

Decision Procedures – Homework 2

Discussed on Tuesday, 28th July, 2016.

Exercise 2.1 Proving equivalence of programs

Show that the two programs do the same, using uninterpreted functions

<pre>int factorial3_a (int in) { int i, out_a=in; for (i=1; i<=2; i++) out_a=out_a*(in-i); return out_a; }</pre>		<pre>int factorial3_b (int in) { int out_b; out_b= in * (in-1) * (in-2) return out_b }</pre>
(a)		(b)

Exercise 2.2 Ackermann's Reduction

Apply Ackermann's Reduction to the following term:

$$x_1 = x_2 \wedge y_1 = y_2 \wedge F(x_1, F(x_1, G(F(x_1, y_1)))) = F(x_2, F(x_2, G(F(x_2, y_2))))$$

Exercise 2.3 Congruence Closure

Apply the congruence closure algorithm to the following terms:

- (a) $\varphi_a^{UF} := x_1 = x_2 \wedge x_2 \neq x_3 \wedge x_3 = x_4 \wedge x_4 = x_5 \wedge F(x_1) \neq F(x_3)$
- (b) $\varphi_b^{UF} := x_1 = x_2 \wedge x_2 = x_3 \wedge x_3 \neq x_4 \wedge F(x_1, x_2) = F(x_2, x_4)$
- (c) $\varphi_c^{UF} := x_1 = x_2 \wedge x_2 \neq x_3 \wedge F(x_1) = F(x_2) \wedge \neg(F(x_1) \neq G(x_3) \vee G(x_2) = G(x_3))$
- (d) $\varphi_d^{UF} := F(F(F(x))) = x \wedge F(F(F(F(F(x)))) = x \wedge F(x) \neq x$