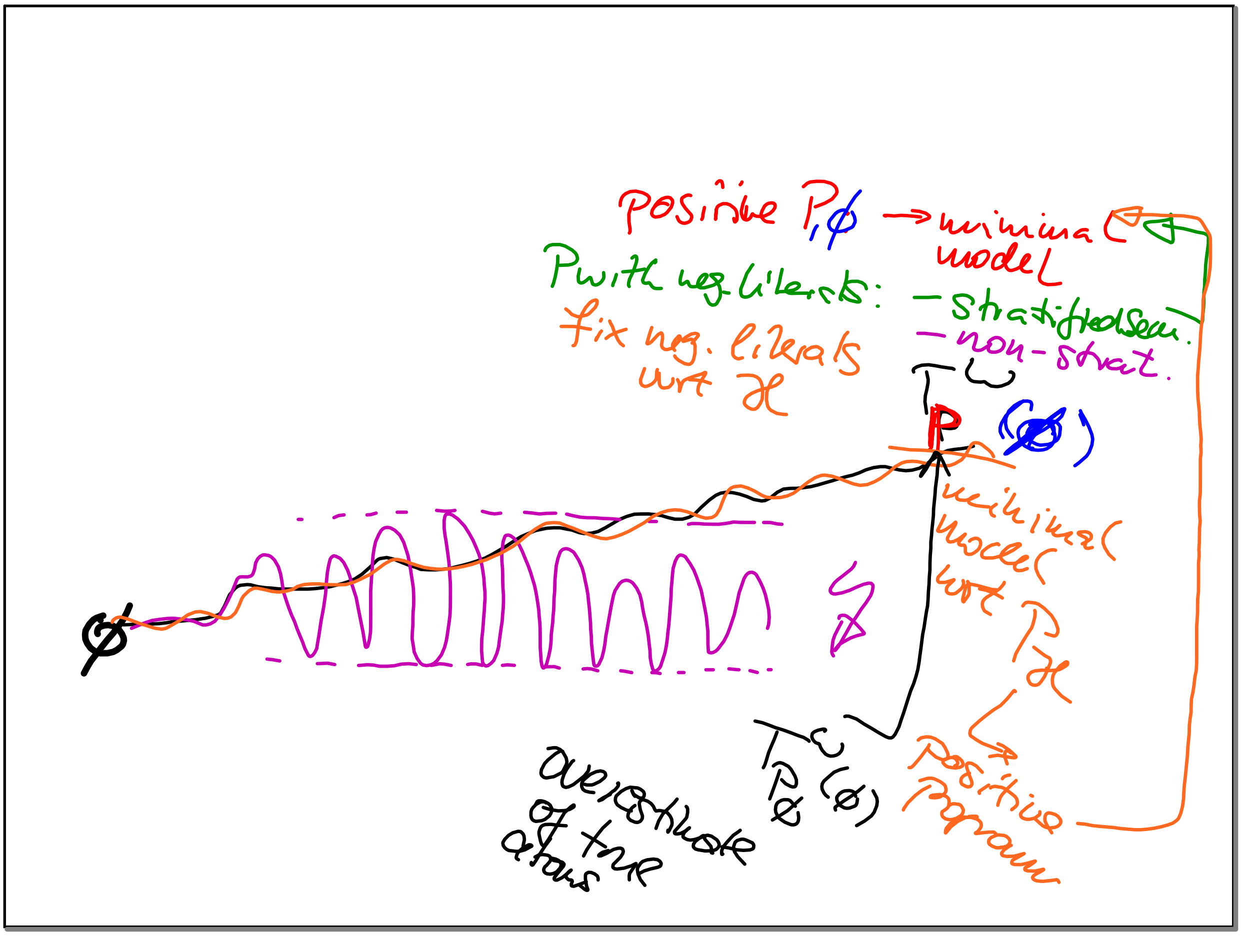


consider P and a ^guess^ "perfect" solution $\mathcal{H}$

$T_P^\omega(\mathcal{H})$ ⇒ $\mathcal{H}$ is a model ⇒ it did not "invent" anything

⇒ $T_P(\mathcal{H}) \subset \mathcal{H}$

⇒ $\mathcal{H} \subseteq T_P(\mathcal{H})$

"stationary" $T_P(\mathcal{H}) = \mathcal{H}$

in case $\mathcal{H}$ is a model, but contains "invented" (= not well-founded) atoms $p(a,b,c)$

⇒ $p(a,b,c) \notin T_P(\mathcal{H})$

usually this holds, except there is a rule

$p(X,Y,Z) \leftarrow p(X,Y,Z)$.

⇒ confirm non-well-founded atoms

Ex 2.3 – Stratification:

EDB: $p/1$, $q/1$ $\quad \left.\begin{matrix} p(a). & p(b) \\ q(a). & \end{matrix}\right\} P_1$

S_3: s
S_2: $\downarrow\neg$ r
S_1: $\downarrow\neg$ p, q

$P_2 := r(x) :- p(x), \neg q(x).$
$P_3 := s(x) :- p(x), \neg r(x).$

$$T_{P_1}^{\omega}(\emptyset) = \{p(a), p(b), q(a)\} := J_1 = J_1 = K_1$$

$$K_2 := T_{P_2}^{\omega}(\underline{K_1})$$

$$T_{P_2}^{1}(K_1) = \{r(b)\}$$ forgets K_1

$$T_{P_2}^{2}(K_1) = T_{P_2}(\{r(b)\}) = \emptyset$$

Def. as in slide 596:

$$J_2 := T_{P_2 \cup J_1}^{\omega}(\emptyset)$$

$$T_{P_2 \cup J_1}^{1}(\emptyset) = \{p(a), p(b), q(a)\}$$ – rule P_2 cannot fire on $\emptyset$

