Description Logics

Exercise Sheet 14

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Exercise 1

Prove that for a given TBox $\mathcal{T}$ and a consequence $A \sqsubseteq B$ there can be exponentially many MinAs for $A \sqsubseteq B$. Hint: You do not need any concept constructors except conjunction.

Exercise 2

Complete the proof of Theorem 8.5 for the case where ψ is obtained using (R3).

Exercise 3

Let $\mathcal{L}_1$ and $\mathcal{L}_2$ be two DL-languages. We define the $\mathcal{L}_2$-lcs as follows. Let C_1, C_2 be two $\mathcal{L}_1$-concept descriptions. An $\mathcal{L}_2$-concept description C is called the *$\mathcal{L}_2$-lcs of C_1 and C_2* iff

(1) $C_1 \sqsubseteq C$ and $C_2 \sqsubseteq C$, and

(2) for all $\mathcal{L}_2$-concept descriptions D it holds that $C_1 \sqsubseteq D$ and $C_2 \sqsubseteq D$ imply $C \sqsubseteq D$.

This generalizes the standard notion of least common subsumers since it allows different logics for C_1, C_2 and their lcs.

Consider the following $\mathcal{FLE}$-concept descriptions

$$C_1 = \exists r.C \sqcap \exists r.D \sqcap \forall r.(A \sqcap B),$$
$$C_2 = \exists r.B \sqcap \exists r.D \sqcap \forall r.(A \sqcap D).$$

Find

a) the $\mathcal{EL}$-lcs,

b) the $\mathcal{FLE}$-lcs[1], and

c) the $\mathcal{ALC}$-lcs

of C_1 and C_2. Hint: It is not necessary to provide an algorithm that can compute the lcs in the general case.

[1] $\mathcal{FLE}$ provides conjunction, existential restrictions and value restrictions.