



Uwe Waldmann

May 27, 2020

Tutorials for “Automated Reasoning II”
Exercise sheet 3

Exercise 3.1:

Find a simple example that demonstrates that the deterministic Nelson-Oppen combination procedure is incomplete if one of the theories is not convex.

Exercise 3.2:

Is the theory of abelian groups stably infinite? Give an explanation. (Hint: If $(G_1, +_1, 0_1)$ and $(G_2, +_2, 0_2)$ are abelian groups, then the cartesian product $(G_1 \times G_2, +, 0)$ with $(x, y) + (x', y') := (x +_1 x', y +_2 y')$ and $0 := (0_1, 0_2)$ is again an abelian group.)

Exercise 3.3:

Use the CDCL(EUF) calculus to determine whether the following set of clauses is satisfiable or not:

$$f(a, b) \not\approx f(a', b') \quad (1)$$

$$g(g(c)) \not\approx c \quad (2)$$

$$g(d) \approx c \vee g(g(c)) \approx c \quad (3)$$

$$a \approx a' \vee c \approx d \quad (4)$$

$$b \approx b' \vee c \approx d \quad (5)$$

Exercise 3.4:

Normalization of the input literals is an important part of the pre-processing that take place in an SMT solver before running the actual CDCL(T) algorithm. How would you normalize literals in linear integer arithmetic?

Submit your solution (or solution attempt) by e-mail to uwe@mpi-inf.mpg.de, subject Ex 3. until June 2.