

**Kauno technologijos universitetas**  
Informatikos fakultetas

## **Objektinis programavimas 2 (P175B123)**

Laboratorinių darbų ataskaita

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Dėstytojas

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# 1. Rekursija (L1)

## 1.1. Darbo užduotis

### LD\_16.Pažintis.

Įvairių miesto mokyklų geriausi moksleiviai važiuoja į ekskursiją. Nors moksleiviai yra iš skirtingų mokyklų, tačiau yra tokių, kurie pažįsta vieni kitus. Moksleiviai nori užmegzti naujas pažintis, tačiau su nepažįstamu moksleiviu galima susipažinti tik tuomet, jeigu yra pažįstamų moksleivių grandinė (pirmas pažįsta antrą, antras pažįsta trečią, trečias pažįsta ketvirtą, tuomet pirmas gali susipažinti su ketvirtu), kuri veda iki nepažįstamo moksleivio. Pirmame tekstiname faile 'U31DUOM.TXT' apie moksleivius pateikta tokia informacija: moksleivio vardas, jo pažįstamų moksleivių kiekis, pažįstamų moksleivių vardai. Kiekvienam moksleiviui tekstiname faile yra skirta po vieną eilutę. Antrame tekstiname faile 'U32DUOM.TXT' vienoje

eilutėje nurodyti dviejų moksleivių vardai. Tokių eilučių gali būti keletas. Abiejuose failuose moksleivių duomenys skiriami bent vienu tarpu.

Nustatykite kiekvienai moksleivių porai iš antrojo failo ar jie jau yra pažįstami, ar jie gali susipažinti (jeigu gali, reikia nurodyti visus bendrus pažįstamus moksleivius), ar jie negali susipažinti (bendro pažįstamo moksleivio neturi). Spausdinkite poros vardus, šalia nurodant atsakymą, kaip žemiau pateiktame pavyzdyje.

Pirmasis duomenų failas 'U31DUOM.TXT':

Rūta	1	Arnoldas
Agnė	3	Nerijus Neda Antanas
Nerijus	1	Agnė
Antanas	2	Agnė Marius
Marius	2	Antanas Neda
Neda	3	Marius Rūta Agnė
Arnoldas	1	Rūta

Antrasis duomenų failas 'U32DUOM.TXT':

Rūta	Nerijus
Agnė	Antanas
Neda	Nerijus

Rezultatų failas 'U3REZ.TXT':

Rūta	Nerijus	negali susipažinti
Agnė	Antanas	jau pažįstami
Neda	Nerijus	bendri pažįstami: Agnė

## 1.2. Grafinės vartotojo sąsajos schema

```
body
Lab01-16  HeaderLabel

Studentų duomenys: StudentLabel
### StudentTable

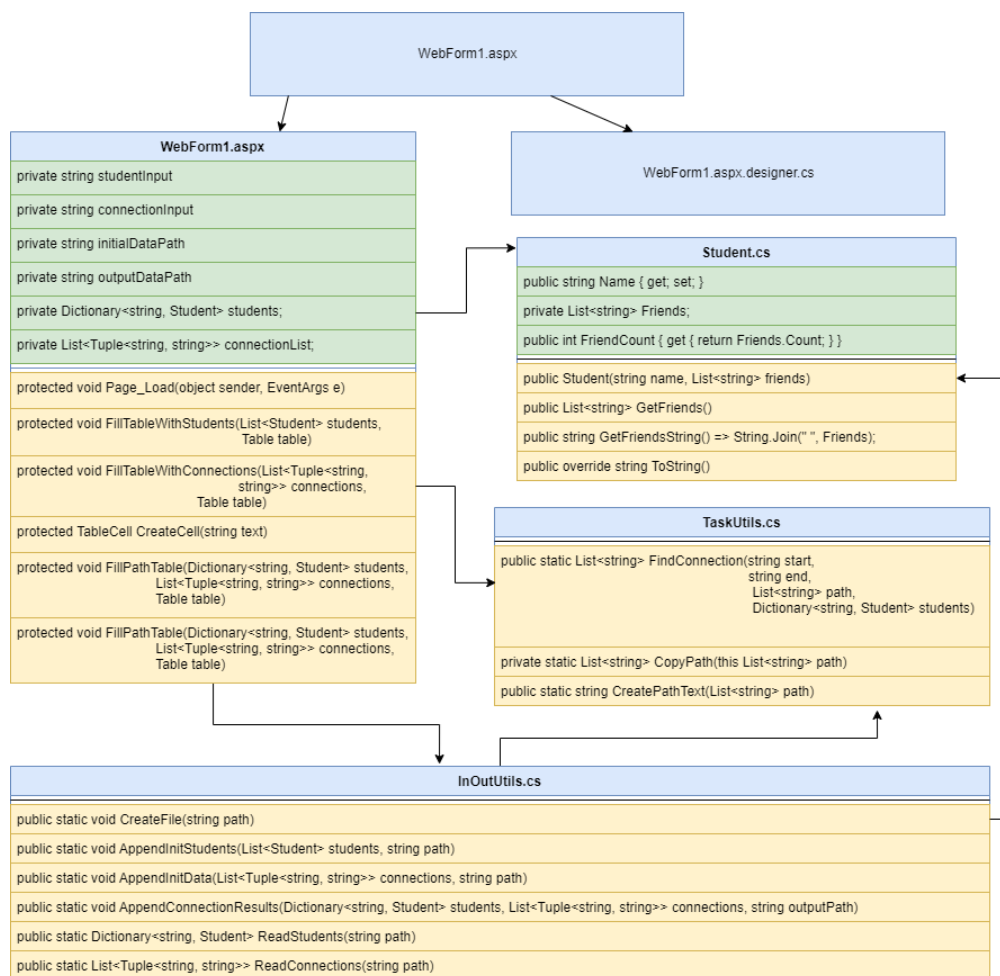
Studentų Ieškomi Junginiai: ConnectionLabel
### ConnectionTable

Rezultatai: OutputLabel
### PathTable
```

## 1.3. Sąsajoje panaudotų komponentų keičiamos savybės

Komponentas	Savybė	Reikšmė
HeaderLabel	Text	"Lab01-16"
StudentLabel	Text	"Studentų duomenys:"
ConnectionLabel	Text	"Studentų Ieškomi Junginiai:"
OutputLabel	Text	"Rezultatai:"

## 1.4. Klasių diagrama



## 1.5. Programos vartotojo vadovas

Atsidarius programą, programa nuskaity App\_Data/students.txt ir App\_Data/connections.txt. Naudojant tą informaciją, parašo visą informaciją į StudentTable, ConnectionTable, PathTable su duota ir apskaičiuota informacija.

## 1.6. Programos tekstas

InOutUtils.cs:

```

using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Web;

namespace Lab01
{
    /// <summary>
    /// InOutUtils class for reading and writing data from/to a file
    /// </summary>
    public static class InOutUtils
    {
        /// <summary>
        /// Creates a new empty file, ready for appending data
    
```

```

/// </summary>
/// <param name="path">path to the file</param>
public static void CreateFile(string path)
{
    using (FileStream fs = new FileStream(path, FileMode.Create))
        new StreamWriter(fs, encoding: System.Text.Encoding.UTF8).Close();
}

/// <summary>
/// appends initial student data to TXT file
/// </summary>
/// <param name="students">List of all students (Student object)</param>
/// <param name="path">path to the file where information will be
appended</param>
public static void AppendInitStudents(List<Student> students, string path)
{
    using (StreamWriter sr = new StreamWriter(path, append: true))
    {
        sr.WriteLine("Studentai ir jų draugai");
        sr.WriteLine($"{ "Studentas",-20} | { "Draugų kiekis",-20} | { "Draugai:."}");
        foreach (Student student in students)
            sr.WriteLine(student);
        sr.WriteLine();
    }
}

/// <summary>
/// Appends initial connection data to output file
/// </summary>
/// <param name="connections">List of Tuples(string, string) that work as nodes
from student a to student b while using DFS</param>
/// <param name="path">path to the file where to append initial data</param>
public static void AppendInitData(List<Tuple<string, string>> connections, string
path)
{
    using (StreamWriter sr = new StreamWriter(path, append: true))
    {
        sr.WriteLine("Studentai ir jų ieškomi draugai:");
        sr.WriteLine($"{ "Studentas",-20} | { "Ieškomas draugas",-20}");
        foreach (Tuple<string, string> connection in connections)
            sr.WriteLine($"{connection.Item1,-20} | {connection.Item2,-20}");
        sr.WriteLine();
    }
}

/// <summary>
/// Appends output connection data to output file
/// </summary>
/// <param name="students">Dictionary, key -> string, name of the student, value
-> Student class object of the student</param>
/// <param name="connections">List of tuples(string, string) that is compromised
of student names that work as nodes that are used for DFS</param>
/// <param name="outputPath">output path to the txt file where data will be
APPENDED</param>
public static void AppendConnectionResults(Dictionary<string, Student> students,
List<Tuple<string, string>> connections, string outputPath)
{
    using (StreamWriter sr = new StreamWriter(outputPath))
    {
        sr.WriteLine("Draugai ir jų junginiai, bei keliai:");
        sr.WriteLine($"{ "Draugas",-20} | { "Ieškomas draugas:",-20} | { "Kelias:."}");
        foreach (Tuple<string, string> connection in connections)
        {
            List<string> studentPath = new List<string>();
            studentPath.Add(connection.Item1);

```

```

        studentPath = TaskUtils.FindConnection(connection.Item1,
connection.Item2, studentPath, students);
        string pathText = TaskUtils.CreatePathText(studentPath);
        sr.WriteLine($"{connection.Item1,-20}|{connection.Item2,-
20}|{pathText}");
    }
}

/// <summary>
/// Creates a name to Student class object relation dictionary
/// </summary>
/// <param name="path">Path to the the text file containing the data</param>
/// <returns>Dictionary(key -> string, value -> Student class object) </returns>
public static Dictionary<string, Student> ReadStudents(string path)
{
    Dictionary<string, Student> students = new Dictionary<string, Student>();
    using (StreamReader sr = new StreamReader(path))
    {
        string line;
        while ((line = sr.ReadLine()) != null)
        {
            string[] elements = line.Split(' ');
            string name = elements[0];
            List<string> friends = new List<string>();
            for (int i = 2; i < elements.Length; i++)
                friends.Add(elements[i]);

            students.Add(name, new Student(name, friends));
        }
    }
    return students;
}

/// <summary>
/// Gets the connections of students
/// </summary>
/// <param name="path">.txt file to the input</param>
/// <returns>List of Tuples(string, string)</returns>
public static List<Tuple<string, string>> ReadConnections(string path)
{
    List<Tuple<string, string>> connctions = new List<Tuple<string, string>>();
    using (StreamReader sr = new StreamReader(path))
    {
        string line;
        while ((line = sr.ReadLine()) != null)
        {
            string[] elements = line.Split(' ');
            connctions.Add(new Tuple<string, string>(elements[0], elements[1]));
        }
    }

    return connctions;
}
}
}

```

TaskUtils.cs:

```

using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Web;

```



```

namespace Lab01
{
    /// <summary>
    /// TaskUtils class for extra (backend) computation functions
    /// </summary>
    public static class TaskUtils
    {
        /// <summary>
        /// Recursive implementation of DFS
        /// </summary>
        /// <param name="start">Start of the person</param>
        /// <param name="end">End of the person</param>
        /// <param name="path">path to current position from initial start</param>
        /// <param name="students">Dictionary, key: string (name of the student), value
        Student class object</param>
        /// <returns>List of strings, that create a path from student a to b</returns>
        public static List<string> FindConnection(string start, string end, List<string>
path, Dictionary<string, Student> students)
        {
            Student curr = students[start];
            List<string> outputPath = null;
            foreach(string next in curr.GetFriends())
            {
                if (next == end)
                    return path;

                else if (path.Contains(next)) // Checks if the current node has been
visited, so it does not loop
                    continue;

                Student nextStudent = students[next];
                List<string> pathCopy = path.CopyPath();
                pathCopy.Add(next);

                List<String> pathToEnd = FindConnection(next, end, pathCopy, students);
// Recursion Call

                if(outputPath == null || (pathToEnd != null && pathToEnd.Count <
outputPath.Count))
                    outputPath = pathToEnd;

            }

            return outputPath; // Did not found the path
        }

        /// <summary>
        /// Deep copies a string list
        /// </summary>
        /// <param name="path">string list</param>
        /// <returns>string list</returns>
        private static List<string> CopyPath(this List<string> path)
        {
            List<string> copy = new List<string>();
            foreach (string s in path)
                copy.Add(s);

            return copy;
        }

        /// <summary>
        /// Creates connection depending on the path
        /// </summary>
        /// <param name="path"> List of strings that the path is compromised of </param>
        /// <returns>a string form of the path from student a to student b</returns>
        public static string CreatePathText(List<string> path)
    }
}

```

```

    {
        if (path == null)
            return "negali susipažinti";
        else if (path.Count == 1)
            return "jau pažįstami";
        else
        {
            path.RemoveAt(0);
            return $"bendri pažįstami: {String.Join(" ", path)}";
        }
    }
}

```

Student.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab01
{
    /// <summary>
    /// Student Class Data Object that stores the name and connection
    /// </summary>
    public class Student
    {
        public string Name { get; set; }
        private List<string> Friends;
        public int FriendCount { get { return Friends.Count; } }

        /// <summary>
        /// Constructor
        /// </summary>
        public Student(string name, List<string> friends)
        {
            Name = name;
            Friends = new List<string>();
            foreach (string friend in friends)
                Friends.Add(friend);
        }

        /// <summary>
        /// Copies friends
        /// </summary>
        /// <returns>Deep copy of Friends List</returns>
        public List<string> GetFriends()
        {
            List<string> friendList = new List<string>();
            foreach (string friend in Friends)
                friendList.Add(friend);

            return friendList;
        }

        /// <summary>
        /// Transforms Friends list into a string separated by spaces
        /// </summary>
        /// <returns>string of all friends</returns>
        public string GetFriendsString() => String.Join(" ", Friends);

        /// <summary>

```

```

    /// ToString Override
    /// </summary>
    /// <returns>string version of the object: Name, Friend Count, Friends</returns>
    public override string ToString()
    {
        return $"{Name,-20}|{Friends.Count,20}|{GetFriendsString()}";
    }
}

```

WebForm1.aspx:

```

<%@ Page Language="C#" AutoEventWireup="true" CodeBehind="WebForm1.aspx.cs"
Inherits="Lab01.WebForm1" %>

<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head runat="server">
    <title></title>
</head>
<body>
    <form id="form1" runat="server">
        <div>
            <asp:Label ID="HeaderLabel" runat="server" Text="Lab01-16"></asp:Label>
            <br />
            <br />
            <asp:Label ID="StudentLabel" runat="server" Text="Studentų
duomenys:"></asp:Label>
            <br />
            <asp:Table ID="StudentTable" runat="server">
            </asp:Table>
            <br />
            <asp:Label ID="ConnectionLabel" runat="server" Text="Studentų Ieškomi
Junginiai:"></asp:Label>
            <br />
            <asp:Table ID="ConnectionTable" runat="server">
            </asp:Table>
            <br />
            <asp:Label ID="OutputLabel" runat="server" Text="Rezultatai:"></asp:Label>
            <br />
            <asp:Table ID="PathTable" runat="server">
            </asp:Table>
        </div>
    </form>
</body>
</html>

```

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI;
using System.Web.UI.WebControls;

```

```
namespace Lab01
```

```

{
    public partial class WebForm1 : System.Web.UI.Page
    {
        private string studentInput = @"App_Data/students.txt";
        private string connectionInput = @"App_Data/connections.txt";
        private string initialDataPath = @"App_Data/initial_data.txt";
        private string outputDataPath = @"App_Data/result.txt";
    }
}

