Towards Social Network based Ontology Evolution Wiki for an Ontology Evolution

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ABSTRACT

There is a lack of well-maintained ontologies thus ontology evolution now becomes an important filed of ontology research. The evolution may reflect new categories of systems being evaluated on broader and different understandings of certain concepts and relations. Alternatively ontologies evolve because the conceptualization improves. For ontology evolution, we focus in this paper a social network based approach in which the user community has direct control over the evolution of the ontologies. Ontologies can be enriched, learnt, and obtained from social network users using various empirical techniques. In this paper, we ground the social network based approach on the philosophy of wikis so called ontology Evolution Wiki.

1. INTRODUCTION

There is a lack of well-maintained ontologies thus ontology evolution now becomes an important field of ontology research. Ontologies inevitably evolve over time. The evolution may reflect new categories of systems being evaluated on broader and different understandings of certain concepts and relations. Alternatively ontologies evolve because the conceptualization improves. For ontology evolution, we focus, in this paper, on a social network based approach in which the user community has direct control over the evolution of the ontologies. Ontologies are developed for community thus the community shall have control over it. Ontologies can be enriched, learnt, and obtained from social network users using various empirical techniques. In this paper, we ground the social network based approach on the philosophy of wikis so called ontology Evolution Wiki. In rapidly evolving domains the ontology Evolution Wiki is important because the community users can keep up with the pace of changes. Ontologies are used to reach consensus on a view of the world and agreed upon by the community users. Due to ontologies used by the community users, they play an important role in the ontology evolution. Maintaining the ontologies is then a joint effort by the community users benefiting from the ontologies. Once reached to the ontology Refined Wiki which is the version all agree upon, knowledge and agreement are explicit and shared not only among members, users, and domain experts but also among software systems. Human as well as machine (i.e. in the form of software applications) can make use of the explicitly knowledge and agreement. At this stage developing and evolving ontologies are tasks that depend on human intelligence as a source of community users and domain expertise in producing a consensual conceptualization and resolving inconsistencies. The developed ontologies can be deployed by both human and software agents.

In the next section, we review chosen social network techniques including media wiki and its extension, semantic media wiki. In section 3, we present the ontologies and their evolution. In section 4, we discuss our approach, ontology Evolution Wiki and conclude the work in section 5.

2. LITERATURE REVIEW

MediaWiki [1] is the engine for Wikis that have been developed so that everyone can collaborate in order to achieve certain goals. More recently, Wikis have been widely used in many organizations and institutions as a way to communicate, share, or explain a specific topic which made it as a knowledge base for everyone.

An application of MediaWiki is the Wikipedia [2] which has been developed in 2001 and made the Wiki concept much more widely used around the universe. Also, there has been a development of the Swiss Experiment – Tagging within Wiki [3] which is an extension for wiki that support personalized access to documents and specialized user group. Also, there has been other Wiki's that has been developed such as Platypus Wiki [4], OntoWiki [5].

Semantic MediaWiki [6] is an extension for MediaWiki which uses the Semantic Web [7] concept on Wiki which allows the computers to understand the content in Wikis instead of only displaying them for human interaction.

All the media Wikis and the semantic media wikis that have been developed thus far were using the new features that it provides. However, none of the Semantic Wikis are aimed at developing a Semantic MediaWiki that allows the users and experts to discuss the ontology in an Evolution Wiki for a specific domain and allow only the experts to modify in a different Wiki (Refined Wiki) after the discussion has been completed.

3. ONTOLOGIES

Ontology is a widely accepted, state-of-the-art way for knowledge representation. The ontology term can be referred to a wide range of formal representations to detailed logical specification of a domain. Basically its details depends ontologists who describe a domain and on a number of factors, for example, the domain itself, its uses, etc. Ontologies are used in many industrial and academic applications e.g. concept-based search, interoperability support, constraint specification, semantic web applications, etc. [8].

Formally, ontologies are formal, explicit specifications of a shared conceptualization of a domain [9][10][11] with following properties:

- machine-process-able semantics

- explicitly defined
- consensual knowledge
- abstract model

Ontology elements are concepts or ontology classes, relationships hold among concepts, constraints or restrictions, and instances. Changes in these elements are inevitable. Changes to any of those elements can cause changes in the ontologies. Different things may imply different views on the domain and consequently a different conceptualization [12]. The evolution may reflect new categories of systems being evaluated on boarder and different understandings of certain concepts and relationships. Alternatively ontologies evolve because the conceptualization improves.

4. ONTOLOGY EVOLUTION WIKI

Ontologies inevitably change over time [12]. Wiki is one of the solutions that allow collaborations amongst different people to reach an agreement. Ontology Evolution Wiki is then a solution to control, track, and trace the changes in which different users are involved in the changes in a form of either a proposal submission or proposal discussion. Figure 1 shows an overview of the systems architecture. There are three types or levels of users to give control over the systems i.e. general users, community members, and domain experts. Each one will have different privileges and roles in the ontology Evolution Wiki. This will help to further control the ontology Refined Wiki, the version everyone agree upon, and will still give the members and experts the ability to discuss and raise issues that they believe are required to be evolved. After all, the general users or even software agents are able to access and use the refined ontology.

