



Evgeny Kruglov
Christoph Weidenbach

April 27, 2010

Tutorials for “Automated Reasoning”
Exercise sheet 2

Exercise 2.1: (2 P)

Let \succ be the total ordering on the propositional variables $D \succ C \succ B \succ A$.

1. For each of the following pairs of triples, determine the lexicographic ordering relationship between the first and the second triple: $((A, A, C) ? (A, B, C))$, $((D, A, C) ? (B, C, D))$, $((B, A, A) ? (A, C, C))$ generated by the lexicographic extension of \succ .
2. Consider the triples of 1. as multisets and determine the relationship generated by the multiset extension of \succ .

Exercise 2.2: (4 P)

Prove termination of the CNF transformation using an appropriate well-founded ordering.

Exercise 2.3: (2 P)

Prove soundness of Resolution and Factoring, i.e., prove that the clauses involved in the rule application logically imply the clause added by the respective rule application.

Exercise 2.4: (2 P)

Use the transition system $\Rightarrow_{\text{DPLL}}$ for the DPLL procedure to check whether the following set of propositional clauses is satisfiable or not. For each step explain briefly which rule you use and why.

$$\begin{array}{rcl}
 \neg A \vee B & & (1) \\
 & \neg C \vee D & (2) \\
 & & \neg E \vee \neg F (3) \\
 \neg B & \vee \neg E \vee F & (4)
 \end{array}$$

Challenge Problem: (*2 Bonus Points*)

Prove that an application of Merging Replacement Resolution to a set of propositional clauses yields an equivalent clause set.

Submit your solution in lecture hall 002 during the lecture on May 4. Please write your name and the date of your tutorial group (Tue, Wed, Fri) on your solution.

Note: Joint solutions are not permitted (work in groups is encouraged).