```

```

private Dictionary<string, Student> students;
private List<Tuple<string, string>> connectionList;
protected void Page_Load(object sender, EventArgs e)
{
    // Initial Data
    InOutUtils.CreateFile(Server.MapPath(initialDataPath));
    students = InOutUtils.ReadStudents(Server.MapPath(studentInput));

    FillTableWithStudents(new List<Student>(students.Values),
                          StudentTable);

    InOutUtils.AppendInitStudents(new List<Student>(students.Values),
                                  Server.MapPath(initialDataPath));

    connectionList = InOutUtils.ReadConnections(Server.MapPath(connectionInput));

    FillTableWithConnections(connectionList,
                             ConnectionTable);

    InOutUtils.AppendInitData(connectionList,
                              Server.MapPath(initialDataPath));

    FillPathTable(students, connectionList, PathTable);
    InOutUtils.CreateFile(Server.MapPath(outputDataPath));

    InOutUtils.AppendConnectionResults(students,
                                       connectionList,
                                       Server.MapPath(outputDataPath));
}

/// <summary>
/// Used to show initial Student Data
/// </summary>
/// <param name="students">List Student data type</param>
/// <param name="table">Table Object data type</param>
protected void FillTableWithStudents(List<Student> students, Table table)
{
    TableRow row = new TableRow();
    row.Cells.Add(CreateCell("Studentas"));
    row.Cells.Add(CreateCell("Draugų Kiekis"));
    row.Cells.Add(CreateCell("Studentų Draugai:"));
    table.Rows.Add(row);

    foreach (Student student in students)
    {
        row = new TableRow();
        row.Cells.Add(CreateCell(student.Name));
        row.Cells.Add(CreateCell(student.FriendCount.ToString()));
        row.Cells.Add(CreateCell(student.GetFriendsString()));
        table.Rows.Add(row);
    }
}

/// <summary>
/// Used to show initial connection data
/// </summary>
/// <param name="connections">List of Tuples compromised of string, string
containing the initial node and end node to use for DFS</param>
/// <param name="table">Table object data type</param>
protected void FillTableWithConnections(List<Tuple<string,
string>> connections,
                                       Table table)
{
    TableRow row = new TableRow();

```

```

        row.Cells.Add(CreateCell("Draugas"));
        row.Cells.Add(CreateCell("Ieškomas Draugas"));
        table.Rows.Add(row);

        foreach (Tuple<string, string> connection in connections)
        {
            row = new TableRow();
            row.Cells.Add(CreateCell(connection.Item1));
            row.Cells.Add(CreateCell(connection.Item2));
            table.Rows.Add(row);
        }
    }

    /// <summary>
    /// Creates A cell with provided Text
    /// </summary>
    /// <param name="text">text to be added to the Cell.text param</param>
    /// <returns>TableCell object</returns>
    protected TableCell CreateCell(string text)
    {
        TableCell cell = new TableCell();
        cell.Style.Add("padding", "5px");
        cell.Text = text;
        return cell;
    }

    /// <summary>
    /// Fills the table with paths from student a to b
    /// </summary>
    /// <param name="students"> Dictionary, key -> string of the student, value ->
student object</param>
    /// <param name="connections">List of Tuples compromised of string, string
containing the initial node and end node to use for DFS</param>
    /// <param name="table">Table object where the data will be added</param>
    protected void FillPathTable(Dictionary<string, Student> students,
                                List<Tuple<string, string>> connections,
                                Table table)
    {
        TableRow row = new TableRow();
        row.Cells.Add(CreateCell("Draugas"));
        row.Cells.Add(CreateCell("Ieškomas Draugas"));
        row.Cells.Add(CreateCell("Kelias: "));
        table.Rows.Add(row);

        foreach (Tuple<string, string> connection in connections)
        {
            List<string> path = new List<string>();
            path.Add(connection.Item1);
            path = TaskUtils.FindConnection(connection.Item1,
                                           connection.Item2,
                                           path, students);

            string pathText = TaskUtils.CreatePathText(path);

            row = new TableRow();
            row.Cells.Add(CreateCell(connection.Item1));
            row.Cells.Add(CreateCell(connection.Item2));
            row.Cells.Add(CreateCell(pathText));
            table.Rows.Add(row);
        }
    }
}

```

## 1.7. Pradiniai duomenys ir rezultatai

Pradiniai Duomenys 1:

students.txt:

Rūta 1 Arnoldas  
Agnė 3 Nerijus Neda Antanas  
Nerijus 1 Agnė  
Antanas 2 Agnė Marius  
Marius 2 Antanas Neda  
Neda 3 Marius Rūta Agnė  
Arnoldas 1 Rūta

connections.txt:

Rūta Nerijus  
Agnė Antanas  
Neda Nerijus

Rezultatai 1:

Vartotojo sąsaja:

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Studentų duomenys:

Studentas	Draugų Kiekis	Studentų Draugai:
Rūta	1	Arnoldas
Agnė	3	Nerijus Neda Antanas
Nerijus	1	Agnė
Antanas	2	Agnė Marius
Marius	2	Antanas Neda
Neda	3	Marius Rūta Agnė
Arnoldas	1	Rūta

Studentų Ieškomi Junginiai:

Draugas	Ieškomas Draugas
Rūta	Nerijus
Agnė	Antanas
Neda	Nerijus

Rezultatai:

Draugas	Ieškomas Draugas	Kelias:
Rūta	Nerijus	negali susipažinti
Agnė	Antanas	jau pažįstami
Neda	Nerijus	bendri pažįstami: Agnė

initial\_data.txt:

Studentai ir jų draugai

Studentas	Draugų kiekis	Draugai:
Rūta	1	Arnoldas
Agnė	3	Nerijus Neda Antanas
Nerijus	1	Agnė
Antanas	2	Agnė Marius
Marius	2	Antanas Neda
Neda	3	Marius Rūta Agnė
Arnoldas	1	Rūta

Studentai ir jų ieškomi draugai:

Studentas	Ieškomas draugas
Rūta	Nerijus
Agnė	Antanas
Neda	Nerijus

Result.txt:

Draugai ir jų junginiai, bei keliai:

Draugas	Ieškomas draugas:	Kelias:
Rūta	Nerijus	negali susipažinti
Agnė	Antanas	jau pažįstami
Neda	Nerijus	bendri pažįstami: Agnė

Pradiniai Duomenys 2:

students.txt:

a 2 g b  
b 2 a c  
c 2 b f  
d 1 e  
e 1 d  
f 2 h c  
g 2 a h  
h 2 g f

connections.txt:

a f  
a b  
a e



Rezultatai 2:

Vartotojo Sąsaja:

### Lab01-16

Studentų duomenys:

Studentas	Draugų Kiekis	Studentų Draugai:
a	2	g b
b	2	a c
c	2	b f
d	1	e
e	1	d
f	2	h c
g	2	a h
h	2	g f

Studentų Ieškomi Junginiai:

Draugas	Ieškomas Draugas
a	f
a	b
a	e

Rezultatai:

Draugas	Ieškomas Draugas	Kelias:
a	f	bendri pažįstami: g h
a	b	jau pažįstami
a	e	negali susipažinti

Initial\_data.txt:

Studentai ir jų draugai

Studentas	Draugų kiekis	Draugai:
a		2 g b
b		2 a c
c		2 b f
d		1 e
e		1 d
f		2 h c
g		2 a h
h		2 g f

Studentai ir jų ieškomi draugai:

Studentas	Ieškomas draugas
a	f
a	b
a	e

result.txt:

Draugai ir jų junginiai, bei keliai:

Draugas	Ieškomas draugas:	Kelias:
a	f	bendri pažįstami: g h
a	b	jau pažįstami
a	e	negali susipažinti

## 1.8. Dėstytojo pastabos

1. Reiktų šiek tiek pakeisti ataskaitos įvardinimą. Jūsų grupė nėra IFF14.
2. Klasių diagramai vien tik Visual Studio įrankio neužtenka. Jis ne neatskleidžia pilnai klasės vidaus.
3. Garmatinės klaidos "su duotą ir apskaičiuotą "
4. • Įvedimo ir išvedimo metodus, veikiančius su tekstiniu failu, talpinkite į public static class InOutUtils.
5. Parametrus reikia komentuoti visiems metodams // /// appends students to TXT file  
/// public static void AppendInitialStudentData(List students, string path)
6. Čia tik rodyklės perrašymas:

```
public Student(string name, List friends)
```

```
{
```

```
    Name = name;
```

```
    Friends = friends;
```

## 2. Dinaminis atminties valdymas (L2)

### 2.1. Darbo užduotis

LD\_16. **Mokesčiai.** Kiekvieną mėnesį gyventojai moka komunalinius mokesčius. Suraskite, kurį mėnesį ir kokie komunaliniai mokesčiai kainavo pigiausiai. Apskaičiuokite, kokią pinigų sumą komunaliniams mokesčiams išleido visi gyventojai. Sudarykite sąrašą gyventojų (pavardė ir vardas, adresas), kurie už komunalines paslaugas per metus mokėjo sumą, mažesnę už vidutinę. Sąrašas turi būti surikiuotas pagal gyventojų adresus, pavardes ir vardus abėcėlės tvarka.

Duomenys:

- tekstiniame faile U16a.txt yra informacija apie komunalines paslaugas: paslaugos kodas, paslaugos pavadinimas, paslaugos vieno mėnesio vieno vieneto kaina;
- tekstiniame faile U16b.txt yra informacija apie gyventojus: pavardė ir vardas, adresas, mėnuo už kurį mokama, komunalinės paslaugos kodas, sunaudotų per mėnesį vienetų kiekis.

Pašalinkite iš sąrašo gyventojus, kurie nemokėjo už nurodytą paslaugą, nurodytą mėnesį (duomenys įvedami klaviatūra).

### 2.2. Grafinės vartotojo sąsajos schema

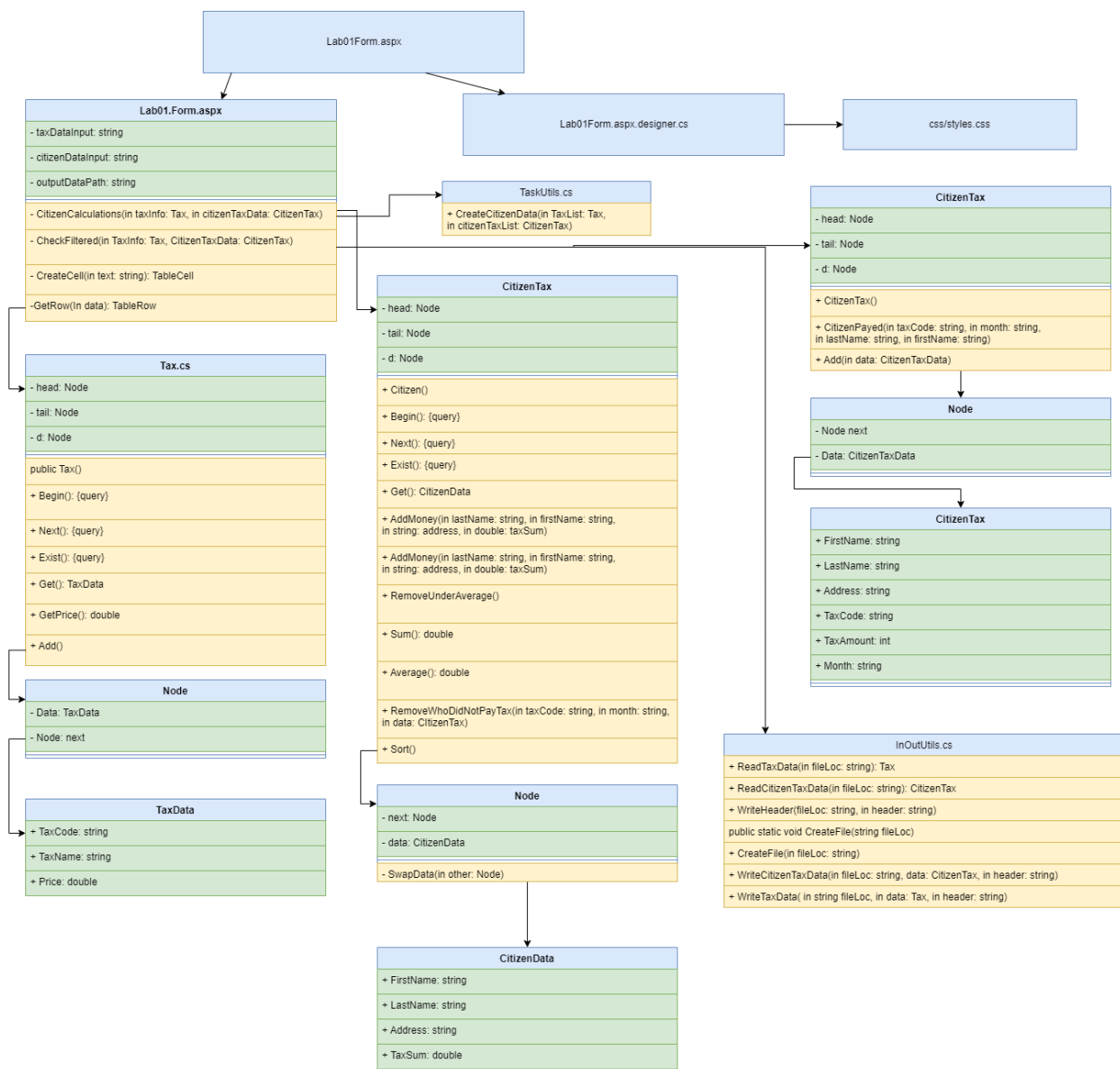
The screenshot shows a web application interface with a dark background. At the top, it says "LAB02 U16". Below this, there are two sections for uploading data. The first section is "Tax Info U16a.txt" with a text input field and a "Browse..." button. The second section is "Every Citizen Tax Data U16b.txt" with a text input field and a "Browse..." button. Below these, there is a "Submit New Data" button. Further down, there are two sections for initial data: "U16a.txt Initial data:" followed by "###" and "U16b.txt Initial data:" followed by "###".

The screenshot shows a web application interface for analyzing tax data. It starts with the title "All Citizen taxes over the months" followed by "###". Below this, there are two labels: "[AverageTax]" and "[TotalTaxSum]". Then, it says "Above Average Tax:" followed by "###". Below that, it says "Filtered data:" followed by "###". At the bottom, there are two input fields: "Tax Code:" and "Month:". Below these fields is a "Submit" button.

### 2.3. Sąsajoje panaudotų komponentų keičiamos savybės

Komponentas	Savybė	Reikšmė
HeaderLabel	Text	LAB02 U16
Label1	Text	Tax InfoU16a.txt:
Label2	Text	Every Citizen Tax Data U16b:
InitTaxLabel	Text	U16a.txt Initial data:
InitCitizenLabel	Text	U16b.txt Initial data:
CitizenTaxLabel	Text	All Citizen taxes over the months
AverageTax	Text	“”
TotalTaxSum	Text	“”
CitizenTaxLabel0	Text	Above Average Tax:
FilterData	Text	Filtered data:
ButtonFilter	Text	Tax Code:
DataButton	Text	Month:

## 2.4. Klasių diagrama



## 2.5. Programos vartotojo vadovas

Jeigu neranda failų visų duombazėje, programa paprašo failų. Jeigu randa tik vieną pradinį failą, rodo tik jį ir prašo likusių failų. Kai abu failai atsiranda duombazėje, užkrauna skaičiavimus. Apskaičiuoja vidutinę mokesčių kainą, sumą visų ir individualių žmonių. Tekstas yra rikiuojamas A-Z pagal: adresą, pavardę, vardą. Kodas leidžia filtruoti žmones, kurie mokėjo nurodytą mėnesį (mėnuo yra string) už nurodytus mokesčius naudojant „Tax Code“ (string). Prie filtered lentelės prideda tik filtruotus duomenis.

