# IMPLMENTING CONSISTENCY AND CONTENT MANAGEMENT IN WEB PERSONALIZATION BASED ON THE COMBINATION OF SEMANTIC WEB TECHNOLOGIES AND USAGE MINING TECHNIQUES

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*Abstract: The Semantic Web provides the way to machine process able data by giving data meaning or semantics. All the applications can share and exchange knowledge from Semantic Web which behaves as one big knowledge base. Ontologies have been accepted as the primary method of representing knowledge in the Semantic Web on World Wide Web. During the last few years the rapid & chaotic growth in World Wide Web results into popularity of Personalization systems. The aim of Personalization is to provide the users with what they need, in other words tailor information presented based on the user requirements. Personalization is performed by combining a metadata query and an ontology-based inference result. This inference and learning algorithm based approach is not very efficient because the whole procedure is very complex and does not take into account content management i.e. keep information up-to-date. So in this thesis a simple approach has been followed for the content personalization system along with content management. In this paper our main goal is to handle the problem of consistency management and content editing in web personalization systems. To solve this problem ontology is used to represent domain model concepts of web service. The ontology instances are used to edit the content of the web and managing consistency on the web. These ontology instances are also used to provide content personalization on web.*

## I. INTRODUCTION

### A. Motivation

In today's world, information is the most important resource available. In the World Wide Web information is presented in natural human language which is not rich enough to convey formal meaning and therefore it is not machine process able. This current web contains millions and millions of resources such as HTML files, documents, images and graphics, and media files. These resources contain huge amounts of information scattered in various web pages and documents. The current web is a web of documents and understandable only to humans. This makes information retrieval processes very hard; humans alone cannot deal with this huge amount of resources on the web.

## II. OBJECTIVE

In this paper our objective is to propose a personalization system which is less complex, more efficient. Although our main concentration during this study is on solving the problem of consistency management and content editing in personalization systems. This paper describes a personalization system based on ontological [1] structure.

- In existing web personalization systems a normal link structure is used to represent the data on web and the same is used for navigating the web.
- In comparison with existing personalization system the proposed system uses ontological structure for, providing personalization, managing contents on the website and for navigating the web.

Our proposed system makes use of both semantic web technologies and web usage mining techniques. Personalization based on Web usage mining can enhance the effectiveness and scalability of collaborative filtering.

## III. PROPOSED SOLUTION

The proposed solution to the problem stated in previous chapter is: the combination of personalization and content management approach. So in this thesis a combined approach is proposed. In ontological structure based websites management of contents mainly consists of content editing and content presentation. Content editing means editing concept instances that is inserting, updating, and removing instances of ontology concepts.

## IV. METHODOLOGY

The proposed system is implemented using the following tools:

- Protégé Ontology Editor
- MySQL Server- 5.0
- SQLyog
- Java net beans IDE- 6.1

The step-by-step methodology to be followed is given below:

- Create an OWL model using the ontology editor tool like Protégé. The OWL model is based on real world scenario like university in this case.
- Store all the ontology concept instances and attributes in the OWL model in a relational database like MySQL server.
- Create an interface based on java that maps the OWL model created and perform some basic operations on the mapped ontology like listing ontology concept instances, inserting, deleting, updating concept instances and checking consistency.
- Create an interface based on java that helps users in

navigating the web information by selecting particular concept instances.
- An interface for user login is also created.
- Finally an interface is created that helps users in providing personalized content and in editing user instance attributes.

## V. EVALUATION

To evaluate the results of the system being implemented we carried out an experiment. We tested simple personalized system and ontological personalized system in terms of navigation links. For this experiment we have taken the websites of three different universities: Rajasthan Technical University (Kota), Delhi University and Mumbai University. The experiment is performed by five users using both systems. During this experiment, five different users were asked to find the answers to five different questions. In this experiment no time limit was placed. For each user the total no. of links followed to find the correct answer is calculated. All users performed this task firstly on simple personalized web of different universities and then this task is performed on ontological personalized web of different universities. The results obtained from the simple personalized web of Rajasthan Technical University is summarized in table 4.1.

