

Advanced Programming C#

Lecture 1

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Organizational issues

- **Lecture + laboratories + project:**

- dr inż. Małgorzata Janik
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- **Time:**

- Wednesday, 12:15-13:45

- **Webpage:**

- www.if.pw.edu.pl/~majanik/wiki

- **Office hours, 117D GF:**

- Please write to me on the chat of MS Teams to schedule a meeting

Organizational issues

- **Final grades:**
 - Laboratories: 60% of the grade
 - Project: 40% of the grade
- **Laboratories:**
 - 14 classes: 1 instructional, 10 graded, 3 project-related
 - used software: Visual Studio Community
 - classes duration: 90 minutes (no break)
- **Projects:**
 - Project presentation on 6th, 10th and 14th classes

Conditions to pass the classes (1)

- **Laboratories:**

- 10 classes of diversified level (**0-6 pkt each**)
- you can use any printed materials, your own programs, as well as resources available on the Internet*
- The task will be explained during the class, afterwards you have **1 week** to finish the program:
 - finished program must be presented in the next class
 - during the class (1.5 h) you can ask me any questions related to the current task & present the program from the previous class

*) it is forbidden to use mailboxes, messangers, social networks or programs written by other students, as well as phones, tablets etc. to communicate with others.

- **Absences:**

- max 2 absences (not presenting the program) are allowed (**0 pkt**)
- unless absence is justified, number of points will be reduced if the deadline is missed

Conditions to pass the classes (2)

- **Project:**

- grading: **0-40 pkt** for the project
- During the semester there will be **2 intermediate stages**, when the current status of the project should be presented
- Each intermediate stage: **0-10 pkt**
- Final project (should be shown in the last class): **0-20 pkt**
- To pass the subject **>50% of the points from the project** should be acquired (minimal project requirements should be completed)

Project proposals

- Simulation of several simple physics experiments
- Simulation of the interaction of the radiation with matter
- Main building path finder: application showing the shortest path between two rooms in the Warsaw University of Technology Main Building
- Network Messenger
- Simple RPG game
- Simple platform game

Project proposals

- Simulation
- Simulation
- Main
between
Main
- Network
- Simple
- Simple



natter

shortest path
echnology

Shooter
Movement
Shooting
Death
Opponents AI

Project proposals

- Simu
- Simu
- Main
- between
- Main
- Netw
- Simp
- Simp



natter

shortest path

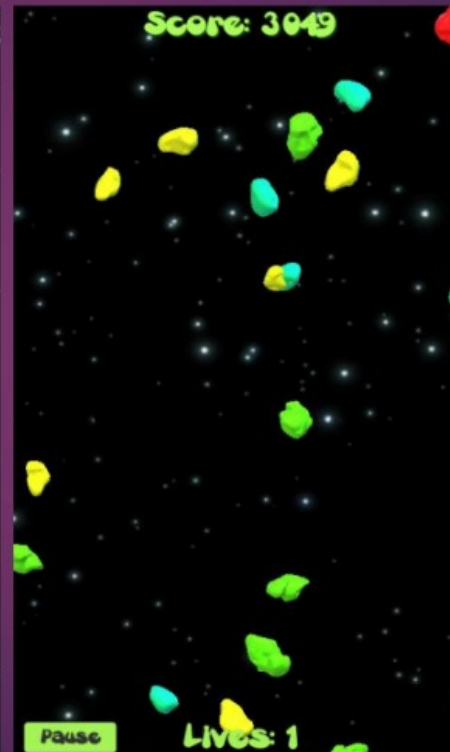
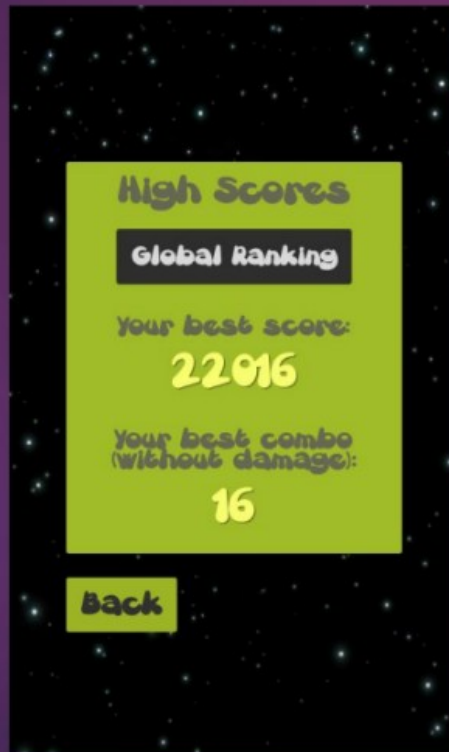
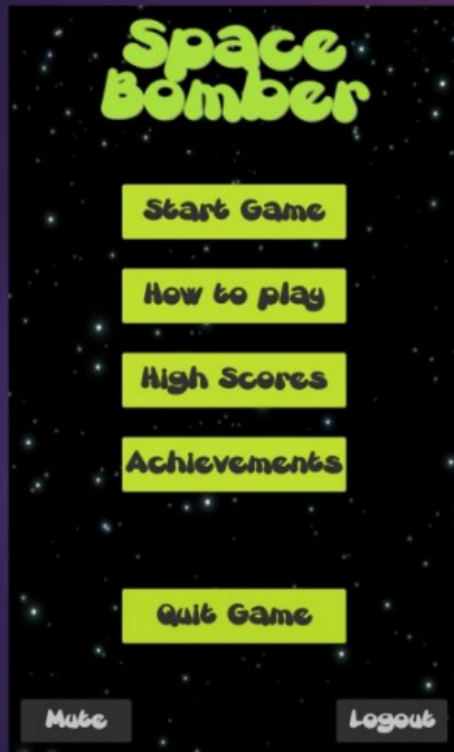
MarsMiner

