

Finite Failure Extension of SLD

Call: "fail A"

A call "fail A" succeeds iff its subcall A finitely fails

Finite failure rule

$\Sigma \cup \{\neg A\}$:- Finitely fails

SLD tree "fail A" succeeds.

- ① finite depth
- ② finite breadth.

⊙ All computations fail.
Recall: Success requires only one success

$\Sigma \models A$ if $\Sigma \cup \{\neg A\}$ neither succeeds nor finitely fails (FF)
"fail A" " " " "

SLP NF

$$\{C_1, C_2\} \models A$$

$$\{C_1, C_2\} \cup \{\neg A\} \vdash \perp$$

$$C_1 :- \neg A$$

$$q :- C_1 :- A \leftarrow \text{not } B, C$$

$$C_2 :- C$$

not = failure = not provable

A = Fred is an ape

B = Fred is human

C = Fred is a primate

$$A \vee B \models B$$

$$\Sigma \models B$$

$$\Sigma \models \neg B$$

Diff between

$$\Sigma \models B$$

$$\Sigma \models \neg B \quad X$$

C_1
 $\vdash \neg B, C$

C_2
 $\vdash \neg B$



SLDNF: sound & complete for prop def cl.
 ↳ not so for FOL.

incompleteness
 ↙ ↘
 non-ground failed clauses unsoundness



Σ, R
 SLDNF

$\Sigma = \{ \leftarrow B \wedge q \} \cdot ?q \cdot \leftarrow B \wedge q$

$\text{not } \underline{\underline{P(x,y)}} \cdot \underline{\underline{Q(x,y)}}$

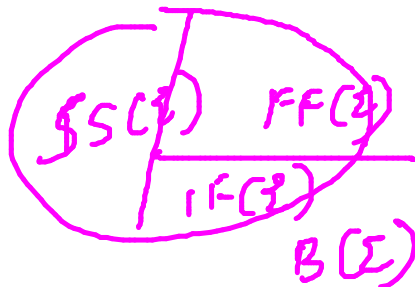
$\models (\Sigma, \underline{\underline{R}}) \cdot ?q$ infin. fails

$\models F(\Sigma, \underline{\underline{R}}) = \text{prop atoms } \underline{\underline{Q}}$

defct SLDNF for which $?q$ finites fails

$\underline{\underline{SS(\Sigma, \underline{\underline{R}})}} := MM(\Sigma)$

Fair Computation Rule



$\forall q \in B(\Sigma), \quad \neg(FF(\Sigma) \wedge \neg SS(\Sigma))$ $\wedge$ $\neg(FF(\Sigma) \wedge \neg IF(\Sigma))$
 ? fail q succeeds under SLDNF
 $\neg(SS(\Sigma) \wedge \neg IF(\Sigma))$ $\wedge$? q succeeds under SLDNF.

Comp Sem for SLDNF

?q.

$$q \in B(\Sigma) \quad \Sigma \models q \text{ if } q \in SS(\Sigma)$$

Soundness of SLDNF.

$$\forall \Sigma \left\{ \begin{array}{ll} \forall q \in B(\Sigma) & \text{Comp}(\Sigma) \models q \quad \text{if } ?q \text{ succeeds under SLDNF} \\ & \text{Comp}(\Sigma) \models \neg q \quad \text{if } ?q \text{ fails} \\ & \text{if } ?q \text{ succeeds under SLDNF.} \end{array} \right.$$

Comp: - Σ is def clause.