TECHNISCHE UNIVERSITÄT DRESDEN

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

Fuzzy Description Logics

Exercise Sheet 8

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Notice

Throughout the exercise sheet, we assume that only $\geq$-axioms are allowed and that reasoning is restricted to witnessed models.

Exercise 36

Decide whether the following instances of PCP have a solution or not.

a) $\{(00, 1), (11, 1), (0, 00)\}$

b) $\{(0, 1), (01, 0), (1, 0)\}$

c) $\{(0, 01), (1, 01), (101, 10), (00, 0)\}$

d) $\{(01, 010), (100, 00), (010, 100)\}$

Exercise 37

Let A be a concept name. Construct a Lukasiewicz-$\mathcal{ALC}$ ontology such that $A^{\mathcal{I}}(x) \in [0.25, 0.75]$ for every model $\mathcal{I}$ and $x \in \Delta^{\mathcal{I}}$.

Exercise 38

For which of the three standard t-norms $\otimes$ are the following $\otimes$-$\mathcal{ALC}$ ABoxes consistent?

a) $\mathcal{A}_1 = \{\langle A(a) \geq 0.5\rangle, \langle \neg(A \sqcap A)(a) \geq 1\rangle\}$

b) $\mathcal{A}_2 = \{\langle \forall r.A(a) \geq 1\rangle, \langle \exists r.\neg A(a) \geq 0.1\rangle$

Exercise 39

Consider the logic $\otimes$-$\mathcal{ALC}$ where

a) $\otimes$ is the Łukasiewicz t-norm, or

b) $\otimes$ is the product t-norm.

Can you construct an ontology $\mathcal{O}$ such that

- $\mathcal{O}$ is consistent, and
- in any model of $\mathcal{O}$ infinitely many truth values occur?

Justify your answer using a proof or an example.