## 2.6. Programos tekstas

CitizenData.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI.WebControls;

namespace Lab02
{
    /// <summary>
    /// TaskUtils static class for helper functions
    /// </summary>
    public static class TaskUtils
    {
        /// <summary>
        /// Creates Citizen class object using Tax object
        /// </summary>
        /// <param name="TaxList">Tax class object</param>
        /// <param name="citizenTaxList">CitizenTax object</param>
        /// <returns>Citizen class object</returns>
        public static Citizen CreateCitizenData(Tax TaxList, CitizenTax citizenTaxList)
        {
            Citizen citizens = new Citizen();
            for (citizenTaxList.Begin(); citizenTaxList.Exist(); citizenTaxList.Next())
            {
                CitizenTaxData citizenTaxData = citizenTaxList.Get();
                for (TaxList.Begin(); TaxList.Exist(); TaxList.Next())
                {
                    TaxData taxData = TaxList.Get();
                    if(citizenTaxData.TaxCode == taxData.TaxCode)
                    {
                        citizens.AddMoney(citizenTaxData.LastName,
citizenTaxData.FirstName, citizenTaxData.Address, (double)taxData.Price *
citizenTaxData.TaxAmount);
                    }
                }
            }

            return citizens;
        }
    }
}

```

Citizen.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI.WebControls;

namespace Lab02
{
    /// <summary>
    /// Citizen class object
    /// </summary>
    public class Citizen
    {
        private Node head;
        private Node tail;
        private Node d;

        /// <summary>
        /// Construcotr
    }
}

```

```

/// </summary>
/// <param name="head"></param>
/// <param name="tail"></param>
public Citizen()
{
    head = null;
    tail = null;
}

/** Address of the head of the list is assigned */
public void Begin()
{ d = head; }
/** Interface variable gets address of the next entry*/
public void Next()
{ d = d.next; }
/** Return true, if list is empty*/
public bool Exist()
{ return d != null; }
//-----
/** Return data according to the interface address*/
public CitizenData Get()
{ return d.Data; }

/// <summary>
/// Returns Citizen with keys
/// </summary>
/// <param name="lastName">Last Name of Citizen</param>
/// <param name="firstName">First Name of Citizen</param>
/// <param name="address">Address of citizen</param>
/// <returns></returns>
public CitizenData Get(string lastName, string firstName, string address)
{
    // If Citizen exists, adds sum to his current balance
    for (Begin(); Exist(); Next())
    {
        CitizenData curr = Get();
        if (curr.LastName == lastName && curr.FirstName == firstName && curr.Address
== address)
        {
            return curr;
        }
    }
    return null;
}

/// <summary>
/// Adds CitizenData to Citizen Linked List
/// </summary>
/// <param name="data">CitizenData object</param>
internal void Add(CitizenData data)
{
    // If No citizen was found, adds the citizen to Linked List
    if (head == null)
    {
        head = new Node(data, null);
        tail = head;
    }
    else
    {
        tail.next = new Node(data, null);
        tail = tail.next;
    }
}

```

```

/// <summary>
/// Removes citizens from linked list who pay below average taxes
/// </summary>
public void RemoveUnderAverage()
{
    if (head == null)
        return;

    Node prev = head;
    Node curr = head.next;
    double average = GetAverage();

    while(curr != null)
    {
        if(curr.Data.TaxSum < average)
        {
            prev.next = curr.next;
            curr = curr.next;
        }
        else
        {
            curr = curr.next;
            prev = prev.next;
        }
    }

    RemoveUnderAverageHead(average);
    ResetTail();
}

/// <summary>
/// Checks if head/start of linked list is below average. If true removes
/// </summary>
/// <param name="average">Average tax sum of a citizen</param>
private void RemoveUnderAverageHead(double average)
{
    Node curr = head;
    while(curr.Data.TaxSum < average)
    {
        curr = curr.next;
    }
    head = curr;
}

/// <summary>
/// Resets tail after removing elements
/// </summary>
private void ResetTail()
{
    Node curr = head;
    if (curr == null)
    {
        tail = null;
        return;
    }

    while(curr.next != null)
    {
        curr = curr.next;
    }
    tail = curr;
}

/// <summary>
/// Returns the total amount citizens pay for taxes

```



```

/// </summary>
/// <returns></returns>
public double Sum()
{
    Node curr = head;
    double sum = 0;
    while (curr != null)
    {
        sum += curr.Data.TaxSum;
        curr = curr.next;
    }
    return sum;
}

public double GetAverage()
{
    Node curr = head;
    double sum = 0;
    int i = 0;
    while (curr != null)
    {
        sum += curr.Data.TaxSum;
        i++;
        curr = curr.next;
    }

    if (i == 0)
        return 0;
    else
        return (double)sum / i;
}

/// <summary>
/// Removes citizens who did not pay taxes specified month
/// </summary>
/// <param name="taxCode"> Tax Code of the tax</param>
/// <param name="month">Specified Month </param>
/// <param name="data">CitizenTaxData to see what citizen payed what tax at the
specified month</param>
public void RemoveWhoDidNotPayTax(string taxCode, string month, CitizenTax data)
{
    {
        if (head == null)
            return;

        Node prev = head;
        Node curr = head.next;

        while (curr != null)
        {
            // Checks if the citizen has payed Taxes in CitizenTaxData on specified
            Month
            if (curr != null && data.CitizenPaid(taxCode, month, curr.Data.LastName,
curr.Data.FirstName) == false)
            {
                prev.next = curr.next;
                curr = curr.next;
            }
            else
            {
                curr = curr.next;
                prev = prev.next;
            }
        }

        RemoveWhoDidNotPayTaxHead(taxCode, month, data);
    }
}

```

```

        ResetTail();
    }
}

/// <summary>
/// Checks first/start/head element of the linked list if the tax was paid
/// </summary>
/// <param name="taxCode">Tax code of the specified tax</param>
/// <param name="month">specified month to check</param>
/// <param name="data">CitizenTaxData to check if the first element of the linked list
payed for taxes</param>
private void RemoveWhoDidNotPayTaxHead(string taxCode, string month, CitizenTax data)
{
    Node curr = head;
    // Checks if the citizen has payed Taxes in CitizenTaxData on specified Month
    while (curr != null && data.CitizenPaid(taxCode, month, curr.Data.LastName,
curr.Data.FirstName) == false)
    {
        curr = curr.next;
    }
    head = curr;
}

/// <summary>
/// Sorts LinkedList A-Z using keys: address, last name, first name. Does data swap
instead of pointers.
/// </summary>
public void Sort()
{
    Node timer = head;
    while(timer != null)
    {
        Node curr = head;
        Node next = head.next;
        while(next != null)
        {
            if (curr.Data.CompareTo(next.Data) > 0)
            {
                curr.SwapData(next);
            }
            curr = next;
            next = next.next;
        }
        timer = timer.next;
    }
}

/// <summary>
/// Node class to be used to save every citizen seperately
/// </summary>
class Node
{
    public CitizenData Data { get; set; }
    public Node next { get; set; }

    /// <summary>
    /// Constructor
    /// </summary>
    /// <param name="data">CitizenData pointer</param>
    public Node(CitizenData data, Node _next)
    {
        Data = data;
        next = _next;
    }
}

```

```

        /// <summary>
        /// Swaps the DATA, keeps the pointers
        /// </summary>
        /// <param name="other">Other node to be swapped with</param>
        public void SwapData(Node other)
        {
            CitizenData temp = Data;
            Data = other.Data;
            other.Data = temp;
        }
    }
}

```

CitizenTaxData.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab02
{
    public class CitizenTaxData
    {
        public string FirstName { get; set; }
        public string LastName { get; set; }
        public string Address { get; set; }
        public string TaxCode { get; set; }
        public int TaxAmount { get; set; }
        public string Month { get; set; }

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="lastName">last name of citizen</param>
        /// <param name="firstName">first name of citizen</param>
        /// <param name="address">address of the citizen</param>
        /// <param name="month">the month the tax was paid</param>
        /// <param name="taxCode">tax code</param>
        /// <param name="taxAmount">tax amount</param>
        public CitizenTaxData(string lastName, string firstName, string address, string
month, string taxCode, int taxAmount)
        {
            FirstName = firstName;
            LastName = lastName;
            Address = address;
            TaxCode = taxCode;
            TaxAmount = taxAmount;
            Month = month;
        }

        public override string ToString()
        {
            return $"{LastName,-20} {FirstName,-20} {Address,-20} {Month,-15} {TaxCode,-
20} {TaxAmount,10} ";
        }
    }
}

```

CitizenTax.cs:

```

using System;

```

```

using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI.WebControls;

namespace Lab02
{
    /// <summary>
    /// Citizen class object meant to store name and how much the individual paid for tax
    /// </summary>
    public class CitizenTax
    {
        private Node head;
        private Node tail;
        private Node d;

        /// <summary>
        /// Constructor
        /// </summary>
        public CitizenTax()
        {
            head = null;
            tail = null;
        }

        /// <summary>
        /// Adds element to Linked List
        /// </summary>
        /// <param name="lastName">Last Name</param>
        /// <param name="firstName">First Name</param>
        /// <param name="address">Address</param>
        /// <param name="month">Month</param>
        /// <param name="taxCode">Tax Code</param>
        /// <param name="taxAmount">Tax Amount</param>
        public void Add(CitizenTaxData data)
        {
            if (head == null)
            {
                head = new Node(data, null);
                tail = head;
            }
            else
            {
                tail.next = new Node(data, null);
                tail = tail.next;
            }
        }

        /** Address of the head of the list is assigned */
        public void Begin()
        { d = head; }
        /** Interface variable gets address of the next entry*/
        public void Next()
        { d = d.next; }
        /** Return true, if list is empty*/
        public bool Exist()
        { return d != null; }
        //-----
        /** Return data according to the interface address*/
        public CitizenTaxData Get()
        { return d.Data; }

        /// <summary>
        /// Checks of the specified citizen has payed
        /// </summary>

```

```

    /// <param name="taxCode">Tax Code of the Tax Company</param>
    /// <param name="month">Month</param>
    /// <param name="lastName">Last name of the citizen</param>
    /// <param name="firstName"> First Name of the citizen</param>
    /// <returns>true if citizen has paid for specified tax on specified month, false if
the citizen did not</returns>
    public bool CitizenPaid(string taxCode, string month, string lastName, string
firstName)
    {
        Node curr = head;
        while (curr != null)
        {
            if (curr.Data.LastName == lastName && curr.Data.FirstName == firstName &&
curr.Data.Month == month && curr.Data.TaxCode == taxCode)
                return true; // The Person paid for the month

            curr = curr.next;
        }
        return false;
    }

    /// <summary>
    /// Node class object for CitizenTaxData
    /// </summary>
    class Node
    {
        public Node next;
        public CitizenTaxData Data { get; set; }

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="data">Pointer to CitizenTaxData object</param>
        public Node(CitizenTaxData data, Node _next)
        {
            Data = data;
            next = _next;
        }
    }
}

```

TaxData.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab02
{
    /// <summary>
    /// TaxData object to be inherited by Tax object
    /// </summary>
    public class TaxData
    {
        public string TaxCode { get; set; }
        public string TaxName { get; set; }
        public double Price { get; set; }

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="taxCode"></param>
        /// <param name="taxName"></param>
        /// <param name="price"></param>
        public TaxData(string taxCode, string taxName, double price)

```

```

    {
        TaxCode = taxCode;
        TaxName = taxName;
        Price = price;
    }

    /// <summary>
    /// Returns Node in string format
    /// </summary>
    /// <returns>Node in string format</returns>
    public override string ToString()
    {
        return $"{TaxCode,-20}|{TaxName,-20}|{Price,10:f}|";
    }
}

```

Tax.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI.WebControls;

namespace Lab02
{
    public class Tax
    {
        private Node head;
        private Node tail;
        private Node d;
        public Tax()
        {
            head = null;
            tail = null;
        }

        /** Address of the head of the list is assigned */
        public void Begin()
        { d = head; }
        /** Interface variable gets address of the next entry*/
        public void Next()
        { d = d.next; }
        /** Return true, if list is empty*/
        public bool Exist()
        { return d != null; }
        //-----
        /** Return data according to the interface address*/
        public TaxData Get()
        { return d.Data; }

        /// <summary>
        /// Returns the price of the tax of a single use
        /// </summary>
        /// <param name="taxCode">Code to identify the type of tax</param>
        /// <returns>Double, price of a single use tax item</returns>
        public double GetPrice(string taxCode)
        {
            Node curr = head;
            while (curr != null)
            {
                if (curr.Data.TaxCode == taxCode)
                    return curr.Data.Price;
                curr = curr.next;
            }
            return 0;
        }
    }
}

```

```

    }

    /// <summary>
    /// Adds Node to the tail of the LinkedList
    /// </summary>
    /// <param name="taxCode">Code of the tax</param>
    /// <param name="name"> name of the company</param>
    /// <param name="price">price of a single use</param>
    public void Add(TaxData data)
    {
        if (head == null)
        {
            head = new Node(data, null);
            tail = head;
        }
        else
        {
            tail.next = new Node(data, null);
            tail = tail.next;
        }
    }

    /// <summary>
    /// Tax Node
    /// </summary>
    class Node
    {
        public Node next;
        public TaxData Data { get; set; }
        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="data">TaxData pointer</param>
        public Node(TaxData data, Node _next)
        {
            Data = data;
            next = _next;
        }
    }
}

```

InOutUtils.cs:

```

using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Web;

namespace Lab02
{
    /// <summary>
    /// Static InOutUtils helper class for Input/Output with files
    /// </summary>
    public static class InOutUtils
    {
        /// <summary>
        /// Reads Tax Data from txt to Tax class object+
        /// </summary>
        /// <param name="fileLoc">Location of the data in .txt format</param>
        /// <returns>Tax class object</returns>
        public static Tax ReadTaxData(string fileLoc)
        {
            Tax taxes = new Tax();

```

```

        string[] lines = File.ReadAllLines(fileLoc);
        foreach (string line in lines)
        {
            string[] elements = line.Split(';');
            taxes.Add(new TaxData(elements[0], elements[1],
double.Parse(elements[2])));
        }
        return taxes;
    }

    /// <summary>
    /// Creates CitizenTaxData from .txt file
    /// </summary>
    /// <param name="fileLoc">Location of .txt file</param>
    /// <returns>CitizenTaxData class object</returns>
    public static CitizenTax ReadCitizenTaxData(string fileLoc)
    {
        CitizenTax data = new CitizenTax();
        string[] lines = File.ReadAllLines(fileLoc);
        foreach (string line in lines)
        {
            string[] elements = line.Split(';');
            CitizenTaxData temp = new CitizenTaxData(elements[1], elements[0],
elements[2], elements[3], elements[4], int.Parse(elements[5]));
            data.Add(temp);
        }
        return data;
    }

    /// <summary>
    /// Appends a header to a file
    /// </summary>
    /// <param name="fileLoc">Name/location of the file</param>
    /// <param name="header">text to be appended</param>
    public static void WriteHeader(string fileLoc, string header)
    {
        using (StreamWriter writer = new StreamWriter(fileLoc, append: true))
        {
            writer.WriteLine(header);
            writer.WriteLine();
        }
    }

    /// <summary>
    /// Creates a new or wipes a file
    /// </summary>
    /// <param name="fileLoc">Location of the file</param>
    public static void CreateFile(string fileLoc)
    {
        using (FileStream fs = new FileStream(fileLoc, FileMode.Create))
            new StreamWriter(fs, encoding: System.Text.Encoding.UTF8).Close();
    }

    /// <summary>
    /// Appends CitizenTaxData to a file
    /// </summary>
    /// <param name="fileLoc">Location/name of the file</param>
    /// <param name="data">data to append to the .txt file</param>
    /// <param name="header">Header text of the data file</param>
    public static void WriteCitizenTaxData(string fileLoc, CitizenTax data, string
header)
    {
        using (StreamWriter writer = new StreamWriter(fileLoc, append:true))
        {
            writer.WriteLine(header);
            writer.WriteLine();

```



```

        writer.WriteLine($"{ "LastName",-20} { "FirstName",-20} { "Address",-
20} { "Month",-15} { "TaxCode",-20} { "TaxAmount",10} |");
        for (data.Begin(); data.Exist(); data.Next())
        {
            CitizenTaxData temp = data.Get();
            writer.WriteLine(temp.ToString());
        }
        writer.WriteLine();
    }
}

/// <summary>
/// appends Citizen class object data to text file
/// </summary>
/// <param name="fileLoc">location/name of the file</param>
/// <param name="data">data to append to the file</param>
/// <param name="header">Header of the file</param>
public static void WriteCitizenData(string fileLoc, Citizen data, string header)
{
    using (StreamWriter writer = new StreamWriter(fileLoc, append: true))
    {
        writer.WriteLine(header);
        writer.WriteLine();
        writer.WriteLine($"{ "LastName",-20} { "FirstName",-20} { "Address",-
20} { "TaxSum",-10} |");
        for (data.Begin(); data.Exist(); data.Next())
        {
            CitizenData temp = data.Get();
            writer.WriteLine(temp.ToString());
        }
        writer.WriteLine();
    }
}

/// <summary>
/// Appends Tax data to a .txt file
/// </summary>
/// <param name="fileLoc">Location/name of the file</param>
/// <param name="data">data to append to the .txt file</param>
/// <param name="header">header to be added to the file</param>
public static void WriteTaxData(string fileLoc, Tax data, string header)
{
    using (StreamWriter writer = new StreamWriter(fileLoc, append: true))
    {
        writer.WriteLine(header);
        writer.WriteLine();
        writer.WriteLine($"{ "TaxCode",-20} { "TaxName",-20} { "Price",10:2f} |");
        for (data.Begin(); data.Exist(); data.Next())
        {
            TaxData temp = data.Get();
            writer.WriteLine(temp.ToString());
        }
        writer.WriteLine();
    }
}
}
}
}

```

css/styles.css:

```

body {
    color:white;
    background:black;
}
td
{
    padding:5px;
}

```

```
}
```

Lab01Form.aspx:

```
<%@ Page Language="C#" AutoEventWireup="true" CodeBehind="Lab01Form.aspx.cs"
Inherits="Lab02.Lab01Form" %>

