

Advanced Data Modeling

Summer Semester 2008

- Exercises IX -

- 1) SLDNF resolution generalizes SLD resolution to negation as failure. It is based on the notion of a SLD trees (Lloyd, 1984):

let P be a normal program and G a normal goal. An SLDNF-tree for $P \cup \{G\}$ is a tree satisfying the following:

1. Each node of the tree is a (possibly empty) goal.
2. The root node is G .
3. Let $\leftarrow L_1, \dots, L_m, \dots, L_p$ ($p \geq 1$) be a non-leaf node in the tree and suppose that L_m is selected. Then either
 1. L_m is an atom and, for each program clause (variant) $A \leftarrow M_1, \dots, M_q$ such that L_m and A are unifiable with mgu θ , the node has a child :
 $\leftarrow (L_1, \dots, L_{m-1}, M_1, \dots, M_q, L_{m+1}, \dots, L_p)\theta$, or
 2. L_m is a ground negative literal $\neg A_m$ and there is a finitely failed SLDNF-tree for $P \cup \{\leftarrow A_m\}$, in which case the only child is $\leftarrow L_1, \dots, L_{m-1}, L_{m+1}, \dots, L_p$.
4. Let $\leftarrow L_1, \dots, L_m, \dots, L_p$ ($p \geq 1$) be a leaf node in the tree and suppose that L_m is selected. Then either
 1. L_m is an atom and there is no program clause (variant) in P whose head unifies with L_m , or
 2. L_m is a ground negative literal $\neg A_m$ and there is a SLDNF-refutation of $P \cup \{\leftarrow A_m\}$.
5. Nodes, which are the empty clause, do not have children.

Give an SLDNF derivation for the following program:

```
p ← ¬r
r ← q(x)
q(a)0 ←
```

- 2) Show that r is a logical consequence of the completion of the following program, but can not be derived using SLDNF resolution. Why?

```
r ← p
r ← ¬p
p ← p
```

- 3) Give a well founded model for the following program using the fixpoint and the alternating fixpoint semantics for programs under the well founded semantics:

```
flies(X) :- bird(X)
penguin(X) :- bird(X), ~flies(X)
bird(X) :- penguin(X)
penguin(X) :- bird(X), lovesFish(X)
freezes(X) :- polarAnimal(X)
penguin(tweety)
```