Anglia Ruskin University

Practical: Introduction to WinForms

Part 1. Creating a WinForm

Windows Forms (WinForms) is the name given to a graphical class library which is part of the Microsoft .NET Framework, and therefore available to to C# applications. To create a 'Winforms' project, undertake the following steps;

1. From Windows Explorer create a new folder called 'Computer Graphics Programming'.
2. Start Visual Studio 2017.
3. Choose File/New Project.
4. Select C# and Windows Forms Application; type in a project name called 'CGP'. Leave unchecked 'Create Directory for solution' and instead click Browse and navigate to the location of the Computer Graphics Programming directory. Click OK.
5. The project then generates all associated files, visible in the Solutions Explorer. You will see two icons; *Form1.cs* and *Program.cs*. The default view that will be visible is the graphical appearance of the application's form called **Form1.cs[Design]**, accessed anytime by clicking on the *Form1.cs* icon in the Solutions Explorer. This is a drag-and-drop interface allowing easy configuration with various GUI elements. To view the *Form1.cs* source code right-click on the *Form1.cs* icon and select 'Open with../Csharp Editor'. You should now the source code with the tab labelled **Form1.cs** (note earlier versions of Visual Studio would automatically display a Solutions Explorer icon to give this editor view, but has not been implemented in VS 2017).
6. Clicking on the triangle to the left of the Form1.cs icon reveals a sub-hierarchical file called *Form1.Designer.cs* and is the editor view of automatically generated code for the form configuration. This code should not normally need to be edited as it is modified automatically by a drag-and-drop process.
7. A third C# source code file called *Program.cs.* should also be present in the Solutions Explorer, this code contains the entry point for the program and ensures a object of Form1 is created at runtime. Again this code should not normally need to be edited.
8. To summarise, if you have opened the three souce code files you should now have at least 3 tabs across the top of the editor, namely **Form1.cs**, **Form1.Designer.cs**, and **Program.cs**. These generated source code files can also be seen outside Visual Studio by looking in the folder 'CGP' in Windows Explorer . The editor window may also have a tab for the design view, **Form1.cs[Design]**. For the purposes of this module in most cases the only file that you need to edit is *Form1.cs*. Class Form1 defined in this file is qualified with the word 'partial' and appended with the colon-phrase ': Form' to indicate the class is encoded across more than one file. Basically *Form1.cs* is highly configurable and for this module most code development will take place within this file, since the form acts as a kind of canvas on which graphics are drawn.
9. To compile the program, select Build/Build Solution.
10. To run the compiled program, select Debug/Start Without Debugging. A simple window (a form) should be displayed to screen. The actual compiled code will be *CGP.exe* and stored in *CGP\bin\Debug*, double-clicking on this file will also execute the program.

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Part 2. Simple drawings in C#

1. Copy the file *SimpleDrawing.cs* to your working directory. Right-click on the *Form1.cs* icon of your existing project and select 'Rename' and rename the form as '*SimpleDrawing.cs*'; you will then be asked if you want to change all references in the project to this new name, ensure you select 'Yes'. Then in editor view delete the existing code and paste in the code from the original *SimpleDrawing.cs*, and save. On running the code you should see 4 shapes displayed in a form.
   a) The *SimpleDrawing.cs* file includes access to the System.Drawing library in order to enable the user-defined drawing of graphical objects, such as simple geometric shapes (rectangles, ovals etc.)
   b) The 'partial' qualifier to the class SimpleDrawing definition means that only part of the code for this class is present, in fact it is a kind of Form, that is, class SimpleDrawing is also a fully functioning window.
   c) Note that the constructor defines the style of the window, its size (500x500 pixels) and its background colour (white).
   d) The OnPaint method is called automatically whenever the window has been damaged, such as being minimised or having another window interacting with it. The method generates a graphics object containing all the necessary information for interacting with the underlying platform.
   e) First a triangle is drawn then a rectangle and oval. In the case of both the rectangle and the oval the position of top left point is supplied and the width and height of the bounding rectangle. Note that co-ordinates are expressed as integers in Hierarchical Co-ordinates (HC) where the y axis origin 0 is top of the form and its value increases downwards.
   f) An array of 5 points is created, each point having a coordinate x and y value. A new colour is explicitly defined by explicit RGB values (rather than using the defaults which are extensive) and used to create a brush to fill the enclosed polygon using method FillPolygon().
   g) In order to create an object of this type it is necessary to create an object of the SimpleDrawing class. This is done in the Main function in *Program.cs*.

Part 3. Simple drawings in C#

1. Modify *SimpleDrawing.cs* to include a circle drawn inside a square.