<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head runat="server">
    <link rel="stylesheet" runat="server" media="screen" href="~/css/styles.css" />
    <title>Lab02 U16</title>
</head>
<body>
    <form id="form1" runat="server">
        <div id="body">
            <asp:Label ID="HeaderLabel" runat="server" Text="LAB02 U16"></asp:Label>
            <br />
            <br />
            <asp:Label ID="Label1" runat="server" Text="Tax Info U16a.txt:"></asp:Label>
            <br />
            <asp:FileUpload ID="FileUpload1" runat="server" />
            <br />
            <br />
            <asp:Label ID="Label2" runat="server" Text="Every Citizen Tax Data U16b.txt:
"></asp:Label>
            <br />
            <asp:FileUpload ID="FileUpload2" runat="server" />
            <br />
            <asp:Button ID="DataButton" runat="server" Text="Submit New Data"
OnClick="DataButton_Click" />
            <br />
            <br />
            <asp:Label ID="InitTaxLabel" runat="server" Text="U16a.txt Initial
data:"></asp:Label>
            <asp:Table ID="InitTaxTable" runat="server">
            </asp:Table>
            <br />
            <asp:Label ID="InitCitizenLabel" runat="server" Text="U16b.txt Initial
data:"></asp:Label>
            <asp:Table ID="InitCitizenTable" runat="server">
            </asp:Table>
            <br />
            <asp:Panel ID="CalculationsPanel" runat="server">
                <asp:Label ID="CitizenTaxLabel" runat="server" Text="All Citizen taxes
over the months"></asp:Label>
                <asp:Table ID="CitizenTaxTable" runat="server">
                </asp:Table>
                <br />
                <asp:Label ID="AverageTax" runat="server"></asp:Label>
                <br />
                <asp:Label ID="TotalTaxSum" runat="server"></asp:Label>
                <br />
                <br />
                <asp:Label ID="CitizenTaxLabel0" runat="server" Text="Above Average
Tax:"></asp:Label>
                <asp:Table ID="AboveAverageTable" runat="server">
                </asp:Table>
                <br />
                <asp:Label ID="FilterData" runat="server" Text="Filtered
data:"></asp:Label>
                <asp:Table ID="FilterTable" runat="server">
                </asp:Table>
                <br />
                Tax Code:<br />
                <asp:TextBox ID="TaxCodeTextBox" runat="server"></asp:TextBox>
            </asp:Panel>
        </div>
    </form>
</body>
</html>
```

```

        <br />
        Month:<br />
        <asp:TextBox ID="TaxMonthTextBox" runat="server"></asp:TextBox>
        <br />
        <asp:Button ID="ButtonFilter" runat="server" Text="Submit"
OnClick="ButtonFilter_Click" />
    </asp:Panel>
    <br />
</div>
</form>
</body>
</html>

```

Lab01Form.aspx.cs:

```

using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Web;
using System.Web.UI;
using System.Web.UI.WebControls;

namespace Lab02
{
    public partial class Lab01Form : System.Web.UI.Page
    {
        private string taxDataInput = @"App_Data/U16a.txt";
        private string citizenDataInput = @"App_Data/U16b.txt";
        private string outputDataPath = @"App_Data/U16result.txt";
        protected void Page_Load(object sender, EventArgs e)
        {
            CitizenTax citizenTaxData = null;
            Tax taxInfo = null;
            InOutUtils.CreateFile(Server.MapPath(outputDataPath));
            if (File.Exists(Server.MapPath(taxDataInput)))
            {
                taxInfo = InOutUtils.ReadTaxData(Server.MapPath(taxDataInput));
                InOutUtils.WriteTaxData(Server.MapPath(outputDataPath), taxInfo, "Initial
Tax Company Data:");
                FillTaxDataTable(taxInfo, InitTaxTable);
            }
            else
            {
                InitTaxLabel.Text = "";
            }

            if (File.Exists(Server.MapPath(citizenDataInput)))
            {
                citizenTaxData =
                InOutUtils.ReadCitizenTaxData(Server.MapPath(citizenDataInput));
                InOutUtils.WriteCitizenTaxData(Server.MapPath(outputDataPath),
                citizenTaxData, "Initial Citizen Tax Data:");
                FillCitizenTaxDataTable(citizenTaxData, InitCitizenTable);
            }
            else
            {
                InitCitizenLabel.Text = "";
            }

            if (citizenTaxData != null && taxInfo != null)
            {
                // Reads Initial Data and Outputs the Initial Data To WebForm and to text

                CitizenCalculations(taxInfo, citizenTaxData);
            }
        }
    }
}

```

```

        CheckFiltered(taxInfo, citizenTaxData);
    }
    else
    {
        HeaderLabel.Text = "Plaese Upload remaining data files";
        CalculationsPanel.Visible = false;
    }
}

/// <summary>
/// Does calculations from Tax and CitizenTax object
/// </summary>
/// <param name="taxInfo">Tax object</param>
/// <param name="citizenTaxData">CitizenTax object</param>
protected void CitizenCalculations(Tax taxInfo, CitizenTax citizenTaxData)
{
    Citizen citizensAverage = TaskUtils.CreateCitizenData(taxInfo,
citizenTaxData); // For Above Average
    InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath), citizensAverage,
"Tax Sum of all citizens:");

    citizensAverage.Sort();
    InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath), citizensAverage,
"Tax Sum of all citizens SORTED A-Z:");
    FillCitizenTable(citizensAverage, CitizenTaxTable);

    double sum = citizensAverage.Sum();
    double average = citizensAverage.GetAverage();
    InOutUtils.WriteHeader(Server.MapPath(outputDataPath), $"All Citizen TOTAL
Tax Sum: {sum:f}");
    InOutUtils.WriteHeader(Server.MapPath(outputDataPath), $"Average Tax Sum:
{average:f}");
    AverageTax.Text = $"Average tax per citizen: {average}";
    TotalTaxSum.Text = $"Total tax sum: {sum}";

    citizensAverage.RemoveUnderAverage();
    InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath), citizensAverage,
"Citizens who paid above average:");
    FillCitizenTable(citizensAverage, AboveAverageTable);
}
/// <summary>
/// Updates filtered data
/// </summary>
/// <param name="taxInfo">Tax Object</param>
/// <param name="citizenTaxData">CitizenTax object</param>
protected void CheckFiltered(Tax taxInfo, CitizenTax citizenTaxData)
{
    if (Session["TaxCode"] != null && Session["Month"] != null)
    {
        Citizen citizensFiltered = TaskUtils.CreateCitizenData(taxInfo,
citizenTaxData); // For Filter
        citizensFiltered.Sort();
        citizensFiltered.RemoveWhoDidNotPayTax(Session["TaxCode"].ToString(),
Session["Month"].ToString(), citizenTaxData);
        InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath),
citizensFiltered, $"Citizens who paid TaxCode: \"{Session["TaxCode"]}\" on Month:
\"{Session["Month"]}\"");
        FillCitizenTable(citizensFiltered, FilterTable);
    }
    else
    {
        FilterData.Text = "No Filter provided";
    }

    Session["TaxCode"] = null;
    Session["Month"] = null;
}
}

```



## 2.7. Pradiniai duomenys ir rezultatai

U16a.txt:

```
11; Elektra; 0.12
21; Dujos; 0.58
31; Benzinai; 1.78
32; Diezelis; 1.90
```

U16b.txt:

```
pavardė1; vardas1; adresas1;1;22;28;
pavardė1; vardas1; adresas1;5;22;20;
pavardė1; vardas1; adresas1;1;32;100;
pavardė1; vardas1; adresas1;2;32;97;
pavardė1; vardas1; adresas1;3;32;63;
pavardė1; vardas1; adresas1;2;22;25;
pavardė1; vardas1; adresas1;3;22;29;
pavardėAA; vardasAA; adresasAA;1;21;13;
pavardėAA; vardasAA; adresasAA;2;21;84;
pavardėAA; vardasAA; adresasAA;3;21;76;
pavardė1; vardas1; adresas1;4;22;39;
pavardė2; vardas2; adresas2;3;31;67;
pavardė2; vardas2; adresas2;4;31;98;
pavardė0; vardas2; adresas2;5;31;125;
pavardė0; vardas0; adresas3;1;11;31;
pavardė1; vardas1; adresas1;4;32;39;
pavardė1; vardas1; adresas1;5;32;20;
pavardė1; vardas1; adresas1;3;11;80;
pavardė1; vardas1; adresas1;4;11;39;
pavardė1; vardas1; adresas1;1;11;120;
pavardė1; vardas1; adresas1;2;11;100;
pavardė1; vardas1; adresas1;5;11;139;
pavardė2; vardas2; adresas2;1;31;31;
pavardė2; vardas2; adresas2;2;31;48;
pavardė0; vardas0; adresas3;2;11;48;
pavardė0; vardas0; adresas3;3;11;67;
pavardė0; vardas0; adresas3;4;11;98;
pavardė0; vardas0; adresas3;5;11;125;
pavardėAA; vardasAA; adresasAA;4;21;8;
pavardėAA; vardasAA; adresasAA;5;21;25;
```

Rezultatai 1:

Vartotojo sąsaja:

Duombazėje nerado jokio failo:

**Plaese Upload remaining data files**

**Tax Info U16a.txt:**  
 No file chosen

**Every Citizen Tax Data U16b.txt:**  
 No file chosen

Prikabinamo U16a.txt failą:

**Plaese Upload remaining data files**

**Tax Info U16a.txt:**  
 No file chosen

**Every Citizen Tax Data U16b.txt:**  
 No file chosen

**U16a.txt Initial data:**

Tax Code	Tax Company Name:	Price:
11	Elektra	0.12
21	Dujos	0.58
31	Benzinas	1.78
32	Diezelis	1.9

Prikabinome U16b.txt:

## LAB02 U16

Tax Info U16a.txt:

Choose File No file chosen

Every Citizen Tax Data U16b.txt

Choose File No file chosen

[Submit New Data](#)

U16a.txt Initial data:

Tax Code	Tax Company Name:	Price:
0000	0000	0000

11	Elektra	0.12
----	---------	------

21	Dujos	0.58
----	-------	------

31	Benzinas	1.78
----	----------	------

32 Diezelis 1.9

U16b.txt Initial data:

Last Name	First Name	Address	Month	Tax Code	Amount
-----------	------------	---------	-------	----------	--------

pavardė1	vardas1	adresas1	1	22	28
----------	---------	----------	---	----	----

pavardė1	vardas1	adresas1	5	22	20
----------	---------	----------	---	----	----

pavardė1	vardas1	adresas1	1	32	100
----------	---------	----------	---	----	-----

pavardė1	vardas1	adresas1	2	32	97
----------	---------	----------	---	----	----

pavardėl	vardasl	adresasl	3	32	63
----------	---------	----------	---	----	----

pavardė1	vardas1	adresas1	2	22	25
----------	---------	----------	---	----	----

pavardė1	vardas1	adresas1	3	22	29
----------	---------	----------	---	----	----

pavardėAA	vardasAA	adresasAA	1	21	13
-----------	----------	-----------	---	----	----

pavardėAA	vardasAA	adresasAA	2	21	84
-----------	----------	-----------	---	----	----

pavardėAA	vardasAA	adresasAA	3	21	76
-----------	----------	-----------	---	----	----

pavardėl	vardasl	adresasl	4	22	39
----------	---------	----------	---	----	----

pavarde2	vardas2	adresas2	3	31	67
----------	---------	----------	---	----	----

pavardė2	vardas2	adresas2	4	31	98
----------	---------	----------	---	----	----

pavardė0	vardas2	adresas2	5	31	125
----------	---------	----------	---	----	-----

navardė0	vardas0	adresas3	1	11	31
----------	---------	----------	---	----	----

pavardel	vardas1	adresas1	4	32	39
----------	---------	----------	---	----	----

pavardėl	vardasl	adresasl	5	32	20
----------	---------	----------	---	----	----

pavardė1	vardas1	adresas1	3	11	80
pavardėl	vardasl	adresasl	3	11	80

pavardel	vardas1	adresas1	4	11	39
----------	---------	----------	---	----	----

pavardėl	vardasl	adresasl	1	11	120
----------	---------	----------	---	----	-----

pavardė1	vardas1	adresas1	2	11	100
----------	---------	----------	---	----	-----

pavardēl	vardas1	adresas1	5	11	139
----------	---------	----------	---	----	-----

navardė2	vardas2	adresas2	1	31	31
----------	---------	----------	---	----	----

pavardė2	vardas2	adresas2	2	31	48
----------	---------	----------	---	----	----

navardė0	vardas0	adresas3	2	11	48
----------	---------	----------	---	----	----

pavardė0	vardas0	adresas3	3	11	67
----------	---------	----------	---	----	----

pavardė0	vardas0	adresas3	4	11	98
----------	---------	----------	---	----	----

pavardė0	vardas0	adresas3	5	11	125
----------	---------	----------	---	----	-----

navardēAA	vardasAA	adresasAA	4	21	8
-----------	----------	-----------	---	----	---

pavardėAA	vardasAA	adresasAA	5	21	25
-----------	----------	-----------	---	----	----



All Citizen taxes over the months

Last Name	First Name	Address	Tax Sum
pavardėAA	vardasAA	adresasAA	119.48
pavardė0	vardas0	adresas3	44.28
pavardė2	vardas2	adresas2	434.32
pavardė0	vardas2	adresas2	222.5
pavardė1	vardas1	adresas1	663.46

Average tax per citizen: 296.808  
Total tax sum: 1484.04

Above Average Tax:

Last Name	First Name	Address	Tax Sum
pavardė2	vardas2	adresas2	434.32
pavardė1	vardas1	adresas1	663.46

No Filter provided

Tax Code:

Month:



Prafiltruojame duomenis pagal kodą: „11“, mėnesį: „2“. Prisidėjo lentelė papildoma.

All Citizen taxes over the months

Last Name	First Name	Address	Tax Sum
pavardėAA	vardasAA	adresasAA	119.48
pavardė0	vardas0	adresas3	44.28
pavardė2	vardas2	adresas2	434.32
pavardė0	vardas2	adresas2	222.5
pavardė1	vardas1	adresas1	663.46

Average tax per citizen: 296.808  
Total tax sum: 1484.04

Above Average Tax:

Last Name	First Name	Address	Tax Sum
pavardė2	vardas2	adresas2	434.32
pavardė1	vardas1	adresas1	663.46

Filtered data:

Last Name	First Name	Address	Tax Sum
pavardė0	vardas0	adresas3	44.28
pavardė1	vardas1	adresas1	663.46

Tax Code:

Month:

U16result.txt:

Tax Sum of all citizens:

LastName	FirstName	Address	TaxSum
pavardė1	vardas1	adresas1	663.46
pavardėAA	vardasAA	adresasAA	119.48
pavardė2	vardas2	adresas2	434.32
pavardė0	vardas2	adresas2	222.50
pavardė0	vardas0	adresas3	44.28

Tax Sum of all citizens SORTED A-Z:

LastName	FirstName	Address	TaxSum
pavardėAA	vardasAA	adresasAA	119.48
pavardė0	vardas0	adresas3	44.28
pavardė2	vardas2	adresas2	434.32
pavardė0	vardas2	adresas2	222.50
pavardė1	vardas1	adresas1	663.46

All Citizen TOTAL Tax Sum: 1484.04

Average Tax Sum: 296.81

Citizens who paid above average:

LastName	FirstName	Address	TaxSum
pavardė2	vardas2	adresas2	434.32
pavardė1	vardas1	adresas1	663.46

Citizens who paid TaxCode: "11" on Month: "2"

LastName	FirstName	Address	TaxSum
pavardė0	vardas0	adresas3	44.28
pavardė1	vardas1	adresas1	663.46

Duomenys 2:

U16a.txt:

VAND; Vanduo; 0.07  
KVND; Karštas vanduo; 0.20  
LH20; Ledinis Vanduo; 0.10

U16b.txt:

Pavardauskis; Vardenis; Adresatas;Vasaris;Benzinas;28;  
Pavardauskis; Vardenis; Adresatas;Vasaris;VAND;14;  
Pavardauskis; Vardenis; Adresatas;Kovas;KVND;20;  
Pavardauskis; Vardenis; Adresatas;Kovas;LH20;30;  
Pavardauskis; Vardenis; Adresatas;Kovas;VAND;15;  
Pavardauskis; Vardenis; Adresatas;Balandis;VAND;99;  
Tomas; Tomukas; Tomo namas 1;Kovas;VAND;97;  
Tomas; Tomukas; Tomo namas 1;Balandis;VAND;156;  
Tomas; Tomukas; Tomo namas 1;Rugsėjis;VAND;20;

Rezultatai:

Vartotojo sąsaja

Naudojant mėnesį: Balandis ir mokesčių kodą: VAND:

LAB02 U16

Tax Info U16a.txt:

Choose File

No file chosen

Every Citizen Tax Data U16b.txt:

Choose File

No file chosen

Submit New Data

U16a.txt Initial data:

Tax Code	Tax Company Name:	Price:
VAND	Vanduo	0.07
KVND	Karštas vanduo	0.2
LH20	Ledinis Vanduo	0.1

U16b.txt Initial data:

Last Name	First Name	Address	Month	Tax Code	Amount
Pavardauskis	Vardenis	Adresatas	Vasaris	Benzinas	28
Pavardauskis	Vardenis	Adresatas	Vasaris	VAND	14
Pavardauskis	Vardenis	Adresatas	Kovas	KVND	20
Pavardauskis	Vardenis	Adresatas	Kovas	LH20	30
Pavardauskis	Vardenis	Adresatas	Kovas	VAND	15
Pavardauskis	Vardenis	Adresatas	Balandis	VAND	99
Tomas	Tomukas	Tomo namas 1	Kovas	VAND	97
Tomas	Tomukas	Tomo namas 1	Balandis	VAND	156
Tomas	Tomukas	Tomo namas 1	Rugsėjis	VAND	20

All Citizen taxes over the months

Last Name	First Name	Address	Tax Sum
Tomas	Tomukas	Tomo namas 1	19.11
Pavardauskis	Vardenis	Adresatas	15.96

Average tax per citizen: 17.535

Total tax sum: 35.07

Above Average Tax:

Last Name	First Name	Address	Tax Sum
Tomas	Tomukas	Tomo namas 1	19.11

Filtered data:

Last Name	First Name	Address	Tax Sum
Tomas	Tomukas	Tomo namas 1	19.11
Pavardauskis	Vardenis	Adresatas	15.96

Tax Code:

Month:

Submit

U16result.txt:

Tax Sum of all citizens:

LastName	FirstName	Address	TaxSum
Pavardauskis	Vardenis	Adresatas	15.96
Tomas	Tomukas	Tomo namas 1	19.11

Tax Sum of all citizens SORTED A-Z:

LastName	FirstName	Address	TaxSum
Tomas	Tomukas	Tomo namas 1	19.11
Pavardauskis	Vardenis	Adresatas	15.96

All Citizen TOTAL Tax Sum: 35.07

Average Tax Sum: 17.54

Citizens who paid above average:

LastName	FirstName	Address	TaxSum
Tomas	Tomukas	Tomo namas 1	19.11

Citizens who paid TaxCode: "VAND" on Month: "Balandis"

LastName	FirstName	Address	TaxSum
Tomas	Tomukas	Tomo namas 1	19.11
Pavardauskis	Vardenis	Adresatas	15.96

## 2.8. Dėstytojo pastabos

1. Klasių diagramoje nebūna žodžių private ar public. Tam yra spec. simboliai.
2. Negalima private int count;
3. Kam žodis internal, internal class Node?
4. Negalim painioti su sąsaja:  
public TableRow GetRow(int index
5. Taip neturi būti:  
public string TaxCode { get; set; }  
public string TaxName { get; set; }  
public double Price { get; set; }  
public Node next;
6. Kur klasės Tax sąsajos metodai?  
Perdaryti.
7. Negaliu sutikti su tokia klase Node:  
public Node(string lastName, string firstName, string address)  
{  
Data = new CitizenData(lastName, firstName, address);  
}

