



Christoph Weidenbach

November 29, 2016

Tutorials for “Automated Reasoning”
Exercise sheet 5

Exercise 5.1: (6 P)

Show unsatisfiability of the below clause set N via the superposition calculus based on the atom ordering $P_1 \succ P_4 \succ P_5 \succ P_2 \succ P_3$.

- | | | |
|------------------------------|------------------------------|------------------------------|
| (1) $P_1 \vee P_2 \vee P_3$ | (2) $\neg P_1 \vee \neg P_2$ | (3) $\neg P_2 \vee \neg P_3$ |
| (4) $\neg P_1 \vee \neg P_3$ | (5) $P_4 \vee P_5 \vee P_1$ | (6) $\neg P_4 \vee P_1$ |
| (7) $\neg P_4 \vee P_2$ | (8) $\neg P_5 \vee P_2$ | (9) $\neg P_5 \vee P_3$ |
| (10) $\neg P_1 \vee P_4$ | | |

Exercise 5.2: (4+4 P)

Demonstrate the Superposition Partial Model Construction on the following sets of clauses:

1. Set of clauses $N = \{\neg Q_0 \vee \neg P_2 \vee Q_1, \neg Q_1 \vee Q_2, P_0 \vee Q_0, \neg Q_0 \vee P_1, Q_0 \vee P_1\}$. Use ordering $Q_2 \succ P_2 \succ Q_1 \succ P_1 \succ Q_0 \succ P_0$ on atoms.
2. Set of clauses $N = \{\neg P \vee Q \vee P, S \vee \neg Q \vee R, \neg R \vee \neg S, Q \vee \neg S \vee S, R \vee S \vee P, S \vee Q, \neg R \vee \neg P \vee S \vee \neg Q\}$. Use ordering $P \succ Q \succ R \succ S$ on atoms.

Demonstrate here means: order the clauses in the set, show how (partial) interpretations (i.e. N_D for every $D \in N$) looks like, show how δ_D look like for every $D \in N$ and show the minimal clause which is not entailed by $N_{\mathcal{I}}$ if there is some. Don't do any inferences!

Exercise 5.3: (4 P)

Prove: If $\delta_C = \{P\}$ while constructing $N_{\mathcal{I}}$ then for all clauses $D = P \vee D'$ with $C \neq D$ we have $\delta_D = \emptyset$, $D \in N$.

Submit your solution in lecture hall E1.3, Room 001 during the lecture on December 6. Please write your name and the date/time of your tutorial group (Wed-Fabian, Wed-Tobias) on your solution.

Joint solutions, prepared by up to three persons together, are allowed (but not encouraged). If you prepare your solution jointly, submit it only once and indicate all authors on the sheet.