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:

\[\text{edge}(3,2). \]
\[\text{edge}(2,6). \]
\[\text{edge}(2,5). \]
\[\text{edge}(5,3). \]
\[\text{path}(X,Y) : \neg \text{edge}(X,Y). \]
\[\text{path}(X,Y) : \neg \text{edge}(X,Z), \text{path}(Z,Y). \]

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

Exercise 3
Provided is following Datalog^{neg} program:

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

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 \( \mathcal{P} := \mathcal{P}_0 \cup \ldots \cup \mathcal{P}_0 \) (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^{neg}. Provide an equivalent version of the program without negation. (3p)

Exercises for Relational Databases I