Course 2D_WPF: 2D-Computer Graphics with C# + WPF
Chapter C1: The Complete Code of the Intro Project

Preliminaries

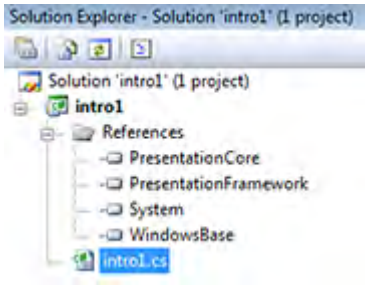
Guidance for **Visual Studio 2008**:

`1)` Main Menu after start of VS 2008: `Tools → Options →`
check lower left checkbox: `Show all Settings → Projects and Solutions →`
`Visual Studio projects location: → C:\temp`

`2)` Main Menu after start of VS 2008: `File → New Project... →`
`Visual Studio installed templates: Empty project`
`Name: intro1 → Location: C:\temp → Create directory for solution:` switch off `→ OK`.

`3)` In the window titeld: `Solution Explorer -Solution 'intro1' (1 project)` we have to add 4 `References` and an `intro1.cs` file:
`3.1` **Right**-click the branch `References`. A drop-down menu appears. Click `Add Reference...`. An `Add Reference`- window appears. Scroll down until You detect the Component Names `Presentation Core` and `Presentation Framework` and select them by `Strg`+click. Continue scrolling and `Strg`+click two more Component Names: `System` and `WindowsBase`. Quit the `Add Reference`- window with the button `OK`.
`3.2` **Right**-click the branch **`intro1`**. A drop-down menu appears. Click `Add` and select `New Item...`. An `Add New Item - intro1`- window appears. Select the template `Code File` and give it the Name: `intro1.cs`.
Quit the `Add New Item - intro1`- window with the button `Add`.

The `Solution Explorer` should show this:



`4)` Main menu of Visual Studio 2008 → `Project` → `intro1 Properties...` → `Application` → `Output type:` Change from `Console Application` to `Windows Application`.

`5)` Main menu of Visual Studio 2008 → `Tools` → `Options...` → An `Options`-window appears.
Double-click the branch `Text Editor`. **Double**-click `C#`. **Double**-click `Formatting`.
Click `General`. Uncheck all three check boxes.
Click `Indentation`. Uncheck all four check boxes.
Click `New Lines`. Uncheck all thirteen check boxes.
Click `Spacing`. Uncheck all twenty three check boxes.
Click `IntelliSense`. Uncheck all six check boxes.
Quit the `Options`- window with the `OK`-button.

