TECHNISCHE UNIVERSITÄT DRESDEN

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

Fuzzy Description Logics

Exercise Sheet 4

Dr. Felix Distel
Summer Semester 2013

Exercise 15

Using ordinal sums, construct a continuous t-norm where exactly 3 values from $[0, 1]$ are idempotent, i.e. exactly 3 values satisfy $x \otimes x = x$.

Exercise 16

Which of the following t-norms (if any) are isomorphic?

2nd Hamacher t-norm: $x \otimes_2^H y = \frac{xy}{xy-x-y+2}$

2nd Schweizer-Sklar t-norm: $x \otimes_2^{SS} y = \sqrt{\max\left\{x^2 + y^2 - 1, 0\right\}}$

2nd Yager t-norm: $x \otimes_2^Y y = \max\left\{1 - \sqrt{(1-x)^2 + (1-y)^2}, 0\right\}$

Exercise 17

Consider the fuzzy ABox

$$\mathcal{A} = \{\langle A(a) \geq 0.5\rangle, \langle r(a, b) \geq 0.9\rangle, \langle r(a, c) \geq 0.7\rangle\}$$

and the fuzzy TBox

$$\mathcal{T} = \{\langle A \sqsubseteq \forall r.(A \sqcup \neg B) \geq 0.8\rangle, \\ \langle A \sqsubseteq \exists r.\neg B \geq 0.9\rangle$$

the Gödel t-norm is used. Present a non-crisp model of $\mathcal{A}$ and $\mathcal{T}$.

Exercise 18

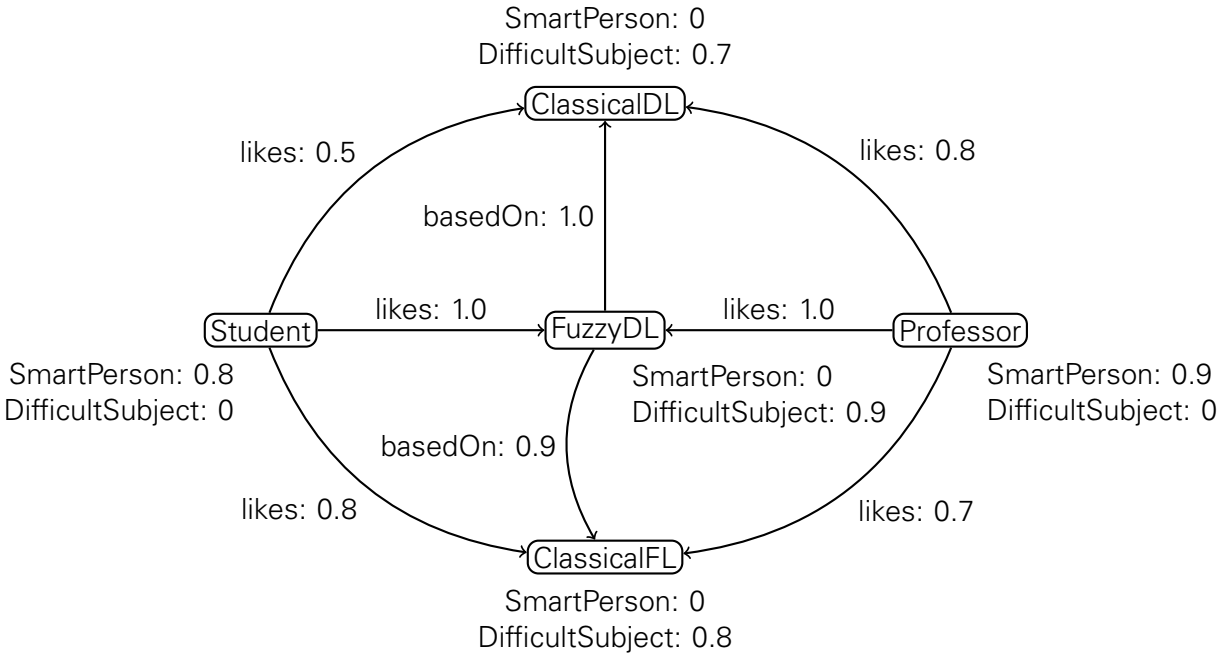
Consider a set of concept names

$$\mathcal{N}_C = \{\text{DifficultSubject}, \text{SmartPerson}\}$$

and a set of role names

$$\mathcal{N}_R = \{\text{likes}, \text{basedOn}\}.$$

Let a fuzzy interpretation be given by the following graphical representation (absent edges are meant to be read as 0, e.g. in this example $\text{likes}^{\mathcal{I}}(\text{Student}, \text{Professor}) = 0$).



For the Gödel t-norm, give the interpretations of the following concept descriptions.

a) SmartPerson $\sqcap \exists$likes.DifficultSubject

b) $\forall$likes.$\exists$basedOn.DifficultSubject

c) $\exists$likes.$\forall$basedOn.DifficultSubject