

Homework

1. Compute the equality graph of the equality logic formula

$$a = b \wedge c = d \wedge a = c \wedge e = f \wedge e \neq j \wedge b = d \wedge c \neq d \wedge g \neq h \wedge g \neq i \wedge h = i \wedge f = j$$

and list its simple contradictory cycles.

2. How would you search for contradictory cycles efficiently?
3. Use the congruence closure algorithm to determine the satisfiability of the following formulas:

(a) $x \neq G(x) \wedge G(x) = G(G(x)) \wedge G(G(G(G(G(G(x)))))) = x$

(b) $F(G(x)) = G(F(x)) \wedge F(G(F(y))) = G(x) \wedge F(y) = x \wedge G(F(x)) \neq x$

(c) $G(x) \neq G(F(x)) \wedge G(F(G(F(x)))) = F(F(F(x))) \wedge F(G(F(x))) = G(F(x)) \wedge F(G(x)) = G(F(x)) \wedge G(G(x)) = F(F(x))$

4. Encode one of the problems for the last exercise in SMTLib and try an SMT solver on it.