intro1.cs driven by a DispatcherTimer Object

```
using System;
using System.Windows;
using System.Windows.Media;
using System.Windows.Controls;
using System.Windows.Shapes;
using System.Windows.Threading;

public class window1 : Window
{ [STAThread] static void Main() { new Application().Run( new window1() ); }
  Canvas    myCanvas = new Canvas();
  Line      line1    = new Line();
  Line      line2    = new Line();
  Rectangle rect     = new Rectangle();
  Ellipse   elli     = new Ellipse();
  DockPanel myPanel  = new DockPanel();
  TextBox   left     = new TextBox();
  TextBox   top      = new TextBox();
  TextBox   right    = new TextBox();
  TextBox   bottom   = new TextBox();
  TextBox   central  = new TextBox();
  double    zoom     = 1.1;
  double    angle    = 0;
  Random    r        = new Random();
  Byte      r1, g1, b1, r2, g2, b2;

  public window1() //constructor
  { Top = Left = 50;
    this.Width = this.Height = 500;
    this.Title = "intro1";
    myCanvas.Children.Add( line1 );
    myCanvas.Children.Add( line2 );
    myCanvas.Children.Add( rect  );
    myCanvas.Children.Add( elli  );
    myCanvas.Children.Add( myPanel );
    myPanel.Children.Add( top    ); DockPanel.SetDock( top   , Dock.Top    ); top   .Text = "top";
    myPanel.Children.Add( bottom ); DockPanel.SetDock( bottom, Dock.Bottom ); bottom.Text = "bottom";
    myPanel.Children.Add( left   ); DockPanel.SetDock( left  , Dock.Left   ); left  .Text = "left";
    myPanel.Children.Add( right  ); DockPanel.SetDock( right , Dock.Right  ); right .Text = "right";
    myPanel.Children.Add( central );
    //Background = new SolidColorBrush( Colors.Cornsilk );
    Background = new LinearGradientBrush( Colors.Red, Colors.Blue, 90 );
    Foreground = new SolidColorBrush( Color.FromRgb( 0, 0, 200 ) );
    FontFamily = new FontFamily( "Courier New" );
    FontSize = 12;
    foreach( TextBox text in myPanel.Children )
    { text.HorizontalAlignment = HorizontalAlignment.Center;
      text.VerticalAlignment   = VerticalAlignment.Center;
    }
    foreach( Object obj in myCanvas.Children )
    { if ( obj.GetType() == typeof(DockPanel) ) continue;
      ((Shape)obj).Stroke = Brushes.Black;
      ((Shape)obj).StrokeThickness = 5;
    }
    rect.Fill = Brushes.White;
    r1 = (Byte)r.Next(255); g1 = (Byte)r.Next(255); b1 = (Byte)r.Next(255);
    r2 = (Byte)r.Next(255); g2 = (Byte)r.Next(255); b2 = (Byte)r.Next(255);
    DispatcherTimer myTimer = new DispatcherTimer();
    myTimer.Interval = TimeSpan.FromMilliseconds( 40 );
    myTimer.Tick += TimerOnTick;
    myTimer.Start();
  }

  void TimerOnTick( Object sender, EventArgs args )
  { if ( myCanvas.ActualWidth < 200 ) zoom = 1.1;
    if ( myCanvas.ActualWidth > 800 ) zoom = 0.99;
    this.Width    *= zoom;
    this.Height   *= zoom;
    this.FontSize *= zoom;
  }
```

```
  protected override void OnRenderSizeChanged( SizeChangedInfo sizeInfo )
  { String s1 = "Hello World " + DateTime.Now.ToString() + "\n";
    int width  = Convert.ToInt32( this.Width  );
    int height = Convert.ToInt32( this.Height );
    String s2 = "Window Size = " + width.ToString() + " x " + height.ToString() + "\n";
    width  = Convert.ToInt32( myCanvas.ActualWidth  );
    height = Convert.ToInt32( myCanvas.ActualHeight );
    String s3 = "Client Size = " + width.ToString() + " x " + height.ToString() + "\n";
    String s4 = String.Format( "Font   Size = {0,2:F1}", this.FontSize );
    central.Text = s1 + s2 + s3 + s4;
    line1.X1 = 0; line1.Y1 = 0; line1.X2 = myCanvas.ActualWidth; line1.Y2 = myCanvas.ActualHeight;
    line2.X1 = myCanvas.ActualWidth; line2.Y1 = 0; line2.X2 = 0; line2.Y2 = myCanvas.ActualHeight;
    Canvas.SetLeft( rect, myCanvas.ActualWidth /5 );
    Canvas.SetLeft( elli, myCanvas.ActualWidth /5 );
    Canvas.SetTop ( rect, myCanvas.ActualHeight/5 );
    Canvas.SetTop ( elli, myCanvas.ActualHeight/5 );
    rect .Width  = elli.Width  = 3 * myCanvas.ActualWidth  / 5;
    rect .Height = elli.Height = 3 * myCanvas.ActualHeight / 5;
    Color color1 = Color.FromRgb( r1++, g1++, b1++ );
    Color color2 = Color.FromRgb( r2++, g2++, b2++ );
    RadialGradientBrush brush = new RadialGradientBrush( color1, color2 );
    brush.SpreadMethod = GradientSpreadMethod.Repeat;
    brush.RadiusX = brush.RadiusY = 0.1;
    brush.GradientOrigin = new Point( 0.5+0.05*Math.Cos(angle), 0.5+0.05*Math.Sin(angle) );
    elli.Fill = brush;
    angle += Math.PI / 32;
    myPanel.Width  = myCanvas.ActualWidth;
    myPanel.Height = myCanvas.ActualHeight;
    Content = myCanvas;
  }
}
```

