5/9/2016 EX 2

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Exercise 2 Given the following ASP program P:

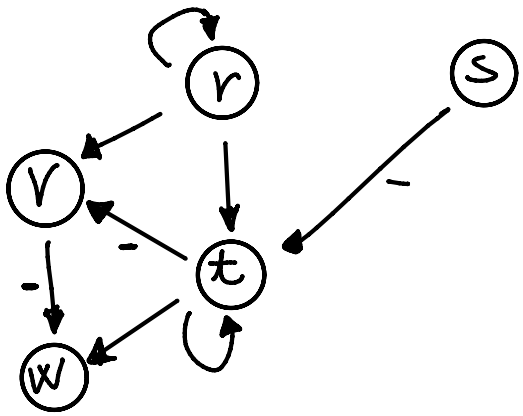
```
r(x,y) :- p1(x,y).
r(x,y) :- p2(y,x).
r(x,z) :- r(x,y), r(y,z).
s(x,y) :- p1(x,y).
t(x,y) :- r(x,y), not s(x,y).
t(x,y) :- t(y,x).
v(x,y) :- r(x,y), not t(x,y).
w(x,y) :- t(x,y), not v(x,y).
p1(a,b). p1(b,c). p1(c,d). p2(c,d). p2(d,e). p2(e,f).
```

(a) tell whether P is stratified;

(b) compute the answer sets of P.

a)

IDB = {r/2, s/2, t/2, v/2, w/2}
EDB ={p1/2, p2/2}

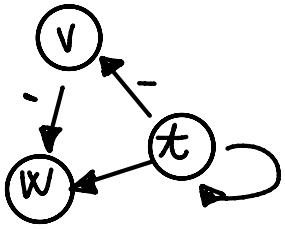


P is stratified

b)

The answer set is unique and coincide with MM(P)

S1 = {r,s}



S2 = {t}

S3 = {v}

S3 = {v}

S4 ={w}

MM0 = {p1(a,b), p1(b,c), p1(c,d), p2(c,d), p2(d,e), p2(e,f)}

P(S1)={
    r(x,y) :- p1(x,y).
    r(x,y) :- p2(y,x).
    r(x,z) :- r(x,y), r(y,z).
    s(x,y) :- p1(x,y).
}
Apply semi naive algorithm

I = MM0
I' =Tp(I) = { r(a,b),r(b,c), r(c,d), r(d,c), r(e,d), r(f,e), s(a,b), s(b,c), s(c,d)}
Delta' I = {Delta' r(a,b), Delta' r(b,c),Delta' r(c,d), Delta'r(d,c),Delta' r(e,d),Delta' r(f,e),Delta' s(a,b),Delta' s(b,c),Delta' s(c,d)}

Delta P = {
    Delta' r(x,z) :- Delta r(x,y), Delta r(y,z).
}

1-iteration
I = I union { r(a,b),r(b,c), r(c,d), r(d,c), r(e,d), r(f,e), s(a,b), s(b,c), s(c,d)}
Delta I ={Delta r(a,b), Delta r(b,c),Delta r(c,d), Delta r(d,c),Delta r(e,d),Delta r(f,e),Delta s(a,b), Delta s(b,c),Delta s(c,d)}
Delta' I = {Delta' r(a,c), Delta' r(b,d), Delta' r(c,c),Delta' r(e,c), Delta' r(f,d)}

2-iteration
I =I union {r(a,c), r(b,d), r(c,c), r(e,c), r(f,d)}
Delta I = {Delta r(a,c), Delta r(b,d), Delta r(c,c),Delta r(e,c), Delta r(f,d)}
Delta' I = {Delta' r(a,d), Delta' r(f,c)}

3-iteration
I = I union {r(a,d), r(f,c)}
Delta I = {Delta r(a,d), Delta r(f,c)}
Delta' I = {Delta' r(f,d)}

4-iteration
I = I union {r(f,d)}

Delta I = {Delta r(f,d)}
Delta' I = {}

MM1 = MM0 union { r(a,b),r(b,c), r(c,d), r(d,c), r(e,d), r(f,e), r(a,c), r(b,d),
r(c,c), r(e,c), r(f,d),r(a,d), r(f,c),
s(a,b), s(b,c), s(c,d)}

P(S2)={
t(x,y) :- r(x,y), not s(x,y).
t(x,y) :- t(y,x).
}

MM2 = MM1 union {t(d,c), t(e,d), t(f,e), t(a,c), t(b,d), t(c,c), t(e,c), t(f,d),t(a,d), t(f,c), t(c,d), t(d,e),t(e,f), t(c,a), t(d,b), t(c,e), t(d,f), t(d,a), t(c,f)}

P(S3)={
v(x,y) :- r(x,y), not t(x,y).
}
MM3 = MM2 union {v(a,b),v(b,c), v(c,d)}

P(S4)={
w(x,y):- t(x,y), not v(x,y).
}

MM4 = MM3 union {w(d,c), w(e,d), w(f,e), w(a,c), w(b,d), w(c,c), w(e,c), w(f,d), w(a,d), w(f,c), w(d,e), w(e,f), w(c,a), w(d,b), w(c,e), w(d,f), w(d,a), w(c,f)}

MM(P) = {p1(a,b), p1(b,c), p1(c,d), p2(c,d), p2(d,e), p2(e,f),
r(a,b),r(b,c), r(c,d), r(d,c), r(e,d), r(f,e), r(a,c), r(b,d), r(c,c), r(e,c), r(f,d),r(a,d), r(f,c),
s(a,b), s(b,c), s(c,d),
t(d,c), t(e,d), t(f,e), t(a,c), t(b,d), t(c,c), t(e,c), t(f,d),t(a,d), t(f,c), t(c,d), t(d,e),t(e,f),
t(c,a), t(d,b), t(c,e), t(d,f), t(d,a), t(c,f),
w(d,c), w(e,d), w(f,e), w(a,c), w(b,d), w(c,c), w(e,c), w(f,d), w(a,d), w(f,c), w(d,e),
w(e,f), w(c,a), w(d,b), w(c,e), w(d,f), w(d,a), w(c,f)}