

"Cut"ting out Redundancy

1) parent(sue, ted).

2) parent(john, fred).

3) parent(john, jerry).

4) parent(john, carol).

8) parent(jerry, ted).

10) parent(jim, bob).

5) parent(alice, fred).

6) parent(alice, jerry).

7) parent(alice, carol).

9) parent(carol, bob).

sib(X, Y) :- parent(Z, X), parent(Z, Y), X \== Y.

?- sib(X, Y). --- gives 12 answers.

from solving 1st parent goal with assertion
parent(john, fred).

then solving the 2nd parent goal with assertion
parent(john, jerry).

and then re-solving the 2nd parent goal with
parent(john, carol).

We get X=fred Y=jerry, and X=fred Y=carol

2 more solving 1st goal with parent(john, jerry) –

2 more solving 1st goal with parent(john, carol) –

and then another 6 due to parent(alice, ____).

- 1) parent(sue, ted).
- 2) parent(john, fred).
- 3) parent(john, jerry).
- 4) parent(john, carol).
- 5) parent(alice, fred).
- 6) parent(alice, jerry).
- 7) parent(alice, carol).
- 8) parent(jerry, ted).
- 9) parent(carol, bob).
- 10) parent(jim, bob).

sib1(X,Y) :- parent(Z,X), !, parent(Z,Y), X \== Y.

?- sib1(X,Y). --- fails. 1st parent goal frozen
on assertion 1).

sib2(X, Y) :- parent(Z, X), findsib(Y,Z,X).

findsib(Y,Z,X) :- parent(Z,Y), !, X \== Y.

?- sib2(X,Y). --- 4 solutions –
two solutions each for
parents john & alice

The cut is freezing the choice for Y in parent(Z,Y)
to be the very first for which Z is the parent.

Backtracking: other choices for X in parent(Z,X)

To get rid of the redundant solutions -
one for each parent - use only the female parent.

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sib3(X,Y) :- parent(Z,X), female(Z), fsib(Y,Z,X).  
fsib(Y,Z,X) :- parent(Z,Y), !, X \= Y.
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?- sib3(X,Y). --- only 2 solutions

X=jerry, Y=fred and X=carol, Y=fred

But, suppose the goal is:

?- sib3(fred, Y). --- Prolog responds NO!

Problem: The choice for 1st arg. in sib3 is now
fixed as fred. But the choice for the 2nd arg.
is frozen on fred also, by the cut.

Solution:

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sib4(X,Y) :- var(X), !, sib3(X,Y); sib3(Y,X).
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The bagof and setof predicates

?- bagof(X/Y, sib(X,Y), L).

X = _0

Y = _1

L = [fred/jerry, fred/carol,
jerry/fred, jerry/carol,
carol/fred, carol/jerry,
fred/jerry, fred/carol,
jerry/fred, jerry/carol,
carol/fred, carol/jerry]

?- setof(X/Y, sib(X,Y), L).

X = _0

Y = _1

L = [carol/fred, carol/jerry,
fred/carol, fred/jerry,
jerry/carol, jerry/fred]