```

/// <summary>
/// Swaps the DATA, keeps the pointers
/// </summary>
/// <param name="other">Other node to be swapped with</param>
public void SwapData(Node other)
{
    CitizenData temp = Data;
    Data = other.Data;
    other.Data = temp;
}

```

8. Nèra klasès InoutUtils.
9. AddMoney(string lastName, string firstName, string address, double  
Kodèl ne citizen?
10. Kodèl nèra Next antraštèje?  
public Node(CitizenData data)

### 3. Bendrinės klasės ir testavimas (L3)

#### 3.1. Darbo užduotis

**LD\_16. Mokesčiai.** Kiekvieną mėnesį gyventojai moka komunalinius mokesčius. Suraskite, kurį mėnesį ir kokie komunaliniai mokesčiai kainavo pigiausiai. Apskaičiuokite, kokią pinigų sumą komunaliniams mokesčiams išleido visi gyventojai. Sudarykite sąrašą gyventojų (pavardė ir vardas, adresas), kurie už komunalines paslaugas per metus mokėjo sumą, mažesnę už vidutinę. Sąrašas turi būti surikiuotas pagal gyventojų adresus, pavardes ir vardus abėcėlės tvarka.

Duomenys:

- tekstiniame faile U16a.txt yra informacija apie komunalines paslaugas: paslaugos kodas, paslaugos pavadinimas, paslaugos vieno mėnesio vieno vieneto kaina;
- tekstiniame faile U16b.txt yra informacija apie gyventojus: pavardė ir vardas, adresas, mėnuo už kurį mokama, komunalinės paslaugos kodas, sunaudotų per mėnesį vienetų kiekis.

Pašalinkite iš sąrašo gyventojus, kurie nemokėjo už nurodytą paslaugą, nurodytą mėnesį (duomenys įvedami klaviatūra).

#### 3.2. Grafinės vartotojo sąsajos schema

LAB02 U16

Tax Info U16a.txt:  Browse...

Every Citizen Tax Data U16b.txt:  Browse... Submit New Data

U16a.txt Initial data:

U16b.txt Initial data:

All Citizen taxes over the months

[AverageTax]
[TotalTaxSum]

Above Average Tax:

Filtered data:

Tax Code:

Month:

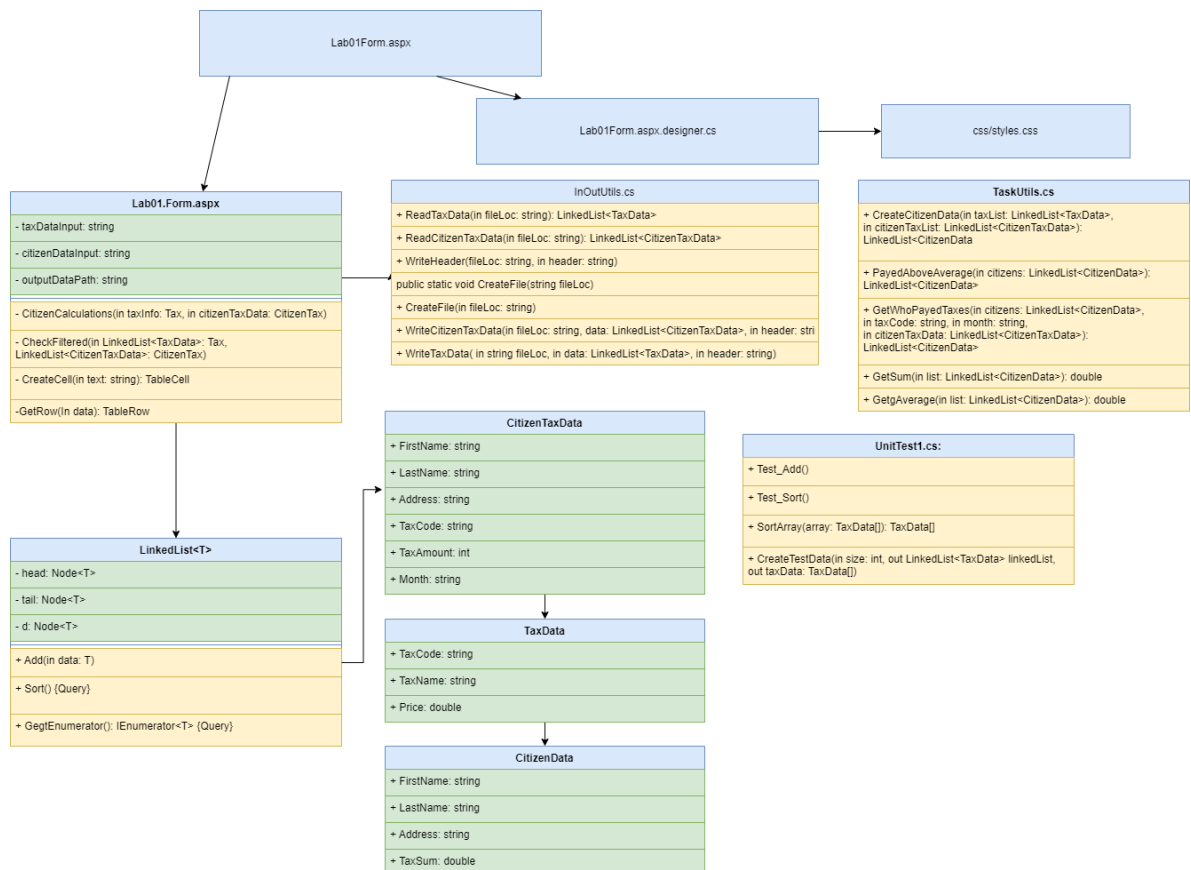
Submit

#### 3.3. Sąsajoje panaudotų komponentų keičiamos savybės

Komponentas	Savybė	Reikšmė
HeaderLabel	Text	LAB02 U16
Label1	Text	Tax InfoU16a.txt:
Label2	Text	Every Citizen Tax Data U16b:
InitTaxLabel	Text	U16a.txt Initial data:
InitCitizenLabel	Text	U16b.txt Initial data:
CitizenTaxLabel	Text	All Citizen taxes over the months

AverageTax	Text	""
TotalTaxSum	Text	""
CitizenTaxLabel0	Text	Above Average Tax:
FilterData	Text	Filtered data:
ButtonFilter	Text	Tax Code:
DataButton	Text	Month:

### 3.4. Klasių diagrama



### 3.5. Programos vartotojo vadovas

Jeigu neranda failų visų duombazėje, programa paprašo failų. Jeigu randa tik vieną pradinį failą, rodo tik jį ir prašo likusių failų. Kai abu failai atsiranda duombazėje, užkrauna skaičiavimus. Apskaičiuoja vidutinę mokesčių kainą, sumą visų ir individualių žmonių. Tekstas yra rikiuojamas A-Z pagal: adresą, pavardę, vardą. Kodas leidžia filtruoti žmones, kurie mokėjo nurodytą mėnesį (mėnuo yra string) už nurodytus mokesčius naudojant „Tax Code“ (string). Prie filtered lentelės prideda tik filtruotus duomenis.

### 3.6. Programos tekstas

CitizenData.cs:

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab02
{
    /// <summary>
    /// CitizenData class object to be used by class Citizen
    /// </summary>
    public class CitizenData : IComparable<CitizenData>, IEquatable<CitizenData>
    {
        public string FirstName { get; set; }
        public string LastName { get; set; }
        public string Address { get; set; }

        public double TaxSum { get; set; }

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="lastName">Last name of the citizen</param>
        /// <param name="firstName">First Name of the citizen</param>
        /// <param name="address">Address of the citizen</param>
        public CitizenData(string lastName, string firstName, string address, double
taxSum)
        {
            LastName = lastName;
            FirstName = firstName;
            Address = address;
            TaxSum = taxSum;
        }

        /// <summary>
        /// To String override
        /// </summary>
        /// <returns>stringg format of the citizen</returns>
        public override string ToString()
        {
            return $"{LastName,-20} {FirstName,-20} | {Address,-20} | {TaxSum,10:f} | ";
        }

        /// <summary>
        /// Compares to other Node of citizen type
        /// </summary>
        /// <param name="other"></param>
        /// <returns>Integer</returns>
        public int CompareTo(CitizenData other)
        {
            int comparison = other.Address.CompareTo(Address);
            if (comparison == 0)
            {
                comparison = other.LastName.CompareTo(LastName);
                if (comparison == 0)
                {
                    comparison = other.FirstName.CompareTo(FirstName);
                }
            }
        }
    }
}
```



```

        return comparison;
    }

    /// <summary>
    /// IEquatable iomplementation
    /// </summary>
    /// <param name="other">Comparison object</param>
    /// <returns>Boolean</returns>
    public bool Equals(CitizenData other)
    {
        if (FirstName == other.FirstName && LastName == other.LastName && Address ==
other.Address)
            return true;
        return false;
    }

    /// <summary>
    /// IEquatable iomplementation
    /// </summary>
    /// <param name="other">Comparison object</param>
    /// <returns>Boolean</returns>
    public bool Equals(CitizenTaxData other)
    {
        if (FirstName == other.FirstName && LastName == other.LastName && Address ==
other.Address)
            return true;
        return false;
    }
}
}

```

CitizenTaxData.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab02
{
    public class CitizenTaxData : IComparable<CitizenTaxData>, IEquatable<CitizenTaxData>
    {

        public string FirstName { get; set; }
        public string LastName { get; set; }
        public string Address { get; set; }
        public string TaxCode { get; set; }
        public int TaxAmount { get; set; }
        public string Month { get; set; }

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="lastName">last name of citizen</param>
        /// <param name="firstName">first name of citizen</param>
        /// <param name="address">address of the citizen</param>
        /// <param name="month">the month the tax was paid</param>
        /// <param name="taxCode">tax code</param>
        /// <param name="taxAmount">tax amount</param>
        public CitizenTaxData(string lastName, string firstName, string address, string
month, string taxCode, int taxAmount)
        {
            FirstName = firstName;
            LastName = lastName;
            Address = address;

```

```

        TaxCode = taxCode;
        TaxAmount = taxAmount;
        Month = month;
    }

    /// <summary>
    /// ToString implementation
    /// </summary>
    /// <returns>String</returns>
    public override string ToString()
    {
        return $"{LastName,-20} {FirstName,-20} {Address,-20} {Month,-15} {TaxCode,-
20} {TaxAmount,10}";
    }

    /// <summary>
    /// IEquatable implementation
    /// </summary>
    /// <param name="other">Comparison object</param>
    /// <returns>Boolean</returns>
    public bool Equals(CitizenTaxData other)
    {
        if (FirstName == other.FirstName && LastName == other.LastName && Address ==
other.Address)
            return true;
        return false;
    }

    /// <summary>
    /// IComparable Implementation
    /// </summary>
    /// <param name="other">Comparison object</param>
    /// <returns>Integer</returns>
    public int CompareTo(CitizenTaxData other)
    {
        int comparison = LastName.CompareTo(other.LastName);
        if (comparison == 0)
        {
            comparison = FirstName.CompareTo(other.FirstName);
            if (comparison == 0)
                comparison = TaxAmount.CompareTo(other.TaxAmount);
        }

        return comparison;
    }
}
}

```

TaxData.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab02
{
    /// <summary>
    /// TaxData object to be inherited by Tax object
    /// </summary>
    public class TaxData : IComparable<TaxData>, IEquatable<TaxData>
    {
        public string TaxCode { get; set; }
        public string TaxName { get; set; }
        public double Price { get; set; }
    }
}

```

```

/// <summary>
/// Constructor
/// </summary>
/// <param name="taxCode"></param>
/// <param name="taxName"></param>
/// <param name="price"></param>
public TaxData(string taxCode, string taxName, double price)
{
    TaxCode = taxCode;
    TaxName = taxName;
    Price = price;
}

/// <summary>
/// Returns Node in string format
/// </summary>
/// <returns>Node in string format</returns>
public override string ToString()
{
    return $"{TaxCode,-20}|{TaxName,-20}|{Price,10:f}|";
}

/// <summary>
/// IComparable implementation
/// </summary>
/// <param name="other">Comparison object</param>
/// <returns>Integer</returns>
public int CompareTo(TaxData other)
{
    int comparison = Price.CompareTo(other.Price);
    return comparison;
}

/// <summary>
/// IEquatable implementation
/// </summary>
/// <param name="other"> comparison object </param>
/// <returns>boolean</returns>
public bool Equals(TaxData other)
{
    if (TaxCode == other.TaxCode)
        return true;
    return false;
}
}
}

```

LinkedList.cs:

```

using System;
using System.Collections;
using System.Collections.Generic;
using System.Linq;
using System.Web;

namespace Lab02
{
    /// <summary>
    /// Linked List Class Object
    /// </summary>
    /// <typeparam name="T">Object Type</typeparam>
    public class LinkedList<T> : IEnumerable<T> where T : IComparable<T>, IEquatable<T>
    {
        private Node<T> head;
        private Node<T> tail;
    }
}