Tile generation
Selling Minerals
Town Buildings
Buttons, Mouse Support

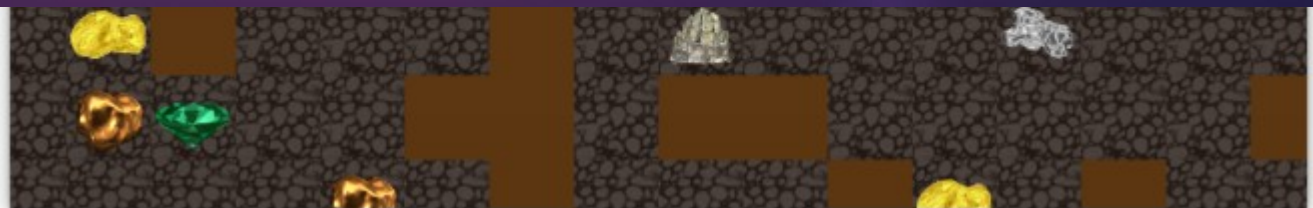


Project proposals

- Simu



The generation
Selling Minerals
Town Buildings
Buttons, Mouse Support



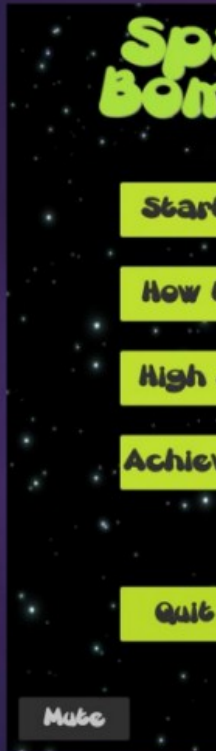
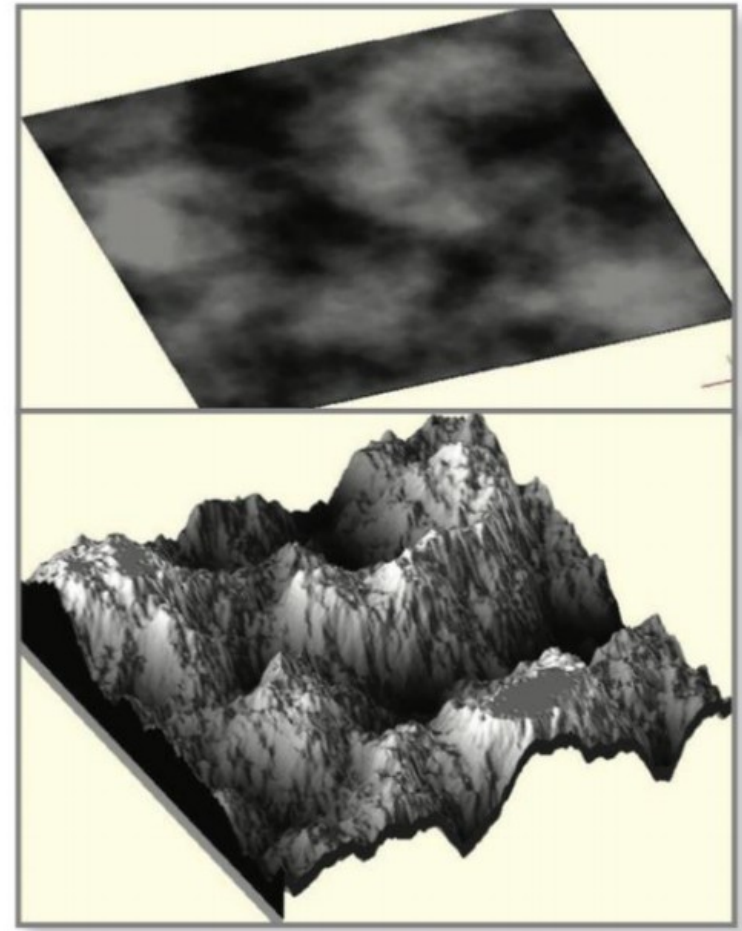
Project proposals

- Simulation



Topic

Convert BMP file to
STL file



The game
Selling minerals
Town Buildings
Buttons, Mouse Support



Conditions to pass the classes (3)

- **Grading:**
 - Maximal number of points: **100**
 - laboratories: **$10 \cdot 6 = 60$**
 - project: **$2 \cdot 10 + 20 = 40$**
- **To pass the subject (% of the total number of points):**
 - **>50% - 3** (50,5 pkt. – 60,0 pkt.)
 - **>60% - 3,5** (60,5 pkt. – 70,0 pkt.)
 - **>70% - 4** (70,0 pkt. – 80,0 pkt.)
 - **>80% - 4,5** (80,5 pkt. – 90,0 pkt.)
 - **>90% - 5** (90,5 pkt. – 100,0 pkt.)
- **Warning! To pass the subject you have to deliver the project (>50% points)**

Literature

- English:

1. Joseph Albahari, Ben Albahari, C# 6.0 in a Nutshell, 2016.
2. Ian Griffiths, Programming C# 5.0, O'Reilly Media, 2012.

