Министерство образования Российской Федерации

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КАЗАНСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

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Кафедра АСОИУ

Лабораторные работы №4

по дисциплине

«ТЕОРИЯ фОРМАЛЬНЫХ ГРАММАТИК И АВТОМАТОВ»

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**Лабораторная работа № 4. Введение табличного способа хранения слов**

**Текст задания:**

1. Подключить класс «Массив хеш-таблиц» к программе.
2. Завести три таблицы для хранения слов первого типа, слов второго типа и служебных слов (многосимвольных)
3. Отладить программу до рабочего состояния.

**Form1.cs**

using System;

using System.Collections.Generic;

using System.ComponentModel;

using System.Data;

using System.Drawing;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

using System.Windows.Forms;

using nsLex;

using nsSynt;

using nsHashTables;

//011101110

namespace KhayrullinKA\_4307

{

public partial class Form1 : Form

{

public CHashTableList htl = new CHashTableList(2);

public Form1()

{

InitializeComponent();

tbFSource.AppendText("aba=aba" + "\r\n");

int n = tbFMessage.Lines.Length;

}

public void TablesToMemo(object sender, System.EventArgs e)

{

List<string> listTable = new List<string>();

listBox1.Items.Clear();

listBox2.Items.Clear();

htl.TableToStringList(0, listTable);

for (int i = 0; i < listTable.Count; i++)

listBox1.Items.Add(listTable[i]);

listTable.Clear();

htl.TableToStringList(1, listTable);

for (int i = 0; i < listTable.Count; i++)

listBox2.Items.Add(listTable[i]);

listTable.Clear();

}

private void Form1\_Load(object sender, EventArgs e)

{

}

private void btnFStart\_Click(object sender, EventArgs e)

{

tbFMessage.Clear();

uSyntAnalyzer Synt = new uSyntAnalyzer();

Synt.Lex.strPSource = tbFSource.Lines;

Synt.Lex.strPMessage = tbFMessage.Lines;

Synt.Lex.enumPState = TState.Start;

try

{

Synt.Lex.NextToken();

Synt.O();

throw new Exception("Текст верный");

}

catch (Exception exc)

{

tbFMessage.Text += exc.Message;

tbFSource.Select();

tbFSource.SelectionStart = 0;

int n = 0;

for (int i = 0; i < Synt.Lex.intPSourceRowSelection; i++) n += tbFSource.Lines[i].Length + 2;

n += Synt.Lex.intPSourceColSelection;

tbFSource.SelectionLength = n;

}

}

private void btnFRecord\_Click(object sender, EventArgs e)

{

CLex Lex = new CLex();

Lex.strPSource = tbFSource.Lines;

Lex.strPMessage = tbFMessage.Lines;

Lex.intPSourceColSelection = 0;

Lex.intPSourceRowSelection = 0;

int x = tbFSource.TextLength;

int y = tbFSource.Lines.Length;

tbFMessage.Text = "";

try

{

while (Lex.enumPState != TState.Finish)

{

Lex.NextToken();

string s1 = "", s = "";

switch (Lex.enumPToken)

{

case TToken.lxmIdentifier:

{

s1 = "id " + Lex.strPLexicalUnit; int b = 0;

if (htl.AddLexicalUnit(Lex.strPLexicalUnit, 0, ref b))

{

TablesToMemo(this, e);

}

break;

}

case TToken.lxmNumber:

{

s1 = "num " + Lex.strPLexicalUnit; int b = 0;

if (htl.AddLexicalUnit(Lex.strPLexicalUnit, 1, ref b))

{

TablesToMemo(this, e);

}

break;

}

}

String m = "(" + s + "" + s1 + ")";

tbFMessage.Text += m;

}

}

catch (Exception exc)

{

tbFMessage.Text += exc.Message;

tbFSource.Select();

tbFSource.SelectionStart = 0;

int n = 0;

for (int i = 0; i < Lex.intPSourceRowSelection; i++) n += tbFSource.Lines[i].Length + 2;

n += Lex.intPSourceColSelection;

tbFSource.SelectionLength = n;

}

}

private void Search\_Click(object sender, EventArgs e)

{

CLex Lex = new CLex();

Lex.strPSource = tbFSource.Lines;

Lex.strPMessage = tbFMessage.Lines;

Lex.intPSourceColSelection = 0;

Lex.intPSourceRowSelection = 0;

int x = tbFSource.TextLength;

int y = tbFSource.Lines.Length;

tbFMessage.Text = "";

try

{

while (Lex.enumPState != TState.Finish)

{

Lex.NextToken();

string s1 = "", s = "";

switch (Lex.enumPToken)

{

case TToken.lxmIdentifier:

{

s1 = "id " + Lex.strPLexicalUnit; int b = 0;

if (htl.SearchLexicalUnit(Lex.strPLexicalUnit, 0, ref b))

{

tbFMessage2.AppendText("(Найден идентификатор)");

}

else tbFMessage2.AppendText("(Идентификатор не найден)");

break;

}

case TToken.lxmNumber:

{

s1 = "num " + Lex.strPLexicalUnit; int b = 0;

if (htl.SearchLexicalUnit(Lex.strPLexicalUnit, 1, ref b))

{

tbFMessage2.AppendText("(Найден номер)");

