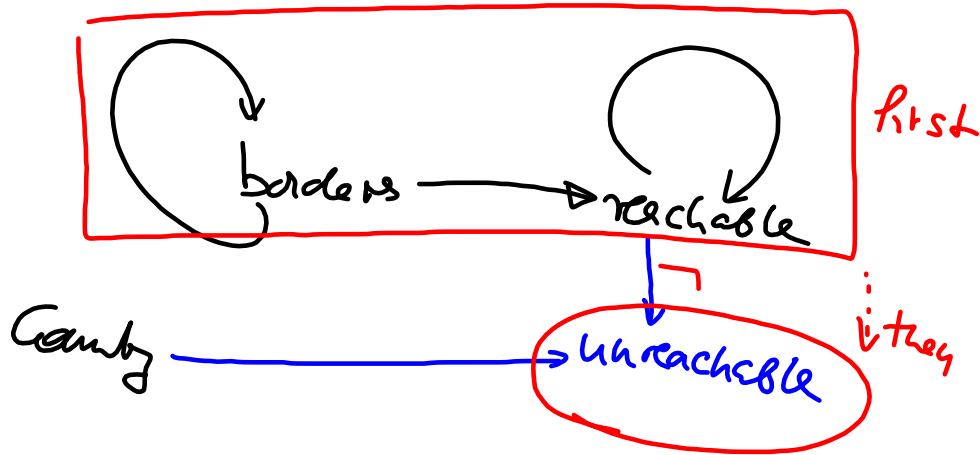


Dependency graph for Slide 569



Jan 15-10:08

Reasoning,

up to now: only positive rules

- conjunctive bodies
- several rules with same head: Union

Negation

FOL: $\varphi \models p(x)$ if $p(x)$ can be proven from φ
 $\varphi \models \neg p(x)$ if $\neg p(x)$ can be proven from φ

Reasoning \Rightarrow in case of incomplete knowledge:
 sometimes neither $p(x)$ nor $\neg p(x)$ can be proven! \rightarrow no conclusion "Open World"

monotonic
 Defn Log, minimal model $P \models_{min} p(x)$ if $p(x) \in$ minimal model of P

Reasoning \Downarrow **Reasoning**
 ques: $P \models_{min} \neg p(x)$ if $p(x) \notin$ minimal model
 \Rightarrow similar as in SQL "querying" "closed-world semantics"

next step: move negation into rule bodies

for instance:

$nonreachable(x, y) :- \neg reachable(x, y)$
 $nonmonotonic$ \leftarrow $conj(x), conj(y), \dots$

Jan 15-10:36

8.572

Consider $P \leftarrow \neg Q$

- intuitive:

- nothing holds; "I don't know anything by now"
- TP idea: if we cannot prove Q , then we should believe P

$\mathcal{M}_1 = \{P\}$ ← accepted in $\mathcal{P} \text{ logic}$

- another model $\{Q\} = \mathcal{M}_2$

Consider (symmetric!)

$\{Q \leftarrow \neg P\}$

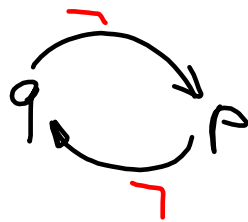
← not accepted in $\mathcal{P} \text{ logic}$

→ $\mathcal{M}_1 \{Q\}$
→ $\mathcal{M}_2 \{P\}$

Jan 15-10:54

Consider: $P := \neg Q$
 $Q := \neg P$

not stratifiable!



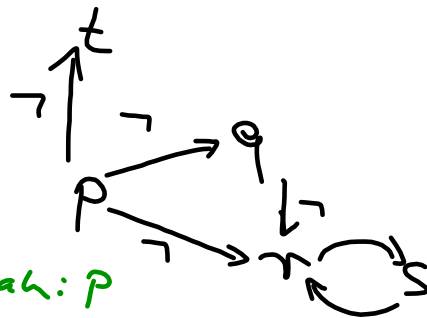
Consider

$q := \neg p$

$r := \neg p, \neg q$

$s := \neg r$

$r := \neg s$



1. Strah: p
2. q t or
3. r, s t

Jan 15-11:10

Consider again $P := \neg q, q := r, s.$

$S_1 = \{q, r, s\} \Rightarrow P_1$: all rules that have q or r in the heads

$S_2 = \{p\} \Rightarrow P_2 = \{p := \neg q\}$ $P_1 = \{q := r, s\}$

$\mathcal{M}_0 := T_{P_2}^\omega(\emptyset) = \{s\}$

\Rightarrow since r is in S_1 : $\mathcal{M}_0 \models \neg r$

$\mathcal{M}_1 := T_{P_2}^\omega(\mathcal{M}_0) = \{p, s\}$

Fix r, s, q for even.
 $\mathcal{M}_0 \models \neg q$
 $\mathcal{M}_0 \models s$

Result. \mathcal{M}_2 is the stabilized model of P