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Tutorials for "Automated Reasoning"
Exercise sheet 6

Exercise 6.1: *(2 P)*
Prove that I_N is a minimal model in the following sense. For every ground clause set N with $I_N \models N$, there exists no Herbrand interpretation J with $J \subset I_N$ and $J \models N$.

Exercise 6.2: *(4 P)*
Solve the following unification problems using both $\Rightarrow_{SU}$ and $\Rightarrow_{PU}$.

a) $E_1 = \{f(x, g(x), x', x') \doteq f(g(y), z, y, g(z))\}$

b) $E_2 = \{f(x, x, b, f(b, x, b, x)) \doteq f(g(b), g(y), y, z)\}$

Exercise 6.3: *(2 P)*
Refute the clauses $\{\neg p(x), \neg p(y), p(g(x)), p(g(y))\}$, $\{p(b), p(c)\}$, $\{\neg p(g(b))\}$, $\{\neg p(g(c))\}$ via the general resolution calculus.

Exercise 6.4: *(2 P)*
Saturate the clause set $\{\neg p(x), \neg p(g(x)), p(h(x))\}$, $\{p(b)\}$, $\{\neg p(h(x)), p(g(g(x)))\}$ by the general resolution calculus employing an appropriate selection function.

Challenge Problem: (*2 Bonus Points*)
We call a term t *linear* if any variable occurs at most once in t. We define the *depth* of a term t to be $max\{|p| \,|\, p \in pos(t)\}$. Now consider two linear terms s, t that do not share variables. Prove that for any mgu σ of s and t we have

$$max(depth(t), depth(s)) = max(depth(t\sigma), depth(s\sigma))$$

Submit your solution in lecture hall 003 during the lecture on June 5. Please write your name and the date of your tutorial group (Mon, Thu, Fri) on your solution.

Note: 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.