| Users | No. of Links followed |
|-------|-----------------------|
| U1 | 5 |
| U2 | 7 |
| U3 | 4 |
| U4 | 6 |
| U5 | 3 |

Table 5.1: Navigation Results for simple web of Rajasthan Technical   University

The results obtained from the simple personalized web of Delhi University are summarized in table 8.2.

| Users | No. of Links Followed |
|-------|-----------------------|
| U1 | 4 |
| U2 | 6 |
| U3 | 8 |
| U4 | 10 |
| U5 | 6 |

Table 5.2: Navigation Results for simple web of Delhi University

The results obtained from the simple personalized web of Mumbai University are summarized in table 8.3.

| Users | No. of  Links Followed |
|-------|------------------------|
| U1 | 4 |
| U2 | 4 |
| U3 | 6 |
| U4 | 5 |
| U5 | 4 |

Table 5.3: Navigation Results for simple web of Mumbai University

The results obtained from the simple web of three different universities shows that links followed to find particular information is varied from one user to another. The results obtained from the ontological personalized web of Rajasthan Technical University, Delhi University and Mumbai University are shown in table 8.4.

| Users | No. of Links Followed |
|-------|-----------------------|
| U1 | 3 |
| U2 | 3 |
| U3 | 3 |
| U4 | 3 |
| U5 | 3 |

Table 5.4: Navigation Results for Ontological web of three Universities

The results obtained from the ontological system of three different universities shows that links followed to find particular information is constant for all users.

In this type of system our main aim is to reduce the no. of links followed to find particular information to as minimum as possible. In our case the results of ontological system shows that the links followed to find particular information are reduced to three.

## VI. COMPARISON BETWEEN BOTH THE SYSTEMS

The resulting comparison chart of all three university systems with ontological system is shown in figure 4.1.
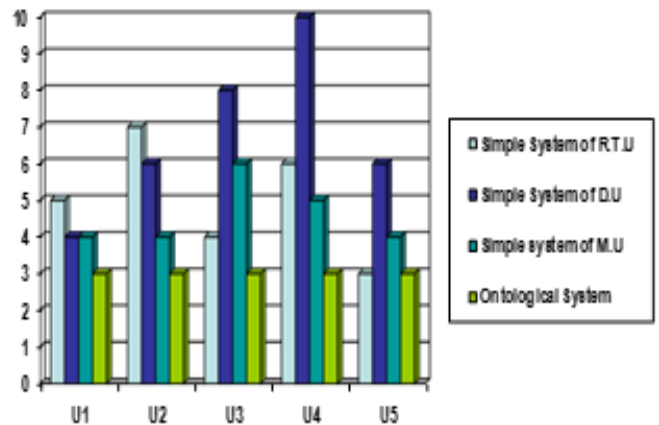


Figure 1: Graph for Comparison between Simple and Ontological Systems

The results show that users performed task better using ontological web comparing to simple web. Users found answer to questions more easily on ontological web. The main reason was the structure of information on ontological web. Ontology hierarchy provided a good structure for accessing web data. Also, users liked semantic links; they enable them to complete task easily.

## VII. CONCLUSIONS

From the design and implementation of the proposed system we can conclude the following points:

- Ontologies provide a rich platform for knowledge representation and it is important to carefully plan the knowledge model.
- The results show that the ontological personalized system is better than the simple personalized system in terms of navigation.
- The ontological personalized system is a better way for managing contents in personalization systems.
- The proposed system is simple one and also present consistency checking.
- The proposed system takes into consideration both the user model and the system knowledge model.

## REFERENCES

[1] Mahendra Thakur and Geetika S. Pandey," Performance Based Novel Techniques for Semantic Web Mining" IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 1, No 1, January 2012

[2] Mr. Kanani Hiren M and Prof.Virani Sagar :"A Study of Web Personalization Using Semantic Web Mining "INTERNATIONAL JOURNAL OF ENGINEERING DEVELOPMENT AND RESEARCH | ISSN: 2321-9939

[3] Christina Tziviskou, Marco Brambilla, 2007 Semantic Personalization of Web Portal Contents

[4] V. Wolowski, N. Ishikawa and H. Sumino, 2007 Semantic Web Approach to Content Personalization