}

else tbFMessage2.AppendText("(Номер не найден)");

break;

}

}

String m = "(" + s + "" + s1 + ")";

tbFMessage.Text += m;

}

}

catch (Exception exc)

{

tbFMessage.Text += exc.Message;

tbFSource.Select();

tbFSource.SelectionStart = 0;

int n = 0;

for (int i = 0; i < Lex.intPSourceRowSelection; i++) n += tbFSource.Lines[i].Length + 2;

n += Lex.intPSourceColSelection;

tbFSource.SelectionLength = n;

}

}

private void Ydalenie\_Click(object sender, EventArgs e)

{

CLex Lex = new CLex();

Lex.strPSource = tbFSource.Lines;

Lex.strPMessage = tbFMessage.Lines;

Lex.intPSourceColSelection = 0;

Lex.intPSourceRowSelection = 0;

int x = tbFSource.TextLength;

int y = tbFSource.Lines.Length;

tbFMessage.Text = "";

try

{

while (Lex.enumPState != TState.Finish)

{

Lex.NextToken();

string s1 = "", s = "";

switch (Lex.enumPToken)

{

case TToken.lxmIdentifier:

{

s1 = "id " + Lex.strPLexicalUnit;

htl.DeleteLexicalUnit(Lex.strPLexicalUnit, 0);

TablesToMemo(this, e);

break;

}

case TToken.lxmNumber:

{

s1 = "num " + Lex.strPLexicalUnit;

htl.DeleteLexicalUnit(Lex.strPLexicalUnit, 1);

TablesToMemo(this, e);

break;

}

}

String m = "(" + s + "" + s1 + ")";

tbFMessage.Text += m;

}

}

catch (Exception exc)

{

tbFMessage.Text += exc.Message;

tbFSource.Select();

tbFSource.SelectionStart = 0;

int n = 0;

for (int i = 0; i < Lex.intPSourceRowSelection; i++) n += tbFSource.Lines[i].Length + 2;

n += Lex.intPSourceColSelection;

tbFSource.SelectionLength = n;

}

}

private void Izmenenie\_Click(object sender, EventArgs e)

{

CLex Lex = new CLex();

Lex.strPSource = tbFSource.Lines;

Lex.strPMessage = tbFMessage.Lines;

Lex.intPSourceColSelection = 0;

Lex.intPSourceRowSelection = 0;

int x = tbFSource.TextLength;

int y = tbFSource.Lines.Length;

tbFMessage.Text = "";

try

{

while (Lex.enumPState != TState.Finish)

{

Lex.NextToken();

string s1 = "", s = "";

switch (Lex.enumPToken)

{

case TToken.lxmIdentifier:

{

s1 = "id" + Lex.strPLexicalUnit; int b = 0;

object p = listBox1.SelectedItem;

string index = Convert.ToString(p); //kotoroe menyaem

htl.DeleteLexicalUnit(index, 0);

htl.AddLexicalUnit(Lex.strPLexicalUnit, 0, ref b);

TablesToMemo(this, e);

break;

}

case TToken.lxmNumber:

{

s1 = "num " + Lex.strPLexicalUnit; int b = 0;

object p = listBox2.SelectedItem;

string index = Convert.ToString(p); //kotoroe menyaem

htl.DeleteLexicalUnit(index, 1);

htl.AddLexicalUnit(Lex.strPLexicalUnit, 1, ref b);

TablesToMemo(this, e);

break;

}

}

String m = "(" + s + "" + s1 + ")";

tbFMessage.Text += m;

}

}

catch (Exception exc)

{

tbFMessage.Text += exc.Message;

tbFSource.Select();

tbFSource.SelectionStart = 0;

int n = 0;

for (int i = 0; i < Lex.intPSourceRowSelection; i++) n += tbFSource.Lines[i].Length + 2;

n += Lex.intPSourceColSelection;

tbFSource.SelectionLength = n;

}

}

}

}

**Hashtable.cs**

using System;

using System.Collections.Generic;

using System.IO;

using System.Windows.Forms;

using System.Linq;

namespace nsHashTables

{

public class THashTable

{

public List<int> arrFHashTable = new List<int>();

private int intFCurrentPrimeNumber;

private int intFItemReserve;

private bool boolIsSaved;

public int intFHashIndex;

public int cardPTableSize { get { return arrFHashTable.Count; } }

public List<object> arrFUserTable = null;

static THeap objFHeap;

public THashTable(ref THeap objAHeap)

{

objFHeap = objAHeap;

Init(7);

intFItemReserve = 0;

}

public void Init(int count)

{

arrFHashTable.Clear();

Resize(arrFHashTable, count);

intFCurrentPrimeNumber = count;

}

static void Resize(List<object> list, int size)

{

if (size > list.Count)

while (size > list.Count)

list.Add(new object());

else if (size < list.Count)

while (list.Count - size > 0)

list.RemoveAt(list.Count - 1);

}

static void Resize(List<int> list, int size)

{

if (size > list.Count)

while (size > list.Count)

list.Add(new Int32());

else if (size < list.Count)

while (list.Count - size > 0)

list.RemoveAt(list.Count - 1);

}

int NextPrimeNumber(int cardAOldPrimeNumber)

