ASP for Minimal Entailment in a Rational Extension of $SROEL$ (Extended Abstract)*

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This work exploits Answer Set Programming (ASP) for reasoning in a rational extension of $SROEL(\sqcap, \times)$ [5], the low complexity description logic which underlies the OWL EL ontology language. It is based on a preferential approach to defeasible reasoning in description logics (DLs) [2, 3], which has been developed along the lines of the preferential semantics introduced by Kraus, Lehmann and Magidor [4, 6].

Following [3], we have considered an extension of $SROEL(\sqcap, \times)$ with a typicality operator $T$, which allows the definition of defeasible inclusions $T(C) \subseteq D$ ("the typical $C$ elements are $D$s"). In this extension, $SROEL(\sqcap, \times)^R T$, instance checking under rational entailment has polynomial complexity. We observe that the notion of minimal canonical model introduced in [3] as a semantic characterization of the rational closure for $ALC$ is not adequate to capture many knowledge bases (KBs) in $SROEL(\sqcap, \times)^R T$. In particular, when nominals or the universal role are used, a KB may have no canonical model at all. The $T$-minimal model semantics is introduced as an alternative to the minimal canonical model semantics. It weakens the canonical model condition in [3], by requiring that only for the concepts $C$ such that $T(C)$ occurs in the KB (or in the query), an instance of $C$ has to exist in the model, when $C$ is satisfiable wrt the KB. For the KBs having minimal canonical models with the same rank assignment to concepts as in the rational closure, we show that $T$-minimal models capture the same defeasible inferences as minimal canonical models.

We prove that, for arbitrary $SROEL(\sqcap, \times)^R T$ KBs, instance checking under $T$-minimal entailment is $\Pi^p_2$-complete. Based on a Small Model result, where models correspond to answer sets of a suitable ASP encoding, we exploit Answer Set Preferences and the asprin framework [1] for reasoning under $T$-minimal entailment.

References

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