hybr2d Theory of Hybrid Systems Informatik 2

RWTH AACHEN UNIVERSITY

Satisfiability Checking - WS 2016/2017

Series 5

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Exercise 1

a) Give a formula describing the Unequal game instance of Series 3 Exercise 2 in *equality logic with uninterpreted functions*. Remember, that the formula shall be satisfiable iff the game instance has a solution. You must not use propositional variables in your solution!

b) Compare the resulting formula to the propositional encoding. More precisely, compare the number of literals and clauses using the big $\mathcal{O}$ notation. Draw a conclusion.

c) Does the usage of equality logic with uninterpreted functions improve the runtime complexity of solving the problem? Give an explanation!

2 + 1 + 1 points

Exercise 2

In the lecture “Equalities and Uninterpreted Functions”, given on November 19th, 2015, it was mentioned that for each formula of equality logic with uninterpreted functions φ^{UF} there is an equisatifiable formula $\hat{\varphi}^{UF}$ without constants. Define a general constant elimination procedure for a formula in equality logic with uninterpreted functions containing constants.

3 points

Exercise 3

Consider the following formula in equality logic:

$$\varphi \quad := \quad a = b \ \wedge \ (\ b = c \ \vee \ c = e \ ) \ \wedge \ (\ b = d \ \vee \ c = f \ ) \ \wedge \ a \neq e$$

a) Construct the equality graph with polarity for φ.

b) Simplify the constructed equality graph and the formula using the method presented in the lecture (slides 37-38).

c) Make the simplified equality graph without polarity chordal. What are the chord-free simple cycles?

d) Construct the satisfiability-equivalent propositional logic formula for φ using the previous results.

1 + 1 + 1 + 1 points