{

int intVLowerBound, intVUpperBound, intVNextPrimeNumber;

bool boolVIsDivisor;

intVNextPrimeNumber = cardAOldPrimeNumber + cardAOldPrimeNumber / 10 + 1; // увеличиваем на 10 процентов

if ((intVNextPrimeNumber % 2) == 0) intVNextPrimeNumber++;

do

{

boolVIsDivisor = true; intVNextPrimeNumber = intVNextPrimeNumber + 2;

intVLowerBound = 3; intVUpperBound = intVNextPrimeNumber / 3 + 1; // диапазон делителей

while (boolVIsDivisor && (intVLowerBound < intVUpperBound))

{

if ((intVNextPrimeNumber % intVLowerBound) == 0) boolVIsDivisor = false;

else intVLowerBound = intVLowerBound + 2;

}

} while (!boolVIsDivisor);

return intVNextPrimeNumber;

}

//HashFunc

UInt32 HashFunction\_Wainberger(string strALexicalUnit)

{

UInt32 h = 0;

for (int i = 0, l = strALexicalUnit.Length; i < l; i++)

{

h += strALexicalUnit[i]; //Функция хэширования

}

return h; }

int ReHashFunction\_Line(int h, string strALexicalUnit)

{

if (h == 0) h = arrFHashTable.Count / 3;

else if (h == 1) h = arrFHashTable.Count \* 3 / 4;

int i = 1, hi = h;

bool boolVFinish = false;

do

{

if (arrFHashTable[hi] == 0) boolVFinish = true;

else

if (objFHeap.arrFHeapTable[arrFHashTable[hi]].strFLexicalUnit == strALexicalUnit)

boolVFinish = true;

else

{

i++;

hi = (h + i) % (Int32)(arrFHashTable.Count); //функция избавления от коллизий

}

} while (!boolVFinish);

return hi;

}

public void HashIndex(string strALexicalUnit)

{

int h;

h = (Int32)HashFunction\_Wainberger(strALexicalUnit) % (Int32)(arrFHashTable.Count);

intFHashIndex = ReHashFunction\_Line(h, strALexicalUnit);

}

void TableReHashing()

{

int i, j;

List<int> cardarrVHashTableImage = new List<int>();

List<object> arrVUserTableImage = new List<object>();

Resize(cardarrVHashTableImage, arrFHashTable.Count);

if (arrFUserTable != null)

Resize(arrVUserTableImage, arrFHashTable.Count);

for (i = 0; i < arrFHashTable.Count; i++)

{

cardarrVHashTableImage[i] = arrFHashTable[i];

if (arrFUserTable != null) arrVUserTableImage[i] = arrFUserTable[i];

}

arrFHashTable.Clear();

if (arrFUserTable != null) arrFUserTable.Clear();

Resize(arrFHashTable, intFCurrentPrimeNumber);

if (arrFUserTable != null) Resize(arrFUserTable, intFCurrentPrimeNumber);

for (i = 0; i < cardarrVHashTableImage.Count; i++)

{

if (cardarrVHashTableImage[i] != 0)

{

j = cardarrVHashTableImage[i];

HashIndex(objFHeap.arrFHeapTable[j].strFLexicalUnit);

arrFHashTable[intFHashIndex] = j;

if (arrFUserTable != null) arrFUserTable[intFHashIndex] = arrVUserTableImage[i];

THeapItem Th2 = objFHeap.arrFHeapTable[j];

Th2.intFHashIndex = intFHashIndex;

objFHeap.arrFHeapTable[j] = Th2;

}

}

cardarrVHashTableImage.Clear();

if (arrFUserTable != null) arrVUserTableImage.Clear();

}

void Expansion()

{

intFCurrentPrimeNumber = NextPrimeNumber(intFCurrentPrimeNumber);

TableReHashing();

}

object GetUserPointer(int cardILexicalCode)

{

THeapItem Item = objFHeap.arrFHeapTable[cardILexicalCode];

if (Item.intFHashIndex >= cardPTableSize)

{

MessageBox.Show("Индекс пользовательского массива вышел за диапазон!");

return null;

}

else

{

return arrFUserTable[objFHeap.arrFHeapTable[cardILexicalCode].intFHashIndex];

}

}

void SetUserPointer(int cardILexicalCode, object ptrANewPoint)

{

if (objFHeap.arrFHeapTable[cardILexicalCode].intFHashIndex >= cardPTableSize)

MessageBox.Show("Индекс пользовательского массива вышел за диапазон!");

else

arrFUserTable[objFHeap.arrFHeapTable[cardILexicalCode].intFHashIndex] = ptrANewPoint;

}

public void SetUserTable()

{

arrFUserTable = new List<object>();

Resize(arrFUserTable, arrFHashTable.Count);

}

public bool SearchLexicalUnit(string strAlexicalUnit, ref int intALexicalCode)

{

HashIndex(strAlexicalUnit);

if (arrFHashTable[intFHashIndex] == 0) return false;

else

{

intALexicalCode = arrFHashTable[intFHashIndex];

return true;

}

}

public bool AddLexicalUnit(string strALexicalUnit, byte byteAHashTable, ref int intALexicalCode)

{

HashIndex(strALexicalUnit);

if (arrFHashTable[intFHashIndex] != 0)

{

intALexicalCode = arrFHashTable[intFHashIndex];

return true;

