**Отчет по Лабораторной работе №5**

Студентка группы ИУ5-34

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**Формулировка задачи:**

Разработать программу, реализующую вычисление расстояния Левенштейн с использованием алгоритма Вагнера-Фишера.

1. Программа должна быть разработана в виде библиотеки классов на языке C#.

2. Использовать самый простой вариант алгоритма без оптимизации.

3. Дополнительно возможно реализовать вычисление расстояния Дамерау- Левенштейна (с учетом перестановок соседних символов).

4. Модифицировать предыдущую лабораторную работу, вместо поиска подстроки используется вычисление расстояния Левенштейна.

5. Предусмотреть отдельное поле ввода для максимального расстояния. Если расстояние Левенштейна между двумя строками больше максимального, то строки считаются несовпадающими и не выводятся в список результатов.

**Код**

Файл 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 System.IO; // for working with Directories |
|  | using System.Diagnostics; |
|  |  |
|  | namespace Lab5 |
|  | { |
|  | public partial class Lab5Form : Form |
|  | { |
|  | public Lab5Form() |
|  | { |
|  | InitializeComponent(); |
|  | } |
|  |  |
|  | /// <summary> |
|  | /// File content list |
|  | /// </summary> |
|  | List<string> list = new List<string>(); |
|  |  |
|  | public static int Distance(string s1, string s2) |
|  | { |
|  | if ((s1 == null) || (s2 == null)) return -1; |
|  | if ((s1.Length == 0) && (s2.Length == 0)) return 0; |
|  | if (s1.Length == 0) return s2.Length; //if one str is empty return length of another |
|  | if (s2.Length == 0) return s1.Length; |
|  |  |
|  | string str1 = s1.ToUpper(); |
|  | string str2 = s2.ToUpper(); |
|  |  |
|  | int[,] matrix = new int[str1.Length + 1, str2.Length + 1]; //+1 for(int i=1 ...) |
|  |  |
|  | //initialization of first row and column |
|  | for (int i = 0; i <= str1.Length; i++) matrix[i, 0] = i; |
|  | for (int j = 0; j <= str2.Length; j++) matrix[0, j] = j; |
|  |  |
|  | //counting Levenshtein distance |
|  | for (int i = 1; i <= str1.Length; i++) |
|  | { |
|  | for (int j = 1; j <= str2.Length; j++) |
|  | { |
|  | int equalChar = (str1.Substring(i - 1, 1) == str2.Substring(j - 1, 1) ? 0 : 1); //m(s1[i],s2[j]) |
|  | int ins = matrix[i, j - 1] + 1; //insert |
|  | int del = matrix[i - 1, j] + 1; //delete |
|  | int subst = matrix[i - 1, j - 1] + equalChar; //substitute |
|  |  |
|  | matrix[i, j] = Math.Min(Math.Min(ins, del), subst); //matrix element count as min of 3 variants |
|  |  |
|  | //additional part for replacing 2 one by one elements |
