COS20007: Object Oriented Programming

Credit Task 5.3: Drawing Program — Saving and Loading

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ExtensionMethods.cs

```
using System;
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    // To extend the methods we use static class with static instance memeber
    public static class ExtensionMethods
    {
        public static int ReadInteger(this StreamReader reader)
        {
            return Convert.ToInt32(reader.ReadLine());
        }

        public static float ReadSingle(this StreamReader reader)
        {
            return Convert.ToSingle(reader.ReadLine());
        }

        public static Color ReadColor(this StreamReader reader)
        {
            return Color.RGBColor(reader.ReadSingle(), reader.ReadSingle(), reader.ReadSingle());
        }

        public static void WriteColor(this StreamWriter writer, Color clr)
        {
            writer.WriteLine($"{clr.R}\n{clr.G}\n{clr.B}");
        }
    }
}
```

Drawing.cs

```
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    public class Drawing
    {
        // Fields
        private readonly List<Shape> _shapes;
        private Color _background;

        // Constructor
        public Drawing(Color background)
        {
            _shapes = new List<Shape>();
            _background = background;
        }
        public Drawing() : this(Color.White)
        {

        }

        // Property
        public List<Shape> SelectedShapes
        {
            // readonly property
            get
            {
                List<Shape> selectedShapes = new List<Shape>();
                foreach (Shape s in _shapes)
                {
                    if (s.Selected) selectedShapes.Add(s);
                }
                return selectedShapes;
            }
        }

        public int ShapeCount
        {
            // readonly property
            get { return this._shapes.Count; }
        }

        public Color Background
        {
            get { return this._background; }
```

```
            set { this._background = value; }
        }

        // Methods
        public void Draw()
        {
            SplashKit.ClearScreen(_background);
            foreach (Shape s in _shapes)
            {
                s.Draw();
            }
        }

        public void SelectShapesAt(Point2D pt)
        {
            foreach (Shape s in _shapes)
            {
                s.Selected = s.IsAt(pt);
            }
        }

        public void AddShape(Shape s)
        {
            _shapes.Add(s);
        }

        public void RemoveShape(Shape s)
        {
            _ = _shapes.Remove(s);
        }

        public void Save(string fileName)
        {
            StreamWriter writer = new StreamWriter(fileName);
            try
            {
                writer.WriteColor(Background);
                writer.WriteLine(ShapeCount);

                foreach (Shape s in _shapes) s.SaveTo(writer);
            }
            finally
            {
                writer.Close();
            }
        }

        public void Load(string fileName)
        {
            StreamReader reader = new StreamReader(fileName);
            try
            {
                Background = reader.ReadColor();
                int count = reader.ReadInteger();
                Shape s;

                _shapes.Clear();

                for (int i = 0; i < count; i++)
                {
                    string? kind = reader.ReadLine();
                    switch (kind)
                    {
                        case "Rectangle":
                            s = new MyRectangle();
                            break;
                        case "Circle":
                            s = new MyCircle();
                            break;
                        case "Line":
                            s = new MyLine();
                            break;
                        default:
                            throw new InvalidDataException($"Unknown shape kind: {kind}");
                    }
                    s.LoadFrom(reader);
                    AddShape(s);
                }
            }
            finally
            {
                reader.Close();
            }
        }
    }

}
```

Shape.cs

```
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    public abstract class Shape
    {
        // Fields
        private Color _color;
        private float _x;
        private float _y;
        private bool _selected = false;

        // Constructors
        public Shape() : this(Color.Yellow)
        {
        }

        public Shape(Color color)
        {
            Color = color;
            _x = 0.0f; _y = 0.0f;
        }

        // Properties
        public float X
        {
            get { return _x; }
            set { _x = value; }
        }
        public float Y
        {
            get { return _y; }
            set { _y = value; }
        }
        public Color Color
        {
            get { return _color; }
            set { _color = value; }
        }
        public bool Selected
        {
            get { return this._selected; }
            set { _selected = value; }
        }


        // Methods
        public abstract void Draw();

        public abstract bool IsAt(Point2D pt);

        public abstract void DrawOutline();

        public virtual void SaveTo(StreamWriter writer)
        {
            writer.WriteColor(Color);
            writer.WriteLine(X);
            writer.WriteLine(Y);
        }

        public virtual void LoadFrom(StreamReader reader)
        {
            Color = reader.ReadColor();
            X = reader.ReadInteger();
            Y = reader.ReadInteger();
        }
    }
}
```