}

else

{

if ((intFItemReserve + 2) > (cardPTableSize \* 0.9))

{

Expansion();

HashIndex(strALexicalUnit);

}

objFHeap.AddLexicalUnit(strALexicalUnit, byteAHashTable, intFHashIndex, ref intALexicalCode);

arrFHashTable[intFHashIndex] = intALexicalCode;

intFItemReserve++;

return false;

}

}

public void DeleteLexicalUnit(string strAlexicalUnit)

{

HashIndex(strAlexicalUnit);

if (arrFHashTable[intFHashIndex] != 0)

{

if (arrFUserTable != null)

{

if (arrFUserTable[intFHashIndex] != null)

MessageBox.Show("Удаление из таблицы связанного данного");

else

{

objFHeap.DeleteLexicalUnit(arrFHashTable[intFHashIndex]);

arrFHashTable[intFHashIndex] = 0;

intFItemReserve--;

TableReHashing();

}

}

else

{

objFHeap.DeleteLexicalUnit(arrFHashTable[intFHashIndex]);

arrFHashTable[intFHashIndex] = 0;

intFItemReserve--;

TableReHashing();

}

}

}

public void DeleteLexicalCode(int cardALexicalCode)

{

int VHashIndex;

VHashIndex = objFHeap.arrFHeapTable[cardALexicalCode].intFHashIndex;

if (arrFHashTable[VHashIndex] != 0)

if (arrFUserTable.Count != 0)

if (arrFUserTable[VHashIndex] != null)

MessageBox.Show("Удаление из таблицы связанного данного");

else

{

objFHeap.DeleteLexicalUnit(cardALexicalCode);

arrFHashTable[VHashIndex] = 0;

intFItemReserve--;

TableReHashing();

}

else

{

objFHeap.DeleteLexicalUnit(cardALexicalCode);

arrFHashTable[VHashIndex] = 0;

intFItemReserve--;

TableReHashing();

}

}

public void Save(ref StreamWriter fl)

{

try

{

fl.WriteLine(cardPTableSize.ToString());

fl.WriteLine(intFItemReserve.ToString());

for (int i = 1; i < cardPTableSize; i++)

fl.Write("\t" + arrFHashTable[i].ToString());

fl.Write("\n");

boolIsSaved = true;

}

catch (InvalidCastException)

{ boolIsSaved = false; }

}

public void GetLexicalUnitList(ref List<string> sList)

{

for (int i = 0; i < arrFHashTable.Count; i++) if (arrFHashTable[i] != 0) sList.Add(objFHeap.arrFHeapTable[arrFHashTable[i]].strFLexicalUnit);

}

}

}

**Hashtableslist.cs**

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.IO;

using System.Windows.Forms;

namespace nsHashTables

{

public class CHashTableList

{

private List<THashTable> arrFHashTableList = new List<THashTable>();

private bool boolFIsSaved;

public bool boolFIsLoaded;

private byte byteFTablesSize;

static THeap objFHeap = new THeap();

//------------------------------------------------------------------------------

public CHashTableList(byte byteATableCount)

{

this.byteFTablesSize = byteATableCount;

objFHeap = new THeap();

Resize(arrFHashTableList, byteATableCount);

}

//------------------------------------------------------------------------------

public CHashTableList(string strAFileName)

{

try

{

boolFIsLoaded = Load(strAFileName);

}

catch (InvalidCastException)

{

MessageBox.Show("Ошибка при восстановлении хеш-таблиц из файла !");

boolFIsLoaded = false;

}

}

//------------------------------------------------------------------------------

public byte GetTableNumber(int intALexicalCode) { return objFHeap.arrFHeapTable[intALexicalCode].byteFHashTable; }

//------------------------------------------------------------------------------

public int GetTablesCount()

{

return arrFHashTableList.Count();

}

//------------------------------------------------------------------------------

static void Resize(List<THashTable> list, int size)

{

if (size > list.Count)

while (size > list.Count)

{

list.Add(new THashTable(ref objFHeap));

}

else if (size < list.Count)

while (list.Count - size > 0)

list.RemoveAt(list.Count - 1);

}

//------------------------------------------------------------------------------

static void Resize(List<object> list, int intANewSize)

{

if (intANewSize > list.Count)

while (intANewSize > list.Count)

list.Add(new object());

else if (intANewSize < list.Count)

while (list.Count - intANewSize > 0)

list.RemoveAt(list.Count - 1);

}

//------------------------------------------------------------------------------

static void Resize(List<int> list, int intANewSize)

{

if (intANewSize > list.Count)

while (intANewSize > list.Count)

list.Add(new Int32());

else if (intANewSize < list.Count)

while (list.Count - intANewSize > 0)

list.RemoveAt(list.Count - 1);

}

//------------------------------------------------------------------------------

public object GetUserData(int intALexicalCode)

{

if ((0 < intALexicalCode) && (intALexicalCode < objFHeap.intPFreeItem))

return arrFHashTableList[GetTableNumber(intALexicalCode)].arrFUserTable[intALexicalCode];

else

{

MessageBox.Show("Неверно задан лексический код при чтении пользовательских данных");

return null;

}

}

//------------------------------------------------------------------------------

public void SetUserData(int intALexicalCode, object objAUserData)

