Ex. 2.4, Slide 605 (borders, reachable)

– stratified negation

consider first naive T_P^ω strategy (cf. T_P with negation, Slide 591)

$T_P^0(\emptyset) = \emptyset$ (cf. Definition S1.570)

$T_P^1(\emptyset) = T_P(\emptyset) = EDB$

$T_P^2(\emptyset) = T_P(EDB) = [EDB \cup \{borders(y,x,\ell) \mid borders(x,y,\ell) \in EDB\}$
$\cup \{\text{reachable 1step forw}\}$]
$\cup \{notReachable(X,Y) \mid X,Y \text{ countries}\}$

$T_P^3(\emptyset) = [\ldots] \cup reachable^{1\,backw} \cup reachable^{2\,forw}$
$\cup \{notReachable \mid X,Y \text{ countries and not } reachable(X,Y) \text{ in}\}$

⋮

$T_P^{n+2}(\emptyset) = EDB \cup borders^{symm} \cup reachable^{all}$
$\cup \{notReachable(X,Y) \mid X,Y \text{ countries and not } reachable(X,Y) \in T_P^{n+1}(\emptyset)\}$ which was not yet complete

$T_P^{n+3}(\emptyset) = EDB \cup borders^{symm} \cup reachable^{all}$
$\cup \{not\ reachable(X,Y) \mid Y \text{ is not reachable from } X\}$

$T_P^{n+4}(\emptyset) = T_P^{n+3}$

$\Rightarrow \lim_{n\to\infty} T_P^n(\emptyset)$ is often (not always...) also the minimal model ☺ for stratifiable

if there is a rule "$p \leftarrow p$"

notReachable(X,Y) :- notReachable(X,Y).

Jun 15-14:10

Consider stability of the stratified model $\mathcal{S}_P$ wrt. $\underbrace{\text{transitiveclosure2.P}}_{=:P}$ (Slide 605):

$P_g = \{\ borders(b,a,\ell) \text{ :- } borders(a,b,\ell) \mid a,b \text{ country codes}, \ell \in \pi[\$3](borders)\}$
$\cup \{\ reachable(a,b) \text{ :- } borders(a,b) \mid a,b \text{ country codes}\}$
$\cup \{\ reachable(a,b) \text{ :- } reachable(a,c),\ borders(c,b) \mid a,b,c \text{ country codes}\}$
$\cup \{\ notReachable(a,b) \text{ :- } country(\_,a,\_\ldots),\ country(\_,b,\_),$ not $reachable(a,b) \mid a,b \text{ country codes}\}$

$\Rightarrow$ all (relevant) ground instances of rules

$P^{\mathcal{S}_P}$: take P_g, delete $\{notReachable(a,b) \text{ :- } country(\_,a,\_),\ country(\_,b,\_),$ not $reachable(a,b) \mid a,b$ country codes and $reachable(a,b) \in \mathcal{S}_P\}$

and in the other rules, delete the "not reachable(a,b)" (because $reachable(a,b) \notin \mathcal{S}_P$)

$\Rightarrow$ amongst the blue rules, only the instances for (a,b) that are not in reachable remain.

$\Rightarrow T^\omega_{P^{\mathcal{S}_P}}(\emptyset) = \mathcal{S}_P$ is stable ☺

+ Mondial-EDB

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Ex 2.4 "b" several minimal models

P Borders, readable, notReadable:

- φP is a minimal model
- $\varphi' := \varphi P \cup \{readable(IS, R)\} \cup \{readable(IS, x) \mid readable(R,x) \in \varphi P\}$

  φ' is a model of P

  is not minimal.

  (contain atoms that are not (longer) required by P)
- $\varphi'' := \varphi' \setminus (\{notReadable(IS,x) \mid readable(R,x) \in \varphi P\} \cup \{notReadable(IS,R)\})$
  - is a model of P
  - is minimal

is φ'' stable wrt (original) P ?

$\Rightarrow$ no!

$readable(IS,R) \notin T^{\omega}_{P^{\varphi''}}(\emptyset)$

(has no support by the EDB facts + rules)

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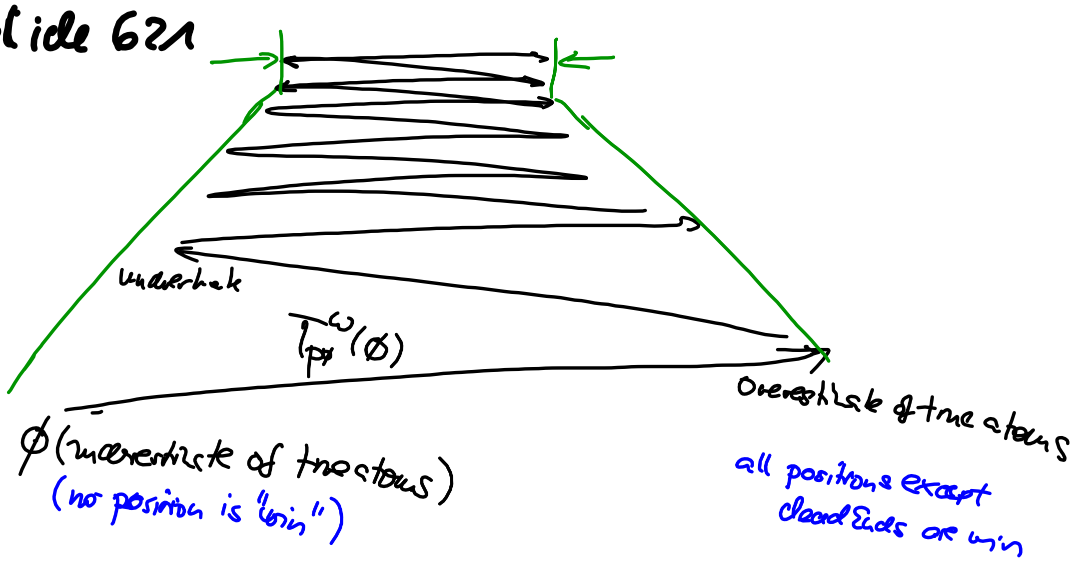
Slide 621



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win move game : (only win(x) listed)

$J_0 = \emptyset$

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$J_0 = \emptyset \leadsto P^{\emptyset} = \{$ win(a) :- move(a,f) ~~¬win(f)~~.   satisfied in $\emptyset$

win(b) :- move(b,k) ~~¬win(k)~~.

win(b) :- move(b,c) ~~¬win(c)~~.

win(a) :- move(a,b), ~~¬win(b)~~.

$\vdots$

$\}$

take only ground instances where move(...) is true

$= T_{P^{\emptyset}}(\emptyset) = \{$ win(a), win(b), ... $\}$

win(f), win(k), win(h), win(j) are <u>not</u> there!

≙ an overestimate of 'win' but some nodes are already excluded :-)

⇒ Continue: exercise → 20.6.

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