**Lab Sheet 7**

**Semantic Analysis using Symbol Table**

Symbol table is the data structure used in Compiler to store all the information about variables used in a program. Symbol table is used to detect the following sematic errors:

1. Variable usage before declaration
2. Duplicate declaration
3. Invalid type assignment

Write a cup program to generate a java program, which will check for the above-mentioned errors.

Use int, float and string types in your program.

**Sample program**

Symbol table is implemented in the program using Hashmap.

The CUP program given below will insert all integer variables into the symbol table for a valid declaration, and it will detect duplicate integer declarations. You are supposed to extend the following program to include String, float types, include the grammar for definition statement, and check for semantic errors for that.

**Jlex program**

import java\_cup.runtime.Symbol;

import java\_cup.runtime.Scanner;

%%

%cup

%eofval{

return new Symbol(sym.EOFILE);

%eofval}

%%

[\n] {System.out.println("NL "+yytext());return new Symbol(sym.NL);}

";" {System.out.println("LA "+yytext());return new Symbol(sym.SEMI);}

"," {System.out.println("LA "+yytext());return new Symbol(sym.COMMA);}

"=" {System.out.println("EQ "+yytext());return new Symbol(sym.EQ);}

" " {System.out.println("LA "+yytext());return new Symbol(sym.SPACE);}

"int" {System.out.println("LA "+yytext());return new Symbol(sym.INT);}

[0-9]+ {System.out.println("LA "+yytext());return new Symbol(sym.NUM ,new Integer(yytext()));}

**Cup Program**

import java\_cup.runtime.\*;

import java.util.\*;

init with {: :};

action code {: Map<String,String> hash = new HashMap<String,String>(); :};

scan with {: return getScanner().next\_token(); :};

terminal INT,STRING,COMMA,ID, SPACE, EOFILE,NL,EQ,QUOTE,STR,NIL,VAR,FLOAT,DECIMAL,SEMI,NUM;

non terminal prog, stmt, decln, s,val, defn;

s ::= prog {: System.out.println("Completed Parsing");System.exit(0); :} EOFILE {:System.exit(0);:} ;

prog ::= prog stmt|stmt;

stmt ::= decln

|SPACE

|NL;

decln ::= INT SPACE ID:e SEMI {:

if(hash.get(e)==null)

{

System.out.println("Valid Declaration, Adding INT to HashMap");

hash.put(e.toString(),"INT");

}

else{

System.out.println("Error : Dupicate Declaration");

}

:};

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