{

if ((0 < intALexicalCode) && (intALexicalCode < objFHeap.intPFreeItem))

{

if (arrFHashTableList[GetTableNumber(intALexicalCode)].arrFUserTable.Count > 0)

arrFHashTableList[GetTableNumber(intALexicalCode)].arrFUserTable[intALexicalCode] = objAUserData;

else

MessageBox.Show("Попытка записи адреса в несозданный массив пользовательских данных!");

}

else MessageBox.Show("Неверно задан лексический код при записи пользовательских данных!");

}

//------------------------------------------------------------------------------

public string GetLexicalUnit(int intALexicalCode)

{

if ((0 < intALexicalCode) && (intALexicalCode < objFHeap.intPFreeItem)) return objFHeap.arrFHeapTable[intALexicalCode].strFLexicalUnit;

else

{

MessageBox.Show("Неверно задан лексический код при чтении пользовательских данных!");

return "";

}

}

//------------------------------------------------------------------------------

public bool SearchLexicalUnit(string strALexicalUnit, byte byteATable, ref int intALexicalCode)

{

return arrFHashTableList[byteATable].SearchLexicalUnit(strALexicalUnit, ref intALexicalCode);

}

//------------------------------------------------------------------------------

public bool AddLexicalUnit(string strALexicalUnit, byte byteATable, ref int intALexicalCode)

{

if (byteATable >= arrFHashTableList.Count)

{

if (MessageBox.Show("Увеличить количество таблиц?", "Запрашиваемый индекс таблицы не существует.", MessageBoxButtons.YesNo) == DialogResult.Yes)

Resize(arrFHashTableList, byteATable + 1);

else

return false;

}

return arrFHashTableList[byteATable].AddLexicalUnit(strALexicalUnit, byteATable, ref intALexicalCode);

}

//------------------------------------------------------------------------------

public void DeleteLexicalUnit(string strALexicalUnit, byte byteATable)

{

arrFHashTableList[byteATable].DeleteLexicalUnit(strALexicalUnit);

}

//------------------------------------------------------------------------------

public void DeleteLexicalCode(int intALexicalCode)

{

short T = objFHeap.arrFHeapTable[intALexicalCode].byteFHashTable;

arrFHashTableList[T].DeleteLexicalCode(intALexicalCode);

}

//------------------------------------------------------------------------------

public void SetUserTable(byte byteATable)

{

arrFHashTableList[byteATable].SetUserTable();

}

//------------------------------------------------------------------------------

public void Expantion()

{

Resize(arrFHashTableList, ++byteFTablesSize);

}

//------------------------------------------------------------------------------

public void Save(string strAFileName)

{

try

{

StreamWriter fl = File.CreateText(strAFileName);

fl.WriteLine(byteFTablesSize.ToString());

for (int i = 0; i < byteFTablesSize; i++)

fl.Write(arrFHashTableList[i].arrFHashTable.Count.ToString() + "\t");

fl.WriteLine("");

objFHeap.Save(ref fl);

boolFIsSaved = true;

fl.Close();

}

catch (InvalidDataException)

{ boolFIsSaved = false; }

}

//------------------------------------------------------------------------------

public bool Load(string strAFileName)

{

boolFIsLoaded = false;

try

{

StreamReader sr = new StreamReader(strAFileName);

byteFTablesSize = Convert.ToByte(sr.ReadLine());

if (byteFTablesSize < 1 || byteFTablesSize > 16)

{

MessageBox.Show("Unbelivable count of tables: " + byteFTablesSize.ToString());

return boolFIsLoaded;

}

arrFHashTableList.Clear();

Resize(arrFHashTableList, byteFTablesSize/\*+1\*/);

string line = sr.ReadLine();

char[] delim = { '\t'/\*,'\n'\*/ };

string[] counts = line.Split(delim);

for (int i = 0; i < byteFTablesSize; ++i)

{

arrFHashTableList[i].Init(Convert.ToInt32(counts[i]));

}

objFHeap.Load(ref sr);

sr.Close();

int n = objFHeap.arrFHeapTable.Count;

for (int i = 1; i < n; ++i)

{

THeapItem Item = objFHeap.arrFHeapTable[i];

if (Item.strFLexicalUnit.Length == 0)

break;

arrFHashTableList[Item.byteFHashTable].arrFHashTable[Item.intFHashIndex] = i;

}

boolFIsLoaded = true;

}

catch (InvalidDataException)

{

MessageBox.Show("Ошибка при восстановлении из файла хеш-таблиц!"); boolFIsLoaded = false;

}

return boolFIsLoaded;

}

//------------------------------------------------------------------------------

// отладка

public void HeapTableView(List<string> sList)

{

objFHeap.HeapTableView(sList);

}

//------------------------------------------------------------------------------

public void TableToStringList(byte byteATable, List<string> sList)

{

arrFHashTableList[byteATable].GetLexicalUnitList(ref sList);

}

//------------------------------------------------------------------------------

public int GetHashIndex(byte Table)

{

return arrFHashTableList[Table].intFHashIndex;

}

//------------------------------------------------------------------------------

}

}

**THeap.cs**

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.IO;

using System.Windows.Forms;

namespace nsHashTables

{

public struct THeapItem

{

public string strFLexicalUnit;

public byte byteFHashTable;

public int intFHashIndex;

public THeapItem(string strALexicalUnit, byte byteATable, int intAHashIndex)

