Міністерство освіти і науки України

Національний університет «Львівська політехніка»

Інститут комп’ютерних наук та інформаційних технологій

Кафедра ІТВС

Лабораторна робота №4

З дисципліни:

«Технологія програмування та створення програмних продуктів»

На тему:

«Робота зі структурами у Visual Studio 2017 (C++)»

Варіант 9

Виконала:

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**Лабораторна робота N 4.**

Назва : **Робота зі структурами у Visual Studio 2017 (C++).**

Мета : Вивчення методів роботи зі структурами у

Visual Studio 2017 (C++).

Завдання: У масивi структур приведена iнформацiя про студентiв факультету: прiзвище, iм'я, по-батьковi, стать, вiк, курс, група, оцiнки по 5-ти предметах.

Написати програму, яка виводить:

а) номер курсу, на якому найбiльший процент хлопців;

б) найбiльш розповсюдженi чоловiчi та жiночi iмена;

в) номери груп в порядку спадання середньої успiшностi сту-

дентiв першого курсу;

Код:

#pragma once

#include <string>

#include <vector>

#include <msclr\marshal\_cppstd.h>

struct student

{

int age;

std::string first\_name;

std::string father\_name;

std::string second\_name;

int sex;

int course;

std::string group;

std::vector<int> marks;

};

std::vector<student> students;

using namespace msclr::interop;

namespace Project4 {

using namespace System;

using namespace System::ComponentModel;

using namespace System::Collections;

using namespace System::Windows::Forms;

using namespace System::Data;

using namespace System::Drawing;

/// <summary>

/// Сводка для MyForm

/// </summary>

public ref class MyForm : public System::Windows::Forms::Form

{

public:

MyForm(void)

{

InitializeComponent();

//

//TODO: добавьте код конструктора

//

}

protected:

/// <summary>

/// Освободить все используемые ресурсы.

/// </summary>

~MyForm()

{

if (components)

{

delete components;

}

}

public

private: System::Windows::Forms::Button^ button1;

private: System::Windows::Forms::Button^ button2;

private: System::Windows::Forms::TextBox^ textBox1;

private: System::Windows::Forms::TextBox^ textBox2;

private: System::Windows::Forms::TextBox^ textBox3;

private: System::Windows::Forms::TextBox^ textBox5;

private: System::Windows::Forms::TextBox^ textBox6;

private: System::Windows::Forms::TextBox^ textBox7;

private: System::Windows::Forms::Label^ label1;

private: System::Windows::Forms::Label^ label4;

private: System::Windows::Forms::Label^ label5;

private: System::Windows::Forms::Label^ label6;

private: System::Windows::Forms::Label^ label7;

private: System::Windows::Forms::Label^ label8;

private: System::Windows::Forms::TextBox^ textBox8;

private: System::Windows::Forms::TextBox^ textBox9;

private: System::Windows::Forms::TextBox^ textBox10;

private: System::Windows::Forms::TextBox^ textBox11;

private: System::Windows::Forms::Label^ label9;

private: System::Windows::Forms::Label^ label10;

private: System::Windows::Forms::Label^ label11;

private: System::Windows::Forms::CheckBox^ checkBox1;

private: System::Windows::Forms::CheckBox^ checkBox2;

private:

/// <summary>

/// Обязательная переменная конструктора.

/// </summary>

System::ComponentModel::Container ^components;

#pragma region Windows Form Designer generated code

/// <summary>

/// Требуемый метод для поддержки конструктора — не изменяйте

/// содержимое этого метода с помощью редактора кода.

/// </summary>

void InitializeComponent(void)

{

this->button1 = (gcnew System::Windows::Forms::Button());

this->button2 = (gcnew System::Windows::Forms::Button());

this->textBox1 = (gcnew System::Windows::Forms::TextBox());

this->textBox2 = (gcnew System::Windows::Forms::TextBox());

this->textBox3 = (gcnew System::Windows::Forms::TextBox());

this->textBox5 = (gcnew System::Windows::Forms::TextBox());

this->textBox6 = (gcnew System::Windows::Forms::TextBox());

this->textBox7 = (gcnew System::Windows::Forms::TextBox());

this->label1 = (gcnew System::Windows::Forms::Label());

this->label4 = (gcnew System::Windows::Forms::Label());

this->label5 = (gcnew System::Windows::Forms::Label());

this->label6 = (gcnew System::Windows::Forms::Label());