- Polish:

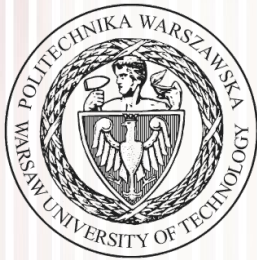
1. Joseph Albahari, Ben Albahari, C# 6.0 w pigułce, Helion 2016
2. Ian Griffiths - "C# 5.0. Programowanie", Helion, 2013.
3. Andrew Troelsen - "Język C# 2010 i platforma .NET 4", PWN, 2011.
4. Jon Skeet - "C# od podszewki", Helion, 2012.
5. Jesse Liberty - "Programowanie C#", Helion 2012

Programme

1. Introduction to the C# programming language and Visual Studio software.
2. Principles of C# programming language, basic information on the .NET platform. Windows Forms.
3. Classes, inheritance, virtual methods.
4. Interfaces, instruction foreach, yield iterators.
5. Standard library classes (collections, streams and files).
6. Delegations, lambda expressions.
7. Events, exceptions.
8. LINQ technology.

Programme

1. Introduction to the C# programming language and Visual Studio software. Principles of C# programming language.
2. Windows Forms.
3. Windows Presentation Foundation (WPF).
4. Web Forms: ASP.NET.
5. Databases: AOD.NET. → [Online?]
6. PROJECT I
7. Classes, inheritance, virtual methods.
8. Delegations, lambda expressions.
- 9 . Events, exceptions.
10. LINQ technology.
11. PROJECT II
12. LINQ to SQL
13. Multithreading.
9. Writing code with Chat GPT
14. PROJECT II



Introduction to the C# language and Visual Studio software

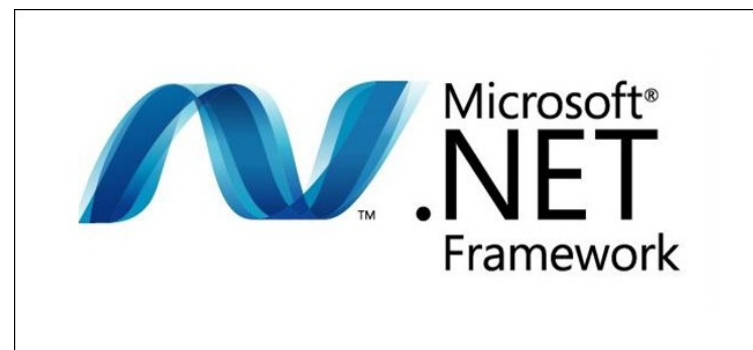
C#

- C# (pronounced "C sharp") is a programming language that is designed for building a variety of applications that run on the .NET Framework.



.NET Framework

.NET Framework (pronounced **dot net**) is a software framework developed by Microsoft.



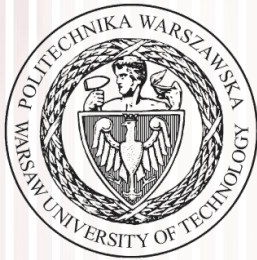
.NET Framework includes 2 parts:

- a **large class library** known as **Framework Class Library** (FCL) and provides language interoperability (each language can use code written in other languages) **across several programming languages (C#, C++, F#, Visual Basic, and a few dozen others)**.
- programs written for .NET Framework execute in a software environment known as **Common Language Runtime (CLR)**, an **application virtual machine** that provides services such as security, memory management, and exception handling.

Why C#?



- Simple and easy to learn
- Curly-brace syntax of C# will be instantly recognizable to anyone familiar with C, C++ or Java → easy for people previously programming in any of those languages
- C# syntax simplifies many of the complexities of C++ and provides powerful features such as nullable value types, enumerations, delegates, lambda expressions and direct memory access, which are not found in Java.
- C# supports generic methods and types, which provide increased type safety and performance, and iterators, which enable implementers of collection classes to define custom iteration behaviors that are simple to use by client code.
- Language-Integrated Query (LINQ) expressions make the strongly-typed query a first-class language construct.



Hands on!