The ontology Evolution Wiki is where the members and experts propose the changes through proposal submission and discussion. The ontology Refined Wiki is the version that the ontology Evolution Wiki get updated / modified. The ontology Refined Wiki will be modified by the experts after brainstorming and discussion in the ontology Evolution Wiki. By having two separate wikis, it will give a further control for the domain. Additionally, it will provide consensus information that everyone agree upon.

As from Figure 1, the experts and the members import the ontology file (an OWL file) to choose the domain to work on. The chosen ontology will be shown in a tree-like structure of concepts (concepts hierarchy) as well as relationships hold concepts together and constraints. This will give a clear understanding for the members and experts of how the domain is described and how the concepts are related to each other. If there is any issue over them, the members and the experts then raise the issue through proposal submission. Once the proposal has been submitted, the experts and the members will start to discuss over the submitted proposal to reach to a point of agreement. After automatic text analysis and pre-processing, these change requests will be transferred to the ontology Refined Wiki. If changes are required, the expert will be responsible to update within the ontology Refined Wiki. Everyone can then follow the new update in the ontology Refined Wiki if these changes are finalized. Eventually, the changes will be propagated to the Ontology Evolution wiki through the refreshing mechanism.

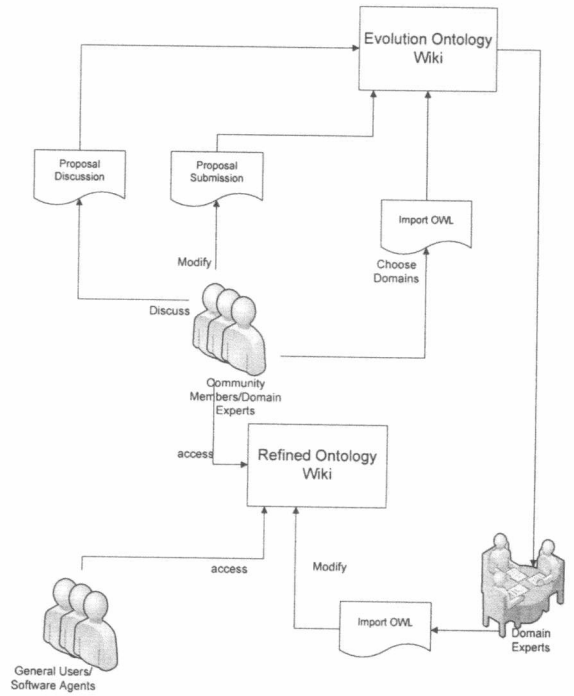

Figure 1, Overview of systems architecture

5. ONTOLOGY EVOLUTION WIKI IMPLEMENTATION

MediaWiki, Semantic MediaWiki and TreeAndMenu are essential to set up the environment for ontology Evolution Wiki. Both Semantic MediaWiki and TreeAndMenu are extensions for MediaWiki. Ontology Evolution Wiki is a plug-in allowing user to install it as an extension to the Semantic MediaWiki. The ontology Evolution Wiki displays the ontology into a tree-like structure as shown in Figure 2.

Figure 2 illustrates the Evolution Wiki for the software engineering ontology [13] as an example. The user is able to click on the concept to inspect relationships, related concepts, properties, constraints, instances, etc. Related concepts will be displayed in other pages in more details. Ontology Evolution Wiki allows the users to view the tree-like structure and display each concept details and its associated properties.

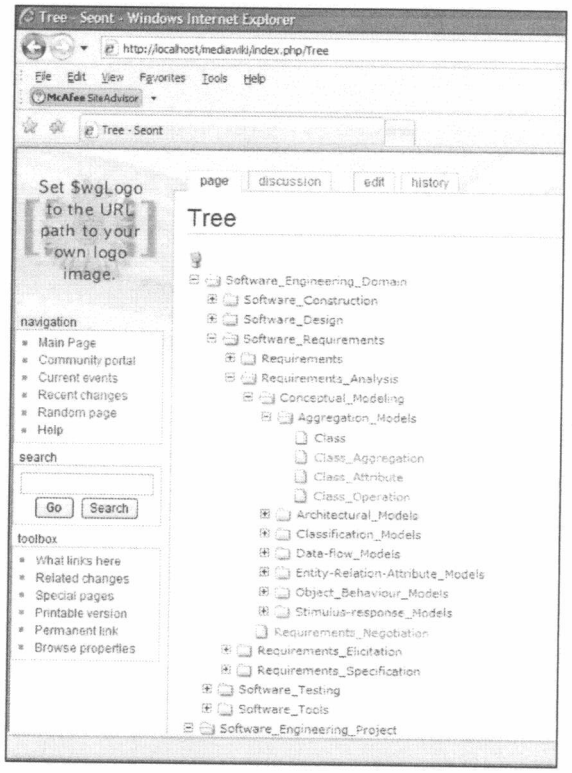

Figure 2, Tree-like structure of the software engineering ontology

6. CONCLUSION AND FUTURE WORK

We have proposed a social network-based approach towards ontology Evolution Wiki for an ontology evolution. This is a step forward in the ontology research. There will be considerable amount of improvement for the future work. In our future work, we aim to have a methodology and a prototype for community ground evolution of ontologies. We also aim to develop key functionalities that software agents can involve in ontology evolution on behalf of human agent. This will combine human and machinery power to support users in achieving ontology evolution.

7. REFERENCES

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