a number of important problems can be overcome with the aid of light-weight ontologies. We also demonstrated our approach through the implementation of the user personalization in real time scenario.

An evaluation was conducted to evaluate the performance of our system. The main outcomes of evaluation were user wanted more accurate deeper URL links for the ACM query. We conclude that light-weight ontologies have an important role for scrutable user personalization. The simple, but effective, techniques have allowed the tools we have used and developed be used in other domains and applications already, and can be applied to many more to ensure scrutable user personalization.
In this process we have addressed a number of problems:

- The evidence normalization problem meant that we had to find a way to easily aggregate and compare varying amounts of evidence of different reliability for a concept. We used a relative measure against the different user's evidence.
- The evidence combination problem involved dealing with the issues of varying reliability and number of evidence sources, for a single component concept. We addressed this problem with a way to weigh the evidence sources based on the reliability, but at the same time keeping the weightings scrutable to user's own goals.
- We also presented a small user study. Based on the results of the study, the approach we proposed for building our user models seems promising. This study contributes to the assessment of the other elements of the system:
- The fact that users could easily do this task and make no negative comments about the ontology lends some support to the plausibility of the generated ontology.

- The relatively large user models consisting of around 2000 concepts show that the ontological structuring with the user model overlay was intuitive enough for the user to understand the importance of the system.

The design process is an essential stage in every software development process. It that sense, it has to be emphasized that a good software design allows to satisfy the current needs of the application user and allows to extend the system for future changes. Every personalized system uses its own user model, and therefore, several models of the same user exist within different personalization systems. So this work needs to expand to centralize such a user model.
Although the user personalization system is developed as part of the AdeLE[3] research project, the required user personalization system must work as a single application. To satisfy the needs of different adaptive applications the user personalization system must offer possibilities to add specific personalization components.

References

[1] Sergey A. Sosnovsky and Darina Dicheva. Ontological technologies for user personalization. *IJMSO*, 5(1):32–71, 2010.
[2] Andrew Wai Kwong Lum, *"Light-weight Ontologies for Scrutable User"*. May 2007.
[3] Fensel, D. (2001). *Ontologies: A Silver Bullet for Knowledge Management and Electronic Commerce*, Springer.
[4] Luca, E. W. D. and Nurnberger, A. (2004). "The Importance of Ontology Based User Personalization and Adaptation in Information Retrieval."
[5] Tallon, S. (2005). Adaptive Ontology-Driven Personalised News Services. *Knowledge and Data Engineering Group, Trinity College*. Dublin, University of Dublin. Masters of Science in Computer Science, pp. 108.
[6] McGuinness, D. L. and Harmelen, F. v. (2003). OWL Web Ontology Language Overview. *Web Ontology Working Group*, W3C. 2006.
[7] Noy, N. F., Sintek, M., et al. (2001). "Creating Semantic Web Contents with Protege-2000." *IEEE Intelligent Systems* 16(2), pp. 60-71.
[8] Carroll, J. J., Dickinson, I., et al. (2003). Jena: Implementing the Semantic Web Recommendations. Bristol, UK, Hewlett-Packard Labs.
[9] Pepper, S. and Moore, G. (2001). XML Topic Maps (XTM) 1.0. *TopicMaps.Org Authoring Group*. T. O. A. Group. 2006.
[10] Biezunski, M., Bryan, M., et al. (1999). ISO/IEC 13250:2000 Topic Maps: Information Technology -- Document Description and Markup Languages. *JTC1/SC34*, ISO/IEC. 2006.
[11] Miles, A. and Brickley, D. (2005). "SKOS Core Guide." W3C Working Draft 2 November 2005. Retrieved 26 March, 2006, from http://www.w3.org/TR/2005/WD-swbp-skos-core-guide-20051102/
[12] Winter, M., Brooks, C., et al. (2005). *Towards Best Practices for Semantic Web Student Personalization*. In Proceedings: 12th International Conference on Artificial Intelligence in Education, Amsterdam, Netherlands, IOS Press, pp. 694-701.
[13] Hodgins, W. (2002). 1484.12.1: IEEE Standard for Learning Object Metadata. *WG12: Learning Object Metadata*, IEEE Learning Technology Standards Committee 2006.
[14] Heckmann, D., Schwartz, T., et al. (2005). *GUMO - the General User Model Ontology*. In Proceedings: 10th International Conference on User Personalization, Edinburgh, Scotland, UK, Springer, pp. 428-432.
[15] Liana Razmerita. An ontology-based framework for personalization user behavior - a case study in knowledge management. *IEEE Transactions on Systems, Man, and Cybernetics, Part A*, 41(4):772–783, 2011.