|  | if ((i > 1) && (j > 1) && (str1.Substring(i - 1, 1) == str2.Substring(j - 2, 1)) && (str1.Substring(i - 2, 1) == str2.Substring(j - 1, 1))) |
|  | { |
|  | matrix[i, j] = Math.Min(matrix[i, j], matrix[i - 2, j - 2] + equalChar); |
|  | } |
|  | } |
|  | } |
|  | return matrix[str1.Length, str2.Length]; //result is in the lower right cell |
|  | } |
|  |  |
|  | private void choosefile\_Click(object sender, EventArgs e) |
|  | { |
|  | OpenFileDialog fileDialog = new OpenFileDialog(); |
|  | fileDialog.Filter = "текстовые файлы|\*.txt"; |
|  |  |
|  | if (fileDialog.ShowDialog() == DialogResult.OK) |
|  | { |
|  | listBox.Items.Clear(); |
|  | listBoxResults.Items.Clear(); |
|  | Timer2Box.Clear(); |
|  | EnterWordBox.Clear(); |
|  | Stopwatch timer = new Stopwatch(); |
|  | timer.Start(); |
|  |  |
|  | string text = File.ReadAllText(fileDialog.FileName); //read text from file in string |
|  | char[] separators = new char[] { ' ', '.', ',', ':', ';', '«', '»', '!', '?', '/', '\r', '\t', '\n' }; |
|  | string[] textArray = text.Split(separators); |
|  |  |
|  | listBox.BeginUpdate(); |
|  | foreach (string tempStr in textArray) |
|  | { |
|  | string str = tempStr.Trim(); //delete spaces |
|  | if (!list.Contains(str) && str.Length!=0) //repeat and empty string check |
|  | { |
|  | list.Add(str); //add word to list |
|  | //TextBox.Text += str + "\r\n"; |
|  | listBox.Items.Add(str); |
|  | } |
|  | } |
|  | listBox.EndUpdate(); |
|  | timer.Stop(); |
|  | Timer1Box.Text = timer.Elapsed.ToString(); |
|  | WordsCountBox.Text = list.Count.ToString(); |
|  | } |
|  | else MessageBox.Show("Choose file!"); |
|  | } |
|  |  |
|  | private void SearchWordButton\_Click(object sender, EventArgs e) |
|  | { |
|  | listBoxResults.Items.Clear(); //clean listbox with results |
|  | string word = EnterWordBox.Text.Trim(); //word for search |
|  | string maxD = MaxDistBox.Text.Trim(); |
|  |  |
|  | if (!string.IsNullOrWhiteSpace(word) && list.Count != 0 && maxD.Length!=0) |
|  | { |
|  | Stopwatch timer = new Stopwatch(); |
|  | timer.Start(); |
|  | listBoxResults.BeginUpdate(); |
|  | foreach (string str in list) |
|  | { |
|  | int currentWordDist = Distance(str, word); |
|  | if (currentWordDist<=int.Parse(maxD)) |
|  | { |
|  | listBoxResults.Items.Add(str + " (distance " + currentWordDist + ")"); |
|  | } |
|  | } |
|  | listBoxResults.EndUpdate(); |
|  | timer.Stop(); |
|  | Timer2Box.Text = timer.Elapsed.ToString(); |
|  | } |
|  | else MessageBox.Show("Choose file, enter word and maximum distance."); |
|  | } |
|  | } |
|  | } |