```

```

private Node<T> d;

/// <summary>
/// Construcotr
/// </summary>
public LinkedList()
{
    head = null;
    tail = null;
}

//Deprecated, Use Foreach with IEnumerable
/** Address of the head of the list is assigned */
public void Begin()
{ d = head; }
/** Interface variable gets address of the next entry*/
public void Next()
{ d = d.next; }
/** Return true, if list is empty*/
public bool Exist()
{ return d != null; }
//-----
/** Return data according to the interface address*/
public T Get()
{ return d.Data; }

/// <summary>
/// Adds T object to Linked List
/// </summary>
/// <param name="data"> <T> Type Object</param>
public void Add(T data)
{
    // If No citizen was found, adds the citizen to Linked List
    if (head == null)
    {
        head = new Node<T>(data, null);
        tail = head;
    }
    else
    {
        tail.next = new Node<T>(data, null);
        tail = tail.next;
    }
}

/// <summary>
/// Sort Function using iComprable
/// </summary>
public void Sort()
{
    Node<T> timer = head;
    while (timer != null)
    {
        Node<T> curr = head;
        Node<T> next = head.next;
        while (next != null)
        {
            if (curr.Data.CompareTo(next.Data) > 0)
            {
                curr.SwapData(next);
            }
            curr = next;
            next = next.next;
        }
        timer = timer.next;
    }
}

```

```

    }

    /// <summary>
    /// IEnumerable implementation
    /// </summary>
    /// <returns>yield of T data</returns>
    public IEnumerator<T> GetEnumerator()
    {
        for (Node<T> dd = head; dd != null; dd = dd.next)
        {
            yield return dd.Data;
        }
    }

    /// <summary>
    /// Obligatory, since IEnumerable<T> inherits IEnumerable
    /// </summary>
    /// <returns>none</returns>
    /// <exception cref="NotImplementedException">Not Implemented</exception>
    IEnumerator IEnumerable.GetEnumerator()
    {
        throw new NotImplementedException();
    }

    /// <summary>
    /// Node class to be used to save every citizen separately
    /// </summary>
    class Node<T>
    {
        public T Data { get; set; }
        public Node<T> next { get; set; }

        /// <summary>
        /// Constructor
        /// </summary>
        /// <param name="data">CitizenData pointer</param>
        public Node(T data, Node<T> link)
        {
            Data = data;
            next = link;
        }

        /// <summary>
        /// Swaps the DATA, keeps the pointers
        /// </summary>
        /// <param name="other">Other node to be swapped with</param>
        public void SwapData(Node<T> other)
        {
            T temp = Data;
            Data = other.Data;
            other.Data = temp;
        }
    }
}

```

TaskUtils.cs:

```

using System;
using System.Collections.Generic;
using System.Linq;
using System.Web;
using System.Web.UI.WebControls;

namespace Lab02

```

```

{
    /// <summary>
    /// TaskUtils static class for helper functions
    /// </summary>
    public static class TaskUtils
    {
        /// <summary>
        /// Creates Citizen class object using Tax object
        /// </summary>
        /// <param name="TaxList">Tax class object</param>
        /// <param name="citizenTaxList">CitizenTax object</param>
        /// <returns>Citizen class object</returns>
        public static LinkedList<CitizenData> CreateCitizenData(LinkedList<TaxData>
taxList, LinkedList<CitizenTaxData> citizenTaxList)
        {
            LinkedList<CitizenData> citizens = new LinkedList<CitizenData>();
            // Goes through every tax data record
            foreach (CitizenTaxData citizenTaxData in citizenTaxList)
            {
                // Finds the the tax code and returns price
                foreach(TaxData taxData in taxList)
                {
                    if(citizenTaxData.TaxCode == taxData.TaxCode)
                    {
                        CitizenData temp = null;
                        // Finds the citizen if already exists
                        foreach (CitizenData citizen in citizens)
                        {
                            // Finds the citizen if it already exists
                            if(citizen.Equals(citizenTaxData))
                            {
                                temp = citizen;
                                break;
                            }
                        }

                        // Creates a new citizen or appends the data
                        if (temp != null)
                        {
                            temp.TaxSum += (double)taxData.Price *
citizenTaxData.TaxAmount;
                        }
                        else
                        {
                            temp = new CitizenData(citizenTaxData.LastName,
citizenTaxData.FirstName, citizenTaxData.Address, (double)taxData.Price *
citizenTaxData.TaxAmount);
                            citizens.Add(temp);
                        }
                    }
                }
            }

            return citizens;
        }

        /// <summary>
        /// Returns a list for people who payed above average
        /// </summary>
        /// <param name="citizens">CitizenData Linked List</param>
        /// <returns>Citizen Data Linked List</returns>
        public static LinkedList<CitizenData> PayedAboveAverage(LinkedList<CitizenData>
citizens)
        {
            double average = GetAverage(citizens);

```

```

        LinkedList<CitizenData> output = new LinkedList<CitizenData>();

        foreach (CitizenData citizen in citizens)
        {
            if (citizen.TaxSum >= average)
            {
                output.Add(citizen);
            }
        }

        return output;
    }

    /// <summary>
    /// Creates a new list who paid taxes specified tax, month
    /// </summary>
    /// <param name="citizens">CitizenData Linked List</param>
    /// <param name="taxCode">Tax Code to filter by</param>
    /// <param name="month">Month to filter by</param>
    /// <param name="citizenTaxData">CitizenTaxData Linked List</param>
    /// <returns></returns>
    public static LinkedList<CitizenData> GetWhoPayedTaxes(LinkedList<CitizenData>
citizens, string taxCode, string month, LinkedList<CitizenTaxData> citizenTaxData)
    {
        LinkedList<CitizenData> output = new LinkedList<CitizenData>();
        foreach (CitizenData citizen in citizens)
        {
            foreach (CitizenTaxData citizenTax in citizenTaxData)
            {
                if(citizenTax.TaxCode == taxCode && citizenTax.Month == month &&
citizen.Equals(citizenTax))
                {
                    output.Add(citizen);
                    break;
                }
            }
        }
        return output;
    }

    /// <summary>
    /// Returns Sum
    /// </summary>
    /// <param name="list">CitizenData LinkedList</param>
    /// <returns>Double</returns>
    public static double GetSum(LinkedList<CitizenData> list)
    {
        double sum = 0;
        foreach (CitizenData citizen in list)
            sum += citizen.TaxSum;

        return sum;
    }

    /// <summary>
    /// Gets Average
    /// </summary>
    /// <param name="list">CitizenData Linked List</param>
    /// <returns>Double</returns>
    public static double GetAverage(LinkedList<CitizenData> list)
    {
        double sum = 0;
        int i = 0;
        foreach (CitizenData citizen in list)
        {
            sum += citizen.TaxSum;

```

```

        i++;
    }

    return (double)(i > 0 ? sum / i : 0);
}

}
}

```

InOutUtils.cs:

```

using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Web;

namespace Lab02
{
    /// <summary>
    /// Static InOutUtils helper class for Input/Output with files
    /// </summary>
    public static class InOutUtils
    {
        /// <summary>
        /// Reads Tax Data from txt to Tax class object+
        /// </summary>
        /// <param name="fileLoc">Location of the data in .txt format</param>
        /// <returns>Linked List TaxData class object</returns>
        public static LinkedList<TaxData> ReadTaxData(string fileLoc)
        {
            LinkedList<TaxData> taxes = new LinkedList<TaxData>();
            string[] lines = File.ReadAllLines(fileLoc);
            foreach (string line in lines)
            {
                string[] elements = line.Split(';');
                taxes.Add(new TaxData(elements[0], elements[1],
double.Parse(elements[2])));
            }
            return taxes;
        }

        /// <summary>
        /// Creates CitizenTaxData from .txt file
        /// </summary>
        /// <param name="fileLoc">Location of .txt file</param>
        /// <returns>LinkedList CitizenTaxData class object</returns>
        public static LinkedList<CitizenTaxData> ReadCitizenTaxData(string fileLoc)
        {
            LinkedList<CitizenTaxData> data = new LinkedList<CitizenTaxData>();
            string[] lines = File.ReadAllLines(fileLoc);
            foreach (string line in lines)
            {
                string[] elements = line.Split(';');
                CitizenTaxData temp = new CitizenTaxData(elements[1], elements[0],
elements[2], elements[3], elements[4], int.Parse(elements[5]));
                data.Add(temp);
            }
            return data;
        }

        /// <summary>
        /// Appends a header to a file
        /// </summary>
    }
}

```



```

/// <param name="fileLoc">Name/location of the file</param>
/// <param name="header">text to be appended</param>
public static void WriteHeader(string fileLoc, string header)
{
    using (StreamWriter writer = new StreamWriter(fileLoc, append: true))
    {
        writer.WriteLine(header);
        writer.WriteLine();
    }
}

/// <summary>
/// Creates a new or wipes a file
/// </summary>
/// <param name="fileLoc">Location of the file</param>
public static void CreateFile(string fileLoc)
{
    using (FileStream fs = new FileStream(fileLoc, FileMode.Create))
        new StreamWriter(fs, encoding: System.Text.Encoding.UTF8).Close();
}

/// <summary>
/// Appends CitizenTaxData to a file
/// </summary>
/// <param name="fileLoc">Location/name of the file</param>
/// <param name="data">data to append to the .txt file</param>
/// <param name="header">Header text of the data file</param>
public static void WriteCitizenTaxData(string fileLoc, LinkedList<CitizenTaxData>
data, string header)
{
    using (StreamWriter writer = new StreamWriter(fileLoc, append:true))
    {
        writer.WriteLine(header);
        writer.WriteLine();
        writer.WriteLine($"{ "LastName",-20} { "FirstName",-20} | { "Address",-
20} | { "Month",-15} | { "TaxCode",-20} | { "TaxAmount",10} |");
        foreach (CitizenTaxData taxData in data)
        {
            writer.WriteLine(taxData.ToString());
        }
        writer.WriteLine();
    }
}

/// <summary>
/// appends Citizen class object data to text file
/// </summary>
/// <param name="fileLoc">location/name of the file</param>
/// <param name="data">data to append to the file</param>
/// <param name="header">Header of the file</param>
public static void WriteCitizenData(string fileLoc, LinkedList<CitizenData> data,
string header)
{
    using (StreamWriter writer = new StreamWriter(fileLoc, append: true))
    {
        writer.WriteLine(header);
        writer.WriteLine();
        writer.WriteLine($"{ "LastName",-20} { "FirstName",-20} | { "Address",-
20} | { "TaxSum",-10} |");
        foreach (CitizenData taxData in data)
        {
            writer.WriteLine(taxData.ToString());
        }
        writer.WriteLine();
    }
}

```

```

    /// <summary>
    /// Appends Tax data to a .txt file
    /// </summary>
    /// <param name="fileLoc">Location/name of the file</param>
    /// <param name="data">data to append to the .txt file</param>
    /// <param name="header">header to be added to the file</param>
    public static void WriteTaxData(string fileLoc, LinkedList<TaxData> data, string
header)
    {
        using (StreamWriter writer = new StreamWriter(fileLoc, append: true))
        {
            writer.WriteLine(header);
            writer.WriteLine();
            writer.WriteLine($"{ "TaxCode",-20} | { "TaxName",-20} | { "Price",10:2f} |");
            foreach (TaxData taxData in data)
            {
                writer.WriteLine(taxData.ToString());
            }
            writer.WriteLine();
        }
    }
}

```

UnitTest1.cs:

```
using Microsoft.VisualStudio.TestTools.UnitTesting;
using System;
using Lab02;

namespace UnitTest
{
    [TestClass]
    public class UnitTest1
    {
        /// <summary>
        /// Compares CitizenData object with same parameters. Comparison should return 0
        /// </summary>
        [TestMethod]
        public void CompareTo_CitizenDataSame_Returns0()
        {
            CitizenData cData1 = new CitizenData("lastname", "firstname", "address", 0);
            CitizenData cData2 = new CitizenData("lastname", "firstname", "address", 0);
            Assert.AreEqual(cData1.CompareTo(cData2), 0);
        }

        /// <summary>
        /// Compares lhs CitizenData object with alphabetically higher parameters.
        Comparison should return 1
        /// </summary>
        [TestMethod]
        public void CompareTo_CitizenDataSame_Returns1()
        {
            CitizenData cData1 = new CitizenData("a", "a", "a", 0);
            CitizenData cData2 = new CitizenData("b", "b", "b", 0);
            Assert.AreEqual(cData1.CompareTo(cData2), 1);
        }

        /// <summary>
        /// Compares lhs CitizenData object with alphabetically lower parameters.
        Comparison should return -1
        /// </summary>
        [TestMethod]
        public void CompareTo_CitizenDataSame_ReturnsMinus1()
        {
            CitizenData cData1 = new CitizenData("b", "b", "b", 0);
            CitizenData cData2 = new CitizenData("a", "a", "a", 0);
            Assert.AreEqual(cData1.CompareTo(cData2), -1);
        }

        /// <summary>
        /// Tests CitizenTax and CitizenTaxData object comparison with different
        parameters
        /// </summary>
        [TestMethod]
        public void Equals_CitizenDataCitizenTaxDataDifferentParameters_False()
        {
            CitizenData cData = new CitizenData("lastname1", "firstname1", "address1",
0);
            CitizenTaxData cTaxData = new CitizenTaxData("lastname0", "firstname0",
"address0", "April", "0", 0);
            Assert.IsFalse(cData.Equals(cTaxData));
        }

        /// <summary>
        /// Tests CitizenTax and CitizenTaxData object comparison with same parameters
        /// </summary>
        [TestMethod]
        public void Equals_CitizenDataCitizenTaxDataSameParameters_True()
        {
            CitizenData cData = new CitizenData("lastname", "firstname", "address", 0);
```

```

        CitizenTaxData cTaxData = new CitizenTaxData("lastname", "firstname",
"address", "April", "0", 0);
        Assert.IsTrue(cData.Equals(cTaxData));
    }

    /// <summary>
    /// Tests 2 Citizen Data Comparison with same parameters. Should Return True.
    /// </summary>
    [TestMethod]
    public void Equals_CitizenDataSameParameters_True()
    {
        CitizenData cData1 = new CitizenData("lastname1", "firstname1", "address1",
0);
        CitizenData cData2 = new CitizenData("lastname1", "firstname1", "address1",
0);

        Assert.IsTrue(cData1.Equals(cData2));
    }

    /// <summary>
    /// Tests 2 Citizen Data Comparison with different Keys. Should Return false.
    /// </summary>
    [TestMethod]
    public void Equals_CitizenDataDifferentParameters_False()
    {
        CitizenData cData1 = new CitizenData("lastname1", "firstname1", "address1",
0);
        CitizenData cData2 = new CitizenData("lastname2", "firstname2", "address2",
0);

        Assert.IsFalse(cData1.Equals(cData2));
    }

    /// <summary>
    /// Tets add function and compares to array
    /// </summary>
    [TestMethod]
    public void Add_LinkedListArrayEquality_True()
    {
        TaxData[] testArray;
        LinkedList<TaxData> list;
        CreateTestData(10, out list, out testArray);

        int index = 0;
        foreach (TaxData taxData in list)
        {
            Assert.IsTrue(taxData.Equals(testArray[index]));
            index++;
        }
    }

    /// <summary>
    /// Tests LinkedList Sort() function and compares to array funcction
    /// </summary>
    [TestMethod]
    public void Sort_LinkedListArrayEquality_True()
    {
        TaxData[] testArray;
        LinkedList<TaxData> list;
        CreateTestData(10, out list, out testArray);

        list.Sort();
        testArray = SortArray(testArray);
        int index = 0;
        foreach (TaxData taxData in list)
        {
            Assert.IsTrue(taxData.Equals(testArray[index]));

```

```

        index++;
    }
}

/// <summary>
/// Sorts TaxData[] object to compare to LinkedList object
/// </summary>
/// <param name="array">Unsorted object</param>
/// <returns>sorted array</returns>
public TaxData[] SortArray(TaxData[] array)
{
    for (int i = 0; i < array.Length - 1; i++)
    {
        for (int j = 0; j < array.Length - 1 - i; j++)
        {
            if(array[j].CompareTo(array[j+1]) > 0)
            {
                // SWAP
                TaxData temp = array[j];
                array[j] = array[j+1];
                array[j+1] = temp;
            }
        }
    }
    return array;
}

/// <summary>
/// Creates test data with the same objects to compare while doing testsgggg
/// </summary>
/// <param name="size">amount of elements</param>
/// <param name="linkedList">OUT Lab03 implementation of linked list</param>
/// <param name="taxData">OUT Array</param>
public void CreateTestData(int size, out LinkedList<TaxData> linkedList, out
TaxData[] taxData)
{
    linkedList = new LinkedList<TaxData>();
    taxData = new TaxData[size];
    for (int i = 0; i < size; i++)
    {
        Random rng = new Random();
        TaxData temp = new TaxData(rng.Next(100).ToString(), i.ToString(),
(double)i/10);
        linkedList.Add(temp);
        taxData[i] = temp;
    }
}
}
}

