

29/11/24

- * Create a knowledge base consisting of first order logic statements and prove the given query using forward reasoning.

function FOL-FC-ASK(KB, α)

return a substitution or false

input: KB, the knowledge base, a set of first-order definite clauses α , the query, an atomic sentence

local variable: new, the new sentence inferred on each iteration

repeat until new is empty

new $\leftarrow \{\}$

for each rule in KB do

$\{P_1 \wedge \dots \wedge P_n \Rightarrow q\} \leftarrow \text{STANDARDIZE-VARIABLE}$

for each α such that $\text{SUBSET}(\emptyset, P_1 \wedge \dots \wedge P_n)$
 $= \text{SUBSET}(\emptyset, P'_1 \wedge \dots \wedge P'_n)$

for some $P'_1 \dots P'_n$ in KB

$q' \leftarrow \text{SUBST}(\emptyset, q)$

if q' does not unify with some sentence already in KB or new then

add q' to new

$\phi \leftarrow \text{UNIFY}(q', \alpha)$

if ϕ is not fail then return ϕ

add new to KB

return false.

OUTPUT:

criminal (Robert) is proven!

Inferred Facts:

Sells (Robert, T1, A)

Enemy (A, America)

Weapon (T1)

Hostile (A)

Missile (T1)

Criminal (Robert)

American (Robert)

Own (A, T1)

Equation

a) $\text{Occupation}(\text{Entity}, \text{Surgeon}) \vee \text{Occupation}(\text{Entity}, \text{Lawyer})$

b) $\text{Occupation}(\text{Joe}, \text{Actor}) \wedge \exists (\text{Occupation}(\text{Joe}, O) \wedge O \neq \text{Actor})$

c) $\forall p (\text{Occupation}(p, \text{surgeon}) \rightarrow \text{customer}(\text{Joe}, p))$

d) $\exists p (\text{Occupation}(p, \text{lawyer}) \wedge \text{customer}(\text{Joe}, p))$

e) $\exists p (\text{Boss}(p, \text{Entity}) \wedge \text{Occupation}(p, \text{lawyer}))$

f) $\exists p (\text{Occupation}(p, \text{lawyer}) \wedge \neg (\text{customer}(c, p) \rightarrow \text{Occupation}(c, \text{doctor})))$

g) $\forall p (\text{Occupation}(p, \text{surgeon}) \rightarrow \exists c (\text{Occupation}(c, \text{lawyer}) \wedge \text{customer}(p, c)))$