Technische Universität München
I7
Stefan Göller ST 2014

Logic

Exercise Sheet 5

Discussion: May 22, 2014

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1. For each of the following formulas, give the Herbrand univserse.

- $F_1 = P(x) \to P(c)$
- $F_2 = P(x) \to Q(f(x), g(c))$
- $F_3 = \forall x \exists y P(x, y)$

What properties must hold for a formula such that its Herbrand universe is finite?

2. Prove the validity of the following formula using Gilmore's algorithm:

$$F = (\forall x P(x, f(x))) \to (\exists y P(c, y))$$

3. Formalize the following propositions in predicate logic and use Gilmore's algorithm to show that i) implies ii).

(1) Professor p is happy if all his students like logic.

(2) Professor p is happy if he has no students.

4. Close the gap in the correctness proof of the unification algorithm by proving that we can assume w.l.o.g. that the set of variables that appear in the terms L and the terms $\{ysub' \mid y \in \mathrm{dom}(sub')\}$ do not not have any variables in common.

5. Which of the following sets of terms are unifiable? Give a most general unifier if it exists.

- $L_1 = \{f(x, y), f(h(a), x)\}$
- $L_2 = \{f(x, y), f(h(x), x)\}$
- $L_3 = \{f(x, b), f(h(y), z)\}$
- $L_4 = \{f(x, x), f(h(y), y)\}$