this->label7 = (gcnew System::Windows::Forms::Label());

this->label8 = (gcnew System::Windows::Forms::Label());

this->textBox8 = (gcnew System::Windows::Forms::TextBox());

this->textBox9 = (gcnew System::Windows::Forms::TextBox());

this->textBox10 = (gcnew System::Windows::Forms::TextBox());

this->textBox11 = (gcnew System::Windows::Forms::TextBox());

this->label9 = (gcnew System::Windows::Forms::Label());

this->label10 = (gcnew System::Windows::Forms::Label());

this->label11 = (gcnew System::Windows::Forms::Label());

this->checkBox1 = (gcnew System::Windows::Forms::CheckBox());

this->checkBox2 = (gcnew System::Windows::Forms::CheckBox());

this->SuspendLayout();

//

// button1

//

this->button1->Location = System::Drawing::Point(181, 160);

this->button1->Margin = System::Windows::Forms::Padding(2);

this->button1->Name = L"button1";

this->button1->Size = System::Drawing::Size(127, 46);

this->button1->TabIndex = 1;

this->button1->Text = L"Добавити студента";

this->button1->UseVisualStyleBackColor = true;

this->button1->Click += gcnew System::EventHandler(this, &MyForm::button1\_Click);

//

// button2

//

this->button2->Location = System::Drawing::Point(198, 342);

this->button2->Margin = System::Windows::Forms::Padding(2);

this->button2->Name = L"button2";

this->button2->Size = System::Drawing::Size(92, 33);

this->button2->TabIndex = 4;

this->button2->Text = L"Вивести";

this->button2->UseVisualStyleBackColor = true;

this->button2->Click += gcnew System::EventHandler(this, &MyForm::button2\_Click);

//

// textBox1

//

this->textBox1->Location = System::Drawing::Point(136, 10);

this->textBox1->Margin = System::Windows::Forms::Padding(2);

this->textBox1->Name = L"textBox1";

this->textBox1->Size = System::Drawing::Size(97, 20);

this->textBox1->TabIndex = 5;

this->textBox1->TextChanged += gcnew System::EventHandler(this, &MyForm::textBox1\_TextChanged);

//

// textBox2

//

this->textBox2->Location = System::Drawing::Point(237, 10);

this->textBox2->Margin = System::Windows::Forms::Padding(2);

this->textBox2->Name = L"textBox2";

this->textBox2->Size = System::Drawing::Size(97, 20);

this->textBox2->TabIndex = 6;

//

// textBox3

//

this->textBox3->Location = System::Drawing::Point(338, 11);

this->textBox3->Margin = System::Windows::Forms::Padding(2);

this->textBox3->Name = L"textBox3";

this->textBox3->Size = System::Drawing::Size(97, 20);

this->textBox3->TabIndex = 7;

//

// textBox5

//

this->textBox5->Location = System::Drawing::Point(136, 42);

this->textBox5->Margin = System::Windows::Forms::Padding(2);

this->textBox5->Name = L"textBox5";

this->textBox5->Size = System::Drawing::Size(97, 20);

this->textBox5->TabIndex = 9;

this->textBox5->TextChanged += gcnew System::EventHandler(this, &MyForm::textBox5\_TextChanged);

//

// textBox6

//

this->textBox6->Location = System::Drawing::Point(136, 78);

this->textBox6->Margin = System::Windows::Forms::Padding(2);

this->textBox6->Name = L"textBox6";

this->textBox6->Size = System::Drawing::Size(97, 20);

this->textBox6->TabIndex = 10;

this->textBox6->TextChanged += gcnew System::EventHandler(this, &MyForm::textBox6\_TextChanged);

//

// textBox7

//

this->textBox7->Location = System::Drawing::Point(338, 78);

this->textBox7->Margin = System::Windows::Forms::Padding(2);

this->textBox7->Name = L"textBox7";

this->textBox7->Size = System::Drawing::Size(97, 20);

this->textBox7->TabIndex = 11;

//

// label1

//

this->label1->AutoSize = true;

this->label1->Location = System::Drawing::Point(42, 18);

this->label1->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label1->Name = L"label1";

this->label1->Size = System::Drawing::Size(74, 13);

this->label1->TabIndex = 12;

this->label1->Text = L"ПІП студента";