{

strFLexicalUnit = strALexicalUnit;

byteFHashTable = byteATable;

intFHashIndex = intAHashIndex;

}

}

public class THeap

{

public List<THeapItem> arrFHeapTable = new List<THeapItem>();

private List<int> arrFDeleted = new List<int>();

private int intFFreeItem;

bool boolIsSaved;

bool boolIsLoaded;

public bool boolPIsSaved { get { return boolIsSaved; } }

public bool boolPIsLoaded { get { return boolIsLoaded; } }

public int intPFreeItem { get { return intFFreeItem; } }

public THeap()

{

Init();

intFFreeItem = 1;

}

protected void Init()

{

arrFDeleted.Clear();

arrFHeapTable.Clear();

int cnt = 4;

Resize(arrFHeapTable, cnt);

}

static void Resize(List<THeapItem> list, int size)

{

if (size > list.Count)

while (size > list.Count)

list.Add(new THeapItem("", 0, 0));

else if (size < list.Count)

while (list.Count - size > 0)

list.RemoveAt(list.Count - 1);

}

static void Resize(List<int> list, int size)

{

if (size > list.Count)

while (size > list.Count)

list.Add(new Int32());

else if (size < list.Count)

while (list.Count - size > 0)

list.RemoveAt(list.Count - 1);

}

static void Resize(List<char> list, int size)

{

if (size > list.Count)

while (size > list.Count)

list.Add('0');

else if (size < list.Count)

while (list.Count - size > 0)

list.RemoveAt(list.Count - 1);

}

public void Expansion()

{

int cardVSize = arrFHeapTable.Count;

cardVSize = cardVSize + cardVSize % 10 + 1;

Resize(arrFHeapTable, cardVSize);

Resize(arrFHeapTable, cardVSize);

}

public void AddLexicalUnit(string strALexicalUnit, byte byteAHashTable, int cardAHashIndex, ref int cardALexicalCode)

{

int intVIndex;

if (arrFDeleted.Count == 0)

{

intVIndex = intFFreeItem;

intFFreeItem++;

if (intFFreeItem >= (Int32)(arrFHeapTable.Count \* 0.9))

Expansion();

}

else

{

intVIndex = arrFDeleted[arrFDeleted.Count - 1];

Resize(arrFDeleted, arrFDeleted.Count - 1);

}

THeapItem Item = arrFHeapTable[intVIndex];

Item.strFLexicalUnit = strALexicalUnit;

Item.byteFHashTable = byteAHashTable;

Item.intFHashIndex = cardAHashIndex;

arrFHeapTable[intVIndex] = Item;

cardALexicalCode = intVIndex;

}

public void DeleteLexicalUnit(int cardALexicalCode)

{

int i;

if (arrFDeleted == null || !arrFDeleted.Any())

i = 0;

else i = arrFDeleted.Count();

Resize(arrFDeleted, i + 1);

arrFDeleted[i] = cardALexicalCode;

THeapItem Item = arrFHeapTable[cardALexicalCode];

Item.strFLexicalUnit = "";

Item.byteFHashTable = 0;

Item.intFHashIndex = 0;

}

public void Save(ref StreamWriter sw)

{

try

{

for (int i = 1; i < arrFHeapTable.Count; i++) //type?

{

if (arrFHeapTable[i].strFLexicalUnit == "")

break;

sw.Write(arrFHeapTable[i].strFLexicalUnit + "\t");

sw.Write(arrFHeapTable[i].byteFHashTable.ToString() + "\t");

sw.WriteLine(arrFHeapTable[i].intFHashIndex.ToString());

}

boolIsSaved = true;

}

catch (Exception) { boolIsSaved = false; }

}

public void Load(ref StreamReader sr)

{

try

{

Init();

int size = arrFHeapTable.Count;

int readSz = 0;

while (true)

{

string line = sr.ReadLine();

if (line == null)

break;

if (++readSz >= size)

{

size \*= 2;

Resize(arrFHeapTable, size);

}

char[] delim = { '\t'/\*,'\n'\*/ };

string[] lines = line.Split(delim);

THeapItem it = arrFHeapTable[readSz];

it.strFLexicalUnit = lines[0];

it.byteFHashTable = Convert.ToByte(lines[1]);

it.intFHashIndex = Convert.ToInt32(lines[2]);

arrFHeapTable[readSz] = it;

}

intFFreeItem = readSz + 1;

boolIsLoaded = true;

}

catch (InvalidCastException)

{ boolIsLoaded = false; }

}

THeapItem GetItem(int i)

{

if (i >= arrFHeapTable.Count)

{

MessageBox.Show("GetИндекс кучи вышел за диапазон!");

THeapItem Item = new THeapItem("", 0, 0);

return Item;

}

else return arrFHeapTable[i];

}

void SetItem(int i, THeapItem NewItem)

{

if (i >= arrFHeapTable.Count)

MessageBox.Show("SetИндекс кучи вышел за диапазон!");

else arrFHeapTable[i] = NewItem;

}

public void HeapTableView(List<string> sList)

{

for (int i = 0; i < arrFHeapTable.Count; i++)

sList.Add(arrFHeapTable[i].strFLexicalUnit);

