Demo Paper: A Tool for Hybrid Ontology Engineering

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Abstract. We demonstrate a collaborative knowledge management platform in which communities representing autonomously developed information systems build ontologies to achieve semantic interoperability between those systems. The tool is called GOSPL, which stands for Grounding Ontologies with Social Processes and natural Language, and supports the method bearing the same name. Ontologies in GOSPL are hybrid, meaning that concepts are both described informally in natural language and formally. Agreements on these two levels are made simultaneously and the social interaction between and across communities drive the ontology evolution process.

Key words: Hybrid Ontology Engineering

1 Introduction

GOSPL was first mentioned in [2], in which a initial prototype was described for developing *hybrid ontologies*. Hybrid ontologies are ontologies in which concepts are both described informally by means of natural language descriptions called *glosses* and formally by means of *lexons* [4], and all operations on the hybrid ontology are parameterized with the community owning that ontology.

Lexons are binary-fact types of the form $\langle \gamma, h, r, c, t \rangle$ where - in some context referred to by $\gamma \in \Gamma$ - term h plays the role of r on term t and t the role of c on h. In hybrid ontology engineering, the context-identifiers refer to communities and help to disambiguate the concepts the terms in the lexons refer to. An example of a lexon is given below.

Example 1. $\langle \overbrace{Cultural\ Domain}^{\gamma}, \overbrace{Concert}^{h}, \overbrace{is\ a}^{r}, \overbrace{subsumes}^{c}, \overbrace{Cultural\ Event}^{t} \rangle$

Concepts are described informally by means of two functions: g_1 mapping community-term pairs to a gloss and g_2 mapping lexons to a gloss. Both functions show an explicit grounding with the community. Below is an example of a gloss for a community-term pair.

Example 2. $g_1(Cultural\ Domain, Concert) =$ *"A concert is a live performance (typically of music) before an audience."*

Glosses are used to circumscribe concepts linguistically and (mostly) declaratively by agreement within (human) communities. The lexons describe concepts formally (and unambiguously) for use in computer-based information systems. Glosses facilitate the communities in aligning their thoughts before describing the concepts formally, and also facilitate agreements across communities. In this demonstration, we present the method and tool for hybrid ontology engineering.

2 The Method

To support hybrid ontology engineering, the fact-oriented method for ontology engineering called DOGMA [3] was extended to define a framework for hybrid ontologies [1]: (i) the context-identifiers were limited to refer to communities, (ii) a special linguistic resource called *Glossary* containing natural language descriptions employed by these communities was introduced and (iii) a series of social processes for evolving the ontologies were defined. An example of a social process is the discussion to introduce a constraint on a role of a lexon, e.g., `EACH Cultural Event has AT MOST ONE Date`.

We built a method around this framework. Communities define the semantic interoperability requirements, out of which a set of key terms is identified. Those terms need to be informally described before the formal description (in terms of lexons) can be added. In order for a lexon to be entered, at least one of the terms needs to be articulated. The terms and roles in lexons can be constrained and the community can then commit to the hybrid ontology by annotating an individual application's symbols with a constrained subset of the lexons. At the same time, communities can interact to agree on the equivalence of glosses and the synonymy of terms. Indeed, we make a distinction between the agreement of descriptions referring to the same concept and terms in lexons referring to the same concept.

Commitments of individual applications to the hybrid ontology are described by means of Ω-RIDL [5]. Commitments in Ω-RIDL annotate the application's symbols (e.g. fields in a table of a relational database) with a selection of lexons. A commitment can also contain lexons and constraints specific to an application. Including application-specific knowledge in a commitment is for instance useful to annotate foreign keys; they are not part of the domain, but necessary to join related information when interoperating.

3 The Tool

The core of GOSPL is a series of services for hybrid ontology engineering on which multiple (types of) clients can connect to. Services include: community management, ontology retrieval, starting and resolving discussions involving requests, etc. Discussions involve around requests to evolve the ontology. Fig. 1 depicts a screenshot of the GOSPL prototype, and shows some lexons and constraints currently residing in the "Venue Community", which aimed to describe the venues in which cultural events take place.