– first reproduce J_1, and then...

$$T_{P_2 \cup J_1}^{2}(\emptyset) = \{r(b), p(a), p(b), q(a)\}$$

$$= T^3 = T^{\omega} = J_2$$

J_3: $T_{P_3 \cup J_2}^{1}(\emptyset) = \{r(b), p(a), p(b), q(a)\}$

$$T_{P_3 \cup J_2}^{2}(\emptyset) = \{s(a)\} \cup \{\ \downarrow\ \} = T^3$$

EDB: $p/1$, $q/1$ $\quad \left.\begin{matrix} p(a). & p(b) \\ q(a). & \end{matrix}\right\} P_1$

$P_2 := r(x) :- p(x), \neg q(x).$
$P_3 := s(x) :- p(x), \neg r(x)$

Consider Ex. 2.3 (a)

$$J_1 = \{p(a), p(b), q(a)\}$$

$$J_2 = J_1 \cup T_{P_2}^{\omega}(\underline{J_1})$$ seeding

$$T_{P_2}^{1}(J_1) = \{r(b)\}$$ rule P_2 fires

$$T_{P_2}^{2}(J_1) = T_{P_2}^{1}(\{r(b)\}) = \emptyset$$ ↯

$$= \{p(a), p(b), q(a)\} \cup \emptyset$$ ↯

Ex 2.3. b)

EDB: $p/1$ $q/1$ $\left.\begin{matrix} p(a). & p(b) \\ q(a). & \end{matrix}\right\} P_1$

$P_2 := r(x) :- p(x), \neg q(x).$

$P_3 := s(x) :- p(x), \neg r(x)$

$J_1 = \{p(a), p(b), q(a)\}$

$J_2 = T^{\omega}_{P_1 \cup P_2}(J_1)$

→ seed cannot be forgotten → J has been derived by $P_0 .. P_{k-1}$

→ invented seeding? — no: J_{k-1}

$T^{1}_{\{r(x):-p(x),\neg q(x)\} \cup \{p(a), p(b). q(a)\}}(\emptyset \; J_1)$

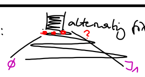
$= \{p(a), p(b), q(a)\}$

T_2: $\{r(x), p(a), p(b), q(a)\} = T^3 = T^{\omega}$

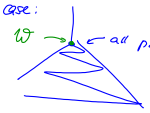
$= \{r(b), p(a), p(b), q(a)\} = T^2 = T^{\omega}$

⇒ seeding is safe and accelerates the process

go back to lecture: alternating fixpoint



simple case:



apply program P to ω

$T^1_P(\omega) \subseteq \omega$

$\subseteq \omega$

ω contains all necessary things

ω contains only necessary things

Consider $\vartheta \supseteq \omega$ with "invented" atoms

$\vartheta \models P$ possible, but not necessary

→ extend ϑ to a model of $P \to \vartheta'$

$\vartheta' \models P$

$T^1_P(\vartheta') \subseteq \vartheta'$ since $\vartheta' \models P$

but possible $T_P(\vartheta') \subsetneq \vartheta'$

because it does not confirm the "invented" atoms

⇒ it "corrects" them :)

on the other hand:

self-confirming rules $p(x) :- p(x)$

would confirm invented atoms ! :(

⇒ seeding together with self-confirming rules is a problem !

⇒ instead of seeding, encode ω into the program

↓ negative literals

→ reduct :)

ω is a stable model if

$$\boxed{T^{\omega}_{\underbrace{P_{\omega}}_{\text{positive prog}}}(\emptyset) = \omega}$$

... shortly to some different aspect:

$P = \{ \; p :- \neg q$
$q :- \neg p \; \}$ $\hat{=}$ "p or q"

$T_P(\emptyset)$: $\emptyset \xrightarrow{1} \{p, q\} \xrightarrow{2} \emptyset$

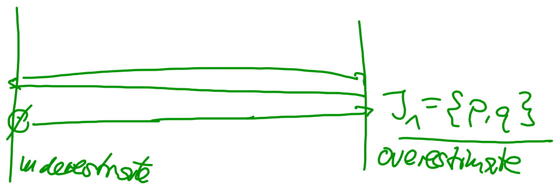
$T_{P_X}(\emptyset)$: $J_0 = \emptyset$ =

$P_{J_0} = P_\emptyset = \{ p :- true, q :- true \}$

$T^\omega_{P_{J_0}}(\emptyset) = \{p, q\}$ $=: J_1$

$P_{J_1} = \emptyset$

$T_{P_{J_1}}(\emptyset) = T_\emptyset(\emptyset) = \emptyset =: J_2$



$\Rightarrow$ guess possible solutions
("stable models")

~~$\mathcal{S} = \{p, q\}$~~ bad idea $T_P(\mathcal{S}_0) = \emptyset$

$\mathcal{S}_1 = \{p\}$ P does not contain a self-confirming rule

$T^\omega_P(\mathcal{S})$: $\mathcal{S}_1 \rightarrow \mathcal{S}_1$:-)

$\mathcal{S}_2 = \{q\}$

$T^\omega_P(\mathcal{S}_2) = \mathcal{S}_2$:-) } "p or q"