First console application

- Open Visual Studio
- File → New → Project
- Console Application

(without “.NET Framework”)



Create a new project

Choose a project template with code scaffolding
to get started

Console Application - Printing

```
namespace ConsoleApplication1
{
    class Program
    {
        static void Main(string[] args)
        {
            System.Console.WriteLine("Hello World!");

            // Keep the console window open in debug mode.
            System.Console.WriteLine("Press any key to exit.");
            System.Console.ReadKey();
        }
    }
}
```

Additional information

Console App

C#

Linux

macOS

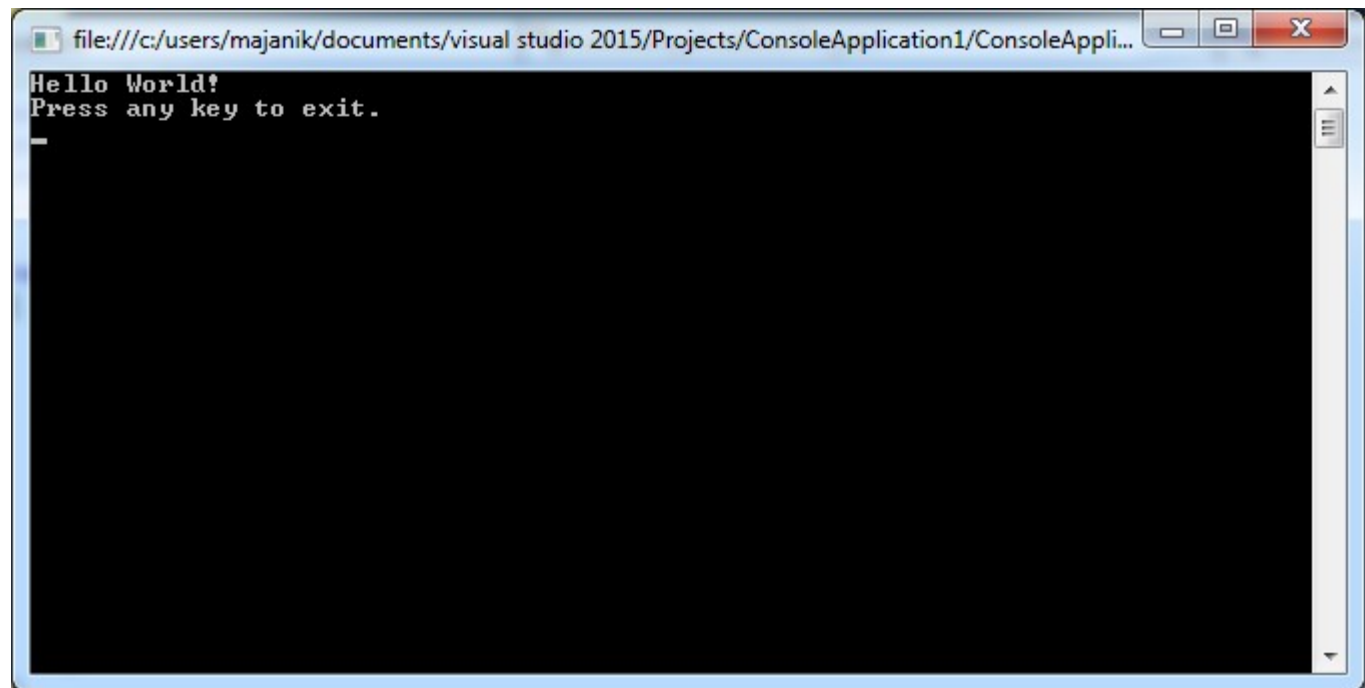
Windows

Console

Framework ⓘ

.NET 6.0 (Long Term Support)

☒ Do not use top-level statements ⓘ



Console Application - Variables

```
namespace ConsoleApplication1
{
    class Program
    {
        static void Main(string[] args)
        {
            System.Console.WriteLine("Hello World!");

            int a = 10;
            string b = "label";
            System.Console.WriteLine("Variables: {0} {1}", a, b);
            System.Console.WriteLine($"Variables: {a} {b}");

            var c = "label2";
            // var d; // NOT POSSIBLE
            // Keep the console window open in debug mode.
            System.Console.WriteLine("Press any key to exit.");
            System.Console.ReadKey();
        }
    }
}
```

Console Application - Task

```
namespace ConsoleApplication1
{
    class Program
    {
        static void Main(string[] args)
        {
            System.Console.WriteLine("Hello World!");

            int a = 10;
            string b = "label";
            System.Console.WriteLine("Variables: {0} {1}", a, b);
            System.Console.WriteLine($"Variables: {a} {b}");

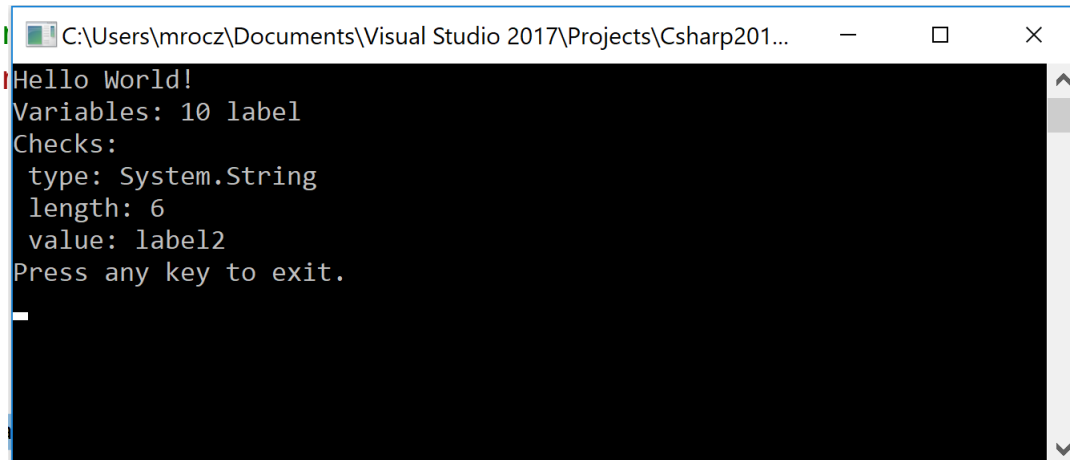
            var c = "label2";

            // TASK
            // Print: type of c, length of c and value of c

            // Keep the console window open in debug mode
            System.Console.WriteLine("Press any key to exit.");
            System.Console.ReadKey();
        }
    }
}
```

Type "c." and wait for the list of possible methods and properties appear.