[5] M. Eirinaki, D. Mavroeidis, G. Tsatsaronis, and M. Vazirgiannis, 2006 Introducing Semantics in Web Personalization: The Role of Ontologies

[6] Nicola Henze and Daniel Krause, 2006 Personalized Access to Web Services in the Semantic Web

[7] Anupriya Ankolekar, Denny Vrande¡cic, 2005 Personalizing web surfing with semantically enriched personal profiles

[8] G. Adomavicius and A. Tuzhilin. "Personalization Technologies: A Process-Oriented Perspective." Communications of the ACM, vol. 48, no. 10, October 2005.

[9] Nicola Henze, 2005 Personalization Services for the Semantic Web: The Personal Reader Framework

[10] Albanese, M., Picariello, A., Sansone, C., L., 2004 A Web Personalization System based on Web Usage Mining Techniques

[11] Baoyao Zhou, Siu Cheung Hui, and Alvis C. M. Fong, 2004 Web usage mining for semantic web personalization

[12] Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, MIT Press, April 2004

[13] M., Eirinaki, C., Lampos, S., Paulakis, M., Vazirgiannis, 2004 Web Personalization Integrating Content Semantics and Navigational Patterns

[14] Nicola Henze, Marc Herrlich, 2004. The Personal Reader: A Framework for Enabling Personalization Services on the Semantic Web

[15] P. Dolog, N. Henze, W. Nejdl, M. Sintek, 2004 Personalization in Distributed eLearning Environments

[16] P. Dolog, N. Henze, W. Nejdl, M. Sintek, 2004 The Personal Reader: Personalizing and Enriching Learning Resources using Semantic Web Technologies

[17] R., Baumgartner, C., Enzi, N., Henze, M., Herrlich, M., Herzog, M., Kriesell, and K., Tomaschewski, 2004. Semantic Web enabled Information Systems: Personalized Views on Web Data

[18] H. Dai, B. Mobasher, 2003 Integrating Semantic Knowledge with Web Usage Mining for Personalization

[19] M. Eirinaki, M. Vazirgiannis, I. Varlamis, 2003. SEWeP: Using Site Semantics and a Taxonomy to Enhance the Web Personalization Process

[20] H. Dai, B. Mobasher, *Using Ontologies to Discover Domain-Level Web Usage Profiles*, in Proc. of the 2nd Workshop on Semantic Web Mining, Helsinki, Finland, 2002

[21] Koch, N. and Rossi, G., Patterns for adaptive web applications, In Proc. 7th European Conference on Pattern Languages of Programs, 2002

[22] Marja-Riitta Koivunen and Eric Miller, W3C Semantic Web Activity, Semantic Web Kickoff Seminar in Finland Nov 2, 2001

[23] ARAGAO, V., FERNANDES, A., GOBLE, C., A., 2001. Towards an architecture for personalization and adaptivity on the semantic web

[24] Tim Berners-Lee, Jim Hendler, and Ora Lassila. The Semantic Web. Scientific American, 2001, http://www.sciam.com/article.cfm?articleID=00048144-10D21C7084A9809EC588EF21&pageNumber=2&catID=2

[25] COENEN, F., SWINNEN, G., VANHOOF, K., AND WETS, G. 2000. A framework for self-adaptive websites: Tactical versus strategic changes. In *proceedings of WEBKDD'2000 Web Mining for ECommerce—Challenges and Opportunities, Sixth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (Boston, August).

[26] CINGIL, I., DOGAC, A., AND AZGIN, A. 2000. A broader approach to personalization. *Commun. ACM, 43,* 8 (August), 136–141.

[27] MOBASHER, B., COOLEY, R., AND SRIVASTAVA, J. 2000a. Automatic personalization based on web usage mining. *Commun. ACM, 43,* 8 (August), 142–151.

[28] MOBASHER, B., DAI, H., LUO, T., SUNG, Y., AND ZHU, J. 2000b. Discovery of aggregate usage profiles for web personalization. In *Proceedings of the Web Mining for E-Commerce Workshop (WEBKDD'2000), Sixth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (Boston, August).

