

Problem assignment 4

Due: Wednesday, October 8, 2008

Unification

The unification process in FOL aims to find the most general substitution that makes the two sentences the same. Write a lisp function *unify* that takes as its arguments two sentences in the FOL and the current substitution and returns the new (updated) most general substitution. For simplicity sake we will assume the expression uses only logical and, logical or and negations and that biconditionals and implications has been eliminated.

Assume the following conventions for representing the FOL sentences:

- negation (not A)
- logical-and, (and A B)
- logical-or, (or A B)
- variable x (var x)
- forall (forall (var x) (P (var x)))
- exists (exists (var x) (P (var x)))
- predicate P(A,B): (P A B)
- function f(x): (f (var x))
- equality of terms x=y: (eqterms (var x) (var y))

Assume that the substitution is represented as a list of variable/substitution pairs, for example: '((x (var y)) (z (father-of John) (u Mary) (v (mother-of (var t)))) where the first element of the pair is the name of the variable and the second element is its value. Please submit your programs in the file main4.lisp

Resolution-refutation in FOL

Let L be a first-order language that contains the predicates, $A(x)$, $C(x)$, $D(x)$, to say x is an animal, cat, and dog, respectively, and $L(x; y)$ and $F(x; y)$, to say x loves y and y is a friend of x , respectively.

Part a. Translate the following knowledge base into the language L .

1. Cats and dogs are animals.
2. Everyone loves either a cat or a dog.
3. Anyone who loves an animal has a friend.
4. Everyone has a friend.

Part b. Convert these formulas into normal form, negating the last beforehand .

Part c. Prove that everyone has a friend (sentence 4) follows from sentences 1,2 and 3, using generalized resolution and proof-by-refutation.