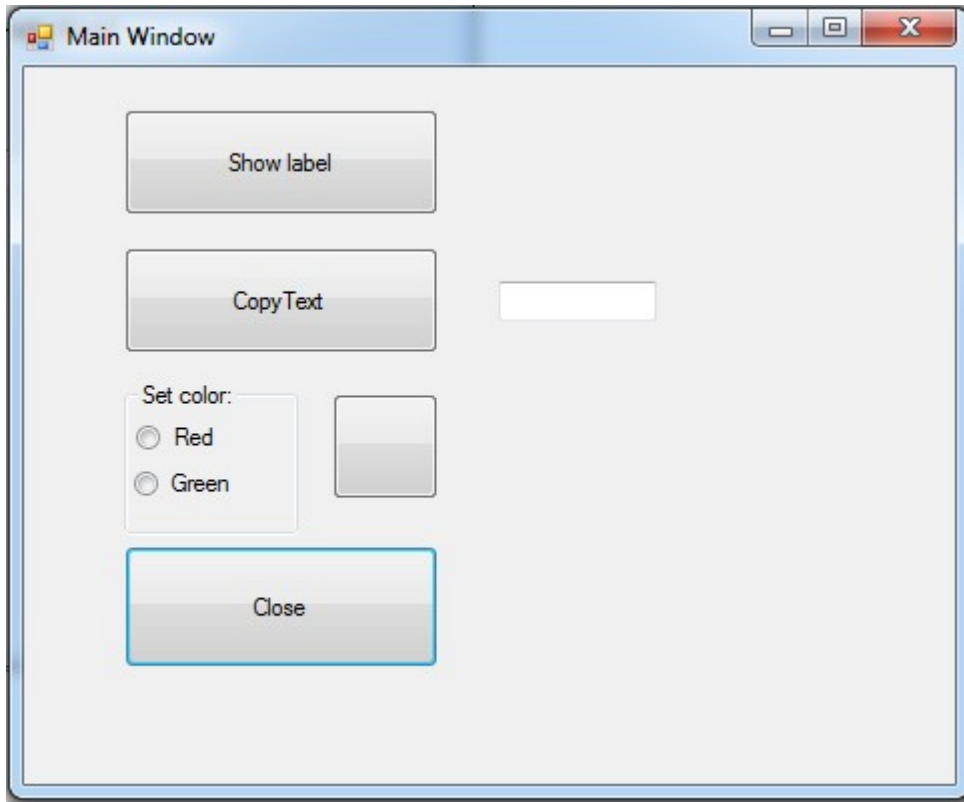
Browse through them and try to find the ones requested.



```
C:\Users\mrocz\Documents\Visual Studio 2017\Projects\Csharp201...
Hello World!
Variables: 10 label
Checks:
  type: System.String
  length: 6
  value: label2
Press any key to exit.
_
```

