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Deductive Databases & Knowledge Based Systems

Sheet 6 (until 12.05.2008)

Exercise 1

1. What is a least Herbrand model? (1p)
2. What are minimal Herbrand models? (1p)
3. What are perfect Herbrand models? (1p)
4. In general, why aren't there least Herbrand models for $Datalog^{neg}$? (1p)

Exercise 2

Provided is following $Datalog^{f}$ program:

$edge(3,2).$
$edge(2,6).$
$edge(2,5).$
$edge(5,3).$
$path(X,Y) :- edge(X,Y).$
$path(X,Y) :- edge(X,Z), path(Z,Y).$

Compute the least model step by step using the fixpoint iteration. (4p)

Exercise 3

Provided is following $Datalog^{neg}$ program:

$q(1,2).$
$q(2,3).$
$s(1,3).$
$r(X,Y) :- s(X,Y).$
$p(X,Y) :- q(X,Y), \neg r(X,Y).$
$p(X,Y) :- q(X,Y), \neg s(X,Y).$
$p(X,Y) :- p(X,Y), p(X,Y).$

1. Provide all minimal Herbrand models of the program. (2p)
2. Provide a program connection graph and stratification for the program. (2p)
3. Partition the program according the stratification into $\mathcal{P} := \mathcal{P}_0 \uplus \ldots \uplus \mathcal{P}_0$ (1p)
4. Compute the perfect model step by step using the iterated fixpoint iteration. (4p)
5. $Datalog^{f}$ is supposed to be computationally complete. Thus, the above program should be able to be expressed in $Datalog^{f}$. Provide an equivalent version of the program without negation. (3p)