**Тема работы:** Включение ассемблерных фрагментов в программы на языках высокого уровня.

**Цель работы:** изучить способы использования ассемблера в программах, написанных на языках программирования высокого уровня.

Создайте приложение WindowsForms, которое производит расчеты по формулам на языке ассемблера. Все данные необходимо вводить в текстовые поля (TextBox). Программа должна быть реализована в двух вариантах: с использование встраиваемого ассемблерного кода и с использование библиотеки, написанной на ассемблере. Распечатайте результаты вычислений и текст программы.

|  |  |
| --- | --- |
| Вариант | Вид функции |
| 4 |  |

**Исходный код**

* файл asm\_lib.asm:

PUBLIC CalculateY

.CODE

CalculateY PROC

; RCX = a, RDX = b, R8 = c, R9 = x

mov rax, r9 ; x -> RAX

cmp rax, 0

jle check\_second

cmp rax, r8

jge check\_second

; Первое условие: 0 < x < c

imul rax, r8 ; x \* c

add rax, rcx ; +a

sub rax, rdx ; -b

ret

check\_second:

cmp rax, r8

jle end\_calc

; Второе условие: x > c

mov rax, r8 ; c -> RAX

imul rax, r9 ; c \* x

add rax, rdx ; +b

sub rax, r8 ; -c

ret

end\_calc:

mov rax, 0 ; Возвращаем 0, если условия не выполнены

ret

CalculateY ENDP

END

* MainForm.h:

#pragma once

#include <windows.h>

namespace SisPLab1 {

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 MainForm

/// </summary>

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

{

public:

MainForm(void)

{

InitializeComponent();

//

//TODO: добавьте код конструктора

//

}

protected:

/// <summary>

/// Освободить все используемые ресурсы.

/// </summary>

~MainForm()

{

if (components)

{

delete components;

}

}

// Объявление типа для функции из DLL

typedef int(\_\_cdecl\* CalculateYFunc)(int, int, int, int);

HINSTANCE hDll = LoadLibrary(TEXT("asm\_lib.dll"));

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

protected:

private: System::Windows::Forms::Label^ label2;

private: System::Windows::Forms::Label^ label3;

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::TextBox^ textBox1;

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

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

private: System::Windows::Forms::TextBox^ textBox4;

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

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

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

protected:

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>

typedef int(\_\_cdecl\* AsmFunction)(int, int, int, int);

void InitializeComponent(void)

{

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

this->label2 = (gcnew System::Windows::Forms::Label());

this->label3 = (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->textBox1 = (gcnew System::Windows::Forms::TextBox());

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

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

this->textBox4 = (gcnew System::Windows::Forms::TextBox());

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

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

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

this->SuspendLayout();

//

// label1

//

this->label1->AutoSize = true;

this->label1->FlatStyle = System::Windows::Forms::FlatStyle::Popup;

this->label1->Font = (gcnew System::Drawing::Font(L"Sylfaen", 14.25F, System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label1->Location = System::Drawing::Point(150, 9);

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

this->label1->Size = System::Drawing::Size(125, 25);

this->label1->TabIndex = 0;

this->label1->Text = L"Грицай Н.С.";

//

// label2

//

this->label2->AutoSize = true;

this->label2->FlatStyle = System::Windows::Forms::FlatStyle::Popup;

this->label2->Font = (gcnew System::Drawing::Font(L"Sylfaen", 14.25F, System::Drawing::FontStyle::Bold, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(204)));

this->label2->Location = System::Drawing::Point(114, 42);

this->label2->Name = L"label2";

this->label2->Size = System::Drawing::Size(197, 25);

this->label2->TabIndex = 1;

this->label2->Text = L"студент гр.: СКС-23";

this->label2->Click += gcnew System::EventHandler(this, &MainForm::label2\_Click);

//

// label3

//

this->label3->AutoSize = true;

this->label3->BackColor = System::Drawing::SystemColors::ControlLight;

this->label3->BorderStyle = System::Windows::Forms::BorderStyle::Fixed3D;

this->label3->Font = (gcnew System::Drawing::Font(L"Microsoft Sans Serif", 12, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label3->Location = System::Drawing::Point(88, 86);

this->label3->Name = L"label3";

this->label3->Size = System::Drawing::Size(212, 62);

this->label3->TabIndex = 2;

this->label3->Text = L" xc + a - b, если 0 < x < c\r\ny =\r\n cx + b - c, если x > c\r\n";

this->label3->Click += gcnew System::EventHandler(this, &MainForm::label3\_Click);

//

// label4

//

this->label4->AutoSize = true;

this->label4->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label4->Location = System::Drawing::Point(29, 156);

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

this->label4->Size = System::Drawing::Size(26, 20);

this->label4->TabIndex = 3;

this->label4->Text = L"a =";

//

// label5

//

this->label5->AutoSize = true;

this->label5->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label5->Location = System::Drawing::Point(29, 216);

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

this->label5->Size = System::Drawing::Size(26, 20);

this->label5->TabIndex = 4;

this->label5->Text = L"b =";

//

// label6

//

this->label6->AutoSize = true;

this->label6->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label6->Location = System::Drawing::Point(285, 156);

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

this->label6->Size = System::Drawing::Size(26, 20);

this->label6->TabIndex = 5;

this->label6->Text = L"c =";

