

Foundations of Logic Programming

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Exercise 6.1

Show with the help of the Prolog tree how the cut is used in the following program,

```
(r1) r(a).
(r2) r(b).
(r3) q(a) :- r(X), !, p(a).
(r4) q(f(X)) :- r(X).
(r5) p(X) :- r(X).
(r6) p(f(X)) :- q(X), !, r(X).
(r7) p(g(X)) :- r(X).
```

and where the query `?- p(X).` is taken. What would happen without the cut?

Exercise 6.2

Consider the following Prolog program for the intersection of two sets:

```
inter([],_, []).
inter([X|Xs],Ys,[X|Zs]) :- member(X,Ys), !, inter(Xs,Ys,Zs).
inter([X|Xs],Ys,Zs) :- inter(Xs,Ys,Zs).
```

Find three ground terms t_1, t_2, t_3 which represent sets such that query `inter(t1, t2, t3)` is successful although t_3 is not an intersection of t_1 and t_2 . How can this fault be fixed?

Exercise 6.3

Consider the program P :

- (1) $num(0)$
- (2) $num(s(x)) \leftarrow num(x)$
- (3) $odd(s(x)) \leftarrow \neg odd(x), num(x)$

- a) Using the “leftmost” selection rule, show the sequence of pre-SLDNF-trees which leads to a successful SLDNF-tree for

$$P \cup \{\neg odd(s(s(0)))\}.$$

- b) Is P allowed? Is the query $\neg odd(s(s(0)))$ allowed? Is the query $odd(x)$ allowed? Give a query Q such that $P \cup \{Q\}$ flounders.
- c) Compute $comp(P)$.
- d) Construct the dependency graph D_P of P . Is P strict with respect to any query Q ? Is P stratified?
- e) Show that $odd(s(0))$ is not a semantic consequence of P .

Exercise 6.4

Take the following program P :

- $p \leftarrow$
- $p \leftarrow p$
- $q \leftarrow r$
- $q \leftarrow \neg r, p$
- $r \leftarrow \neg p$
- $t \leftarrow q$
- $t \leftarrow r, \neg q$

- a) Construct the dependency graph D_P of P .
- b) Give a stratification of P .
- c) Using your stratification show how to compute the standard model M_P of P .