

Integrated Logic Systems (Part I)

Prof. Michael Thielscher, Sebastian Voigt

International Master Program in Computational Logic — summer term 2009

29.05.2009

Exercise 3.1

Give the \mathcal{L}_3 code for the following program:

```
add(0, N, N).
add(s(M), N, s(L)) :- add(M, N, L).
```

and the \mathcal{L}_3 query $?- \text{add}(X, s(0), s(s(0)))$. Trace the execution of the query and show how the stack, the heap and the trail evolve.

Exercise 3.2

Download the Prolog code for the tableau prover (`tableau.pl`) from the course web page. Transform the following formula into a Skolem CNF formula and check the validity with Prolog:

$$[(\forall x \exists y)(p(x, y)) \wedge (\forall x, y)(p(x, y) \rightarrow p(y, x)) \wedge (\forall x, y, z)(p(x, y) \wedge p(y, z) \rightarrow p(x, z))] \\ \rightarrow (\forall x)(p(x, x))$$

Exercise 3.3

Consider the following statement:

“Jaden is a parent without a child.”

- Using the definitions from Sl. IV/18, formulate this statement as an ABox A .
- Transform A to negation normal form and replace all defined concepts (i.e. all concepts that occur in a left-hand side of the definitions from Sl. IV/18) by their definitions in terms of primitive concepts (those that only occur on right hand sides).
- Apply the Transformation Rules for \mathcal{ALC} (Sl. IV/23) to show that A is inconsistent.