MyRectangle.cs

```
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    public class MyRectangle : Shape
    {
        // Fields
        private int _width;
        private int _height;

        // Constructor
        public MyRectangle() : this(Color.Green, 0.0f, 0.9f, 100 + 41, 100 + 41)
        {

        }
        public MyRectangle(Color color, float x, float y, int width, int height) : base(color)
        {
            X = x;
            Y = y;
            Width = width;
            Height = height;
        }
```

```
        // Properties
        public int Width
        {
            get { return _width; }
            set { _width = value; }
        }
        public int Height
        {
            get { return _height; }
            set { _height = value; }
        }

        // Methods
        public override void Draw()
        {
            if (Selected) this.DrawOutline();
            SplashKit.FillRectangle(Color, X, Y, Width, Height);
        }

        public override void DrawOutline()
        {
            int outlineThickness = 6; //5+1
            SplashKit.FillRectangle(Color.Black, X - outlineThickness, Y - outlineThickness, Width + 2 * outlineThickness, Height + 2
* outlineThickness);
        }

        public override bool IsAt(Point2D pt)
        {
            return (pt.X >= X && pt.X <= X + Width) && (pt.Y >= Y && pt.Y <= Y + Height);
        }

        public override void SaveTo(StreamWriter writer)
        {
            writer.WriteLine("Rectangle");
            base.SaveTo(writer);
            writer.WriteLine(Width);
            writer.WriteLine(Height);
        }

        public override void LoadFrom(StreamReader reader)
        {
            base.LoadFrom(reader);
            Width = reader.ReadInteger();
            Height = reader.ReadInteger();
        }
    }
}
```

MyCircle.cs

```
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    public class MyCircle : Shape
    {
        // Fields
        private int _radius;

        // Constructor
        public MyCircle() : this(Color.Blue, 100 + 41, 100 + 41, 50 + 41)
        {
        }
        public MyCircle(Color color, int x, int y, int radius) : base(color)
        {
            X = x;
            Y = y;
            Radius = radius;
        }

        // Properties
        public int Radius
        {
            get { return _radius; }
            set { _radius = value; }
        }

        // Methods
        public override void Draw()
        {
            if (Selected) DrawOutline();
            SplashKit.FillCircle(Color, X, Y, Radius);
        }

        public override void DrawOutline()
        {
            int outlineThickness = 7; //5+2
            SplashKit.FillCircle(Color.Black, X, Y, Radius + outlineThickness);
        }

        public override bool IsAt(Point2D pt)
        {
            // By Distance Formula
            // = √(x2-x1)^2 + (y2-y1)^2
            // And then we get the distnace between mouse click and circle area
            // If that distance is smaller than and equal the circle's radius
            // of course, it is inside the circle
            // return Math.Sqrt(Math.Pow(pt.X - X, 2) + Math.Pow(pt.Y - Y, 2)) <= Radius;
```

```
            return SplashKit.PointInCircle(pt,
                    new Circle()
                    {
                        Center =
                        new Point2D() { X = this.X, Y = this.Y },
                        Radius = this.Radius
                    });
        }

        public override void SaveTo(StreamWriter writer)
        {
            writer.WriteLine("Circle");
            base.SaveTo(writer);
            writer.WriteLine(Radius);
        }

        public override void LoadFrom(StreamReader reader)
        {
            base.LoadFrom(reader);
            Radius = reader.ReadInteger();
        }
    }
}
```

MyLine.cs

```
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    public class MyLine : Shape
    {
        // Fields
        private float _endX;
        private float _endY;

        // Constructor
        public MyLine() : this(Color.Red, SplashKit.MouseX(), SplashKit.MouseY(), SplashKit.MouseX() + new Random().Next(-150, 150),
new Random().Next(0, 601))
        {

        }

        public MyLine(Color color, float startX, float startY, float endX, float endY) : base(color)
        {
            X = startX;
            Y = startY;
            EndX = endX;
            EndY = endY;
        }

        // Properties
        public float EndX
        {
            get { return _endX; }
            set { _endX = value; }
        }
        public float EndY
        {
            get { return _endY; }
            set { _endY = value; }
        }

        // Methods
        public override void Draw()
        {
            if (Selected) DrawOutline();
            SplashKit.DrawLine(Color, X, Y, EndX, EndY);
        }

        public override void DrawOutline()
        {
            int circleRadius = 5;
            SplashKit.FillCircle(Color.Black, X, Y, circleRadius);
            SplashKit.FillCircle(Color.Black, EndX, EndY, circleRadius);
        }

        public override bool IsAt(Point2D pt)
        {
            return SplashKit.PointOnLine(pt,
                new Line()
                {
                    StartPoint = new Point2D() { X = this.X, Y = this.Y },
                    EndPoint = new Point2D() { X = this.EndX, Y = this.EndY },
                });
        }

        public override void SaveTo(StreamWriter writer)
        {
            writer.WriteLine("Line");
            base.SaveTo(writer);
            writer.WriteLine(EndX);
            writer.WriteLine(EndY);
        }

        public override void LoadFrom(StreamReader reader)
        {
            base.LoadFrom(reader);
            EndX = reader.ReadInteger();
```