[29] MOBASHER, B., DAI, H., LUO, T., SUNG, Y., AND ZHU, J. 2000c. Integrating web usage and content mining for more effective personalization. In *Proceedings of the International Conference on Ecommerce and Web Technologies (ECWeb2000).*

(Greenwich, UK, Sept.).

[30] SRIVASTAVA, J., COOLEY, R., DESHPANDE, M., AND TAN, P-N. 2000. Web usage mining: Discovery and applications of usage patterns from web data. *SIGKDD Explorations 1*, 2 (Jan.), 12–23.

[31] PERKOWITZ, M. AND ETZIONI, O. 2000a. Towards adaptive web sites: Conceptual framework and case study. In *Artif. Intell. 118*, 1–2, 245–275.

[32] PERKOWITZ, M. AND ETZIONI, O. 2000b. Adaptive web sites. *Commun. ACM, 43*, 8 (August), 152–158.

[33] COOLEY, R., MOBASHER, B., AND SRIVASTAVA, J. 1999a. Data preparation for mining World Wide Web browsing patterns. *Knowl. Inf. Syst., 1*, 1 (Feb.).

[34] COOLEY, R., TAN, P-N., AND SRIVASTAVA, J. 1999b. WebSIFT: The web site information filters system. In *Proceedings of the Web Usage Analysis and User Profiling Workshop (WEBKDD'99), Fifth ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (Boston, August).

[35] MOBASHER, B., COOLEY, R., AND SRIVASTAVA, J. 1999. Creating adaptive web sites through Usage based clustering of URLs. In *Proceedings of the 1999 IEEE Knowledge and Data Engineering Exchange Workshop (KDEX'99)* (Nov.).

[36] PERKOWITZ, M. AND ETZIONI, O. 1999. Adaptive web sites: Conceptual cluster mining. In *Proceedings of the Sixteenth International Joint Conference on Artificial Intelligence (IJCAI99)* (Stockholm).

[37] Tim Bray, Dave Hollander and Andrew Layman, Namespaces in XML, W3C, http://www.w3.org/TR/1999/REC-xml-names-19990114, 1999

[38] [Grosso et al., 1999] W. E. Grosso, H. Eriksson, R. W. Fergerson, J. H. Gennari, S. W. Tu, & M. A. Musen: Knowledge Modeling at the Millennium (The Design and Evolution of Prot´eg´e-2000), 1999

[39] PERKOWITZ, M. AND ETZIONI, O. 1998. Adaptive web sites: Automatically synthesizing web pages. In *Proceedings of the Fifteenth National Conference on Artificial Intelligence* (Madison, WI, July).

[40] Tim Berners-Lee, Semantic Web Road map, W3C , http://www.w3.org/DesignIssues/Semantic.html, September 1998

[41] JOACHIMS, T., FREITAG, D., AND MITCHELL, T. 1997. Web Watcher: A tour guide for the World Wide Web. In Proceedings of IJCAI97 (August).

[42] N. Guarino (1997). 'Understanding, building, and using ontologies: A commentary to "Using Explicit Ontologies in KBS Development"'. http://citeseer.nj.nec.com /guarino97understanding.html.

[43] PERKOWITZ, M. AND ETZIONI, O. 1997. Adaptive web sites: An AI challenge. In *Proceedings of the Fifteenth International Joint Conference on Artificial Intelligence* (Nagoya, Japan).

[44] Gruber, T. 1995. Toward Principles for the Design of Ontologies Used for Knowledge Sharing. International Journal of Human and Computer Studies, 43(5/6): 907-928.

[45] LIEBERMAN, H. 1995. Letizia: An agent that assists web browsing. In Proceedings of the Fourteenth International Joint Conference on Artificial Intelligence (Montreal).

[46] Gruber, T.R, A Translation Approach to Portable Ontologies. J. on Knowledge Acquisition, Vol. 5(2), 199 -220 (1993).

[47] Graham Klyne and Jeremy J. Carroll, Resource Description Framework (RDF): Concepts and Abstract Syntax, W3C http://www.w3.org/TR/rdf-concepts

[48] http://kaon.semanticweb.org/

[49] Protege Ontology Editor. http://protege.stanford.edu