//

// label4

//

this->label4->AutoSize = true;

this->label4->Location = System::Drawing::Point(283, 49);

this->label4->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label4->Name = L"label4";

this->label4->Size = System::Drawing::Size(36, 13);

this->label4->TabIndex = 15;

this->label4->Text = L"Стать";

//

// label5

//

this->label5->AutoSize = true;

this->label5->Location = System::Drawing::Point(42, 49);

this->label5->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label5->Name = L"label5";

this->label5->Size = System::Drawing::Size(22, 13);

this->label5->TabIndex = 16;

this->label5->Text = L"Вік";

this->label5->Click += gcnew System::EventHandler(this, &MyForm::label5\_Click);

//

// label6

//

this->label6->AutoSize = true;

this->label6->Location = System::Drawing::Point(42, 81);

this->label6->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label6->Name = L"label6";

this->label6->Size = System::Drawing::Size(31, 13);

this->label6->TabIndex = 17;

this->label6->Text = L"Курс";

//

// label7

//

this->label7->AutoSize = true;

this->label7->Location = System::Drawing::Point(283, 81);

this->label7->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label7->Name = L"label7";

this->label7->Size = System::Drawing::Size(36, 13);

this->label7->TabIndex = 18;

this->label7->Text = L"Група";

//

// label8

//

this->label8->AutoSize = true;

this->label8->Location = System::Drawing::Point(42, 119);

this->label8->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label8->Name = L"label8";

this->label8->Size = System::Drawing::Size(122, 13);

this->label8->TabIndex = 19;

this->label8->Text = L"Оцінки по 5 предметах";

//

// textBox8

//

this->textBox8->Location = System::Drawing::Point(168, 116);

this->textBox8->Margin = System::Windows::Forms::Padding(2);

this->textBox8->Name = L"textBox8";

this->textBox8->Size = System::Drawing::Size(267, 20);

this->textBox8->TabIndex = 20;

//

// textBox9

//

this->textBox9->Location = System::Drawing::Point(258, 273);

this->textBox9->Margin = System::Windows::Forms::Padding(2);

this->textBox9->Name = L"textBox9";

this->textBox9->ReadOnly = true;

this->textBox9->Size = System::Drawing::Size(236, 20);

this->textBox9->TabIndex = 21;

//

// textBox10

//

this->textBox10->Location = System::Drawing::Point(218, 303);

this->textBox10->Margin = System::Windows::Forms::Padding(2);

this->textBox10->Name = L"textBox10";

this->textBox10->ReadOnly = true;

this->textBox10->Size = System::Drawing::Size(276, 20);

this->textBox10->TabIndex = 22;

//

// textBox11

//

this->textBox11->Location = System::Drawing::Point(90, 243);

this->textBox11->Margin = System::Windows::Forms::Padding(2);

this->textBox11->Name = L"textBox11";

this->textBox11->ReadOnly = true;

this->textBox11->Size = System::Drawing::Size(404, 20);

this->textBox11->TabIndex = 23;

//

// label9

//

this->label9->AutoSize = true;

this->label9->Location = System::Drawing::Point(11, 250);

this->label9->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label9->Name = L"label9";

this->label9->Size = System::Drawing::Size(73, 13);

this->label9->TabIndex = 24;

this->label9->Text = L"Рейтинг груп";

//

// label10

//

this->label10->AutoSize = true;

this->label10->Location = System::Drawing::Point(13, 306);

this->label10->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label10->Name = L"label10";

this->label10->Size = System::Drawing::Size(201, 13);

this->label10->TabIndex = 25;

this->label10->Text = L"Найпоширеніші чоловічі та жіночі імена";

//

// label11

//

this->label11->AutoSize = true;

this->label11->Location = System::Drawing::Point(13, 276);

this->label11->Margin = System::Windows::Forms::Padding(2, 0, 2, 0);

this->label11->Name = L"label11";

this->label11->Size = System::Drawing::Size(241, 13);

this->label11->TabIndex = 26;

this->label11->Text = L"Номер курсу, з найбільшим відсотком хлопців";

//

// checkBox1

//

this->checkBox1->AutoSize = true;

this->checkBox1->Location = System::Drawing::Point(338, 47);

this->checkBox1->Margin = System::Windows::Forms::Padding(2);

this->checkBox1->Name = L"checkBox1";

this->checkBox1->Size = System::Drawing::Size(35, 17);

this->checkBox1->TabIndex = 29;

this->checkBox1->Text = L"М";

this->checkBox1->UseVisualStyleBackColor = true;