Файл Form1.Designer.cs

|  |  |
| --- | --- |
| namespace Lab5 | |
|  | { |
|  | partial class Lab5Form |
|  | { |
|  | /// <summary> |
|  | /// Required designer variable. |
|  | /// </summary> |
|  | private System.ComponentModel.IContainer components = null; |
|  |  |
|  | /// <summary> |
|  | /// Clean up any resources being used. |
|  | /// </summary> |
|  | /// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param> |
|  | protected override void Dispose(bool disposing) |
|  | { |
|  | if (disposing && (components != null)) |
|  | { |
|  | components.Dispose(); |
|  | } |
|  | base.Dispose(disposing); |
|  | } |
|  |  |
|  | #region Windows Form Designer generated code |
|  |  |
|  | /// <summary> |
|  | /// Required method for Designer support - do not modify |
|  | /// the contents of this method with the code editor. |
|  | /// </summary> |
|  | private void InitializeComponent() |
|  | { |
|  | this.SearchWordButton = new System.Windows.Forms.Button(); |
|  | this.choosefile = new System.Windows.Forms.Button(); |
|  | this.listBox = new System.Windows.Forms.ListBox(); |
|  | this.Timer1 = new System.Windows.Forms.Label(); |
|  | this.Timer1Box = new System.Windows.Forms.TextBox(); |
|  | this.label1 = new System.Windows.Forms.Label(); |
|  | this.WordsCountBox = new System.Windows.Forms.TextBox(); |
|  | this.EnterWordLabel = new System.Windows.Forms.Label(); |
|  | this.EnterWordBox = new System.Windows.Forms.TextBox(); |
|  | this.listBoxResults = new System.Windows.Forms.ListBox(); |
|  | this.Timer2Box = new System.Windows.Forms.TextBox(); |
|  | this.Timer2 = new System.Windows.Forms.Label(); |
|  | this.MaxDistBox = new System.Windows.Forms.TextBox(); |
|  | this.MaxDist = new System.Windows.Forms.Label(); |
|  | this.SuspendLayout(); |
|  | // |
|  | // SearchWordButton |
|  | // |
|  | this.SearchWordButton.Location = new System.Drawing.Point(279, 300); |
|  | this.SearchWordButton.Name = "SearchWordButton"; |
|  | this.SearchWordButton.Size = new System.Drawing.Size(82, 29); |
|  | this.SearchWordButton.TabIndex = 1; |
|  | this.SearchWordButton.Text = "Search word"; |
|  | this.SearchWordButton.UseVisualStyleBackColor = true; |
|  | this.SearchWordButton.Click += new System.EventHandler(this.SearchWordButton\_Click); |
|  | // |
|  | // choosefile |
|  | // |
|  | this.choosefile.Location = new System.Drawing.Point(159, 301); |
|  | this.choosefile.Name = "choosefile"; |
|  | this.choosefile.Size = new System.Drawing.Size(84, 28); |
|  | this.choosefile.TabIndex = 2; |
|  | this.choosefile.Text = "Choose file"; |
|  | this.choosefile.UseVisualStyleBackColor = true; |
|  | this.choosefile.Click += new System.EventHandler(this.choosefile\_Click); |
|  | // |
|  | // listBox |
|  | // |
|  | this.listBox.FormattingEnabled = true; |
|  | this.listBox.Location = new System.Drawing.Point(12, 9); |
|  | this.listBox.Name = "listBox"; |
|  | this.listBox.Size = new System.Drawing.Size(123, 316); |
|  | this.listBox.TabIndex = 4; |
|  | // |
|  | // Timer1 |
|  | // |
|  | this.Timer1.AutoSize = true; |
|  | this.Timer1.Location = new System.Drawing.Point(141, 65); |
|  | this.Timer1.Name = "Timer1"; |
|  | this.Timer1.Size = new System.Drawing.Size(39, 13); |
|  | this.Timer1.TabIndex = 5; |
|  | this.Timer1.Text = "Timer1"; |
|  | // |
|  | // Timer1Box |
|  | // |
|  | this.Timer1Box.Location = new System.Drawing.Point(261, 58); |
|  | this.Timer1Box.Name = "Timer1Box"; |
|  | this.Timer1Box.Size = new System.Drawing.Size(100, 20); |
|  | this.Timer1Box.TabIndex = 6; |
|  | // |
|  | // label1 |
|  | // |
|  | this.label1.AutoSize = true; |
|  | this.label1.Location = new System.Drawing.Point(141, 31); |
|  | this.label1.Name = "label1"; |
|  | this.label1.Size = new System.Drawing.Size(87, 13); |
|  | this.label1.TabIndex = 7; |
|  | this.label1.Text = "Number of words"; |
|  | // |
|  | // WordsCountBox |
|  | // |
|  | this.WordsCountBox.Location = new System.Drawing.Point(261, 28); |
|  | this.WordsCountBox.Name = "WordsCountBox"; |