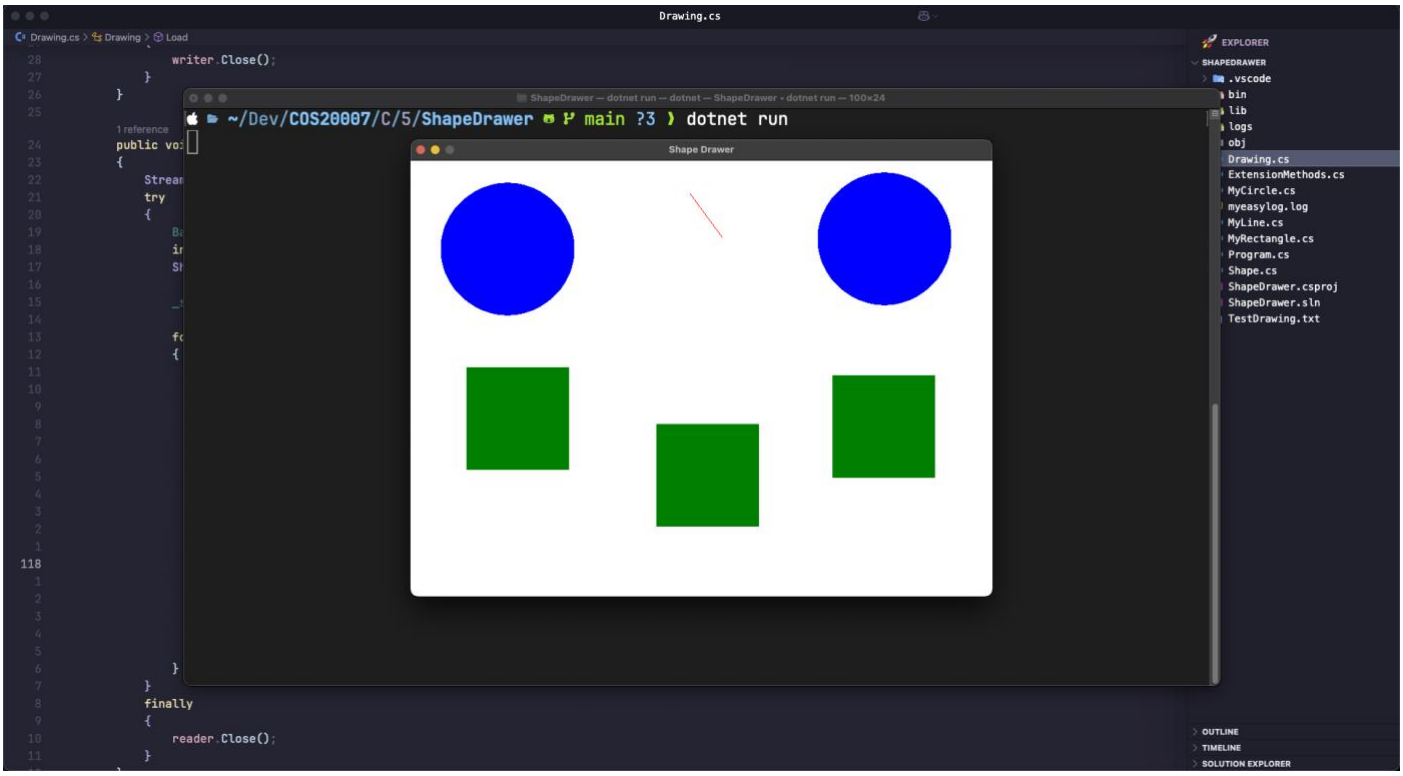
```
            EndY = reader.ReadInteger();
        }
    }
}
```

