



Figure 2: The semantic web stack [1]

munities providing suitable tools like semantic wiki systems, forums, blogs, ranking mechanisms, content filtering, tagging etc [3, 5, 6]. The system has been used for almost two years for various purposes, but most projects deal with knowledge management due to the fact that the system is used in a knowledge management course at the Faculty of organization and informatics. Especially its semantic wiki subsystem is of special interest since it accumulates metainformation. In the end we propose a probabilistic annotation of metainformation based on a social network analysis algorithm.

2 Towards Web 3.0

In the last few years social web technologies became extremely popular. Applications like forums, chat rooms, bulletin boards, social networking software, various open source project management systems, weblogs or just blogs, podcasting, social tagging as well as wiki systems are most often in wide use. Such applications allow a group of people to communicate for sake of collaboration, problem solving, project management or just leisure.

Most important for the Web 3.0 perspective are semantic wiki systems, social tagging systems as well as social networking systems.

Semantic wiki systems try to integrate fast and lightweight content management systems with formal semantic metainformation. This is mostly achieved through adding semantic relationships between wiki pages and tags that are given by users. Such metainformation can later be used to issue dynamic queries against such a knowledge base or to be processed by intelligent agents.

Social tagging systems allow their users to tag

different content they encounter in order to organize it for them selves. It is amazing how such accumulated metainformation often obtains more relevant information than search engines using complex web mining algorithms. These systems most obviously take advantage of the previously mentioned “collective intelligence” of the social system surrounding them.

Social networking applications allow people to connect through various relationships, create contacts and communicate. The FOAF (friend of a friend) initiative is trying to create a “*Web of machine-readable pages describing people, the links between them and the things they create and do*”. Lots of contemporary social networking applications already support this standard. As in the previous cases such metainformation can be used to ease search and reasoning.

3 The Case of τ AOPIs

As mentioned previously τ AOPIs has a semantic wiki subsystem¹ that allows users to create semantic linkages between pages as well as to tag these pages using attribute-value tags. Special attributes are used to enhance possible semantics (like class, subclass, rule etc.). Such additional tags allow the creation of metainformation in an object-oriented manner.

A semantic wiki system on τ AOPIs consists basically of an extensible set of wiki pages describing some particular content. Pages are considered to be objects having their corresponding classes, attributes as well as relations to other objects. Relations to other object are implemented through hyperlinks.

As mentioned previously the system has now been used for almost two years for various projects including open-source project management, university course documentation, political activism, alumni, job search etc. After analyzing the meta-data provided by its users, we were able to observe basically two types of inconsistencies:

- Syntactical inconsistencies - arisen mostly due to different or inadequate spelling in attribute-value tags;

¹Please refer to [3, 5, 6] for an introduction to τ AOPIs architecture

- Semantic inconsistencies - arisen mostly due different views of project members.

While syntactical inconsistencies can be easily detected, solved and prevented, semantic inconsistencies can yield problems in various situations. For example in a case there was a cyclic definition of subclass relations depicted on figure 3. Such a subclass definition can pose problems for intelligent agents reasoning about this particular domain.



Figure 3: Inconsistent definition of subclasses

Other examples include multiple class definitions for a given object (page), set relations to one and the same object due to multiple hyperlinks to the same page,

4 Guidelines and Solutions

To minimize and prevent syntactic errors a suggestion mechanism for attribute-value tags was implemented. The suggestion mechanism allows the user to see the possible classes in a specific domain, attributes for a given class as well as attribute values for a given attribute name. Such a suggestion mechanism allows for less syntactical inconsistencies. The new entry form is shown on figure 4.

As shown on the figure when adding a specific attribute or class the user gets a suggestion of the system for similar terms. On the image the user already entered the attribute city (cro. *grad*) and the system automatically shows possible values for this attribute (e.g. Koprivnica and Zagreb).

Semantic inconsistencies are much harder to prevent, which is why we suggest to couple to the social system. Social network analysis allows to detect the most trustworthy members of a social network. In τ AOPI Σ a special case of eigenvector centrality [2] used in the PageRank algorithm [4]. Users can vote for each other on a given project to establish the trust network. In this way numerical values of trust can be obtained and used to annotate metainformation.

5 Conclusion

Social semantic web applications or web 3.0 technologies seem to be the next step in the evolution of the World Wide Web. Herein we analyzed such an application based on ideas from wiki systems, social tagging systems and social networking applications. Due to the fact that such systems' metainformation is the result of the social system surrounding them it is obvious that certain inconsistencies will emerge. We identified two types of possible inconsistencies in such applications: (1) syntactical and (2) semantic.

Syntactical inconsistencies can be partially solved through suggestion mechanisms. Other solutions would probably include techniques from the fields of pattern matching and data mining.

Semantic inconsistencies pose a much bigger problem, and due to the fact that the average user probably hasn't enough knowledge in semantic modelling, such problems will be a major issue in the future. An approach to solve such inconsistencies is to acknowledge that the social system is a probabilistic system, and allow for uncertain information. The probability of trustworthiness can be determined through social network analysis as proposed in this paper.

Formal search and reasoning techniques for such uncertain information are subject to our future research.

References

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- [3] M. Maleković and M. Schatten. Leadership in team based knowledge management - an autopoietic information system's perspective. In B. Aurer and M. Bača, editors, *19th Central European Conference on Information and Intelligent Systems – CECIIS2008 Conference Proceedings*, pages 47–52. Faculty of Organization and Informatics, September 2008.

New entry

Subject

Class

<input type="text" value="grad"/>	:	<input type="text"/>	<input type="button" value="Remove"/>
<input type="text" value="poslodavac"/>	:	<input type="text" value="Koprivnica"/>	<input type="button" value="ve"/>
<input type="text" value="radno mjesto"/>	:	<input type="text" value="Zagreb"/>	<input type="button" value="ve"/>

Figure 4: Suggestion mechanism entry form

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