intro1.cs driven by a DoubleAnimation Object

Main menu of Visual Studio 2008 → `Project` → `intro1 Properties...` → `Application` → `Output type:` Change from `Windows Application` to `Console Application`, otherwise the animation could never be stopped.

```
using System;
using System.Windows;
using System.Windows.Media;
using System.Windows.Controls;
using System.Windows.Shapes;
using System.Windows.Media.Animation;

public class window1 : Window
{ [STAThread] static void Main() { new Application().Run( new window1() ); }
  Canvas    myCanvas = new Canvas();
  Line      line1    = new Line();
  Line      line2    = new Line();
  Rectangle rect     = new Rectangle();
  Ellipse   elli     = new Ellipse();
  DockPanel myPanel  = new DockPanel();
  TextBox   left     = new TextBox();
  TextBox   top      = new TextBox();
  TextBox   right    = new TextBox();
  TextBox   bottom   = new TextBox();
  TextBox   central  = new TextBox();

  public window1() //constructor
  { Top = Left = 50;
    this.Width = this.Height = 500;
    this.Title = "intro1";
    myCanvas.Children.Add( line1 ); myCanvas.Children.Add( line2 );
    myCanvas.Children.Add( rect  ); myCanvas.Children.Add( elli  );
    myCanvas.Children.Add( myPanel );
    myPanel.Children.Add( top    ); DockPanel.SetDock( top   , Dock.Top    ); top   .Text = "top";
    myPanel.Children.Add( bottom ); DockPanel.SetDock( bottom, Dock.Bottom ); bottom.Text = "bottom";
    myPanel.Children.Add( left   ); DockPanel.SetDock( left  , Dock.Left   ); left  .Text = "left";
    myPanel.Children.Add( right  ); DockPanel.SetDock( right , Dock.Right  ); right .Text = "right";
    myPanel.Children.Add( central );
    //Background = new SolidColorBrush( Colors.Cornsilk );
    Background = new LinearGradientBrush( Colors.Red, Colors.Blue, 90 );
    Foreground = new SolidColorBrush( Color.FromRgb( 0, 0, 200 ) );
    FontFamily = new FontFamily( "Courier New" );
    FontSize = 12;
```

```
    foreach( TextBox text in myPanel.Children )
    { text.HorizontalAlignment = HorizontalAlignment.Center;
      text.VerticalAlignment   = VerticalAlignment.Center;
    }
    foreach( Object obj in myCanvas.Children )
    { if ( obj.GetType() == typeof(DockPanel) ) continue;
      ((Shape)obj).Stroke = Brushes.Black;
      ((Shape)obj).StrokeThickness = 5;
    }
    rect.Fill = Brushes.White;

    DoubleAnimation anim = new DoubleAnimation();
    anim.Duration= new Duration( TimeSpan.FromSeconds( 3 ) );
    anim.AutoReverse = true;
    anim.RepeatBehavior = RepeatBehavior.Forever;
    anim.From = 100;
    anim.To = 600;
    this.BeginAnimation( Window.WidthProperty, anim );
    this.BeginAnimation( Window.HeightProperty, anim );
    anim.From = 100 - 2* SystemParameters.ResizeFrameVerticalBorderWidth;
    anim.To   = 600 - 2* SystemParameters.ResizeFrameVerticalBorderWidth;
    myCanvas.BeginAnimation( Canvas.WidthProperty, anim );
    line1   .BeginAnimation( Line.X2Property, anim );
    line2   .BeginAnimation( Line.X1Property, anim );
    myPanel .BeginAnimation( Panel.WidthProperty, anim );
    anim.From = 100 - 2* SystemParameters.ResizeFrameHorizontalBorderHeight
                    - SystemParameters.CaptionHeight;
    anim.To   = 600 - 2* SystemParameters.ResizeFrameHorizontalBorderHeight
                    - SystemParameters.CaptionHeight;
    myCanvas.BeginAnimation( Canvas.HeightProperty, anim );
    line1.BeginAnimation( Line.Y2Property, anim );
    line2.BeginAnimation( Line.Y2Property, anim );
    myPanel .BeginAnimation( Panel.HeightProperty, anim );
    anim.From = ( 100 - 2* SystemParameters.ResizeFrameVerticalBorderWidth ) / 5;
    anim.To   = ( 600 - 2* SystemParameters.ResizeFrameVerticalBorderWidth ) / 5;
    rect.BeginAnimation( Canvas.LeftProperty, anim );
    elli.BeginAnimation( Canvas.LeftProperty, anim );
    anim.From = ( 100 - 2* SystemParameters.ResizeFrameHorizontalBorderHeight
                      - SystemParameters.CaptionHeight ) / 5;
    anim.To   = ( 600 - 2* SystemParameters.ResizeFrameHorizontalBorderHeight
                      - SystemParameters.CaptionHeight ) / 5;
    rect.BeginAnimation( Canvas.TopProperty, anim );
    elli.BeginAnimation( Canvas.TopProperty, anim );
    anim.From = 3 * ( 100 - 2* SystemParameters.ResizeFrameVerticalBorderWidth ) / 5;
    anim.To   = 3 * ( 600 - 2* SystemParameters.ResizeFrameVerticalBorderWidth ) / 5;
    rect.BeginAnimation( Canvas.WidthProperty, anim );
    elli.BeginAnimation( Canvas.WidthProperty, anim );
    anim.From = 3 * ( 100 - 2* SystemParameters.ResizeFrameHorizontalBorderHeight
                          - SystemParameters.CaptionHeight ) / 5;
    anim.To   = 3 * ( 600 - 2* SystemParameters.ResizeFrameHorizontalBorderHeight
                          - SystemParameters.CaptionHeight ) / 5;
    rect.BeginAnimation( Canvas.HeightProperty, anim );
    elli.BeginAnimation( Canvas.HeightProperty, anim );
    anim.From =  2;
    anim.To   = 20;
    myCanvas.BeginAnimation( Window.FontSizeProperty, anim );
    Content = myCanvas;
  }

  protected override void OnRenderSizeChanged( SizeChangedInfo sizeInfo )
  { String s1 = "Hello World " + DateTime.Now.ToString() + "\n";
    int width  = Convert.ToInt32( this.Width  );
    int height = Convert.ToInt32( this.Height );
    String s2 = "Window Size = " + width.ToString() + " x " + height.ToString() + "\n";
    width  = Convert.ToInt32( myCanvas.ActualWidth  );
    height = Convert.ToInt32( myCanvas.ActualHeight );
    String s3 = "Client Size = " + width.ToString() + " x " + height.ToString();
    central.Text = s1 + s2 + s3;
  }
}
```