Lehrstuhl für Automatentheorie
Institut für Theoretische Informatik, TU Dresden
Prof. Dr. F. Baader

Hans-Grundig-Str. 25
Dresden Johannstadt
Tel.: 0351/463–38237
Tel.: 0351/463–39171

6. Exercises for the Course „Logic-based Knowledge Representation“

Exercise 22:

For the $\geq$-Rule of the tableau-based algorithm to be applicable to some $\mathsf{a}\colon (\geq\ n\ r) \in \mathcal{A}$, the following condition must be satisfied:
there are no n individual names $\mathsf{b}_1, \ldots \mathsf{b}_n$ with

$$\{(\mathsf{a}, \mathsf{b}_1)\colon r, \ldots, (\mathsf{a}, \mathsf{b}_n)\colon r\} \cup \{\mathsf{b}_i \not\doteq \mathsf{b}_j \mid 1 \leq i < j \leq n\} \subseteq \mathcal{A}\,.$$

(a) It is natural to view (and decide) this condition as a graph-theoretical problem by translating inequality assertions into a graph. Describe the graph-theoretic problem corresponding to the above applicability condition. What is the complexity of this problem?

(b) Is it possible to replace the inequality assertions in ABoxes with a more clever data structure, such that checking the applicability of $\geq$-Rule becomes less complex?

Exercise 23:

In the lecture, it has been proved that the tableau algorithm uses space polynomial in the length of the input ABox—provided that numbers in number restrictions are coded unarily.
Modify the tableau algorithm such that this is also true for binary coding of numbers in number restrictions (and such that it still decides consistency of ABoxes).