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Tutorials for “Automated Reasoning”
Exercise sheet 8

Exercise 8.1:

Suppose that the atom ordering \succ compares ground atoms by comparing lexicographically first the predicate symbols ($P > Q > R$), then the size of the first argument, and then the size of the second argument (if present). If at least one of the two atoms to be compared is non-ground, \succ compares only the predicate symbols.

Let N be the following set of clauses:

$$P(f(x), x) \vee R(b, b) \quad (1)$$

$$\neg P(b, x) \vee \neg P(x, b) \vee Q(x) \quad (2)$$

$$Q(f(b)) \vee \neg Q(b) \vee R(f(x), b) \quad (3)$$

$$Q(b) \vee \neg R(f(x), f(x)) \quad (4)$$

$$\neg Q(x) \vee R(x, x) \quad (5)$$

- (a) Which literals are (strictly) maximal in the clauses of N ?
- (b) Which Res_{sel}^{\succ} -inferences are possible if sel selects no literals? What are their conclusions?
- (c) Define a selection function sel such that N is saturated under Res_{sel}^{\succ} .
- (d) Is there a Res_{sel}^{\succ} -inference between the clause

$$P(x, f(x)) \vee R(b, b) \quad (1')$$

and clause (2) if sel selects no literals? Why (not)?

Exercise 8.2:

Let $\Sigma = (\Omega, \Pi)$ be a signature with $\Omega = \{b/0, f/1\}$ and $\Pi = \{P/1, Q/1\}$. Suppose that the atom ordering \succ compares ground atoms by comparing lexicographically first the predicate symbols ($P \succ Q$) and then the size of the argument. Let N be the following set of clauses:

$$\begin{aligned} &\neg Q(y) \vee P(y) \\ &Q(x) \vee Q(f(x)) \end{aligned}$$

(a) Sketch how the set $G_\Sigma(N)$ of all ground instances of clauses in N looks like. How is it ordered with respect to the clause ordering \succ_C ?

(b) Construct the candidate interpretation $I_{G_\Sigma(N)}^\succ$ of the set of all ground instances of clauses in N .

Bring your solution to the tutorial on January 17 and compare it with the solution that is discussed there. If you are still unsure afterwards whether your solution is correct or not, feel free to ask the instructor after the tutorial. Your solution will not be graded.