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Tutorials for “Automated Reasoning”
Exercise sheet 6

Exercise 6.1: (5 P)

Let $\Sigma = (\Omega, \Pi)$ be a signature such that Ω contains at least one constant symbol. A Σ -algebra \mathcal{A} is called *term-generated*, if every $a \in U_{\mathcal{A}}$ is term-generated. Prove that a closed prenex formula without existential quantifiers has a model if and only if it has a term-generated model.

Exercise 6.2: (3+3 P)

Let N be the set containing the following ground clauses:

$$\begin{aligned}C_1 &= P(a) \vee \neg Q(a) \vee \neg Q(b) \\C_2 &= P(a) \vee P(a) \vee Q(b) \\C_3 &= P(b) \vee Q(a) \vee Q(b) \\C_4 &= Q(a) \vee Q(b) \vee Q(b) \\C_5 &= \neg P(a) \vee Q(b) \\C_6 &= \neg P(b)\end{aligned}$$

Let the ordering on ground atoms be given by $P(a) \succ P(b) \succ Q(a) \succ Q(b)$.

- (i) Order the clauses in N according to the associated clause ordering \succ_C .
- (ii) Compute the candidate interpretation I_N^\succ . Which clauses are productive, what do they produce, which clause is the minimal counterexample (if it exists)?

Exercise 6.3: (4 P)

Find a finite set N of ground clauses such that no clause in N is a tautology and such that $\text{Res}^*(N)$ is infinite.

Submit your solution in lecture hall E1.3, Room 003 during the lecture on December 7. Please write your name and the time of your tutorial group (Tue 8–10, Wed 8–10, or Wed 14–16) 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.