

Advanced Data Modeling

Summer Semester 2008

- Exercises III -

To be handed in before **2008-05-17, 23:59** via e-mail to
sschenk@uni-koblenz.de, subject line: [ADM] ...

- 1) The Fibonacci Numbers are computed as follows:
The 0th Fibonacci Number is 0. The 1st Fibonacci Number is 1. The nth Fibonacci Number is the sum of the n-1st and the n-2nd Fibonacci Number for n>1.
Write a logic program with a predicate fib/2, which computes Fibonacci Numbers, such that the goal fib(n, X) binds X to the nth Fibonacci Number. Model the Natural Numbers using only the constant 0 and the successor function f. Do not use any builtin arithmetic functions, but model the necessary operations yourself, for example using a predicate sum(X,Y,Z) for X+Y=Z.
- 2) The factorial of a Natural Number n is $\prod_{i=1}^n i$. Write a program computing the factorial of a natural number without using any builtin arithmetic functions. You may reuse predicates from 1).
 1. List the Herbrand universe of your program.
 2. List the Herbrand base of your program.
 3. Does your program have a smallest Herbrand Model?
 4. If yes, describe the smallest Herbrand model of your program.
- 3) What is the difference between an interpretation in general and an Herbrand interpretation?
- 4) What is the difference between an interpretation and a model?
- 5) Prove that every definite program has a minimal Herbrand model.
- 6) Prove that every normal program has a minimal Herbrand model.
- 7) Which of the following programs are factual (definite, normal)? Which ones have minimal Herbrand models?
 1. p(a).
m(X) :- p(X), not w(X)
w(X) :- p(X), not m(X)
 2. p(a).
w(a).
m(X) :- p(X), not w(X)
w(X) :- p(X), not m(X)
 3. p(a).
w(a).
m(b).
m(b) :- p(b), not w(b)
w(b) :- p(b), not m(b)
 4. mother(a,b).
father(c,b)
sister(a,c).
sister(X,Y) :- sister(Y,X).
aunt(X,Y) :- sister(X,Z), parent(Z,Y).
parent(X,Y) :- mother(X,Y).
parent(X,Y) :- father(X,Y).