



Bromberger/Möhle/Schwarz/Weidenbach

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Tutorials for “Automated Reasoning WS22/23”
Exercise sheet 7

Exercise 7.1:

Let the terms r, s, t be defined by

$$r = g(f(x, h(c)))$$

$$s = f(h(x), g(f(b, g(x))))$$

$$t = f(h(h(c)), f(c, x))$$

Check for each pair of terms $(r, s), (r, t), (s, t)$, whether the terms are comparable using an LPO with precedence $f \succ g \succ b \succ h \succ c$. If they are comparable, say which term is larger.

Exercise 7.2:

Consider a signature with constants a, b , unary function g , and unary predicates P, Q . As usual one sort S serves all.

1. Find some Knuth-Bendix ordering (i.e., define weight function and precedence) in such a way that the following will hold:

$$P(a) \succ_{kbo} Q(g(b)) \succ_{kbo} P(g(b)) \succ_{kbo} P(b)$$

2. Do the same for LPO:

$$P(a) \succ_{lpo} Q(g(b)) \succ_{lpo} P(g(b)) \succ_{lpo} P(b)$$

Justify your definitions.

Exercise 7.3:

Refute the following set of clauses using resolution.

$$N = \{P(a) \vee P(b), \neg P(x) \vee \neg P(f(x)) \vee Q(f(a)), \neg P(x) \vee P(f(x)), Q(a), \neg Q(f(x)) \vee \neg Q(x), Q(f(x)) \vee \neg P(x)\}$$

Exercise* 7.4:

Prove or provide a counter example for the following statements.

1. If two terms are comparable with respect to an LPO instance, then they are comparable with respect to a KBO instance.
2. If two terms are comparable with respect to a KBO instance, then they are comparable with respect to an LPO instance.

It is not encouraged to prepare joint solutions, because we do not support joint exams.