Assignment 3

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QUESTION 1

PART1

Two attributes - **L.type**(for types) and **L.val** (for token values)

Symbol table - **[string id ; string type ; bool loaded]** is a record in symbol table.

isLoadedST(id) (true if 'id' is already loaded and false if not)

checkTypeST(id) (return the type of the 'id' entry)

insertST(id, type) (inserts an entry in the symbol table)

Array for storing the consumption of cost := **int Cost[5]** = {0, 0, 0, 0, 0}

Where :

Cost[0] = coefficient of 's'

Cost[1] = coefficient of 'v'

Cost[2] = coefficient of 'i'

Cost[3] = coefficient of 'a'

Cost[4] = coefficient of 'm'

Total cost = s.Cost[0] + v.Cost[1] + i.Cost[2] + a.Cost[3] + m.Cost[4];

P → **L S** { *if (S.type == 'type_error') //synthesised attribute*

{

P.type = 'type_error';

}

else

{

Print(s.Cost[0] + v.Cost[1] + i.Cost[2] + a.Cost[3] + m.Cost[4]) ;

}

}

L → **L D** {}

| ∈ {}

D → **T** { *V.type = T.type;* } **V** *//* **Inherited attributes.**

V →{ V_1*.type = V.type ;* } $\mathbf{V_1}$ **id** { *insertST(id.val , V.type) ;* }*//* **Inherited attributes.**

| id { *insertST(id.val, V.type);* }

T →**int** { *T.type = 'int';* }

| float { *T.type = 'float';* }

S →S$_1$ A { *if (A.type == 'type_error' OR S$_1$.type == 'type_error')*
{ S.type = 'type_error' ; }
}

| A { *if (A.type == 'type_error')*
{ S.type = 'type_error' ; }
}

A → id = E { *if(id.type == 'float')*
{ Cost[0] += 4 ; A.type = 'float' ;
}
else if (id.type == ' int ' AND E.type == ' int ')
{ Cost[0] += 1 ; A.type = 'int' ;
}
else
{ A.type = 'type_error' ; }
}

E →E$_1$ + E$_2$ { *if(E$_1$.type == 'int' AND E$_2$.type == 'int')*
{ E.type = 'int' ; Cost[3] += 1 ; }
else
{ E.type = 'float' ; Cost[3] += 4 ; }
}

E →E$_1$ * E$_2$ { *if(E$_1$.type == 'int' && E$_2$.type == 'int')*
{ E.type = 'int'; Cost[4] +=1 ; }
else
{ E.type = 'float' ; Cost[4] += 4 ; }
}

E →(E$_1$) {
E.type = E$_1$.type ;
}

E → id { *E.type = checkType(id.val) ; if (isLoaded(id.val) == false){*
if(E.type = 'int') {
Cost[1] += 1;
}
else {
Cost[1] += 4;
}
};
}

E →int-const {
E.type = 'int' ; Cost[2] += 1 ;
}

E →float-const {
E.type = 'float' ; Cost[2] += 4 ;
}

PART2:

Cost of the given program with above estimater is:

float x z ---> 0
int y ---> 0

*x = (y + 3) * 5.0* ---> *v + i + 4i + a + 4m + 4s*
z = y + x ---> *4v + 4a + 4s*
*x = y * y* ---> *m + 4s*

=> Total cost = *(v + 5i + a + 4m + 4s) + (4v + 4a + 4s) + (m + 4s)*
= 5v + 5i + 5a + 5m + 12s

PART3:

Inherited Attributes are : ***type*** ***of identifiers, In the declaration part.***
Synthesised attributes : 1) ***type*** ***of identifiers, as in the statement part I've carried the error Through the type attribute so in that case it is synthesised attribute***
2) val of token.
SDD is L-attributed so to carry the type of from T rule to V rule.