



Fuzzy Description Logics

Summer Semester 2017

Exercise Sheet 5

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Exercise 5.1 Let \otimes be a t-norm without any zero-divisors and consider the logic $\otimes\text{-}\mathcal{S}$, which extends $\otimes\text{-}\mathcal{ALC}$ with transitivity axioms. Note that transitivity axioms are of the form $\text{trans}(r)$ and translate to first-order logic as $\forall x, y, z, r(x, y) \wedge r(y, z) \rightarrow r(x, z)$. Prove that the logic $\otimes\text{-}\mathcal{S}$ has the crisp model property. (Hint: Prove Lemma 3.5 for the transitivity axiom).

Exercise 5.2 Decide whether the following instances of the Post Correspondence Problem 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) $\{(01, 010), (100, 00), (010, 100)\}$