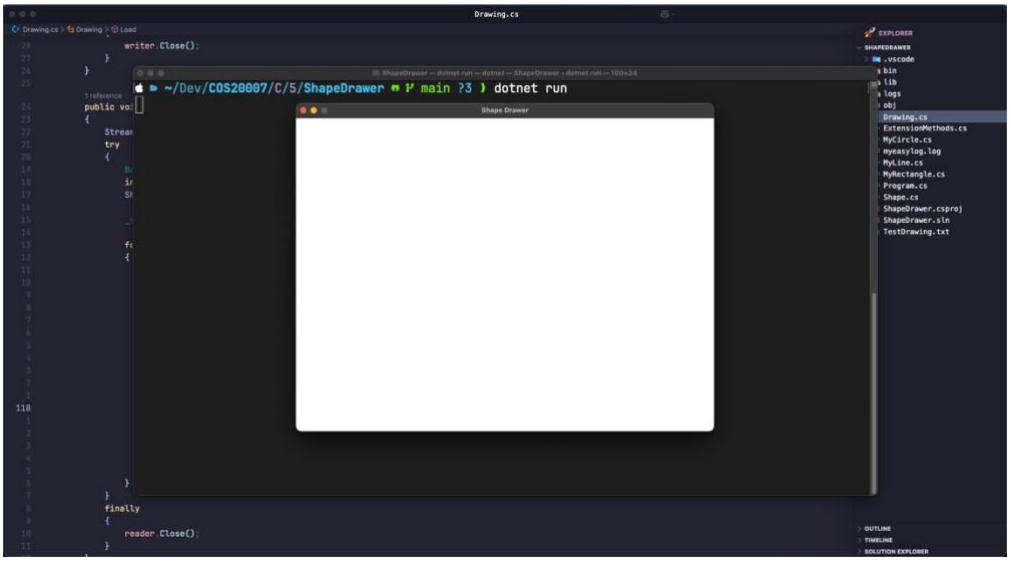
Program.cs

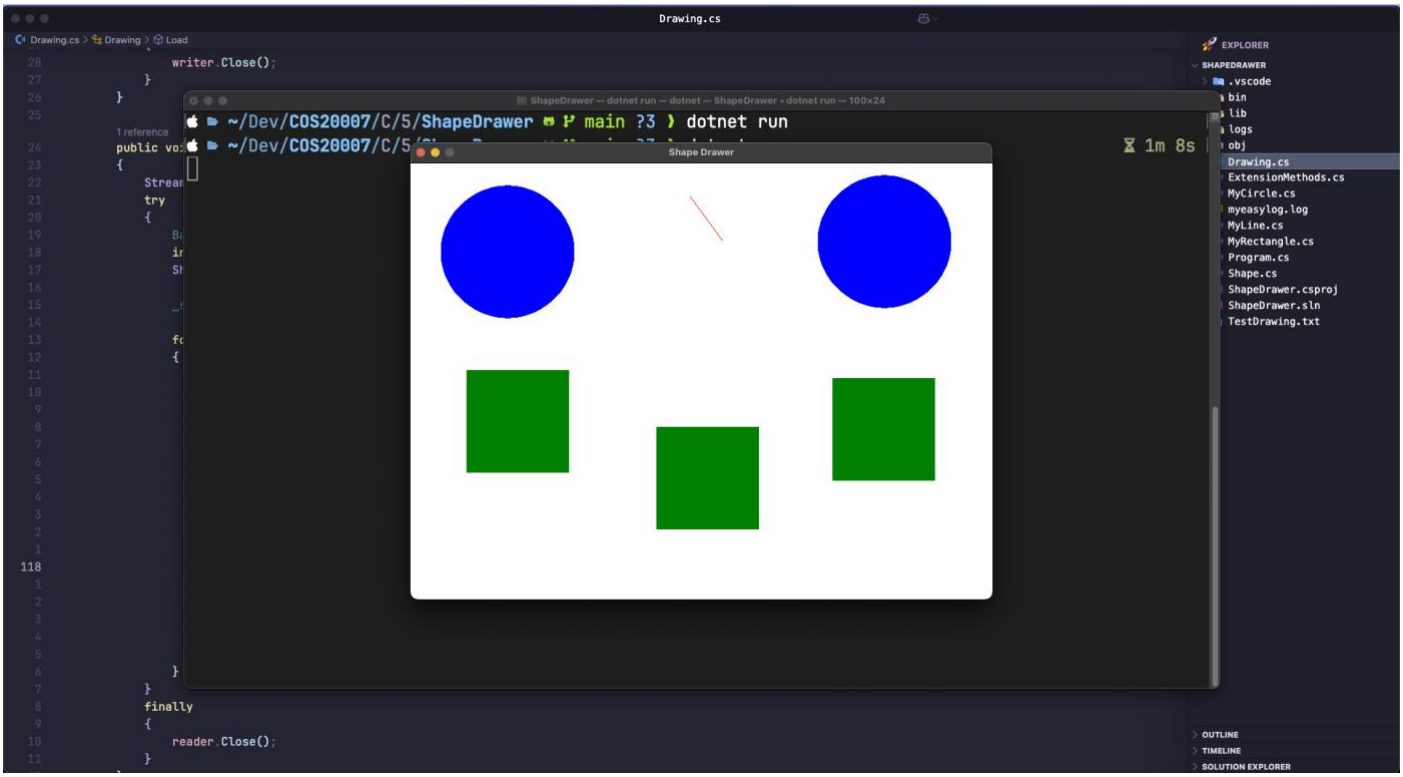
```
using System;
using System.IO;
using SplashKitSDK;

namespace ShapeDrawer
{
    public class Program
    {
        private enum ShapeKind
        {
            Rectangle,
            Circle,
            Line
        }
        public static void Main()
        {
            Window window = new Window("Shape Drawer", 800, 600);
            Drawing myDrawing = new Drawing();

            // ShapeKind Variable
            ShapeKind kindToAdd = ShapeKind.Circle; // First initialization
            int XLineDraw = 1; // Times of line can draw after typed L key

            do
            {
                SplashKit.ProcessEvents();
                SplashKit.ClearScreen();

                if (SplashKit.KeyTyped(KeyCode.RKey))
                {
                    kindToAdd = ShapeKind.Rectangle;
                }
                if (SplashKit.KeyTyped(KeyCode.CKey))
                {
                    kindToAdd = ShapeKind.Circle;
                }
                if (SplashKit.KeyTyped(KeyCode.LKey))
                {
                    kindToAdd = ShapeKind.Line;
                    XLineDraw = 1;
                }

                if (SplashKit.MouseClicked(MouseButton.LeftButton))
                {
                    Shape newShape;

                    switch (kindToAdd)
                    {
                        case ShapeKind.Circle:
                            newShape = new MyCircle();
                            break;

                        case ShapeKind.Line:
                            if (XLineDraw == 0) continue;
                            newShape = new MyLine();
                            --XLineDraw;
                            break;

                        default:
                            newShape = new MyRectangle();
                            break;
                    }

                    newShape.X = SplashKit.MouseX();
                    newShape.Y = SplashKit.MouseY();

