Technische Universität Braunschweig
Institut für Informationssysteme
http://www.ifis.cs.tu-bs.de

Christoph Lofi

Deductive Databases & Knowledge Based Systems

Sheet 4

Exercise 1

The following Boolean formula is given:

$$W \equiv (\neg x_1 \vee x_2 \vee \neg x_3) \wedge (x_2 \wedge x_4 \rightarrow x_5) \wedge x_4 \wedge \neg(x_5 \wedge x_6 \wedge x_7) \wedge (x_6 \vee \neg x_2) \wedge (x_1 \wedge x_3)$$

Is W satisfiable or not? If so, provide a substitution which satisfies it. (3 points)

Exercise 2

1. What does it mean if "A W formula is not decidable within a Theory (deductive system) T" ? (1 point)
2. What are $Datalog^{f,neg}$, $Datalog^{f}$, $Datalog^{neg}$ and $Datalog$ in comparison? (2 points)
3. What is "stratification"? Why is it needed? Which problem does it address? (2 point)
4. Stratify the following rules: (3 points)

   grandmother(X,Y) :- parent(X,Z), parent(Z,Y), female(Y).
   mother(X,Y) :- parent(X,Y), female(Y).
   father(X,Y) :- parent(X,Y), not(mother(X,Y))

Exercise 3

Download and install DES (http://des.sourceforge.net) to your computer. Using Datalog in DES, solve the following exercises. Submit your programs, queries and results via **email**.

Assume the bike manufacturer "Grasshopper". Grasshopper has a database with two predicates for base products it buys externally and products which can be constructed out of others. Please download the database from
http://www.ifis.cs.tu-bs.de/webfm_send/138.

baseproduct(name, price, weight)
product(name, componentname, amountOfComponents)

Grasshopper actually produces two bike models, the "cityliner" and the "climber".

Extend the database with additional rules/predicates/etc such that it is possible to return the price and the weight for each product.

How expensive and how heavy are "cityliner" the "climber"?

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Exercise 4

Download and install DES (http://des.sourceforge.net) to your computer. Using Datalog in
DES, solve the following exercises. Submit your programs, queries and results via email.
Write a Datalog program computing the Ackermann function.

$$A(m,n) = \begin{cases} n+1 & \text{if } m = 0 \\ A(m-1,1) & \text{if } m > 0 \text{ and } n = 0 \\ A(m-1,A(m,n-1)) & \text{if } m > 0 \text{ and } n > 0. \end{cases}$$

Which value has $A(3,4)$?