```

Lab01Form.aspx:

```
<%@ Page Language="C#" AutoEventWireup="true" CodeBehind="Lab01Form.aspx.cs"
Inherits="Lab02.Lab01Form" %>

<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head runat="server">
    <link rel="stylesheet" runat="server" media="screen" href="~/css/styles.css" />
    <title>Lab02 U16</title>
</head>
<body>
    <form id="form1" runat="server">
        <div id="body">
            <asp:Label ID="HeaderLabel" runat="server" Text="LAB02 U16"></asp:Label>
            <br />
            <br />
            <asp:Label ID="Label1" runat="server" Text="Tax Info U16a.txt:"></asp:Label>
            <br />
            <asp:FileUpload ID="FileUpload1" runat="server" />
            <br />
            <br />
            <asp:Label ID="Label2" runat="server" Text="Every Citizen Tax Data U16b.txt:
"></asp:Label>
            <br />
            <asp:FileUpload ID="FileUpload2" runat="server" />
            <br />
            <asp:Button ID="DataButton" runat="server" Text="Submit New Data"
OnClick="DataButton_Click" />
            <br />
            <br />
            <asp:Label ID="InitTaxLabel" runat="server" Text="U16a.txt Initial
data:"></asp:Label>
            <asp:Table ID="InitTaxTable" runat="server">
            </asp:Table>
            <br />
            <asp:Label ID="InitCitizenLabel" runat="server" Text="U16b.txt Initial
data:"></asp:Label>
            <asp:Table ID="InitCitizenTable" runat="server">
            </asp:Table>
            <br />
            <asp:Panel ID="CalculationsPanel" runat="server">
                <asp:Label ID="CitizenTaxLabel" runat="server" Text="All Citizen taxes
over the months"></asp:Label>
                <asp:Table ID="CitizenTaxTable" runat="server">
                </asp:Table>
                <br />
                <asp:Label ID="AverageTax" runat="server"></asp:Label>
                <br />
                <asp:Label ID="TotalTaxSum" runat="server"></asp:Label>
                <br />
                <br />
                <asp:Label ID="CitizenTaxLabel0" runat="server" Text="Above Average
Tax:"></asp:Label>
                <asp:Table ID="AboveAverageTable" runat="server">
                </asp:Table>
                <br />
                <asp:Label ID="FilterData" runat="server" Text="Filtered
data:"></asp:Label>
                <asp:Table ID="FilterTable" runat="server">
                </asp:Table>
                <br />
                Tax Code:<br />
                <asp:TextBox ID="TaxCodeTextBox" runat="server"></asp:TextBox>
                <br />
            </asp:Panel>
        </div>
    </form>
</body>
</html>
```

```

        Month:<br />
        <asp:TextBox ID="TaxMonthTextBox" runat="server"></asp:TextBox>
        <br />
        <asp:Button ID="ButtonFilter" runat="server" Text="Submit"
OnClick="ButtonFilter_Click" />
    </asp:Panel>
    <br />
</div>
</form>
</body>
</html>

```

```

using System;
using System.Collections.Generic;
using System.IO;
using System.Linq;
using System.Web;
using System.Web.UI;
using System.Web.UI.WebControls;

namespace Lab02
{
    public partial class Lab01Form : System.Web.UI.Page
    {
        private string taxDataInput = @"App_Data/U16a.txt";
        private string citizenDataInput = @"App_Data/U16b.txt";
        private string outputDataPath = @"App_Data/U16result.txt";
        protected void Page_Load(object sender, EventArgs e)
        {
            LinkedList<CitizenTaxData> citizenTaxData = null;
            LinkedList<TaxData> taxInfo = null;
            InOutUtils.CreateFile(Server.MapPath(outputDataPath));
            if (File.Exists(Server.MapPath(taxDataInput)))
            {
                taxInfo = InOutUtils.ReadTaxData(Server.MapPath(taxDataInput));
                InOutUtils.WriteTaxData(Server.MapPath(outputDataPath), taxInfo, "Initial
Tax Company Data:");
                FillTaxDataTable(taxInfo, InitTaxTable);
            }
            else
            {
                InitTaxLabel.Text = "";
            }

            if (File.Exists(Server.MapPath(citizenDataInput)))
            {
                citizenTaxData =
                InOutUtils.ReadCitizenTaxData(Server.MapPath(citizenDataInput));
                //citizenTaxData.Sort(); Test
                InOutUtils.WriteCitizenTaxData(Server.MapPath(outputDataPath),
                citizenTaxData, "Initial Citizen Tax Data:");
                FillCitizenTaxDataTable(citizenTaxData, InitCitizenTable);
            }
            else
            {
                InitCitizenLabel.Text = "";
            }

            if (citizenTaxData != null && taxInfo != null)
            {
                // Reads Initial Data and Outputs the Initial Data To WebForm and to text

                CitizenCalculations(taxInfo, citizenTaxData);
                CheckFiltered(taxInfo, citizenTaxData);
            }
        }
    }
}

```

```

    }
    else
    {
        HeaderLabel.Text = "Plaese Upload remaining data files";
        CalculationsPanel.Visible = false;
    }
}

/// <summary>
/// Does calculations from Tax and CitizenTax object
/// </summary>
/// <param name="taxInfo">Tax object</param>
/// <param name="citizenTaxData">CitizenTax object</param>
protected void CitizenCalculations(LinkedList<TaxData> taxInfo,
LinkedList<CitizenTaxData> citizenTaxData)
{
    LinkedList<CitizenData> citizensAverage =
TaskUtils.CreateCitizenData(taxInfo, citizenTaxData); // For Above Average
    InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath), citizensAverage,
"Tax Sum of all citizens:");

    citizensAverage.Sort();
    InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath), citizensAverage,
"Tax Sum of all citizens SORTED A-Z:");
    FillCitizenTable(citizensAverage, CitizenTaxTable);

    double sum = TaskUtils.GetSum(citizensAverage);
    double average = TaskUtils.GetAverage(citizensAverage);
    InOutUtils.WriteHeader(Server.MapPath(outputDataPath), $"All Citizen TOTAL
Tax Sum: {sum:f}");
    InOutUtils.WriteHeader(Server.MapPath(outputDataPath), $"Average Tax Sum:
{average:f}");
    AverageTax.Text = $"Average tax per citizen: {average}";
    TotalTaxSum.Text = $"Total tax sum: {sum}";

    citizensAverage = TaskUtils.PayedAboveAverage(citizensAverage);
    InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath), citizensAverage,
"Citizens who paid above average:");
    FillCitizenTable(citizensAverage, AboveAverageTable);
}
/// <summary>
/// Updates filtered data
/// </summary>
/// <param name="taxInfo">Tax Object</param>
/// <param name="citizenTaxData">CitizenTax object</param>
protected void CheckFiltered(LinkedList<TaxData> taxInfo,
LinkedList<CitizenTaxData> citizenTaxData)
{
    if (Session["TaxCode"] != null && Session["Month"] != null)
    {
        LinkedList<CitizenData> citizensFiltered =
TaskUtils.CreateCitizenData(taxInfo, citizenTaxData); // For Filter
        citizensFiltered = TaskUtils.GetWhoPayedTaxes(citizensFiltered,
Session["TaxCode"].ToString(), Session["Month"].ToString(), citizenTaxData);
        citizensFiltered.Sort();
        InOutUtils.WriteCitizenData(Server.MapPath(outputDataPath),
citizensFiltered, $"Citizens who paid TaxCode: \"{Session["TaxCode"]}\" on Month:
\"{Session["Month"]}\"");
        FillCitizenTable(citizensFiltered, FilterTable);
    }
    else
    {
        FilterData.Text = "No Filter provided";
        FilterTable.Visible = false;
    }

    Session["TaxCode"] = null;
}

```



```

        Session["Month"] = null;
    }

    /// <summary>
    /// Fills Table from CitizenTax object
    /// </summary>
    /// <param name="citizenTaxes">CitizenTaxData LinkedList</param>
    /// <param name="table">Table UI object</param>
    protected void FillCitizenTaxDataTable(LinkedList<CitizenTaxData> citizenTaxes,
    Table table)
    {
        TableRow headerRow = new TableRow();
        headerRow.Cells.Add(CreateCell("Last Name"));
        headerRow.Cells.Add(CreateCell("First Name"));
        headerRow.Cells.Add(CreateCell("Address"));
        headerRow.Cells.Add(CreateCell("Month"));
        headerRow.Cells.Add(CreateCell("Tax Code"));
        headerRow.Cells.Add(CreateCell("Amount"));
        table.Rows.Add(headerRow);
        foreach (CitizenTaxData data in citizenTaxes)
        {
            table.Rows.Add(GetRow(data));
        }
    }

    /// <summary>
    /// Fills Table from Tax object
    /// </summary>
    /// <param name="taxes">LinkedList TaxData object</param>
    /// <param name="table">UI Table object</param>
    protected void FillTaxDataTable(LinkedList<TaxData> taxes, Table table)
    {
        TableRow headerRow = new TableRow();
        headerRow.Cells.Add(CreateCell("Tax Code"));
        headerRow.Cells.Add(CreateCell("Tax Company Name:"));
        headerRow.Cells.Add(CreateCell("Price:"));
        table.Rows.Add(headerRow);
        foreach (TaxData data in taxes)
        {
            table.Rows.Add(GetRow(data));
        }
    }

    /// <summary>
    /// Fills citizen table
    /// </summary>
    /// <param name="citizens">Citizen object</param>
    /// <param name="table">UI.Table object</param>
    protected void FillCitizenTable(LinkedList<CitizenData> citizens, Table table)
    {
        TableRow headerRow = new TableRow();
        headerRow.Cells.Add(CreateCell("Last Name"));
        headerRow.Cells.Add(CreateCell("First Name"));
        headerRow.Cells.Add(CreateCell("Address"));
        headerRow.Cells.Add(CreateCell("Tax Sum"));
        table.Rows.Add(headerRow);
        foreach (CitizenData data in citizens)
        {
            table.Rows.Add(GetRow(data));
        }
    }

    protected void ButtonFilter_Click(object sender, EventArgs e)
    {
        string taxCode = TaxCodeTextBox.Text;
        string month = TaxMonthTextBox.Text;
        if (month != "" && taxCode != null)
    }

```

```

    {
        Session["TaxCode"] = TaxCodeTextBox.Text;
        Session["Month"] = TaxMonthTextBox.Text;
    }
    Response.Redirect("Lab01Form.aspx");
}

protected void DataButton_Click(object sender, EventArgs e)
{
    if(FileUpload1.HasFile && FileUpload1.FileName.EndsWith(".txt"))
    {
        FileUpload1.SaveAs(Server.MapPath(taxDataInput));
    }
    if (FileUpload2.HasFile && FileUpload2.FileName.EndsWith(".txt"))
    {
        FileUpload2.SaveAs(Server.MapPath(citizenDataInput));
    }
    Response.Redirect("Lab01Form.aspx");
}

/// <summary>
/// Creates TableCell from text to speed up TableCell creation
/// </summary>
/// <param name="text">string text to add to the table cell</param>
/// <returns>TableCell class object</returns>
protected static TableCell CreateCell(string text)
{
    TableCell cell = new TableCell();
    cell.Text = text;
    return cell;
}

/// <summary>
/// Creates TableRow from TaxData object
/// </summary>
/// <param name="data">TaxData object</param>
/// <returns>TableRow object</returns>
public TableRow GetRow(TaxData data)
{
    TableRow row = new TableRow();
    row.Cells.Add(CreateCell(data.TaxCode));
    row.Cells.Add(CreateCell(data.TaxName));
    row.Cells.Add(CreateCell(data.Price.ToString()));
    return row;
}

/// <summary>
/// Creates a row from CitizenTaxData
/// </summary>
/// <param name="data">CitizenTaxData class object</param>
/// <returns>TableRow object</returns>
public TableRow GetRow(CitizenTaxData data)
{
    TableRow row = new TableRow();
    row.Cells.Add(CreateCell(data.LastName));
    row.Cells.Add(CreateCell(data.FirstName));
    row.Cells.Add(CreateCell(data.Address));
    row.Cells.Add(CreateCell(data.Month));
    row.Cells.Add(CreateCell(data.TaxCode));
    row.Cells.Add(CreateCell(data.TaxAmount.ToString()));
    return row;
}

```

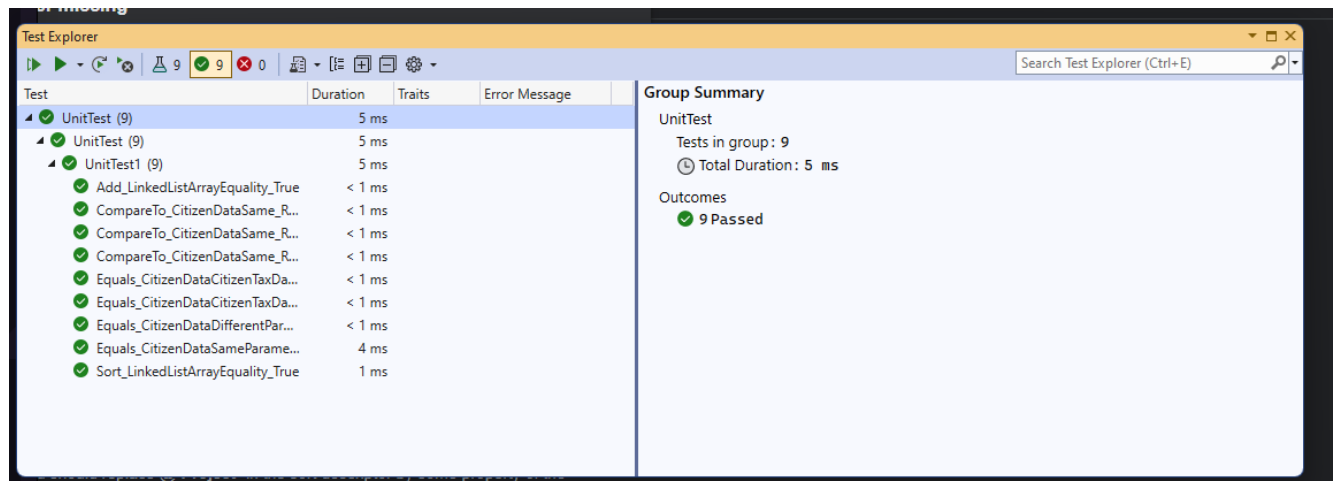
```

    /// <summary>
    /// Returns cictizen in TableRow format for the specified citizen
    /// </summary>
    /// <param name="data">data of the citizen</param>
    /// <returns>TableRow format of the specified citizen</returns>
    public TableRow GetRow(CitizenData data)
    {
        TableRow row = new TableRow();
        row.Cells.Add(CreateCell(data.LastName));
        row.Cells.Add(CreateCell(data.FirstName));
        row.Cells.Add(CreateCell(data.Address));
        row.Cells.Add(CreateCell(data.TaxSum.ToString()));
        return row;
    }
}

```

### 3.7. Pradiniai duomenys ir rezultatai

Testavimo rezultatai:



Pradiniai duomenys 1:

U16a.txt:

```

11; Elektra; 0.12
21; Dujos; 0.58
31; Benzinas; 1.78
32; Diezelis; 1.90