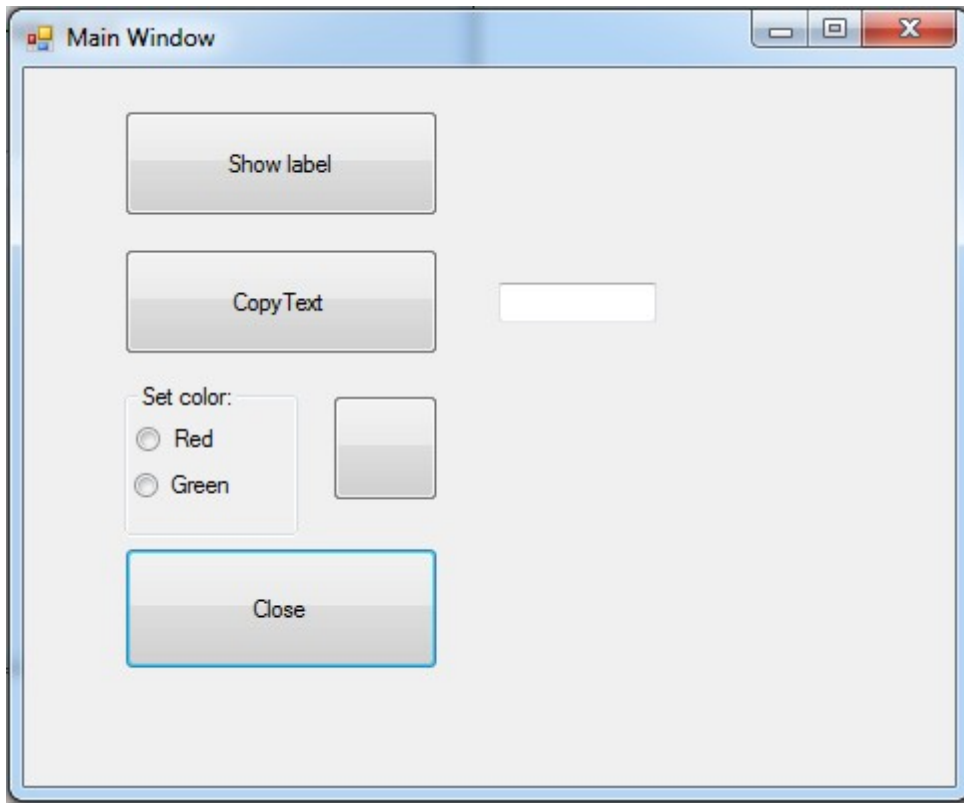
Planned application

Initial window:

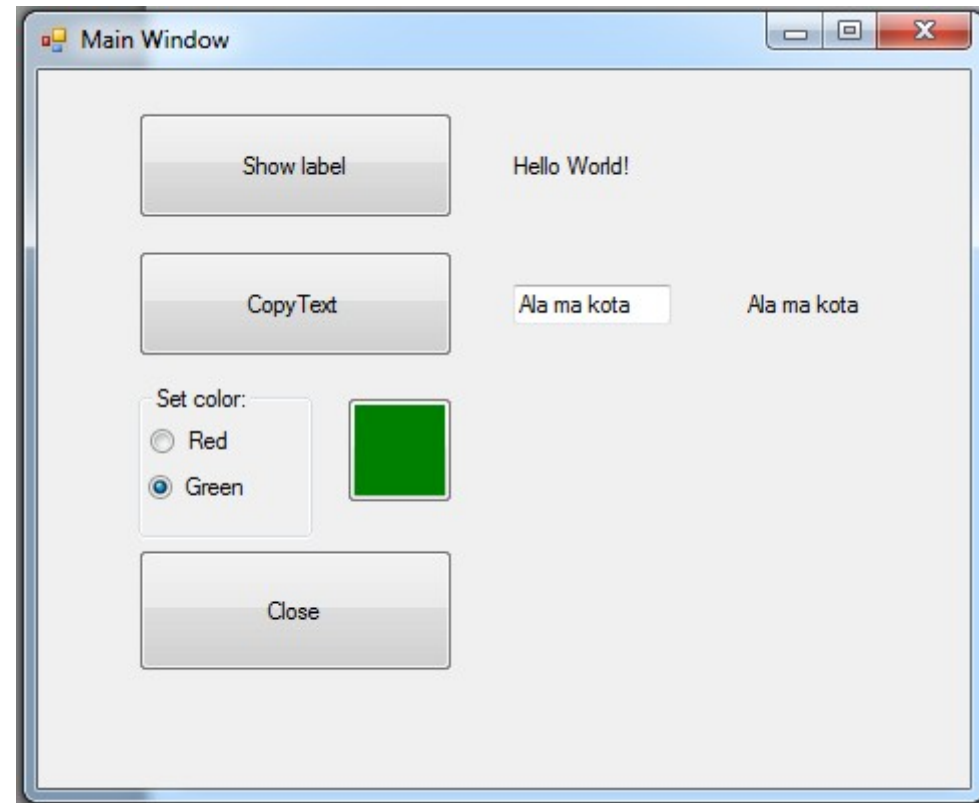


Planned application

Initial window:



Used functionalities:

