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9. Exercises for the Course „Description Logics“

Exercise 42:

Give an inductive definition of

(a) the size $|C|$ of a concept description C and

(b) the set $\mathsf{sub}(C)$ of subdescriptions of C.

Prove that for all concept descriptions C, the cardinality of $\mathsf{sub}(C)$ is bounded by $|C|$.

Exercise 43:

Show that the size $|C|_{\mathcal{T}}$ of a concept C w.r.t. to an acyclic TBox $\mathcal{T}$, as defined in the lecture, is well-defined.

Exercise 44:

Reconsider the proof of Point 1 of Lemma 3.15 (soundness). Fill in the remaining case $C = \neg A$ in the inductive proof that $\mathcal{I}_{\mathcal{A}}$ satisfies every assertion $C(x) \in \mathcal{A}$.

Exercise 45:

(Partially) prove the analogue of Lemma 3.10 for the case with acyclic TBoxes, i.e., if the set of ABoxes $\mathcal{M}'$ is obtained from $\mathcal{M}$ by an application of a tableau rule, then $\mathcal{M}' \prec \mathcal{M}$. Treat the $\forall$-rule and the $\equiv_1$-rule.

Exercise 46:

Complete the proof of Lemma 4.2 by showing that for all $\mathcal{ALC}$-concept descriptions C and all $(d_0, r_1, \ldots, r_m, d_m) \in \Delta^{\widehat{\mathcal{I}}}$, we have $(d_0, r_1, \ldots, r_m, d_m) \in \Delta^{\widehat{\mathcal{I}}}$ iff $d_m \in C^{\mathcal{I}}$.