                    myDrawing.AddShape(newShape);
                }

                if (SplashKit.KeyTyped(KeyCode.SpaceKey))
                {
                    myDrawing.Background = SplashKit.RandomColor();
                }

                if (SplashKit.MouseClicked(MouseButton.RightButton))
                {
                    myDrawing.SelectShapesAt(SplashKit.MousePosition());
                }

                if (SplashKit.KeyTyped(KeyCode.DeleteKey) || SplashKit.KeyTyped(KeyCode.BackspaceKey))
                {
                    foreach (Shape s in myDrawing.SelectedShapes)
                    {
                        myDrawing.RemoveShape(s);
                    }
                }

                if (SplashKit.KeyTyped(KeyCode.SKey))
                {
                    // 105293041
                    // X = 1%3 = 1
                    // 5+1 = 6
                    string fileName = "TestDrawing.txt";
```

```
                myDrawing.Save(fileName);
            }

            if (SplashKit.KeyTyped(KeyCode.OKey))
            {
                try
                {
                    string fileName = "TestDrawing.txt";
                    myDrawing.Load(fileName);
                }
                catch (Exception e)
                {
                    Console.WriteLine($"Error loading file: {e.Message}");
                }
            }

            myDrawing.Draw();

            SplashKit.RefreshScreen();
        } while (!window.CloseRequested);
    }
}
```

Screenshot of the SplashKit Window showing 3 drawings – draw, save, draw, load






Drawing.cs
writer.Close();
}
}
1 reference
public vo
{
Strea
try
{
finally
{
reader.Close();
}
ShapeDrawer — dotnet run — dotnet — ShapeDrawer • dotnet run — 100×24
~/Dev/COS20007/C/5/ShapeDrawer main ?3 dotnet run
1m 8s
Shape Drawer
EXPLORER
SHAPEDRAWER
.vscode
bin
lib
logs
obj
Drawing.cs
ExtensionMethods.cs
MyCircle.cs
myeasylog.log
MyLine.cs
MyRectangle.cs
Program.cs
Shape.cs
ShapeDrawer.csproj
ShapeDrawer.sln
TestDrawing.txt
OUTLINE
TIMELINE
SOLUTION EXPLORER