BOR: a Pragmatic DAML+OIL Reasoner*

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Our group is working on implementation of a DAML+OIL instance reasoner within On-To-Knowledge Project. The storage, management, and querying of ontologies and instances is handled by the system SESAME - an RDF(S) repository which supports the RQL language. For more expressive languages like DAML+OIL it is necessary to implement reasoning services that satisfy the following requirements:

- To be aware of the semantics of DAML+OIL;
- To be efficient in the typical use cases:
  - Ontology development: Terminological Reasoning, usually no instances are involved;
  - Ontology use: Instance Reasoning, stable ontology with huge instance data;
- To be in close integration with the RDF(S) repository.

We consider DAML+OIL as a description logic and follow the developments on the top of of $\mathcal{SHOQ}$(D) logic. We envisage to implement the following reasoning services:

- Realisation;
- Instance checking;
- Retrieval;
- Retrieval of components;
- Model Checking; and
- Minimal Sub-Ontology Extraction.

We consider the last three services as important for the above mentioned tasks. Retrieval of components is important when some of the instances in the *ABox* are represented by numbers or other kind of ids and the important information is given via roles defined on these ids. Model checking tries to show that a given *ABox* is a model of some terminology. Important assumption is that *Abox* already contains all information for a tableau and there is no need to add new information. Only checking for consistency of the individual statements with the terminology is necessary. We envisage model checking to be efficiently decidable. Model checking can be very useful for compatibility check between versions of terminology and different versions of the *ABox*. For minimal sub-ontology extraction, the task is defined in the following way: a terminology and a set of individuals are given, what is the minimum sub-terminology (if unique) such that the set of individuals is a model of it. A minimal ontology is defined as a minimal sub-taxonomy (including role hierarchy), but also such ontology will need to include some non-hierarchical knowledge (because of generalized concept inclusion axioms). This inference service can be very useful for determination the scope of an ontology exchange, for example, when certain information (typically a set of individuals) has to be exchanged between two systems. Our implementation will be tuned to a special kinds of *ABox*es: such that contains ground individual statement:

$a : CN$ - concept statement with CN a concept name

$(a, b) : R$ - role statement with R a role name

$a = b$ - equality statement

$a \neq b$ - inequality statement

Our expectations are that *ABox*es containing only ground instance statements will allow very efficient implementation of inference procedures. Also ground statements are typical for the case studies within the On-To-Knowledge project. A discussion of the relation between DAML+OIL and RDF(S) and definition of functional interfaces for our implementation could be found in [Kiryakov et. al 2002] and [Simov 2002].

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