TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science Institute of Theoretical Computer Science, Chair of Automata Theory

Logic-Based Ontology Engineering

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Exercise Sheet 11 – Modularization

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Dr.-Ing. Stefan Borgwardt, PD Anni-Yasmin Turhan

Exercise 11.1 Let $\Sigma = \{A, B, C, D, r\}$ and let $\mathcal{O}_1$ be defined as $\mathcal{O}_1 = (\emptyset, \mathcal{T}, \emptyset)$, with

$$\begin{aligned}\mathcal{T} = \{\ & C \sqsubseteq D \sqcap E,\\ & D \sqsubseteq \exists r.(A \sqcap B),\\ & E \sqsubseteq \forall s.\bot \qquad\qquad \}.\end{aligned}$$

(a) Devise an ontology $\mathcal{O}_2$ s.t. $\mathcal{O}_1 \neq \mathcal{O}_2$, such that $\mathcal{O}_2$ is a Σ-conservative extension of $\mathcal{O}_1$.

(b) Give reasons why $\mathcal{O}_2$ is a Σ-conservative extension.

Exercise 11.2 Let $\Sigma = \{A, B, C, r\}$ and let $\mathcal{O}_i = (\emptyset, \mathcal{T}_i, \emptyset)$ for $1 \leq i \leq 3$, with

$$\begin{aligned}\mathcal{T}_1 = \{\ & E \sqsubseteq F \sqcap D,\\ & D \sqsubseteq \exists s.F,\\ & \top \sqsubseteq \forall r.\top \ \}\end{aligned}$$

$$\begin{aligned}\mathcal{T}_2 = \{\ & (\forall r.A) \sqcap (\exists r.B) \sqsubseteq \exists r.(A \sqcap B),\\ & A \sqsubseteq \forall r.\top,\\ & D \sqsubseteq D_1 \sqcap \exists r.A_1,\\ & B \sqsubseteq (B \sqcup \neg B),\\ & F \sqsubseteq \exists s.(A_1 \sqcap A_2)\ \}\end{aligned}$$

$$\begin{aligned}\mathcal{T}_3 = \{\ & B \sqsubseteq B \sqcup E,\\ & C \sqsubseteq \exists s.D,\\ & D \sqsubseteq \exists s.F,\\ & F \sqsubseteq \exists r.(A_1 \sqcap A_2)\ \}\end{aligned}$$

Which of the three $\mathcal{O}_i$ are Σ-safe? Give reasons.