//

// checkBox2

//

this->checkBox2->AutoSize = true;

this->checkBox2->Location = System::Drawing::Point(398, 48);

this->checkBox2->Margin = System::Windows::Forms::Padding(2);

this->checkBox2->Name = L"checkBox2";

this->checkBox2->Size = System::Drawing::Size(37, 17);

this->checkBox2->TabIndex = 30;

this->checkBox2->Text = L"Ж";

this->checkBox2->UseVisualStyleBackColor = true;

//

// MyForm

//

this->AutoScaleDimensions = System::Drawing::SizeF(6, 13);

this->AutoScaleMode = System::Windows::Forms::AutoScaleMode::Font;

this->ClientSize = System::Drawing::Size(499, 380);

this->Controls->Add(this->checkBox2);

this->Controls->Add(this->checkBox1);

this->Controls->Add(this->label11);

this->Controls->Add(this->label10);

this->Controls->Add(this->label9);

this->Controls->Add(this->textBox11);

this->Controls->Add(this->textBox10);

this->Controls->Add(this->textBox9);

this->Controls->Add(this->textBox8);

this->Controls->Add(this->label8);

this->Controls->Add(this->label7);

this->Controls->Add(this->label6);

this->Controls->Add(this->label5);

this->Controls->Add(this->label4);

this->Controls->Add(this->label1);

this->Controls->Add(this->textBox7);

this->Controls->Add(this->textBox6);

this->Controls->Add(this->textBox5);

this->Controls->Add(this->textBox3);

this->Controls->Add(this->textBox2);

this->Controls->Add(this->textBox1);

this->Controls->Add(this->button2);

this->Controls->Add(this->button1);

this->Margin = System::Windows::Forms::Padding(2);

this->Name = L"MyForm";

this->Load += gcnew System::EventHandler(this, &MyForm::MyForm\_Load);

this->ResumeLayout(false);

this->PerformLayout();

}

#pragma endregion

private: System::Void label5\_Click(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void MyForm\_Load(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void textBox1\_TextChanged(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void textBox5\_TextChanged(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void textBox6\_TextChanged(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void button3\_Click(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void button1\_Click(System::Object^ sender, System::EventArgs^ e) {

student new\_student;

msclr::interop::marshal\_context context;

new\_student.second\_name = context.marshal\_as<std::string>(System::Convert::ToString(textBox1->Text));

new\_student.first\_name = context.marshal\_as<std::string>(System::Convert::ToString(textBox2->Text));

new\_student.father\_name = context.marshal\_as<std::string>(System::Convert::ToString(textBox3->Text));

new\_student.age = System::Convert::ToInt16(textBox5->Text);

new\_student.course = System::Convert::ToInt16(textBox6->Text);

new\_student.group = context.marshal\_as<std::string>(System::Convert::ToString(textBox7->Text));

System::String^ text = System::Convert::ToString(textBox8->Text);

if (checkBox1->Checked == true)

{

new\_student.sex = 1;

}

else

{

new\_student.sex = 0;

}

array<wchar\_t> ^id = { ',' };

std::vector<int> vect;

array<String^> ^StringArray = text->Split(id);

for each(String^ temp in StringArray) {

int i = System::Convert::ToInt32(temp);

vect.push\_back(i);

}

new\_student.marks = vect;

students.push\_back(new\_student);

textBox1->Text = "";

textBox2->Text = "";

textBox3->Text = "";

textBox5->Text = "";

textBox6->Text = "";

textBox7->Text = "";

textBox8->Text = "";

checkBox1->Checked = false;

checkBox2->Checked = false;

}

private: System::Void button2\_Click(System::Object^ sender, System::EventArgs^ e) {

std::vector<int> courses;

std::vector<int> boys;

std::vector<int> general\_number;

std::vector<int> boys\_per\_cent;

std::vector<std::string> boys\_names;

std::vector<std::string> girls\_names;

std::vector<int> boys\_names\_numbers;

std::vector<int> girls\_names\_numbers;

std::vector<std::string> groups;

std::vector<int> average\_marks;

for (int i = 0; i < students.size(); i++) {

int resp = check\_course(students[i].course, courses);

if (resp == 0) {

courses.push\_back(students[i].course);

}

if (students[i].course == 1) {

resp = check\_name(students[i].group, groups);

if (resp == 0) {

groups.push\_back(students[i].group);

