POSITION STATEMENT
Semantic Web Workshop (SWWS)

Update Semantics for Cooperative Ontologies

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An assumption of the *Semantic Web* is that knowledge producers will generate knowledge (as meta-data or content descriptors) that can be automatically compared. A domain ontology system must aim at helping knowledge consumers and producers to use unambiguous descriptors. For example, when I use the term “switch”, a domain ontology system should know about the various meanings of “switch”: (i) a mechanical, electrical device; (ii) a flexible instrument for punishment; (iii) a substitute (iv) a basketball maneuver, etc. The domain ontology server intervenes to help refine the term until it is classified to a category with its intended meaning. The category can then be compared with other identical categories of “switch” used as meta-data descriptors associated with documents.

Often when terms are used in context, they can be disambiguated automatically. “Switch on a wall” is enough context to discount a number of meanings of switch since the signature of the spatial relation “on” provides a restriction on the category type[1]. Furthermore, a domain ontology system needs facilities for individuals or teams to work together, to create and refine categories, maintain meaningful views and give access security of the categories that they own. The number of categories for “switch” (and their intended meanings) for a company (or industry) that manufactures switches, will need to complement the more general meanings given earlier. For this reason a mechanism to describe categories and their place in a type hierarchy is necessary, as are filters to accommodate multiple views.

To experiment with a ontology that is meaningful and large enough to simulate the difficulties of an ontology server for the World Wide Web we knowledge engineered the natural language ontology WordNet and our own top-level ontology into a object-relational database called FASTDB[2]. We call the resulting ontology server and inference system WEBKB-2[4, 5]. Our ontology contains 94,500 nouns, 66,000 categories referred to by nouns, 21,000 adjectives and 7,900 categories referred to by adjectives. WEBKB-2 is an ontology server but also a inference engine in the classic knowledge base sense. It can also be used to store and retrieve conceptual graphs [6, 7].

[1] In this case the presence of “on” excludes the last two meanings of switch (given above).
[2] http://www.ispras.ru/ knizhnik/fastdb.html

Graph matching is also permitted. The graphs shown below are an interpretation of the original graph placed into the knowledge base. The original graph was of the form,

```
[philippe.martin@gu.edu.au,
  agent of: (the renting,
     object: (an apartment,
              part: 1 bedroom,
              location: Southport),
     instrument: 140 Australian_dollars,
     period: a calendar_week,
     beneficiary: pm#Spirit_Of_Finance)](pm);
```

but would be retrieved by the query "*?[a renting]*" as,

```
[philippe.martin@gu.edu.au,
   pm#agent of: (some #renting,
     pm#object: (some #apartment,
        pm#part: 1 #bedroom,
        pm#location: QLD#Southport),
     pm#instrument: 140 #Australian_dollar,
     #time_period: some #calendar_week,
     pm#beneficiary: pm#Spirit_Of_Finance)]];
```

here we observe that each of the terms in the initial graph have been unambiguously resolved to categories by WEBKB-2. This interpretation of terms as categories is indicative of the ontology domain system service.

Our interest is to experiment with engineering of semantic web-style applications using this ontology server and inference engine and furthermore researching the practical and theoretical difficulty involved in an update semantics for cooperative ontologies. We are also interested in re-engineering our ontology server to interoperate with XML Schema, RDFS and DAML+OIL. WEBKB can be found at http://www.webkb.org

References

[4] P. Martin and P. Eklund *Embedding Knowledge in Web Documents.* Proceedings of WWW8, 8th International World Wide Web Conference, pp. 324–341, Elsevier, 1999.

[5] P. Martin and P. Eklund *Knowledge Indexation and Retrieval and the Word Wide Web, IEEE Intelligent Systems*, July, pp. 18-25, 2000.

[6] P. Martin "Conventions and Notations for Knowledge representation and Retrieval" *Proceedings of the 8th International Conference on Conceptual Graphs*, LNAI 1867, pp. 41–54, Springer-Verlag, 2000.

[7] J.F. Sowa: Conceptual Structures: Information Processing in Mind and Machine. Addison-Wesley, 1984.