The tabs in this figure direct the user to: (1) The lexons and constraints currently agreed upon by the community. (2) The natural language descriptions for terms and lexon currently agreed upon by the community. This page also displays information such as the current gloss-equivalences. (3) The social processes as discussions to evolve the hybrid ontology and the semantic interoperability requirements. (4) Community management. (5) The list of commitments. Such commitments can exist without the platform knowing about its existence. However, the system can only query or test constraints proposed by the community on data of applications of which it the commitment is recorded. (6) The OWL implementation of the hybrid ontology. (7) Activity log of this particular community.

The tool supports the community's discussions on how the ontology should evolve in order to meet their goals defined by the semantic interoperability requirements. Important in GOSPL is that the result of community interaction evolves the hybrid ontology, i.e., the outcome of a discussion is translated into ontology evolution operators.

Acknowledgements

This work was partially funded by the Brussels Institute for Research and Innovation through the Open Semantic Cloud for Brussels Project.

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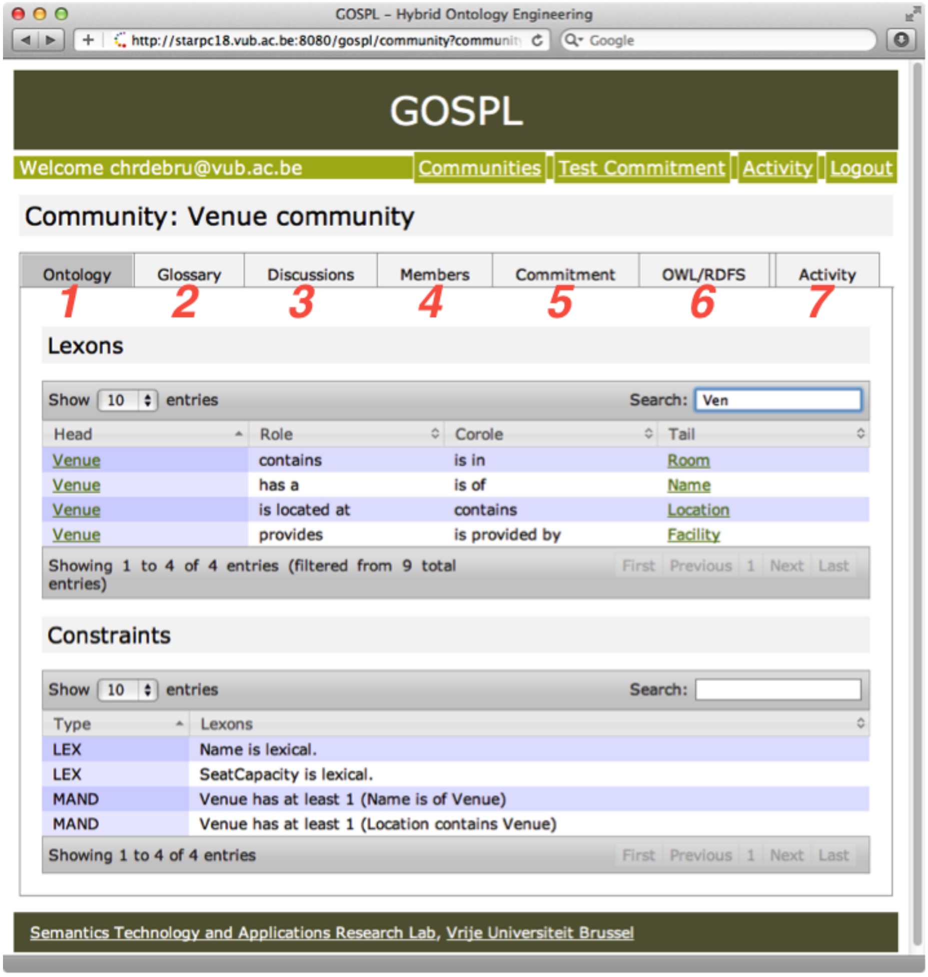

Fig. 1. GOSPL prototype.