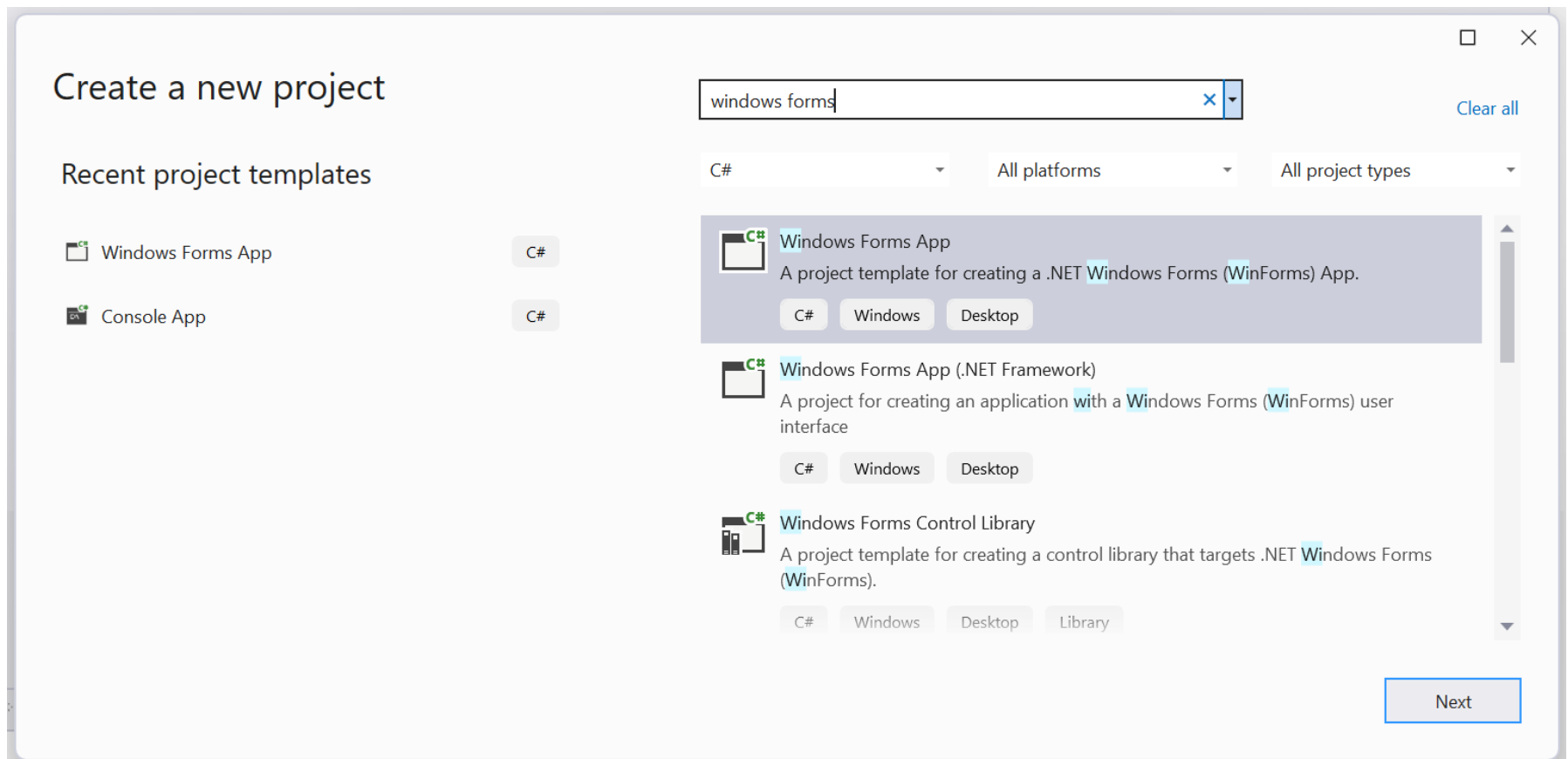
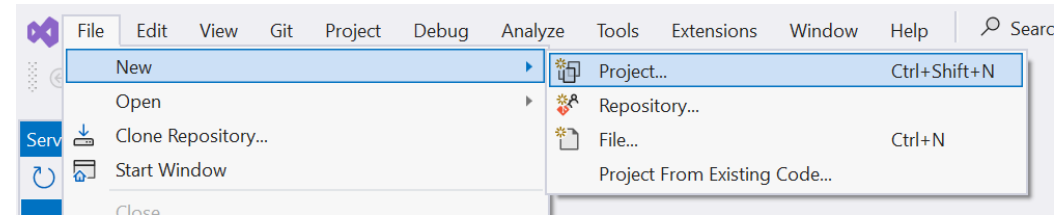


Create new project

New...

Project

Windows Forms App



Create new project and synchronize it with repository

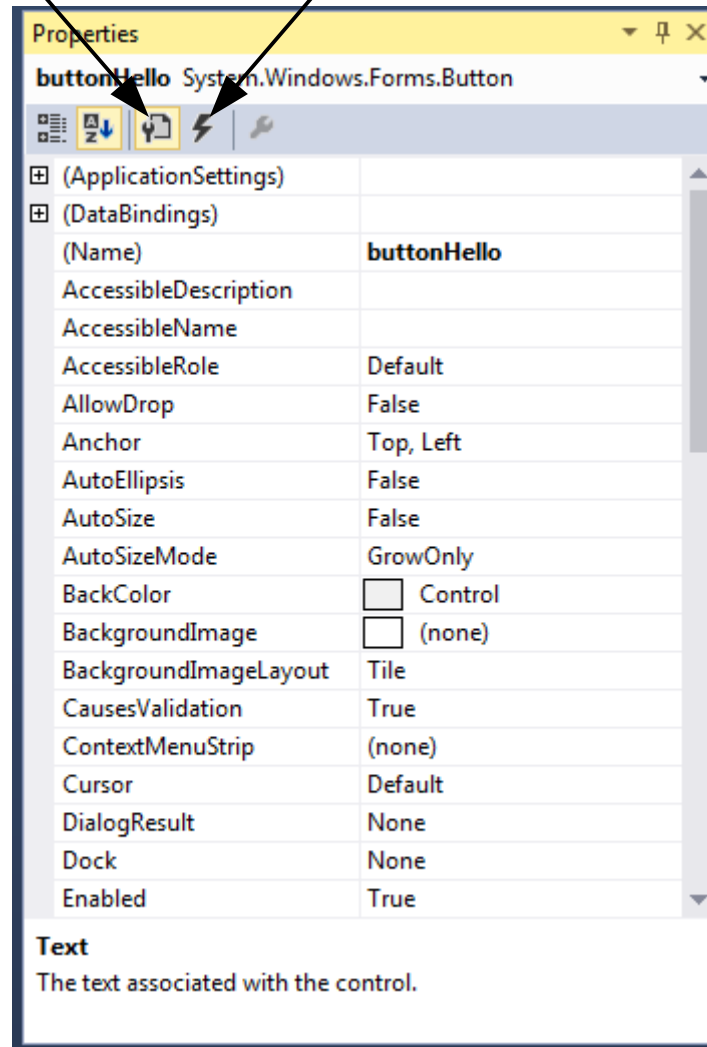
The screenshot displays the Microsoft Visual Studio IDE with a new project named "WindowsFormsApplication1". The interface is divided into several panes:

