

INF4170 - Logic

SAT and DPLL

Spring 2008, week 7

1 Exercises

1.1 Normal forms

Reduce the following formula to NNF, DNF and CNF.

$$\neg((P_1 \vee P_2 \vee P_3) \wedge (P_4 \vee P_5 \vee P_6) \wedge (P_7 \vee P_8 \vee P_9))$$

1.2 Clause sets

Prove Lemma 6(2).

1.3 DPLL

Determine whether $\{[P \neg Q R], [\neg P \neg Q \neg R], [P Q \neg R]\}$ is satisfiable using DPLL.

1.4 DPLL

Prove (the validity of) $(P \supset Q) \supset (\neg Q \supset \neg P)$ in DPLL,

1. by first reducing to CNF, and
2. by first Tseitin-encoding.

1.5 Soundness and Completeness

Does MON, SPLIT and PROP form a sound and complete rule set?

1.6 Soundness and Completeness

Prove Lemma 13.

1.7 Jeroslow Wang heuristic

- Calculate $w(\Gamma)$ from Example 2 on page 50 of the slides.
- Does this weight tell us anything about the satisfiability of Γ ?
- Are there cases where one can determine the satisfiability of a general clause set Γ by just looking at $w(\Gamma)$?

1.8 DPLL implementation

Argue the soundness of the pseudocode implementation of DPLL.

1.9 Tseitin encoding

Prove Lemma 19.