Lab Exercises - Pure Prolog Programming

CMPT333N

Problem 1

Trace the execution of `daugther(X, haran)?` with respect to the program:

```
father(abraham,issac).          male(isaac).
father(haran,lot).              male(lot).
father(haran,milcah).           female(milcah).
father(haran,yiscah).           female(yiscah).

son(X,Y) :- father(Y,X), male(X).
daugther(X,Y) :- father(Y,X), female(X).
```

Problem 2

Verify the order of solutions for the query `ancestor(abraham,X)?` with respect to the program below, and its variant different rule order for ancestor.

```
parent(terach,abraham).          parent(abraham,isaac).
parent(isaac,jacob).             parent(jacob,benjamin).

ancestor(X,Y) :- parent(X,Y).
ancestor(X,Z) :- parent(X,Y), ancestor(Y,Z).
```

Problem 3

Analyze the program for `sublist` below, given as a suffix of a prefix using `append`. Explain why this order of the `append` goals is preferable to a different one. (*Hint:* Consider the query `sublist(Xs, [a,b,c]).`)

```
sublist(Xs, AsXsBs) :-
    append(AsXs, Bs, AsXsBs), append(As, Xs, AsXs).
```

Problem 4

Analyze the Prolog program below for the `substitute` program that we developed in the assignment for Module 6:

```
substitute(X,Y,[],[]).
substitute(X,Y,[X|L1s],[Y|L2s]) :- substitute(X,Y,L1s,L2s).
substitute(X,Y,[Z|L1s],[Z|L2s]) :- X /= Z, substitute(X,Y,L1s,L2s).
```

1. What happens if we change the rules order? Give examples.
2. What happens if we change the goals order? Give examples.
3. Will the program always terminate?

Problem 5

Analyze the `adjacent` program below and answer the two questions:

```
adjacent(a, b).
adjacent(e, f).
adjacent(X, Y) :- adjacent(Y, X).
```

1. What happens if you query with `adjacent(X, Y).` What solutions will it find?
2. How can we modify the program so it behaves better?