Exercise 4

Integrated Logic Systems (Part I)

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Exercise 4.1

Download the constraint handling rules (CHRs) for $\mathcal{ALC}$ Reasoning (`dl.chr`) from the course web page.

a) Apply the CHRs by hand to show that the following statement leads to a contradiction:

```
isa(X,not(some(hasChild,human))), isa((X,Y),hasChild),
isa(Y,or(man,woman)).
```

b) Use the CHRs to automatically show the truth of the following statements by contradiction:

1) Every proud parent has only happy children.
2) If Fritz is a parent and a child of Jody, then Jody is a grandparent.

Exercise 4.2

For the following programs, determine all stable models by search over the truth-values of atoms and by using propagation. Show a complete search tree and all applied Propagation Rules.

a)
```
a :- b, not c.
b :- a, not c.
```

b)
```
dom(1). dom(2).
p(X) :- not q(X), dom(X).
q(X) :- not p(X), dom(X).
:- p(1),p(2).
```

c)
```
a :- not d.
a :- d, not e.
b :- e, not f.
c :- not b, not e.
c :- f, e, not a.
d :- not a, not c.
e :- not c.
f :- a, not b, not d.
```

Exercise 4.3

Let S be a stable model of some program P. Prove that S is a minimal Herbrand model of P.

Hint: Prove that

1) S is a Herbrand model of P, and that
2) there is no Herbrand model S' of P such that $S' \subset S$ (by contradiction).