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Lab-8 First Order Logic: Forward Chaining

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Consider the following problem:

As per the law, it is a crime for an American to sell weapons to hostile nations. Country A, an enemy of America, has some missiles, and all the missiles were sold to it by Robert, who is an American citizen."

PT "Robert is criminal"

It is a crime for an American to sell weapons to hostile nations

Let's ~~say~~ p, q and r are variables

American(p) \wedge Weapon(q) \wedge Sell(p, q, r) \wedge Hostile(r) \Rightarrow Criminal(p)

(i) Country A has some missiles
 $\exists x \text{ Own}(A, x) \wedge \text{Missile}(x)$

(ii) All of the missiles were sold to country A by Robert

$\forall x \text{ Missile}(x) \wedge \text{Own}(A, x) \Rightarrow \text{Sells}(\text{Robert}, x, A)$

(iii) Missiles are weapons
 $\text{Missile}(x) \Rightarrow \text{Weapon}(x)$

(iv) Enemy of America is known as hostile
 $\forall x \text{ Enemy}(x, \text{America}) \Rightarrow \text{Hostile}(x)$

Pseudo-code:

①

Initialize RuleBase
function Forward Chaining(KB, Query):

initialize Inferred = \emptyset

initialize Agenda = KB.Facts

Rules = KB.Rules

while Agenda is not empty:

fact = Remove_first(Agenda)

if fact is the Query:

return True

if fact not in Inferred:
Inferred.add(fact)

for rule in Rules:

if all conditions of the Rule are satisfied by Inferred:

NewFact = Infer Conclusion from rule

if NewFact not in KB.Facts:

Add NewFact to KB.Facts

Add NewFact to Agenda

return False