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Semantic Wiki-based Ontology Evolution

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***Abstract*— the Ontology plays a vital role in sharing conceptualizations and terminology interpretable by machines. There are many tools that provide features for Ontology evolution and Ontology maintenance but those tools have limitation on the social involvement perspectives. As results, only a group of Ontology Engineers' point of views has on the Ontology concepts. Thus Semantic Wiki allows people to get involve in maintaining and evolving the Ontology. Semantic wiki has characteristic of Usability, Timeliness, Interoperability, Reuse of Knowledge, Formalization and Express ability. It also supports the knowledge models that represent in Resource Description Framework (RDF) schema and Web Ontology Language (OWL).**

***Index Terms*—Ontology evolution, Semantic web, Semantic wiki, Semantic wiki based ontology evolution.**

I. Introduction

In Web 2.0 generation, the semantic web has provided the technology such as Semantic web to allows easy data sharing, data search and aggregation of data across application platforms, enterprise and community boundaries. Semantic Wiki had adopted the concepts of Semantic Web such as semantic search and semantic annotation. It also extended some features from normal wikis [1, 2] as mentioned below:

"A semantic wiki tries to extend a normal wiki's flexibility to address structured data. To this end, it supports metadata in the form of semantic annotations of the wiki pages themselves and of the link relations between wiki pages. The annotations usually correspond to an ontology that defines the properties that can be associated with different object types." by Schaffert et al.[3].

In this paper, we have discussed the problems that motivate the concepts and how the semantic wiki features would assist ontology to evolve. Then future research will be carrying out.

II. Motivation

Sharing common understanding on structure of information among people, software agents and machines become more demanding for the industry, which is the main reason for using ontology in application system [4]. In order to develop and maintain ontology, the need of skilled ontology engineers and knowledge engineers are required. The cost of employ Ontology engineers to maintain ontology is expensive [5] but the result might not be the best. That's because the perspective of ontology has limited to a group or a single individual Ontology engineer [4, 6].

Recently the ontology has grown very rapidly into dimensionless. Thus to maintain an ontology, the ontology engineers would capture the changes of ontology and introduce the new version to users. This would take some time for the new ontology version to deliver to users and most likely the ontology would change again before the ontology has delivered [4, 7].

The resolution to hindrance above mentioned is to involve users in the maintaining procedures. This resolution would reduce the cost of ontology maintaining as the users will carry out some of the procedures. Therefore time consuming for maintaining ontology will be reduced as the users can modify the ontology directly. Additionally, the ontology will have multi perspectives because it has been modified by many users.

III. Semantic Wiki

The resolution is promising but due to lack of tools that are intuitive and easy to use for users to involve ontology development and maintenance. This is where the Semantic Wiki comes in. The Semantic wiki has suitable characteristics of Usability, Timeliness, Interoperability [8], Reuse of Knowledge [9], Formalization [4] and Express ability. The semantic wiki has provided the facilities for ontology Management as following:

A. Creation and Edition

Wiki indicates the Usability characteristic by providing simple graphic user interface for every skill level users. The simple graphic user interface would allow navigation of knowledge and ontology to be done quite easily. Most of semantic wiki provide textual editor which allow user to simply edit the knowledge. Some of the semantic wiki require users to use its own textual syntax for editor and some have provide "WYSIWYG" editor [10] as an extension of textual editor. Normally the textual editor would transform contents within the semantic wiki system to the knowledge models, which represents in Resource Description Framework (RDF) schema [11] and Web Ontology Language (OWL) [12].

Creation of new page can mean that a new ontology class or new instance created, the wiki allows user to create a normal wiki page with a specific tag attached in the page. Once the page created, it automatically links between pages. In the wiki page, users can put annotations regarding to the content to express the meaning of knowledge. The annotations reduce the ambiguity in content as the annotation gives the explanation of links between pages. Thus the annotation uses in the semantic wiki can help the knowledge search operate more efficiently and to resolve the in-

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teroperability problem without losing flexibility and its openness [1, 3].