```

U16b.txt:

```

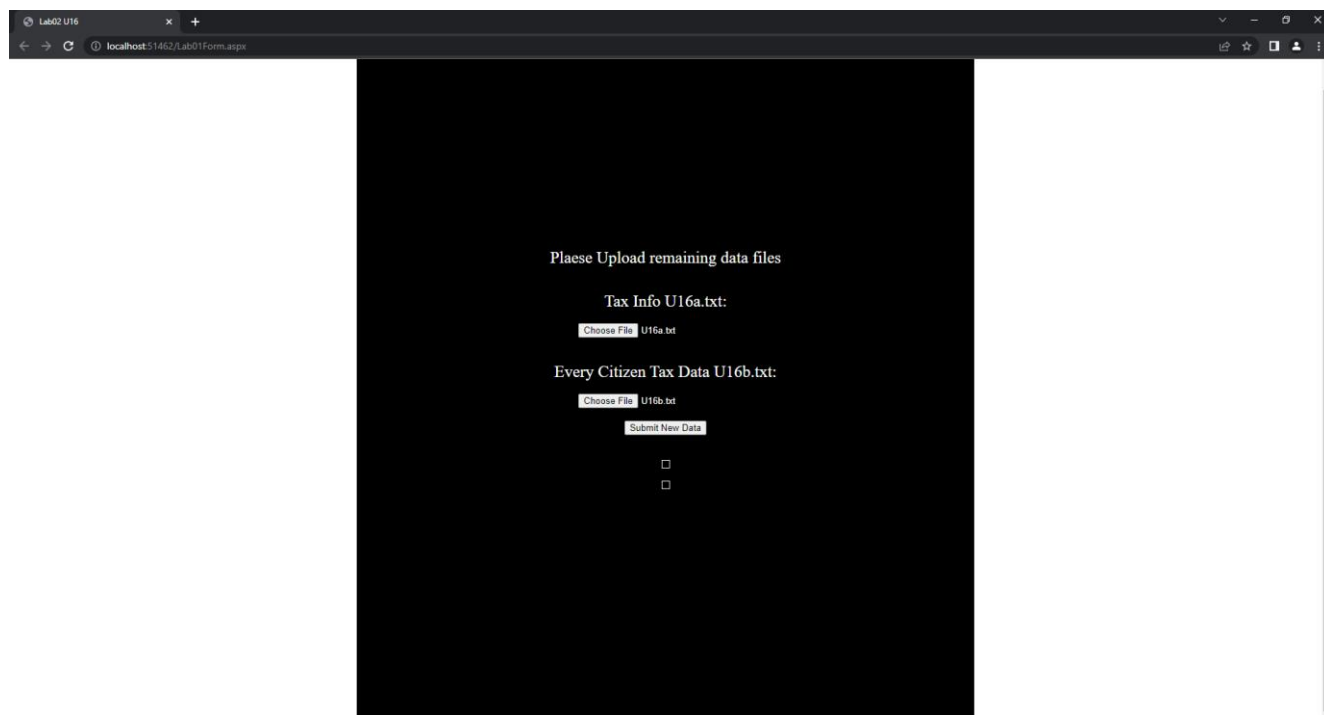
pavardė1; vardas1; adresas1;1;22;28;
pavardė1; vardas1; adresas1;5;22;20;
pavardė1; vardas1; adresas1;1;32;100;
pavardė1; vardas1; adresas1;2;32;97;
pavardė1; vardas1; adresas1;3;32;63;
pavardė1; vardas1; adresas1;2;22;25;
pavardė1; vardas1; adresas1;3;22;29;
pavardėAA; vardasAA; adresasAA;1;21;13;

```

pavardėAA; vardasAA; adresasAA;2;21;84;  
pavardėAA; vardasAA; adresasAA;3;21;76;  
pavardė1; vardas1; adresas1;4;22;39;  
pavardė2; vardas2; adresas2;3;31;67;  
pavardė2; vardas2; adresas2;4;31;98;  
pavardė0; vardas2; adresas2;5;31;125;  
pavardė0; vardas0; adresas3;1;11;31;  
pavardė1; vardas1; adresas1;4;32;39;  
pavardė1; vardas1; adresas1;5;32;20;  
pavardė1; vardas1; adresas1;3;11;80;  
pavardė1; vardas1; adresas1;4;11;39;  
pavardė1; vardas1; adresas1;1;11;120;  
pavardė1; vardas1; adresas1;2;11;100;  
pavardė1; vardas1; adresas1;5;11;139;  
pavardė2; vardas2; adresas2;1;31;31;  
pavardė2; vardas2; adresas2;2;31;48;  
pavardė0; vardas0; adresas3;2;11;48;  
pavardė0; vardas0; adresas3;3;11;67;  
pavardė0; vardas0; adresas3;4;11;98;  
pavardė0; vardas0; adresas3;5;11;125;  
pavardėAA; vardasAA; adresasAA;4;21;8;  
pavardėAA; vardasAA; adresasAA;5;21;25;

Rezultatai 1:

Pradinė vartotojo sąsaja:



Įkeliam U16a.txt ir U16b.txt:

LAB02 U16

Tax Info U16a.txt:

Choose File

No file chosen

Every Citizen Tax Data U16b.txt:

Choose File

No file chosen

Submit New Data

U16a.txt Initial data:

Tax Code	Tax Company Name	Price
11	Elektra	0.12
21	Dujos	0.58
31	Benzinas	1.78
32	Dizelis	1.9

U16b.txt Initial data:

Last Name	First Name	Address	Month	Tax Code	Amount
vardas1	pavardė1	adresas1	1	22	28
vardas1	pavardė1	adresas1	5	22	20
vardas1	pavardė1	adresas1	1	32	100
vardas1	pavardė1	adresas1	2	32	97
vardas1	pavardė1	adresas1	3	32	63
vardas1	pavardė1	adresas1	2	22	25
vardas1	pavardė1	adresas1	3	22	29
vardasAA	pavardėAA	adresasAA	1	21	13
vardasAA	pavardėAA	adresasAA	2	21	84
vardasAA	pavardėAA	adresasAA	3	21	76
vardas1	pavardė1	adresas1	4	22	39
vardas2	pavardė2	adresas2	3	31	67
vardas2	pavardė2	adresas2	4	31	98
vardas2	pavardė0	adresas2	5	31	125
vardas0	pavardė0	adresas3	1	11	31
vardas1	pavardė1	adresas1	4	32	39
vardas1	pavardė1	adresas1	5	32	20
vardas1	pavardė1	adresas1	3	11	80
vardas1	pavardė1	adresas1	4	11	39
vardas1	pavardė1	adresas1	1	11	120
vardas1	pavardė1	adresas1	2	11	100
vardas1	pavardė1	adresas1	5	11	139
vardas2	pavardė2	adresas2	1	31	31
vardas2	pavardė2	adresas2	2	31	48
vardas0	pavardė0	adresas3	2	11	48
vardas0	pavardė0	adresas3	3	11	67
vardas0	pavardė0	adresas3	4	11	98
vardas0	pavardė0	adresas3	5	11	125
vardasAA	pavardėAA	adresasAA	4	21	8
vardasAA	pavardėAA	adresasAA	5	21	25

All Citizen taxes over the months

Last Name	First Name	Address	Tax Sum
vardasAA	pavardėAA	adresasAA	119.48
vardas0	pavardė0	adresas3	44.28
vardas2	pavardė2	adresas2	434.32
vardas2	pavardė0	adresas2	222.5
vardas1	pavardė1	adresas1	663.46

Average tax per citizen: 296.808  
Total tax sum: 1484.04

Above Average Tax:

Last Name	First Name	Address	Tax Sum
vardas2	pavardė2	adresas2	434.32
vardas1	pavardė1	adresas1	663.46

No Filter provided  
Tax Code:  
Month:  

Submit

Filtruojame duomenis pagal TaxCode: 11, Month: 1:

Filtered data:

Last Name	First Name	Address	Tax Sum
vardas0	pavardė0	adresas3	44.28
vardas1	pavardė1	adresas1	663.46

Tax Code:

Month:

Submit

U16result.txt:

Initial Tax Company Data:

TaxCode	TaxName	Price
11	Elektra	0.12
21	Dujos	0.58
31	Benzinas	1.78
32	Dizelis	1.90

Initial Citizen Tax Data:

LastName	FirstName	Address	Month	TaxCode	TaxAmount
vardas1	pavardė1	adresas1	1	22	28
vardas1	pavardė1	adresas1	5	22	28
vardas1	pavardė1	adresas1	1	32	100
vardas1	pavardė1	adresas1	2	32	97
vardas1	pavardė1	adresas1	3	32	63
vardas1	pavardė1	adresas1	2	22	25
vardas1	pavardė1	adresas1	3	22	29
vardasAA	pavardėAA	adresasAA	1	21	13
vardasAA	pavardėAA	adresasAA	2	21	84
vardasAA	pavardėAA	adresasAA	3	21	76
vardas1	pavardė1	adresas1	4	22	39
vardas2	pavardė2	adresas2	3	31	67
vardas2	pavardė2	adresas2	4	31	98
vardas2	pavardė0	adresas2	5	31	125
vardas0	pavardė0	adresas3	1	11	31
vardas1	pavardė1	adresas1	4	32	39
vardas1	pavardė1	adresas1	5	32	28
vardas1	pavardė1	adresas1	3	11	80
vardas1	pavardė1	adresas1	4	11	39
vardas1	pavardė1	adresas1	1	11	120
vardas1	pavardė1	adresas1	2	11	100
vardas1	pavardė1	adresas1	5	11	139
vardas2	pavardė2	adresas2	1	31	31
vardas2	pavardė2	adresas2	2	31	48
vardas0	pavardė0	adresas3	2	11	48
vardas0	pavardė0	adresas3	3	11	67
vardas0	pavardė0	adresas3	4	11	98
vardas0	pavardė0	adresas3	5	11	125
vardasAA	pavardėAA	adresasAA	4	21	8
vardasAA	pavardėAA	adresasAA	5	21	25

Tax Sum of all citizens:

LastName	FirstName	Address	TaxSum
vardas1	pavardė1	adresas1	663.46
vardasAA	pavardėAA	adresasAA	119.48
vardas2	pavardė2	adresas2	434.32
vardas0	pavardė0	adresas3	222.50
vardas0	pavardė0	adresas3	44.28

Tax Sum of all citizens SORTED A-Z:

LastName	FirstName	Address	TaxSum
vardasAA	pavardėAA	adresasAA	119.48
vardas0	pavardė0	adresas3	44.28
vardas2	pavardė2	adresas2	434.32
vardas2	pavardė0	adresas2	222.50
vardas1	pavardė1	adresas1	663.46

All Citizen TOTAL Tax Sum: 1484.04

Average Tax Sum: 296.81

Citizens who paid above average:

LastName	FirstName	Address	TaxSum
vardas2	pavardė2	adresas2	434.32
vardas1	pavardė1	adresas1	663.46

Citizens who paid TaxCode: "11" on Month: "1"

LastName	FirstName	Address	TaxSum
vardas0	pavardė0	adresas3	44.28
vardas1	pavardė1	adresas1	663.46

Pradiniai duomenys 2:

U16a.txt:

VAND; Vanduo; 0.07  
KVND; Karštas vanduo; 0.20  
LH20; Ledinis Vanduo; 0.10

U16b.txt:

Pavardauskis; Vardenis; Adresatas;Vasaris;Benzinas;28;  
Pavardauskis; Vardenis; Adresatas;Vasaris;VAND;14;  
Pavardauskis; Vardenis; Adresatas;Kovas;KVND;20;  
Pavardauskis; Vardenis; Adresatas;Kovas;LH20;30;  
Pavardauskis; Vardenis; Adresatas;Kovas;VAND;15;  
Pavardauskis; Vardenis; Adresatas;Balandis;VAND;99;  
Tomas; Tomukas; Tomo namas 1;Kovas;VAND;97;  
Tomas; Tomukas; Tomo namas 1;Balandis;VAND;156;  
Tomas; Tomukas; Tomo namas 1;Rugsėjis;VAND;20;

Rezultatai 2:

Vartotojo sąsaja:

Naudojant filtrus: TaxCode: Vand, Month: Kovas

## LAB02 U16

### Tax Info U16a.txt:

[Choose File](#) No file chosen

### Every Citizen Tax Data U16b.txt:

[Choose File](#) No file chosen

[Submit New Data](#)

### U16a.txt Initial data:

Tax Code	Tax Company Name:	Price:
VAND	Vanduo	0.07
KVND	Karštas vanduo	0.2
LH20	Ledinis Vanduo	0.1

### U16b.txt Initial data:

Last Name	First Name	Address	Month	Tax Code	Amount
Vardenis	Pavardauskis	Adresatas	Vasaris	Benzinas	28
Vardenis	Pavardauskis	Adresatas	Vasaris	VAND	14
Vardenis	Pavardauskis	Adresatas	Kovas	KVND	20
Vardenis	Pavardauskis	Adresatas	Kovas	LH20	30
Vardenis	Pavardauskis	Adresatas	Kovas	VAND	15
Vardenis	Pavardauskis	Adresatas	Balandis	VAND	99
Tomukas	Tomas	Tomo namas 1	Kovas	VAND	97
Tomukas	Tomas	Tomo namas 1	Balandis	VAND	156
Tomukas	Tomas	Tomo namas 1	Rugsėjis	VAND	20

### All Citizen taxes over the months

Last Name	First Name	Address	Tax Sum
Tomukas	Tomas	Tomo namas 1	19.11
Vardenis	Pavardauskis	Adresatas	15.96

Average tax per citizen: 17.535  
Total tax sum: 35.07

Above Average Tax:

Last Name	First Name	Address	Tax Sum
Tomukas	Tomas	Tomo namas 1	19.11

Filtered data:

Last Name	First Name	Address	Tax Sum
Tomukas	Tomas	Tomo namas 1	19.11
Vardenis	Pavardauskis	Adresatas	15.96

Tax Code:

Month:

U16Result.txt:

```
Initial Tax Company Data:
TaxCode      |TaxName      |   Price|
VAND         | Vanduo      |   0.07|
KVND         | Karštas vanduo |   0.20|
LH20         | Ledinis Vanduo |   0.10|

Initial Citizen Tax Data:
LastName      |FirstName    |Address    |Month      |TaxCode      |TaxAmount|
Vardenis     |Pavardauskis|Adresatas  |Vasaris    |Benzinas     |28|
Vardenis     |Pavardauskis|Adresatas  |Vasaris    |VAND         |14|
Vardenis     |Pavardauskis|Adresatas  |Kovas      |KVND         |20|
Vardenis     |Pavardauskis|Adresatas  |Kovas      |LH20         |30|
Vardenis     |Pavardauskis|Adresatas  |Kovas      |VAND         |15|
Vardenis     |Pavardauskis|Adresatas  |Balandis   |VAND         |99|
Tomukas      |Tomas        |Tomo namas 1|Kovas      |VAND         |97|
Tomukas      |Tomas        |Tomo namas 1|Balandis   |VAND         |156|
Tomukas      |Tomas        |Tomo namas 1|Rugsėjis    |VAND         |20|

Tax Sum of all citizens:|
LastName      |FirstName    |Address    |TaxSum     |
Vardenis     |Pavardauskis|Adresatas  |15.96|
Tomukas      |Tomas        |Tomo namas 1|19.11|

Tax Sum of all citizens SORTED A-Z:
LastName      |FirstName    |Address    |TaxSum     |
Tomukas      |Tomas        |Tomo namas 1|19.11|
Vardenis     |Pavardauskis|Adresatas  |15.96|

All Citizen TOTAL Tax Sum: 35.07

Average Tax Sum: 17.54

Citizens who paid above average:
LastName      |FirstName    |Address    |TaxSum     |
Tomukas      |Tomas        |Tomo namas 1|19.11|

Citizens who paid TaxCode: "VAND" on Month: "Kovas"
LastName      |FirstName    |Address    |TaxSum     |
Tomukas      |Tomas        |Tomo namas 1|19.11|
Vardenis     |Pavardauskis|Adresatas  |15.96|
```

css/styles.css:

```
body {
  color: white;
  background: white;
  padding: 0;
  margin: 0;
  display: flex;
```



```

        justify-content: center;
    }

    #body {
        display: flex;
        flex-direction: column;
        justify-content: center;
        align-items: center;
        text-align: center;
        padding: 15px 280px;
        background-color: black;
        min-height: 100vh;
    }

    td {
        background-color: white;
    }

    table {
        border: 1px solid;
        border-color: white;
        padding: 5px;
    }

    td {
        color: black;
        padding: 10px;
    }

    span {
        font-size: 1.5em;
    }

```

Lab01Form.aspx:

### 3.8. Dėstytojo pastabos

Ačiū, puikus darbas, tik:

1. Testiniai variantai neturi tikslų.
2. Vienetų testavimas yra minimalus.
3. Vienetų testavimo rezultatai nėra įtraukti į ataskaitą.

## **4. Polimorfizmas ir išimčių valdymas (L4)**

### **4.1. Darbo užduotis**

### **4.2. Grafinės vartotojo sąsajos schema**

### **4.3. Sąsajoje panaudotų komponentų keičiamos savybės**

<b>Komponentas</b>	<b>Savybė</b>	<b>Reikšmė</b>

### **4.4. Klasių diagrama**

### **4.5. Programos vartotojo vadovas**

### **4.6. Programos tekstas**

### **4.7. Pradiniai duomenys ir rezultatai**

#### **4.8. Dėstytojo pastabos**

## **5. Deklaratyvusis programavimas (L5)**

### **5.1. Darbo užduotis**

### **5.2. Grafinės vartotojo sąsajos schema**

### **5.3. Sąsajoje panaudotų komponentų keičiamos savybės**

<b>Komponentas</b>	<b>Savybė</b>	<b>Reikšmė</b>

### **5.4. Klasių diagrama**

### **5.5. Programos vartotojo vadovas**

### **5.6. Programos tekstas**

### **5.7. Pradiniai duomenys ir rezultatai**

## **5.8. Dėstytojo pastabos**