

SAT and SMT Solving | SS 2018 | LVA 703048

Exercises 3 | April 12, 2018

[3] 1 Apply the Branch & Bound algorithm to the formula

$$\varphi = (x \vee y \vee z) \wedge \neg x \wedge (x \vee y) \wedge (\neg x \vee \neg y) \wedge (x \vee z) \wedge (\neg x \vee \neg y \vee z) \wedge (y \vee \neg z) \wedge \neg z$$

to determine maxSAT(φ).

2 Implement a maxSAT solver based on binary search, e.g. in Python while using the `z3` library for satisfiability checks.

[3] (a) Write a function `maxSAT` which takes a list of list of `z3` variables representing a CNF formula φ, and returns maxSAT(φ). Test it on the examples of Exercise 1 and the slides of Week 3.

[2] ⋆(b) Also return a valuation which maximizes the number of satisfied clauses.

[4] 3 Solve the Rabbit puzzle by means of a SAT encoding:

(a) There are five houses.
(b) The Englishman lives in the red house.
(c) The Spaniard owns the dog.
(d) Coffee is drunk in the green house.
(e) The Ukrainian drinks tea.
(f) The green house is immediately to the right of the ivory house.
(g) The Old Gold smoker owns snails.
(h) Kools are smoked in the yellow house.
(i) Milk is drunk in the middle house.
(j) The Norwegian lives in the first house.
(k) The man who smokes Chesterfields lives in the house next to the man with the fox.
(l) Kools are smoked in the house next to the house where the horse is kept.
(m) The Lucky Strike smoker drinks orange juice.
(n) The Japanese smokes Parliaments.
(o) The Norwegian lives next to the blue house.

Now, who drinks water? Who owns the rabbit?

(cf. `https://en.wikipedia.org/wiki/Zebra_Puzzle`)