}

}

}

**Usyntanalyzer.cs**

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

using nsLex;

namespace nsSynt

{

class uSyntAnalyzer

{

private String[] strFSource;

private String[] strFMessage;

public String[] strPSource { set { strFSource = value; } get { return strFSource; } }

public String[] strPMessage { set { strFMessage = value; } get { return strFMessage; } }

public CLex Lex = new CLex();

public void O()

{

if (Lex.enumPToken == TToken.lxmNumber || Lex.enumPToken == TToken.lxmIdentifier)

{

A();

if (Lex.enumPToken == TToken.lxmr)

{

Lex.NextToken();

A();

}

else throw new Exception("Ожидал =");

}

else if (Lex.enumPToken == TToken.lxmLeftParenth)

{

Lex.NextToken();

L();

if (Lex.enumPToken == TToken.lxmRightParenth)

{

throw new Exception("Конец слова, текст верный. Для продолжения ожидается (");

}

else throw new Exception("Ожидалась )");

}

else throw new Exception("Ожидалась (");

}

public void A()

{

if (Lex.enumPToken == TToken.lxmNumber || Lex.enumPToken == TToken.lxmIdentifier)

{

Lex.NextToken();

}

else throw new Exception("ozhidal word or numb");

}

public void L()

{

if (Lex.enumPToken == TToken.lxmTrue || Lex.enumPToken == TToken.lxmFalse)

{

Lex.NextToken();

}

else if (Lex.enumPToken == TToken.lxmIdentifier)

{

U();

}

else if (Lex.enumPToken == TToken.lxmNot)

{

Lex.NextToken();

L();

}

else

{

O();

}

}

public void U()

{

if (Lex.enumPToken == TToken.lxmIdentifier)

{

Lex.NextToken();

}

else throw new Exception("Ожидалось слово");

}

}

**Ulex.cs**

using System;

using System.Collections.Generic;

using System.Linq;

using System.Text;

using System.Threading.Tasks;

namespace nsLex

{

public enum TState { Start, Continue, Finish }; //тип состояния

public enum TCharType { Letter, Digit, EndRow, EndText, Space, ReservedSymbol, LBracket, RBracket, Exclamation, Semicolon, Coma, Question, Not, True, False }; // тип символа

public enum TToken { lxmIdentifier, lxmNumber, lxmUnknown, lxmEmpty, lxmLeftParenth, lxmRightParenth, lxmIs, lxmDot, lxmComma, lxmText, lxmtz, lxmdt, lxmr, lxmrs, lxmls, lxmTrue, lxmFalse, lxmNot };

public class CLex

{

private String[] strFSource; // указатель на массив строк

private String[] strFMessage; // указатель на массив строк

public TCharType enumFSelectionCharType;

public char chrFSelection;

private TState enumFState;

private int intFSourceRowSelection;

private int intFSourceColSelection;

private String strFLexicalUnit;

private TToken enumFToken;

public String[] strPSource { set { strFSource = value; } get { return strFSource; } }

public String[] strPMessage { set { strFMessage = value; } get { return strFMessage; } }

public TState enumPState { set { enumFState = value; } get { return enumFState; } }

public String strPLexicalUnit { set { strFLexicalUnit = value; } get { return strFLexicalUnit; } }

public TToken enumPToken { set { enumFToken = value; } get { return enumFToken; } }

public int intPSourceRowSelection { get { return intFSourceRowSelection; } set { intFSourceRowSelection = value; } }

public int intPSourceColSelection

{

get { return intFSourceColSelection; }

set { intFSourceColSelection = value; }

}

public CLex()

{

}

public void GetSymbol() //метод класса лексический анализатор

{

intFSourceColSelection++; // продвигаем номер колонки

if (intFSourceColSelection > strFSource[intFSourceRowSelection].Length - 1)

{

intFSourceRowSelection++;

if (intFSourceRowSelection <= strFSource.Length - 1)

{

intFSourceColSelection = -1;

chrFSelection = '\0';

enumFSelectionCharType = TCharType.EndRow;

enumFState = TState.Continue;

}

else

{

chrFSelection = '\0';

enumFSelectionCharType = TCharType.EndText;

enumFState = TState.Finish;

}

}

else

{

chrFSelection = strFSource[intFSourceRowSelection][intFSourceColSelection]; //классификация прочитанной литеры

if (chrFSelection == ' ') enumFSelectionCharType = TCharType.Space;

else if (chrFSelection >= 'a' && chrFSelection <= 'd') enumFSelectionCharType = TCharType.Letter;

else if (chrFSelection == '0' || chrFSelection == '1') enumFSelectionCharType = TCharType.Digit;

else if (chrFSelection == '/') enumFSelectionCharType = TCharType.ReservedSymbol;

else if (chrFSelection == '\*') enumFSelectionCharType = TCharType.ReservedSymbol;

else if (chrFSelection == '!') enumFSelectionCharType = TCharType.Exclamation;

else if (chrFSelection == ';') enumFSelectionCharType = TCharType.Semicolon;

else if (chrFSelection == ',') enumFSelectionCharType = TCharType.Coma;

else if (chrFSelection == '?') enumFSelectionCharType = TCharType.Question;

else if (chrFSelection == ';' || chrFSelection == ',' || chrFSelection == '[' || chrFSelection == ']' || chrFSelection == '=' || chrFSelection == ':' || chrFSelection == '(' || chrFSelection == ')' || chrFSelection == 'T' || chrFSelection == 'F' || chrFSelection == 'N') enumFSelectionCharType = TCharType.ReservedSymbol;

else throw new System.Exception("Cимвол вне алфавита");

enumFState = TState.Continue;

