



POORNIMA

COLLEGE OF ENGINEERING

DETAILED LECTURE NOTES

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Unification

Unification is all about making the expressions look identical. So, for the given expressions to make them look identical we need to do

Substitution

$$\textcircled{1} P(x, f(y)) , P(a, f(g(z)))$$

→ Variable

$$(x, y) \quad (2, 3)$$

→ term

$$x = 2$$

$$y = 3$$

$$[a/x, g(z)/y] \rightarrow \text{Substitution set}$$

|
a for
x

if we would have

$$P(x, f(y)) , P(a, f(f(z)))$$

→ In this example unification would not be possible.

$f(b)$

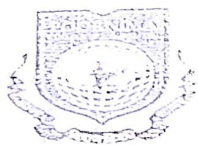
$$\textcircled{2} \quad Q(a, g(x, a), f(y), Q(a, g(f(b), a), \\ [a/a, f(b)/x, b/y])$$

Substitution : A substitution t_i / v_i specifies substitution of term t_i and Variable v_i

Unification Algorithm

Algo : Unify ($L1, L2$)

- 1) If $L1$ and $L2$ is a Variable or Constant, then:
 - a) If $L1$ and $L2$ are identical then return NIL.
 - b) If $L1$ is a Variable, then if $L1$ occurs in $L2$ then return fail, else Return $\{L1/L2\}$.
 - c) same as b ($L2$) $\{L2/L1\}$
 - d) Else return FAIL.
- 2) If the initial predicate symbols in $L1$ and $L2$ are not identical, then return FAIL.
- 3) If $L1$ and $L2$ have different no. of Arguments, then Fail.
- 4) let Subset be NIL.
- 5) loop \rightarrow Append (S , Subset).
- 6) return Subset.



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Implementation

- 1) Initialize the substitution set to be empty
- 2) Recursively unify expressions :
 - Identical term match.
 - If one item is Variable V_i & the other is term t_i not containing that Variable, then :
 - ① Substitute t_i/V_i in the existing substitution.
 - ② Add t_i/V_i to the substitution set.
 - ③ If both items are functions, the function names must be identical and all Arguments must unify.

Examples

Consider $P(x, y), g(x)$

Soln^s →

- ① $P(z, y)$: unifies with $[x/z, g(x)/y]$
- ② $P(z, g(z))$: unifies with $[x/z \text{ or } z/x]$

- ③ $P(\text{socrates}, g(\text{socrates}))$: unifies with $[\text{socrates}/x]$
- ④ $P(g(y), z)$: unifies with $[g(y)/x, g(g(y))/z]$
- ⑤ $P(\text{socrates}, f(\text{socrates}))$: does not unify
(if g does not match)
- ⑥ $P(g(y), y)$: does not unify \rightarrow No substitution works.