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Abstract Machines

Summer Semester 2002

7. Homework *Deadline: Mo. 17. June 2002 12:00*

Exercise 1: *Meals* *4 Points*

A restaurant offers different meals for the same price. A meal consists of one of the following: beef, pork, fish or vegetarian food. It also includes a salad or a soup or a dessert. Write a prolog program that computes all available meals.

Exercise 2: *Lists* *6 Points*

Write a prolog program including following predicates:

(a) *odd*/2 (*even*/2) where the first parameter is a list and the second one a list containing only the odd (even) elements of the first parameter.
(e.g. odd([1,2,3,4,5],[1,3,5]))

(b) *reverse*/2 with two lists as parameters, where one is the reverse list of the other.
(e.g. reverse([1,2,3],[3,2,1]))

(c) *chain*/2 with two lists, where the first list includes the second one as connected chain.
(e.g. chain([1,2,3,4,5],[2,3,4]))

(d) *remove*/3 which removes all occourences of the first parameter in the second parameter, which is a list.
(e.g. remove(2,[1,2,3,2,5],[1,3,5]))

Note: You can write auxiliary predicates if needed.

Exercise 3: *Terms and goals* *5 Points*

Produce $code_A$ and $code_G$ for the following terms/goals !

(a) $f(X, g(b, Y), g(\bar{X}, \bar{Z}))$

(b) $f(g(X, h(\bar{Y}, \_), b), Z)$

Use the following address environment: $\rho = \{X \mapsto 1, Y \mapsto 2, Z \mapsto 3\}$!

Exercise 4: *Most General Unifier* *5 Points*

When two terms are to be unified, they are compared. If they are both constants then the result of unification is success if they are equal else failure. If one is a variable then it is bound to the other, which may be any term, and the unification succeeds. If both terms are structures then each pair of sub-terms is unified recursively and the unification succeeds if all the sub-terms unify.
The result of unification is either failure or success with a set of variable bindings, known as a **"unifier"**. There may be many such unifiers for any pair of terms but there will be at most one **"most general unifier"**, other unifiers simply add extra bindings for sub-terms which are variables in the original terms.

Determine the most general unifiers for the following pairs of terms if possible or explain why the unification fails:

(a) $f(X, g(Y, b))$ and $f(g(a, Z), X)$
(b) $f(g(a, Z), X)$ and $f(X, g(b, Y))$
(c) $g(X, f(X, X), Z)$ and $g(f(a, a), f(Y, Y))$
(d) $a(b, X, d(e, Y, g(h, i, Z)))$ and $a(U, c, d(V, f, g(W, i, j)))$
(e) $f(X, 5, Y, x(a, g(6, 7)))$ and $f(Y, 5, c, x(Z, g(6, X)))$

Example: The most general unifier of $f(X, g(Y, b), Z)$ and $f(g(a, U), g(a, V), W)$ is $[X/g(a, U), Y/a, Z/W, V/b]$

Send your solutions to `ziewer@uni-trier.de`. Deadline is Mo. 17.June 12:00.