Idea: search backward from a query to determine if it is a logical consequence of KB.

An answer clause is of the form:

 $yes \leftarrow a_1 \land a_2 \land \ldots \land a_m$

The SLD Resolution of this answer clause on atom a_i with the clause:

$$a_i \leftarrow b_1 \land \ldots \land b_p$$

is the answer clause

$$yes \leftarrow a_1 \wedge \cdots \wedge a_{i-1} \wedge b_1 \wedge \cdots \wedge b_p \wedge a_{i+1} \wedge \cdots \wedge a_m.$$

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- An <u>answer</u> is an answer clause with m = 0. That is, it is the answer clause yes ← .
- A derivation of query " $q_1 \land \ldots \land q_k$ " from *KB* is a sequence of answer clauses $\gamma_0, \gamma_1, \ldots, \gamma_n$ such that
 - γ_0 is the answer clause $yes \leftarrow q_1 \land \ldots \land q_k$,
 - γ_i is obtained by resolving γ_{i-1} with a clause in KB, and
 - γ_n is an answer.

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To solve the query $?q_1 \land \ldots \land q_k$:

$$ac := "yes \leftarrow q_1 \land \ldots \land q_k"$$

repeat

select atom a_i from the body of ac; choose clause C from KB with a_i as head; replace a_i in the body of ac by the body of C until ac is an answer.

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- Don't-care nondeterminism If one selection doesn't lead to a solution, there is no point trying other alternatives. select
- Don't-know nondeterminism If one choice doesn't lead to a solution, other choices may. choose

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Example: successful derivation

Query: ?a

Example: failing derivation

$$\begin{array}{lll} a \leftarrow b \wedge c. & a \leftarrow e \wedge f. & b \leftarrow f \wedge k. \\ c \leftarrow e. & d \leftarrow k. & e. \\ f \leftarrow j \wedge e. & f \leftarrow c. & j \leftarrow c. \end{array}$$

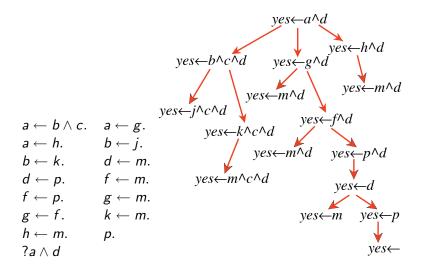
Query: ?a

$$\begin{array}{ll} \gamma_0 : & yes \leftarrow a \\ \gamma_1 : & yes \leftarrow b \land c \\ \gamma_2 : & yes \leftarrow f \land k \land c \\ \gamma_3 : & yes \leftarrow c \land k \land c \end{array}$$

$$\begin{array}{ll} \gamma_{4}: & \textit{yes} \leftarrow e \land k \land c \\ \gamma_{5}: & \textit{yes} \leftarrow k \land c \end{array}$$

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Search Graph for SLD Resolution



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