- Toolbox:** Located on the left, it shows a search bar and a list of controls under "All Windows Forms". Visible controls include Pointer, BackgroundWorker, BindingNavigator, BindingSource, Button, CheckBox, CheckedListBox, ColorDialog, ComboBox, ContextMenuStrip, DataGridView, DataSet, DateTimePicker, DirectoryEntry, DirectorySearcher, DomainUpDown, ErrorProvider, EventLog, FileSystemWatcher, FlowLayoutPanel, FolderBrowserDialog, FontDialog, GroupBox, HelpProvider, HScrollBar, ImageList, Label, and LinkLabel.
- Form1.cs [Design]:** The central design view shows a "Main Window" with a "Show label" button, a "CopyText" button, a "Close" button, and a "Set color" section with radio buttons for "Red" and "Green". A text label "Hello World!" is also present.
- Solution Explorer:** Located on the right, it shows the project structure for "WindowsFormsApplication1". The files listed are Properties, References, App.config, Form1.cs, Form1.Designer.cs, Form1.resx, FormMainWindows, and Program.cs.
- Properties:** The Properties window on the right shows the properties for the selected "buttonHello" (System.Windows.Forms.Button). The properties include Margin (3; 3; 3; 3), MaximumSize (0; 0), MinimumSize (0; 0), Modifiers (Private), Padding (0; 0; 0; 0), RightToLeft (No), Size (157; 53), TabIndex (1), TabStop (True), Tag, and Text (Show label).
- Output:** The Output window at the bottom shows the debug output. It indicates that the thread 0x2ecc has exited with code 0 (0x0), the thread 0x2154 has exited with code 0 (0x0), and the program '[10428] WindowsFormsApplication1.vshost.exe' has exited.

Properties and Events

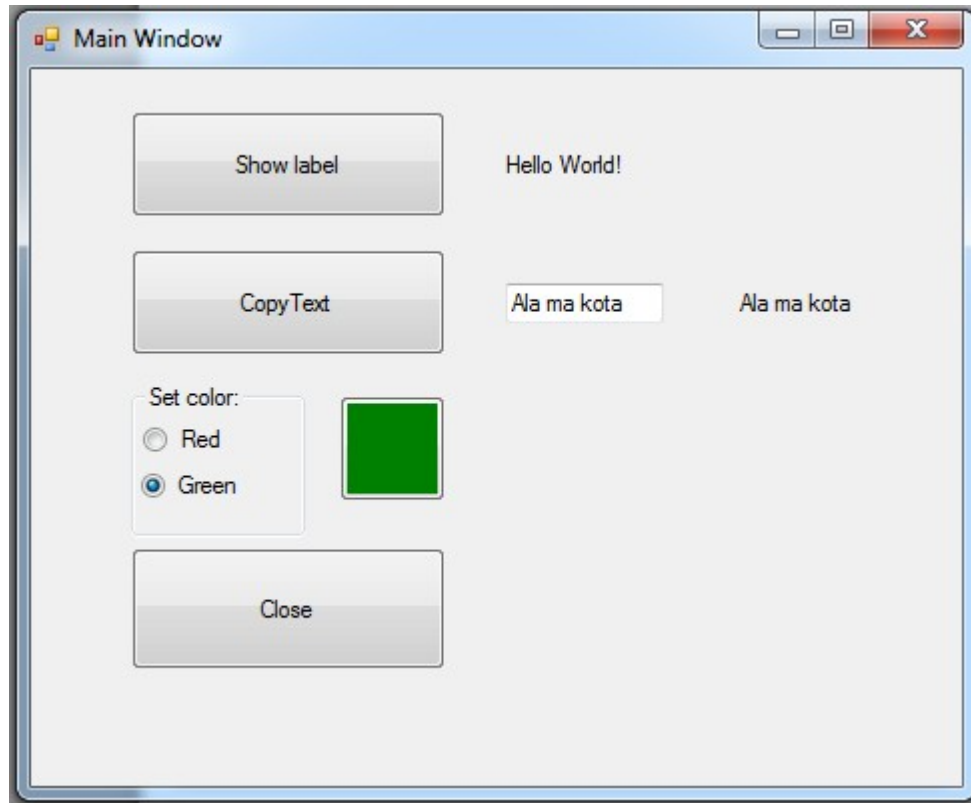
Properties

Events



Build your application

Used functionalities:



Remember to:

- give readable names to all controls
- commit changes after each part

Names:

- Always change default names!
- Each team can have its own naming convention.
- Common thing: names are readable!

This classes:

- Always keep the control name
+ readable part.
e.g. formMainWindows
labelHelloWorld



THE END