win(a) :- move(a,b), ¬ win(b).
win(a) :- move(a,f), ¬ win(f).
win(b) :- move(b,c), ¬ win(c).
win(b) :- " ¬ win(g).
win(b) :- ¬ win(k).
win(c) :- ¬ win(d).
win(c) :- ¬ win(l).
win(d) :- ¬ win(e).
win(e) :- ¬ win(a).
win(f) :- no move, no satisfiable ground instance of rule.
win(g) :- ¬ win(h)
win(g) :- ¬ win(i)
win(h) :- ¬ win(m)
win(i) :- ¬ win(j)
win(j) :- "
win(k) :- "
win(l) :- ¬ win(d)
win(m) :- ¬ win(h)
win(n) :- "

¬win:

win(a) :- move(a,b), ¬ win(b).
win(a) :- move(a,f), ¬ win(f).
win(b) :- move(b,c), ¬ win(c).
win(b) :- " ¬ win(g).
win(b) :- ¬ win(k).
win(c) :- ¬ win(d).
win(c) :- ¬ win(l).
win(d) :- ¬ win(e).
win(e) :- ¬ win(a).
win(f) :- no move, no satisfiable ground instance of rule.
win(g) :- ¬ win(h)
win(g) :- ¬ win(i)
win(h) :- ¬ win(m)
win(i) :- ¬ win(j)
win(j) :- "
win(k) :- "
win(l) :- ¬ win(d)
win(m) :- ¬ win(h)
win(n) :- "

✓ ← ¬win(f) is true

Start:

$\mathcal{X}_0 = \emptyset$

all win(X) false

P_0 = {facts + all these ground instances}

$T^{\omega}_{P_0}(\emptyset)$.

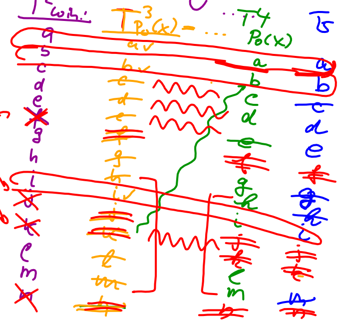
$T^1_{P_0}(\emptyset)$ = {all "move" facts from the game}

Still, all win(X) are false

$T^2_{P_0}(X)$ = {all "move"s}

∪

T^{ω}_{win}: $T^3_{P_0}(X)$ = ... $T^4_{P_0}(X)$ T_5



no grd. instance

no move

finite, have no chance to be in "win"

⇒ avoid this ~~~ win(X)

⇒ Define the reduct w.r.t. $\mathcal{X}_0$ ← fix all negative literals

win(a) :- move(a,b), ~~¬win(b)~~.
win(a) :- move(a,f), ~~¬win(f)~~.
win(b) :- move(b,c), ~~¬win(c)~~.
win(b) :- " ~~¬win(g)~~.
win(b) :- ~~¬win(f)~~.
win(c) :- ~~¬win(d)~~.
win(c) :- ~~¬win(l)~~.
win(d) :- ~~¬win(e)~~.
win(e) :- ~~¬win(a)~~.
win(f) :- no move, no satisfiable ground instance of rule.
win(g) :- ~~¬win(h)~~
win(g) :- ~~¬win(i)~~
win(h) :- ~~¬win(m)~~
win(i) :- ~~¬win(j)~~
win(j) :- "
win(k) :- "
win(l) :- ~~¬win(d)~~
win(m) :- ~~¬win(h)~~
win(n) :- "

$\mathcal{X}_0 = \emptyset \to \neg win(x)$ is true $\forall x$

$=: P_{\mathcal{X}_0}$

$\Rightarrow T_{P_{\mathcal{X}_0}}^1(\emptyset) = \{\text{alle moves}\}$

$T_{P_{\mathcal{X}_0}}^2(\emptyset) = \{\text{alle moves}\} \cup \{win(\ldots)\}$ as previous slide

$T_{P_{\mathcal{X}_0}}^3(\emptyset)$ fixes all ¬win to true ($\mathcal{X}_0$)

win T^2: a, b, c, d, e, ~~f~~, g, h, i, ~~j~~, ~~k~~, l, m, ~~n~~

$= win(T^3) = win(T^4_{P_{\mathcal{X}_0}}) = \ldots T^\omega_{P_{\mathcal{X}_0} = \emptyset}$

$=: \mathcal{X}_1$

⇒ all x s.t. ∃ move are in "win"

⇒ overestimate of "win"

Reduct w.r.t. $\mathcal{X}_1$: ($\mathcal{X}_1$: win = all except {f, j, k, n} definitely not in win)

