TECHNISCHE UNIVERSITÄT DRESDEN

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

Fuzzy Description Logics

Exercise Sheet 8

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Exercise 1

A *Büchi-automaton* is a tuple $\mathcal{A} = (Q, I, \Delta, F)$ where Q is a set of states, $I \in Q$ is the initial state, $\Delta \subseteq Q \times \Sigma \times Q$ is a transition table and $F \subseteq Q$ is the set of accepting states.

A *run* of a Büchi-automaton on an infinite word $w = \sigma_1\sigma_2\ldots$ is an infinite sequence $q_0 q_1 \ldots$ such that $(q_i, \sigma_i, q_{i+1}) \in \Delta$ for all $i \in \mathbb{N}$. The run is *accepting* if some accepting state appears in it infinitely often. The automaton *accepts* the word w if there exists an accepting run on w.

Find a language that can be accepted by a Büchi-automaton but not by a looping automaton.

Exercise 2

Let L be the lattice $L = (D_{140}, \gcd, \mathrm{lcm})$ from the previous exercise sheet, where $\sim x = \frac{140}{x}$ and $\otimes$ and $\Rightarrow$ are defined as in Exercise 4 from Sheet 7, i.e. $x \otimes y = \gcd(x, y)$ and $x \Rightarrow y = \bigvee\{z \mid \gcd(x, z)|y\}$.

Consider the ontology

$$\begin{aligned}\mathcal{O} = \{&\langle \neg B \sqsubseteq C, 28\rangle,\\ &\langle A \sqcup B \sqsubseteq C \sqcap \neg B, 140\rangle,\\ &\langle C \sqsubseteq \bot, 5\rangle\}.\end{aligned}$$

Can you find a Hintikka-function for $\mathcal{O}$ that is compatible with all GCIs from $\mathcal{O}$?