Lab-7

Entailment Process

Q. KB :

1. Alice is the mother of Bob
2. Bob is the father of Charlie
3. A father is a parent
4. A mother is a parent
5. All parents have children
6. If someone is a parent, their children are siblings.
7. Alice is married to David

Hypothesis:

→ "Charlie is a sibling of Bob

Entailment Process:

- From the premise, Alice is the mother of Bob, so Alice is a parent.
- Bob is the father of Charlie, so Charlie's parent is Bob.
- From the premise, If someone is a parent, their child

A → B (Alice is mother of Bob)
B → C (Bob is father of Charlie)
F → P (A father is a parent)
M → P (A mother is a parent)
P → S (If someone is a parent, their children are siblings)
A∧B → Q (If Alice is mother of Bob & Bob is father of Charlie then Charlie is a sibling of Bob)

→ Check for entailment:

1. If A (Alice is mother of Bob) is true, then B (Bob is the father of Charlie) must also be true (A → B)

2. If B is true then C (Bob is a parent) must be true (F → F) & M (Alice is a parent) must also be true (M → P)

3. If both Alice & Charlie are parents (i.e. M & F are true) then S (their children are sibling) must be true. (P → S)

4. Since S is true, the hypothesis Q ("Charlie is sibling of Bob") is true.

Conclusion:
Using Propositional logic, we can conclude the hypothesis "Charlie is a sibling of Bob" is entailed by KB (Knowledge Base).

Lab-7 [First Order Logic Unification]

Key Steps:

1. Same predicate symbol : The predicate symbols in the expressions must match.

2. Same number of arguments: The expressions must have an equal number of arguments.

3. Variable conflict resolution : Variables cannot take multiple conflicting values

4. No conflicting function symbols :- Different function symbols cannot unify.

Example :

Expressions:
1. Knows ($f(x,y)$, $g(x)$)
2. Knows ($f(Alice, Bob)$, $g(z)$)

Steps:

1. Compare Predicates :
   Both are knows, so proceed to unify the arguments.

2. Compare Arguments:
⇒ Arguments 1: $f(x,y)$ vs $f(Alice, Bob)$:
   substitute : x = Alice, y = Bob

⇒ Argument 2: $g(x)$ vs $g(z)$:
   Substitute : z = Alice (since x = Alice)

3. Final Substitutions :

⇒ x = Alice

⇒ y = Bob

⇒ z = Alice

4. Unified Expression :

· knows (f(Alice, Bob), g(Alice))