Universität Koblenz-Landau

FB 4 Informatik

Prof. Dr. Viorica Sofronie-Stokkermans **January 16, 2012**

Exercises for "Decision Procedures for Verification"
Exercise sheet 11

Exercise 11.1: *(6 P)*
Let $\mathcal{T}$ be the combination of $LI(\mathbb{Q})$ (linear arithmetic over $\mathbb{Q}$) and UIF_Σ, the theory of uninterpreted function symbols in the signature $\Sigma = \{\{f/1, g/2\}, \emptyset\}$.

Check the satisfiability of the following ground formula w.r.t. $\mathcal{T}$ using the deterministic version of the Nelson-Oppen procedure (after purifying the formulae check for entailment of equalities between shared constants and propagate the entailed equalities):

- $\phi = (c + f(d) \approx e \wedge d \approx d' \wedge f(e) \approx c + f(d') \wedge f(f(c + f(d))) \not\approx e)$.

For reasoning in UIF_Σ use the graph-based method for computing the congruence closure presented in the class.

For reasoning in $LI(\mathbb{Q})$ use the Fourier-Motzkin algorithm.

Exercise 11.2: *(4 P)*
Check the satisfiability w.r.t. $\mathcal{T} = LI(\mathbb{Q})$ of the following set of ground clauses using one of the versions of the $DPLL(\mathcal{T})$ algorithm presented in the class.

$$(\neg(0 \leq x) \vee \neg(y \leq z)) \quad \wedge \quad (\neg(z \leq x + y) \vee (y \leq z)) \quad \wedge \quad (\neg(0 \leq y) \vee (0 \leq x)) \quad \wedge \quad (z \leq x + y)$$

For theory reasoning in $LI(\mathbb{Q})$ use the Fourier-Motzkin algorithm.

Please submit your solution until Friday, January 20, 2012 at 17:00 by e-mail to
`sofronie@uni-koblenz.de` with the keyword "Homework DP" in the subject.

Joint solutions prepared by up to two persons are allowed.
Please do not forget to write your name on your solution!