Lab 5

Activity

Implement symbol table using array data structure.

Solution:

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Text.RegularExpressions;
using System.Threading.Tasks;
using System.Windows.Forms;
using System.Collections;
namespace LexicalAnalyzerV1
{
public partial class Form1 : Form
{
public Form1()
{
InitializeComponent();
}
private void btn_Input_Click(object sender, EventArgs e)
{
//taking user input from rich textbox
String userInput = tfInput.Text;36
//List of keywords which will be used to seperate keywords
from variables
List<String> keywordList = new List<String>();
keywordList.Add("int");
keywordList.Add("float");
keywordList.Add("while");
keywordList.Add("main"); keywordList.Add("if");
keywordList.Add("else");
keywordList.Add("new");
//row is an index counter for symbol table
int row = 1;
//count is a variable to incremenet variable id in tokens
int count = 1;
//line_num is a counter for lines in user input
int line_num = 0;
//SymbolTable is a 2D array that has the following structure
//[Index][Variable Name][type][value][line#]
//rows are incremented with each variable information entry
String[,] SymbolTable = new String[20, 6];
List<String> varListinSymbolTable = new List<String>();
//Input Buffering
ArrayList finalArray = new ArrayList();
ArrayList finalArrayc = new ArrayList();
ArrayList tempArray = new ArrayList();
char[] charinput = userInput.ToCharArray();
```

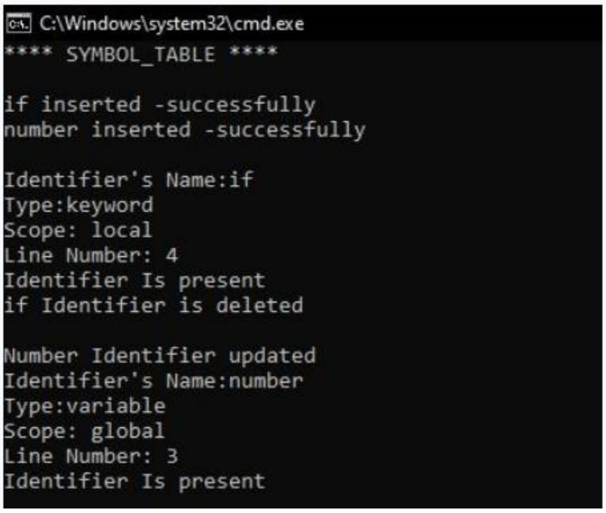
```
//Regular Expression for Variables
Regex variable_Reg = new Regex(@"^[A-Za-z|_][A-Za-z|0-9]*$");
//Regular Expression for Constants
Regex constants_Reg = new Regex(@"^[0-9]+([.][0-
9]+)?([e]([+|-])?[0-9]+)?$");
//Regular Expression for Operators
Regex operators_Reg = new Regex(@"^[-*+/><&&||=]$");
//Regular Expression for Special_Characters
Regex Special_Reg = new Regex(@"^[.,'\[\]{}();:?]$");
for (int itr = 0; itr < charinput.Length; itr++)
{
Match Match_Variable = variable_Reg.Match(charinput[itr]
+ "");
Match Match_Constant = constants_Reg.Match(charinput[itr]
+ "");
Match Match_Operator = operators_Reg.Match(charinput[itr]
+ "");
Match Match_Special = Special_Reg.Match(charinput[itr] +
"");37
if (Match_Variable.Success || Match_Constant.Success ||
Match_Operator.Success || Match_Special.Success ||
charinput[itr].Equals(' '))
{
tempArray.Add(charinput[itr]);
}
if (charinput[itr].Equals('\n'))
{
if (tempArray.Count != 0)
{
int j = 0;
String fin = "";
for (; j < tempArray.Count; j++)
{
fin += tempArray[j];
}
finalArray.Add(fin);
tempArray.Clear();
}
}
}
if (tempArray.Count != 0)
{
int j = 0;
String fin = "";
for (; j < tempArray.Count; j++)
{
fin += tempArray[j];
}
finalArray.Add(fin);
tempArray.Clear();
}
// Final Array SO far correct
tfTokens.Clear();
symbolTable.Clear();
//looping on all lines in user input
```

```
for (int i = 0; i < finalArray.Count; i++)
{
String line = finalArray[i].ToString();
//tfTokens.AppendText(line + "\n");
char[] lineChar = line.ToCharArray();
line_num++;
//taking current line and splitting it into lexemes by
space
for (int itr = 0; itr < lineChar.Length; itr++)
{
Match Match_Variable =
variable_Reg.Match(lineChar[itr] + "");
Match Match_Constant =
constants_Reg.Match(lineChar[itr] + "");
Match Match_Operator =
operators_Reg.Match(lineChar[itr] + "");
Match Match_Special = Special_Reg.Match(lineChar[itr]
+ "");
if (Match_Variable.Success || Match_Constant.Success)
{
tempArray.Add(lineChar[itr]);
}
if (lineChar[itr].Equals(' '))
{
if (tempArray.Count != 0)
{
int j = 0;
String fin = "";
for (; j < tempArray.Count; j++)
{
fin += tempArray[j];
}
finalArrayc.Add(fin);
tempArray.Clear();
}
}
if (Match_Operator.Success || Match_Special.Success)
{
if (tempArray.Count != 0)
{
int j = 0;
String fin = "";
for (; j < tempArray.Count; j++)
{
fin += tempArray[j];
}
finalArrayc.Add(fin);
tempArray.Clear();
}
finalArrayc.Add(lineChar[itr]);
}
}
if (tempArray.Count != 0)
{
String fina = "";
```