B. Knowledge browsing and Semantic Search

As above mentioned on how the semantic wiki linked to each other, the changes in the ontology structure can easily be traced. Hence, full-text search for querying the wiki pages are facilitating to users. In the advantage of full-text search, it had proved the drawback in knowledge retrieval as wiki make the pages accessible by sort out pages manually. Sometimes wiki provides category tools or other extensions to predefine the structure of pages. But sometimes this facility can be inconvenient and constraint to users as their advantage do not overweigh the time it takes users to learn them.

Semantic wiki provides semantic search feature of content beside full-text search [3]. The semantic search is using of keyword and the annotation on the semantic link between pages. For example, a user is doing a search on subject "Company A". Basically the information on "Company A" will be retrieved from the ontology, but the indirect information such as "Employee of the Company A" or "Company A newsletter" may be retrieved as well [3].

C. Authentication and basic quality management

In general, Wiki allows people around the world to access its contents. If wiki allows everyone to modify its content, the knowledge and ontology would be hectic and low quality. Therefore, assigning the users privilege and authentication is vital. This will control users' operations over the knowledge and ontology data, which affects the trust on the contents quality. As low security system, sometimes lead to hinder the user from use the ontology [13].

Another concern is Data quality, as the data can be unreliable, redundant, and inaccurate from non-members editing the content. One way to reduce the amount of unreliable data is "Authentication and Access control", as it would filter who have privilege to modify the content to prevent malicious editing and Spam on the system [13].

In the past few years, many research organizations had proposed and implemented many Semantic wiki to form a "community-driven ontology evolution" system [6]. The semantic wiki such as Ikewiki [10], Semantic MediaWiki [14], OntoWiki [15], and Kaukolu wiki [16] are purposely implemented to facilitate user with Semantic wiki characters and features to support the ontology with different goals.

There is a little drawback on the new invention of semantic wiki, as it cannot automatically detect the ambiguous term in Knowledge contents and in semantic annotations [1].

IV. Towards Semantic Wiki-based Ontology Evolution

A key feature of the ontology evolution system is that it is a social network based system. It is a system supporting remote collaborative ontology evolution and maintenance. The conceptual framework of the semantic wiki-based ontology evolution system architecture is shown in Figure 1. It is grounded in the notion of several important key architectural components and data elements.

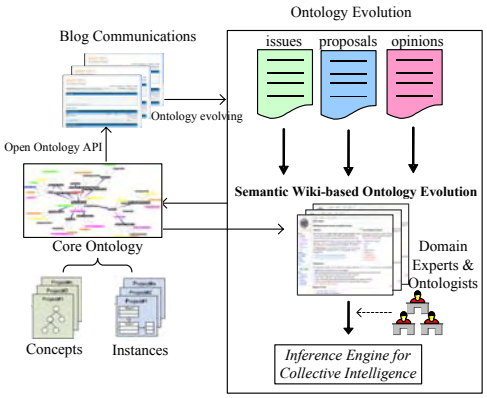

Fig. 1 System overall architecture

Blog communications enable users to share, discuss, comment, tag issues and problems in an informal and lightweight manner. Blogs encourages people to engage in remote discussion and collaboration. It is probably preferable way since it is more personal and people are more willing to emerge in discussions. We integrate the Ontology into it through an open Ontology APT. There are three types of ontology evolution subjects i.e. issues, proposals, and different opinions. Issues represent unresolved queries. Proposals represent the latest/different understanding on related information. Different opinions include all requests that do not comply with the semantics, relations, and concepts defined in the Ontology. Based on the subjects, semantic wiki-based Ontology evolution can be collaboratively edited and annotated by a group of domain experts. The collective knowledge within this Wiki can then be acquired through various text and data mining techniques. Our ontology semantic wiki-based ontology evolution approach considers both users opinions and expert decisions.

V. Conclusion and Future Works

Semantic technologies had made knowledge to become more machine accessible and provide more facilities for human to easily access the knowledge. The more easy knowledge can be accessed, the more opportunity for the knowledge to be reused and to be value added by the community. This leads to Ontology evolutions and ontology maintenances requirements. The semantic wiki is the most suitable tools for involving users and community in the Ontology evolution as it provide facilities to do so. This is the preliminary stage of the research on semantic wiki based ontology evolution. In the future, research will be focused on Ontology alignment and Ontology versioning under the Semantic Wiki environment. Also, how to set the dimension for the ontology growth from editing wiki would be in another area of interest.

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