}

}

private void TakeSymbol()

{

char[] c = { chrFSelection };

String s = new string(c);

strFLexicalUnit += s;

GetSymbol();

}

public void NextToken()

{

strFLexicalUnit = "";

if (enumFState == TState.Start)

{

intFSourceRowSelection = 0;

intFSourceColSelection = -1;

GetSymbol();

}

while (enumFSelectionCharType == TCharType.Space || enumFSelectionCharType == TCharType.EndRow)

{

GetSymbol();

}

if (chrFSelection == '/')

{

GetSymbol();

if (chrFSelection == '/')

while (enumFSelectionCharType != TCharType.EndRow)

{

GetSymbol();

}

GetSymbol();

}

// Вариант 24

switch (enumFSelectionCharType)

{

case TCharType.Letter:

{

// a b c d

// A | B | B | B | B |

// B | | C | | |

// C |DFin| | | |

// DFin |DFin|DFin|DFin|DFin|

A:

{

if (chrFSelection == 'a' || chrFSelection == 'b' || chrFSelection == 'c' || chrFSelection == 'd')

{

TakeSymbol();

goto B;

}

}

B:

{

if (chrFSelection == 'b')

{

TakeSymbol();

goto C;

}

else throw new Exception("Вторые два символа всегда ba");

}

C:

{

if (chrFSelection == 'a')

{

TakeSymbol();

goto DFin;

}

else throw new Exception("Вторые два символа всегда ba");

}

DFin:

{

if (chrFSelection == 'a' || chrFSelection == 'b' || chrFSelection == 'c' || chrFSelection == 'd')

{

TakeSymbol();

goto DFin;

}

else

{

enumFToken = TToken.lxmIdentifier;

return;

}

}

}

if (chrFSelection == '/')

{

GetSymbol();

if (chrFSelection == '/')

while (enumFSelectionCharType != TCharType.EndRow)

{

GetSymbol();

}

GetSymbol();

}

case TCharType.Digit:

{

// 0 1

// A | B | C |

// B | | D |

// C | E | |

// D | | A |

// E | |FFin |

// FFin | | G |

// G | | H |

// H |FFin | |

A:

if (chrFSelection == '0')

{

TakeSymbol();

goto B;

}

else if (chrFSelection == '1')

{

TakeSymbol();

goto C;

}

else throw new Exception("Ожидался 0 или 1");

B:

if (chrFSelection == '1')

{

TakeSymbol();

goto D;

}

else throw new Exception("Ожидался 1");

C:

if (chrFSelection == '0')

{

TakeSymbol();

goto E;

}

else throw new Exception("Ожидался 0");

D:

if (chrFSelection == '1')

{

TakeSymbol();

goto A;

}

else throw new Exception("Ожидался 1");

E:

if (chrFSelection == '1')

{

TakeSymbol();

goto FFin;

}

else throw new Exception("Ожидалась 1");

FFin:

if (chrFSelection == '1')

{

TakeSymbol();

goto G;

}

else if (enumFSelectionCharType != TCharType.Digit) { enumFToken = TToken.lxmNumber; return; }

else throw new Exception("Ожидалась 1");

G:

if (chrFSelection == '1')

{

TakeSymbol();

goto H;

}

else throw new Exception("Ожидался 1");

H:

if (chrFSelection == '0')

{

TakeSymbol();

goto FFin;

}

else throw new Exception("Ожидался 0");

}

case TCharType.ReservedSymbol:

{

if (chrFSelection == '/')

{

GetSymbol();

if (chrFSelection == '/')

{

while (enumFSelectionCharType != TCharType.EndRow)

GetSymbol();

}

GetSymbol();

}

if (chrFSelection == '(')

{

enumFToken = TToken.lxmLeftParenth;

GetSymbol();

return;

}

if (chrFSelection == ')')

{

enumFToken = TToken.lxmRightParenth;

GetSymbol();

return;

}

if (chrFSelection == '[')

{

enumFToken = TToken.lxmls;

GetSymbol();

return;

}

if (chrFSelection == ']')

{

enumFToken = TToken.lxmrs;

GetSymbol();

return;

}

if (chrFSelection == ',')

{

enumFToken = TToken.lxmComma;

GetSymbol();

return;

}

if (chrFSelection == ':')

{

enumFToken = TToken.lxmdt;

GetSymbol();

return;

}

if (chrFSelection == '=')

{

enumFToken = TToken.lxmr;

GetSymbol();

return;

}

if (chrFSelection == 'T')

{

enumFToken = TToken.lxmTrue;

GetSymbol();

return;

}

if (chrFSelection == 'F')

{

enumFToken = TToken.lxmFalse;

GetSymbol();

return;

}

if (chrFSelection == 'N')

{

enumFToken = TToken.lxmNot;

GetSymbol();

return;

}

break;

}

case TCharType.EndText:

{

enumFToken = TToken.lxmEmpty;

break;

}

}

}

}

}

 