Challenging DAML+OIL by a Commercial Technology – What can the Semantic Web learn from it? (Preliminary Results)

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The Q-technology is a formalism (vocabulary and inference mechanism) for the representation of object domains in such a way as to allow for a user-driven processing (e.g., querying) of information based on its semantics. In a distributed setting, ontologies can be defined peripherally on an ad hoc basis. The complex concepts, constructed this way, are close to natural language. They can be deduced to a set of basic concepts supporting a minimal interface to other vocabularies or technologies, such as DAML+OIL. As the Semantic Web shifts human/computer interaction from the Web interface to the interface between the user and a set of artificial agents, a possible application field of the Q-technology is the communication with these agents.

The Q-technology is herein described as a context-free grammar in lean EBNF notation, even though it has also been specified as a webized XML application. In the following, only a small excerpt of a Q-vocabulary is considered.

```
BSORT Person;
BSCALE Gender := ['male', 'female'];
ATTRIB gender := Person -> Gender;
DSORT Man := Person.gender = ['male'];
```

The first two lines refer to the *basis* of the specific Q-vocabulary, whereas the third and fourth lines represent terms that are *derived* from the vocabulary basis. In an application implementing the Q-technology, the latter can be defined interactively and dynamically by the user. This definition can be related to a theoretical algebraic framework as follows.

The basic sort (`BSORT`) `Person` and the derived sort (`DSORT`) `Man` both refer to sorts of a signature. Sorts are defined without a concrete algebra as a framework for the modeling of a domain. Thereby the object-oriented model of classes and subclasses is applied. Despite the object-oriented approach, the model is merely a framework for a full-fledged object-model which is constructed only when attributes are incorporated.

The basic scale (`BSCALE`) `Gender` is a concrete algebra with a finite domain consisting of the set {`male`, `female`}. A term is an element of the set {`male`, `female`} and, to give an example, the following formula can be constructed

```
Gender = male ∨ female.
```

The attribute (`ATTRIB`) `gender` assigns the basic scale `Gender` to a (initially not specified) sort. This assignment binds the sort to a concrete domain, whereby a so called Q-class is created.

In the example, let the unary sort predicates `Person(x)` and `Man(x)` be part of the signature and the attribute `gender` be assigned to the sort `Person`. Based on the formula of the basic scale `Gender`, which is imported into the object system together with the attribute `gender`, the following formulas can be constructed (the free variable `x` refers to an arbitrary element of the object domain; free variables must be considered as all-quantified).

```
gender(x) ↔ [Person(x) →
Gender(x) = male ∨ Gender(x) = female].
Man(x) ↔ Person(x) ∧ Gender(x) = male.
```

By comparing this with the above excerpt of a Q-vocabulary definition, it becomes clear that a Q-vocabulary is essentially a short-hand notation for formulas. These formulas correspond to the terminological axioms of terminological systems. In a terminological axiom a concept is described by an inductively defined concept description. It is, thus, possible to deduce a complex concept (e.g., a Q-attribute or derived Q-sort) to one or more atomic concepts (e.g., a basic Q-sort) and attribute/value pairs (e.g., a basic Q-scale).

It is special to the Q-technology that the set of concepts on the left is predefined by the abstract object model. Thus, each concept is semantically described in two different ways, first in the object model by subsumption and, second, intensionally by a terminological axiom. Whereas the first reflects the objective view on a domain of discourse, the second can be seen as a subjective conceptualization by a specific user or user group.