~~win(a) :- move(a,b), ¬win(b)~~ f
win(a) :- move(a,f), ~~¬win(f)~~ true
~~win(b) :- move(b,c), ¬win(c)~~ f
~~win(b) :- " ¬win(g)~~
win(b) :- ~~¬win(f)~~ true
~~win(c) :- ¬win(d).~~
~~win(c) :- ¬win(l).~~
~~win(d) :- ¬win(e).~~
~~win(e) :- ¬win(a)~~

~~win(g) :- ¬win(h)~~
~~win(g) :- ¬win(i)~~
~~win(h) :- ¬win(m)~~
win(i) :- ~~¬win(j)~~ true

~~win(l) :- ¬win(d)~~
~~win(m) :- ¬win(h)~~

$=: T_{P_{\mathcal{X}_1}}$

$T_{P_{\mathcal{X}_1}}^1(\emptyset) = \{\text{all moves}\}$

$T_{P_{\mathcal{X}_1}}^2(\emptyset) = \{\text{all moves}\} \cup \{win(a), win(b), win(i)\}$

$= T_{P_{\mathcal{X}_1}}^\omega(\emptyset) =: \mathcal{X}_2$

Reduct wrt. $\mathcal{X}_2$ $\mathcal{X}_2$: win (a, b, i)

~~win (a) :- move (a, b), ¬ win (b).~~ f
win (a) :- move (a, f), ~~¬ win (f)~~ true $=: T_{P_{\mathcal{X}_2}}$
win (b) :- move (b, c), ~~¬ win (c)~~.
win (b) :- " ~~¬ win (g)~~.
win (b) :- ~~¬ win (k)~~.
win (c) :- ~~¬ win (d)~~.
win (c) :- ~~¬ win (l)~~.
win (d) :- ~~¬ win (e)~~.
~~win (e) :- ¬ win (a).~~
~~win (f)~~ no move, no satisfiable ground instance of rule.
win (g) :- ~~¬ win (h)~~
~~win (g) :- ¬ win (i)~~
win (h) :- ~~¬ win (m)~~
win (i) :- ~~¬ win (j)~~
~~win (j) :-~~ "
~~win (k) :-~~ "
win (l) :- ~~¬ win (d)~~
win (m) :- ~~¬ win (h)~~
~~win (n)~~ "

$T^1_{P_{\mathcal{X}_2}}(\emptyset) = \{$all moves$\}$
$T^2_{P_{\mathcal{X}_2}}(\emptyset) = \{$all moves$\} \cup \{$win: a, b, c, d, g, h, i, l, m$\}$ $=: \mathcal{X}_3$

not in win: e, f, k, j, n

---

reduct wrt. $\mathcal{X}_3$: not win $\mathcal{X}_3$: e, f, k, j, n

→ ¬win(..) is true

↘ all others: ¬win(.) is false

~~win (a) :- move (a, b), ¬ win (b).~~
win (a) :- move (a, f), ~~¬ win (f)~~ true
~~win (b) :- move (b, c), ¬ win (c)~~
~~win (b) :- " ¬ win (g).~~
win (b) :- " ~~¬ win (k)~~ true $=: P_{\mathcal{X}_3}$
~~win (c) :- ¬ win (d).~~
~~win (c) :- ¬ win (l)~~
win (d) :- ~~¬ win (e)~~ true
~~win (e) :- ¬ win (a).~~
~~win (f) : no move, no satisfiable ground instance of rule~~
~~win (g) :- ¬ win (h)~~
~~win (g) :- ¬ win (i)~~
~~win (h) :- ¬ win (m)~~
win (i) :- ~~¬ win (j)~~ true
~~win (j) :~~ "
~~win (k) :-~~ "
~~win (l) :- ¬ win (d)~~
~~win (m) :- ¬ win (h)~~
~~win (n) :-~~ "

$T^1_{P_{\mathcal{X}_3}}(\emptyset) = \{$all moves$\}$
$T^2_{P_{\mathcal{X}_3}}(\emptyset) = \{$all moves$\} \cup \{$win: a, b, d, i$\}$ new $= T^\omega_{P_{\mathcal{X}_3}}(\emptyset) =: \mathcal{X}_4$

⟹ continue exercise

$\chi_0 = \emptyset$ → underestimate of true atoms
overestimate of false atoms

p(..) :- q(..), ¬r(...) true

⇒ reduct P_{χ_0} is a "big" program

⇒ derives relatively much ≙ "everything possible"

≙ overestimate of the true atoms $=: \chi_1$

(overestimate of "win")

P_{χ_1} ⇒ many negated literals are "false"

⇒ many rules are deleted

"small" program → small $T^{\omega}_{P_{\chi_1}}(\emptyset)$

→ underestimate of true atoms

"everything necessary"