}

int index = get\_name\_index(students[i].group, groups);

int size = average\_marks.size() - 1;

if (size < index) {

average\_marks.push\_back(0);

}

float sum = 0;

for (int m = 0; m < students[i].marks.size(); m++) {

sum += students[i].marks[m];

}

sum = sum / 5;

average\_marks[index] += sum;

}

if (students[i].sex == 1) {

resp = check\_name(students[i].first\_name, boys\_names);

if (resp == 0) {

boys\_names.push\_back(students[i].first\_name);

}

int index = get\_name\_index(students[i].first\_name, boys\_names);

int size = boys\_names\_numbers.size() - 1;

if (size < index) {

boys\_names\_numbers.push\_back(0);

}

boys\_names\_numbers[index]++;

}

else{

resp = check\_name(students[i].first\_name, girls\_names);

if (resp == 0) {

girls\_names.push\_back(students[i].first\_name);

}

int index = get\_name\_index(students[i].first\_name, girls\_names);

int size = girls\_names\_numbers.size() - 1;

if (size < index) {

girls\_names\_numbers.push\_back(0);

}

girls\_names\_numbers[index]++;

}

std::vector<int>::iterator it = std::find(courses.begin(), courses.end(), students[i].course);

int index = std::distance(courses.begin(), it);

int boys\_size = boys.size() - 1;

if (boys\_size < index) {

boys.push\_back(0);

general\_number.push\_back(0);

}

if (students[i].sex == 1) {

boys[index]++;

}

general\_number[index]++;

}

int percent = 0, max\_percent\_index, max\_percent = 0;

for (int i = 0; i < boys.size(); i++) {

percent = boys[i] / general\_number[i];

if (max\_percent < percent) {

max\_percent = percent;

max\_percent\_index = i;

}

}

std::string names = "";

int max = 0;

if (boys\_names\_numbers.size() > 0) {

for (int i = 0; i < boys\_names\_numbers.size(); i++) {

if (boys\_names\_numbers[max] < boys\_names\_numbers[i]) {

max = i;

}

}

names += boys\_names[max] + " ";

max = 0;

}

if (girls\_names\_numbers.size() > 0) {

for (int i = 0; i < girls\_names\_numbers.size(); i++) {

if (girls\_names\_numbers[max] < girls\_names\_numbers[i]) {

max = i;

}

}

names += girls\_names[max];

}

std::string groups\_names = "";

for (int i = 0; i < average\_marks.size(); i++) {

int max\_pos = 0;

for (int k = 0; k < average\_marks.size(); k++) {

if (average\_marks[k] > average\_marks[max\_pos]) {

max\_pos = k;

}

}

if (average\_marks[max\_pos] == -1)

continue;

groups\_names += groups[max\_pos] + ", ";

average\_marks[max\_pos] = -1;

}

textBox9->Text = System::Convert::ToString(courses[max\_percent\_index]);

textBox10->Text = marshal\_as<String^>(names);

textBox11->Text = marshal\_as<String^>(groups\_names);

}

int check\_course(int course, std::vector<int> courses) {

for (int j = 0; j < courses.size(); j++) {

if (course == courses[j]) {

return 1;

}

}

return 0;

}

int check\_name(std::string name, std::vector<std::string> names) {

for (int j = 0; j < names.size(); j++) {

if (name == names[j]) {

return 1;

}

}

return 0;

}

int get\_name\_index(std::string name, std::vector<std::string> names) {

for (int j = 0; j < names.size(); j++) {

if (name == names[j]) {

return j;

}

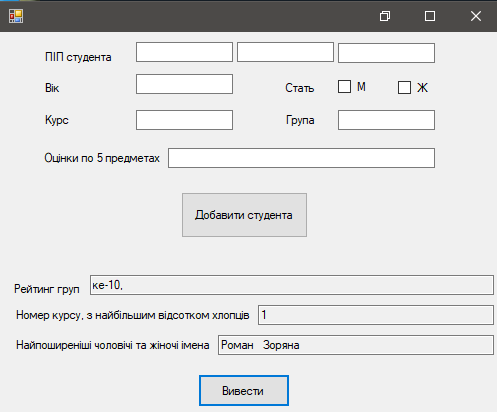
}

}

};

}

Результат виконання:



Висновок: на цій лабораторній роботі я навчилася працювати з структурами.