max planck institut
informatik

Universität
des
Saarlandes
FR Informatik

Uwe Waldmann June 30, 2014

Tutorials for "Automated Reasoning II"
Exercise sheet 10

Exercise 10.1:
Consider the base specification $SP = (\Sigma, \mathcal{C})$ with $\Sigma = (\Xi, \Omega, \emptyset)$, where $\Xi = \{int\}$, Ω contains int-sorted constants $0, 1, -1, 2, -2, \ldots$, a Skolem constant $k : \to int$, $- : int \to int$, and $+ : int \times int \to int$, and $\mathcal{C}$ is the isomorphy class of $\mathbb{Z}$ (with k interpreted by an arbitrary integer number).

We extend SP by a new sort $list$, new operator symbols $cons : int \times list \to list$, $car : list \to int$, $cdr : list \to list$, $empty : \to list$, and $a : \to list$, and the clauses

$$car(cons(x, y)) \approx x \qquad (1)$$
$$cdr(cons(x, y)) \approx y \qquad (2)$$
$$cons(k, a) \approx cons(3, empty) \qquad (3)$$
$$k + 5 \approx 7 \qquad (4)$$

Use the hierarchic superposition calculus to show that the hierarchic specification is inconsistent.

Exercise 10.2:
As mentioned in the lecture, it is not necessary for the completeness of hierarchic superposition to abstract out concrete numbers. This does not hold for Skolem constants, though. Give a simple example of a hierarchic specification that can be refuted using hierarchic superposition if Skolem constants are abstracted out, but that cannot be refuted if the abstraction of Skolem constants is avoided.

Exercise 10.3:
Are the two terms $b + x$ and $y + c$ (with constants b, c) unifiable with respect to associativity? If yes, compute a μCSU.

Exercise 10.4:
Are the two terms $b + x$ and $x + c$ (with constants b, c) unifiable with respect to associativity? If yes, compute a μCSU.

Bring your solution (or solution attempt) to the tutorial on July 7.