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Assignment 4.

IMPLEMENTATION OF UNIFICATION ALGORITHM

Aim : To Implement Unification algorithm.

Objective : To study and implement Unification algorithm.

Theory :

1] UNIFICATION ALGORITHM

- Unification is a programme of making two different logical atomic expressions identical by finding a substitution unification depends on substitution process.
- Unification algorithm in a recursive (matching) procedure that compares two literals and discovered whether their excist a set of substitutions that make them identical.
- Each literal represented as list, where first element is name of predecate and remaining elements are arguements, which may be single element (atom).
- It return a unifier for the two literals if excists or returns fail if expression do not match with each other. This substitution variables are called Most General Unifer or MGU.

3] Resolution

- Resolution method is an inference rule that proves theorem by building proofs by contradiction.
- It is used in both propositional as well as Predi logic.

1) Propositional Logic
- Resolution method is only inference rule which gives a new clause when two or more clauses are occupie together.

2) Predicate Logic
- Resolution method is an uplifted version of proposit resolution method.
- Steps for Resolution :→

ⓐ Conversion of Facts in FOL (First order Logic)
- All the given statements will be converted into FOL

ⓑ Conversion of FOL into CNF (Conjunctive Normal form)
- It is required to convert FOL into CNF as CNF form makes easier for resolution proofs.

ⓒ Negative statement to be proved
- Apply negation (¬) to the conclusion statement.

Step 4 : Set Substitution set (SUBST) to NIL.

Step 5 : For i = 1 to the number of elements in S_1

a) Call Unify function with the i^{th} elements of S_1 and i^{th} elements of S_2 and put result in Sub.

b) If Sub = failure, then returns FAILURE.

c) If Sub ≠ NIL, then do.

Platform :

FAQ's :

Q1] Why resolution is required?

ans: Resolution is used if there are various statements given and we need to prove a conclusion of those statements. Resolution provides a way to look for ground clauses staring from ¬ ∅ in clausal form (∅ - FOL). Clever way to look for proof, as a way to focus on proof.

Q2] What are the pre-requisits for applying Unification algorithm.

Ans : Condition for Unification

1) Predicator symbol must be same, atoms or expression with different pridicate symbol can never be unified

2) Number of Arguements in both expression must identical.

(d) Draw reduction graph

1. Select two clauses. Call them parent clause
2. Resolve them together. The resulting clause, called resolvent will be a disjunction of all of the literals of both of the parent clauses.
3. If resolvent in empty clause, then contradiction is found. If it is not them add it to the set of clause avaliable to the procedure.

Input : Two literal L_1 and L_2

Output : A set of substitution.

Algorithm : Unification Algorithm

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Step 1 : If $S_1$ and $S_2$ is variable or constant then:
    a) If $S_1$ and $S_2$ are identical then return NIL
    b) Else if $S_1$ is variable
        a. Then if $S_1$ occurs in $S_2$, return FAILURE
        b. else return $\{(S_2 | S_1)\}$
    c) Else if $S_2$ is variable
        a. If $S_2$ occurs in $S_1$, return FAILURE
        b. else return $\{(S_1 | S_2)\}$
    d) Else return FAILURE

Step 2 : If initial Predicate symbol in $S_1$ and $S_2$ are
    not same return FAILURE.

Step 3 : $S_1$ and $S_2$ have different number of arguments
    then return FAILURE.
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3. Unification will fail if there are two similar variables present in same expression.

~~fpc~~

Q3] What are the application of Unification algorithm?

Ans : Application of Unification algorithm.

1. Prolog - It uses unification to find values for variables that satisfy the rules.
2. Type Inference - Unification in key mechanism in this
3. Resolution - It requires repeated use of Unificati algorithm.