//

// label7

//

this->label7->AutoSize = true;

this->label7->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label7->Location = System::Drawing::Point(285, 216);

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

this->label7->Size = System::Drawing::Size(25, 20);

this->label7->TabIndex = 6;

this->label7->Text = L"x =";

this->label7->Click += gcnew System::EventHandler(this, &MainForm::label7\_Click);

//

// textBox1

//

this->textBox1->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(204)));

this->textBox1->Location = System::Drawing::Point(61, 153);

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

this->textBox1->Size = System::Drawing::Size(41, 25);

this->textBox1->TabIndex = 7;

//

// textBox2

//

this->textBox2->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(204)));

this->textBox2->Location = System::Drawing::Point(61, 216);

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

this->textBox2->Size = System::Drawing::Size(41, 25);

this->textBox2->TabIndex = 8;

//

// textBox3

//

this->textBox3->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(204)));

this->textBox3->Location = System::Drawing::Point(317, 156);

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

this->textBox3->Size = System::Drawing::Size(41, 25);

this->textBox3->TabIndex = 9;

//

// textBox4

//

this->textBox4->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(204)));

this->textBox4->Location = System::Drawing::Point(317, 216);

this->textBox4->Name = L"textBox4";

this->textBox4->Size = System::Drawing::Size(41, 25);

this->textBox4->TabIndex = 10;

//

// button1

//

this->button1->BackColor = System::Drawing::SystemColors::InactiveCaption;

this->button1->Cursor = System::Windows::Forms::Cursors::Hand;

this->button1->Location = System::Drawing::Point(120, 259);

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

this->button1->Size = System::Drawing::Size(155, 79);

this->button1->TabIndex = 11;

this->button1->Text = L"Выполнить";

this->button1->UseVisualStyleBackColor = false;

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

//

// label8

//

this->label8->AutoSize = true;

this->label8->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(0)));

this->label8->Location = System::Drawing::Point(139, 356);

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

this->label8->Size = System::Drawing::Size(68, 20);

this->label8->TabIndex = 12;

this->label8->Text = L"Результат:";

this->label8->Click += gcnew System::EventHandler(this, &MainForm::label8\_Click);

//

// textBox5

//

this->textBox5->Font = (gcnew System::Drawing::Font(L"Arial Narrow", 11.25F, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,

static\_cast<System::Byte>(204)));

this->textBox5->Location = System::Drawing::Point(213, 356);

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

this->textBox5->Size = System::Drawing::Size(41, 25);

this->textBox5->TabIndex = 13;

//

// MainForm

//

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

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

this->AutoSizeMode = System::Windows::Forms::AutoSizeMode::GrowAndShrink;

this->ClientSize = System::Drawing::Size(401, 421);

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

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

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

this->Controls->Add(this->textBox4);

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

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

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

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

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

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

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

this->Controls->Add(this->label3);

this->Controls->Add(this->label2);

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

this->Name = L"MainForm";

this->StartPosition = System::Windows::Forms::FormStartPosition::CenterScreen;

this->Text = L"Калькулятор";

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

this->ResumeLayout(false);

this->PerformLayout();

}

#pragma endregion

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

}

private: System::Void label1\_Click(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void label2\_Click(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void label3\_Click(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void label8\_Click(System::Object^ sender, System::EventArgs^ e) {

}

private: System::Void label7\_Click(System::Object^ sender, System::EventArgs^ e) {

}

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

// Парсинг введенных данных

try {

int a = int::Parse(textBox1->Text);

int b = int::Parse(textBox2->Text);

int c = int::Parse(textBox3->Text);

int x = int::Parse(textBox4->Text);

HINSTANCE hDll = LoadLibrary(TEXT("asm\_lib.dll"));

if (hDll) {

AsmFunction asmFunc = (AsmFunction)GetProcAddress(hDll, "CalculateY");

if (asmFunc) {

int result = asmFunc(a, b, c, x);

textBox5->Text = result.ToString();

}

else {

textBox5->Text = "Функция не найдена в DLL!";

}

FreeLibrary(hDll);

}

else {

textBox5->Text = "ну так се";

}

}

catch (Exception^ ex) {

MessageBox::Show("Некорректный ввод. Введите целые числа.", "Ошибка");

}

}

};

}

* файл MainForm.cpp:

#include "MainForm.h"

using namespace System;

using namespace System::Windows::Forms;

[STAThread]

void main(array<String^>^ arg) {

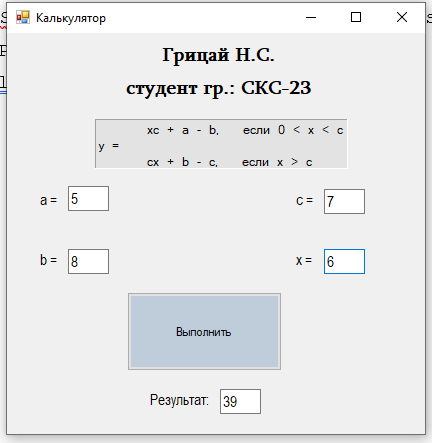
Application::EnableVisualStyles(); Application::SetCompatibleTextRenderingDefault(false);

SisPLab1::MainForm form;

Application::Run(% form);

}

**Результат**



**Вывод:** в ходе данной лабораторной работы были изучены основные способы использования ассемблера в программах, написанных на языках программирования высокого уровня.