|  | this.WordsCountBox.Size = new System.Drawing.Size(100, 20); |
|  | this.WordsCountBox.TabIndex = 8; |
|  | // |
|  | // EnterWordLabel |
|  | // |
|  | this.EnterWordLabel.AutoSize = true; |
|  | this.EnterWordLabel.Location = new System.Drawing.Point(141, 109); |
|  | this.EnterWordLabel.Name = "EnterWordLabel"; |
|  | this.EnterWordLabel.Size = new System.Drawing.Size(58, 13); |
|  | this.EnterWordLabel.TabIndex = 9; |
|  | this.EnterWordLabel.Text = "Enter word"; |
|  | // |
|  | // EnterWordBox |
|  | // |
|  | this.EnterWordBox.Location = new System.Drawing.Point(261, 102); |
|  | this.EnterWordBox.Name = "EnterWordBox"; |
|  | this.EnterWordBox.Size = new System.Drawing.Size(100, 20); |
|  | this.EnterWordBox.TabIndex = 10; |
|  | // |
|  | // listBoxResults |
|  | // |
|  | this.listBoxResults.FormattingEnabled = true; |
|  | this.listBoxResults.Location = new System.Drawing.Point(144, 213); |
|  | this.listBoxResults.Name = "listBoxResults"; |
|  | this.listBoxResults.Size = new System.Drawing.Size(217, 82); |
|  | this.listBoxResults.TabIndex = 11; |
|  | // |
|  | // Timer2Box |
|  | // |
|  | this.Timer2Box.Location = new System.Drawing.Point(261, 172); |
|  | this.Timer2Box.Name = "Timer2Box"; |
|  | this.Timer2Box.Size = new System.Drawing.Size(100, 20); |
|  | this.Timer2Box.TabIndex = 12; |
|  | // |
|  | // Timer2 |
|  | // |
|  | this.Timer2.AutoSize = true; |
|  | this.Timer2.Location = new System.Drawing.Point(141, 177); |
|  | this.Timer2.Name = "Timer2"; |
|  | this.Timer2.Size = new System.Drawing.Size(39, 13); |
|  | this.Timer2.TabIndex = 13; |
|  | this.Timer2.Text = "Timer2"; |
|  | // |
|  | // MaxDistBox |
|  | // |
|  | this.MaxDistBox.Location = new System.Drawing.Point(261, 137); |
|  | this.MaxDistBox.Name = "MaxDistBox"; |
|  | this.MaxDistBox.Size = new System.Drawing.Size(100, 20); |
|  | this.MaxDistBox.TabIndex = 14; |
|  | // |
|  | // MaxDist |
|  | // |
|  | this.MaxDist.AutoSize = true; |
|  | this.MaxDist.Location = new System.Drawing.Point(141, 144); |
|  | this.MaxDist.Name = "MaxDist"; |
|  | this.MaxDist.Size = new System.Drawing.Size(73, 13); |
|  | this.MaxDist.TabIndex = 15; |
|  | this.MaxDist.Text = "Max. distance"; |
|  | // |
|  | // Lab5Form |
|  | // |
|  | this.AutoScaleDimensions = new System.Drawing.SizeF(6F, 13F); |
|  | this.AutoScaleMode = System.Windows.Forms.AutoScaleMode.Font; |
|  | this.ClientSize = new System.Drawing.Size(426, 372); |
|  | this.Controls.Add(this.MaxDist); |
|  | this.Controls.Add(this.MaxDistBox); |
|  | this.Controls.Add(this.Timer2); |
|  | this.Controls.Add(this.Timer2Box); |
|  | this.Controls.Add(this.listBoxResults); |
|  | this.Controls.Add(this.EnterWordBox); |
|  | this.Controls.Add(this.EnterWordLabel); |
|  | this.Controls.Add(this.WordsCountBox); |
|  | this.Controls.Add(this.label1); |
|  | this.Controls.Add(this.Timer1Box); |
|  | this.Controls.Add(this.Timer1); |
|  | this.Controls.Add(this.listBox); |
|  | this.Controls.Add(this.choosefile); |
|  | this.Controls.Add(this.SearchWordButton); |
|  | this.Name = "Lab5Form"; |
|  | this.Text = "Lab5"; |
|  | this.ResumeLayout(false); |
|  | this.PerformLayout(); |
|  |  |
|  | } |
|  |  |
|  | #endregion |
|  |  |
|  | private System.Windows.Forms.Button SearchWordButton; |
|  | private System.Windows.Forms.Button choosefile; |
|  | private System.Windows.Forms.ListBox listBox; |
|  | private System.Windows.Forms.Label Timer1; |
|  | private System.Windows.Forms.TextBox Timer1Box; |
|  | private System.Windows.Forms.Label label1; |
|  | private System.Windows.Forms.TextBox WordsCountBox; |
|  | private System.Windows.Forms.Label EnterWordLabel; |
|  | private System.Windows.Forms.TextBox EnterWordBox; |
|  | private System.Windows.Forms.ListBox listBoxResults; |
|  | private System.Windows.Forms.TextBox Timer2Box; |
|  | private System.Windows.Forms.Label Timer2; |
|  | private System.Windows.Forms.TextBox MaxDistBox; |
|  | private System.Windows.Forms.Label MaxDist; |
|  | } |
|  | } |

**Результаты работы**

 



 