Logic-Based Ontology Engineering

Summer Semester 2018

Exercise Sheet 8

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Exercise 8.1 Clearly, the $\mathcal{ELH}$ concept $(\exists r.A) \sqcap (\exists r.B)$ subsumes $\exists r.(A \sqcap B)$. Using the similarity measure σ_d from the lecture, we can generalize this fact for the concepts

- $C_1 = (\exists r_1.A_1) \sqcap (\exists r_1.B_1)$
- $C_2 = \exists r_2.(A_2 \sqcap B_2)$

which are already expanded w.r.t. their respective ontologies $\mathcal{O}_1$ and $\mathcal{O}_2$. Let the weighting factor β be 0.6 and the primitive measures σ'_a and σ'_b be defined as follows:

	(A_1, A_2)	(B_1, B_2)	(A_1, B_2)	(B_1, A_2)	(r_1, r_2)
σ'_a	1	1	0	0	1
σ'_b	0.9	0.6	0.4	0.3	0.7

Compute the directed similarities $\sigma_d(C_1, C_2)$ and $\sigma_d(C_2, C_1)$ using ...

(a) ...the primitive measure σ'_a. What does this measure essentially encode?

(b) ...the primitive measure σ'_b.

Exercise 8.2 Given the ontology $\mathcal{O} = (\emptyset, \mathcal{T}, \mathcal{R})$ with abbreviations for the axioms as follows:

$$\begin{aligned}
\mathcal{T} = \{\ & C \sqcap \exists s.E \sqsubseteq F \sqcap D_1, && (T_1)\\
& C \sqsubseteq A \sqcap B, && (T_2)\\
& D \equiv D_1 \sqcap \exists r.A_1 \sqcap \exists r.A_2, && (T_3)\\
& A \sqsubseteq D_1 \sqcap \exists s.(A_1 \sqcap A_2), && (T_4)\\
& B \sqsubseteq D, && (T_5)\\
& F \sqsubseteq \exists r.(A_1 \sqcap A_2)\ \} && (T_6)
\end{aligned}$$

$$\begin{aligned}
\mathcal{R} = \{\ & s \sqsubseteq r, && (R_1)\\
& \mathit{ran}(s) = E\ \} && (R_2)
\end{aligned}$$

(a) Compute all justifications for the consequence

$$C \sqcap \exists s.\top \sqsubseteq D \text{ w.r.t. } \mathcal{O}.$$

(b) Use the Hitting Set Tree (HST) algorithm to compute all diagnoses.

Exercise 8.3 Prove that $\mathsf{Just}_{\mathcal{O}}(\alpha) = \mathsf{MHS}_{\mathcal{O}}(\mathsf{Diag}_{\mathcal{O}}(\alpha))$.