```
for (int k = 0; k < tempArray.Count; k++)
{
fina += tempArray[k];
}
finalArrayc.Add(fina);
tempArray.Clear();
}39
// we have asplitted line here
for (int x = 0; x < finalArrayc.Count; x++)
{
Match operators =
operators_Reg.Match(finalArrayc[x].ToString());
Match variables =
variable_Reg.Match(finalArrayc[x].ToString());
Match digits =
constants_Reg.Match(finalArrayc[x].ToString());
Match punctuations =
Special_Reg.Match(finalArrayc[x].ToString());
if (operators.Success)
{
// if a current lexeme is an operator then
make a token e.g. < op, = >
tfTokens.AppendText("< op, " +
finalArrayc[x].ToString() + "> ");
}
else if (digits.Success)
{
// if a current lexeme is a digit then make a
token e.g. < digit, 12.33 >
tfTokens.AppendText("< digit, " +
finalArrayc[x].ToString() + "> ");
}
else if (punctuations.Success)
{
// if a current lexeme is a punctuation then
make a token e.g. < punc, ; >
tfTokens.AppendText("< punc, " +
finalArrayc[x].ToString() + "> ");
}
else if (variables.Success)
{
// if a current lexeme is a variable and not
a keyword
if
(!keywordList.Contains(finalArrayc[x].ToString())) // if it is
not a
keyword
{
// check what is the category of
varaible, handling only two cases here
//Category1- Variable initialization of
type digit e.g. int count = 10 ;
//Category2- Variable initialization of
type String e.g. String var = ' Hello ' ;
Regex reg1 = new
```

```
Regex(@"^(int|float|double)\s([A-Za-z|_][A-Za-z|0-
9]{0,10})\s(=)\s([0-
9]   +([.][0-9]+)?([e][+|-]?[0-9]+)?)\s(;)$"); // line of type
int alpha = 2
```

OUTPUT :



C:\Windows\system32\cmd.exe

```
**** SYMBOL_TABLE ****

if inserted -successfully
number inserted -successfully

Identifier's Name:if
Type:keyword
Scope: local
Line Number: 4
Identifier Is present
if Identifier is deleted

Number Identifier updated
Identifier's Name:number
Type:variable
Scope: global
Line Number: 3
Identifier Is present
```

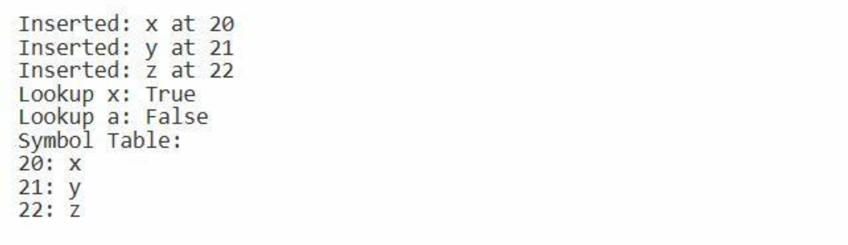
Graded task 1:

Implement symbol table using hash function

```
using System;
using System.Collections.Generic;

class SymbolTable
{
    private Dictionary<int, string> table;

    public SymbolTable()
    {
        table = new Dictionary<int, string>();
    }

    private int HashFunction(string key)
    {
        int hash = 0;
        foreach (char c in key)
        {
            hash = (hash * 31 + c) % 100; // Simple hash function
        }
        return hash;
    }

    public void Insert(string identifier)
    {
        int hash = HashFunction(identifier);
        if (!table.ContainsKey(hash))
        {
            table[hash] = identifier;
            Console.WriteLine($"Inserted: {identifier} at {hash}");
        }
        else
        {
```

```
        Console.WriteLine($"Collision occurred for {identifier} at {hash}");
    }
}

public bool Lookup(string identifier)
{
    int hash = HashFunction(identifier);
    return table.ContainsKey(hash) && table[hash] == identifier;
}

public void Display()
{
    Console.WriteLine("Symbol Table:");
    foreach (var entry in table)
    {
        Console.WriteLine($"{entry.Key}:  {entry.Value}");
    }
    }
}

class Program
{
    static void Main()
    {
        SymbolTable symTable = new SymbolTable();
        symTable.Insert("x");
        symTable.Insert("y");
        symTable.Insert("z");

        Console.WriteLine("Lookup x: " + symTable.Lookup("x"));
        Console.WriteLine("Lookup a: " + symTable.Lookup("a"));

        symTable.Display();
    }
}
```

Output



```
Inserted: x at 20
Inserted: y at 21
Inserted: z at 22
Lookup x: True
Lookup a: False
Symbol Table:
20: x
21: y
22: z
```