Learning C#

What is C#

- A new object oriented language
  - Syntax based on C
    - Similar to C++ and Java
  - Used to write .NET software
    - Software that targets the .NET Framework is called managed code
  - C# gains much from the .NET Framework
    - Internet oriented platform
    - JIT compilation
    - Automatic memory management
    - Security, type-safety
    - Framework Class Library

C#: Rich Software Development

- Provides access to the .NET Framework
  - Great language for targeting .NET
  - Access the features of the framework
    - For example, the FCL
    - Create Web-based apps, GUI, apps, etc.
- Offers access to the underlying OS
  - Full access to Windows (or host OS)
  - Enables creation of rich applications
- Object oriented
  - Create component based applications
  - Gain the benefits of OO design, with no compromises

Defining the .NET Framework

- The .NET Framework is
  - A software development environment
  - A runtime engine for *Managed Code*
  - A platform designed for Internet-Distributed software
- The .NET Framework is an exciting new computing platform

Hello World a-la C#

HelloGUI.cs

```
using System.Windows.Forms;
using System.Drawing;

class MyForm:Form{
   public static void Main(){
      Application.Run(new MyForm());
   }

   protected override void OnPaint(PaintEventArgs e){
      e.Graphics.DrawString("Hello World!",
      new Font("Arial", 35), Brushes.Blue, 10, 100);
   }
}
```

```
c:\> csc /target:winexe HelloGui.cs
```

Types of Applications

- Managed code is packaged as *Assemblies*
- The three kinds of assemblies that you can create with C# are the following.
  - Console applications
  - GUI applications
  - Libraries of Types
- Libraries of Types are especially important because
  - Applications are going to consist of more and more reusable component code
  - Web Forms and Web Service applications are published as libraries

Creating a Console Application

Rabbits.cs

```
using System;
class App{
   public static void Main(String[] args){
      try{
         Int32 iterations = Convert.ToInt32(args[0]);
         if(iterations > 138){
            throw new Exception();
         }
         Decimal lastNum = 1;
         Decimal secondToLastNum = 0;
         while(iterations-- > 0){
            Decimal newNum = lastNum+secondToLastNum;
            Console.WriteLine(newNum);
            secondToLastNum = lastNum;
            lastNum = newNum;
         }
      }catch{
         Console.WriteLine(
            "Usage:  Rabbits [Fib Index]\n"+
            "\t[Fib Index] < 139");
      }
   }
}
```

```
c:\> csc Rabbits.cs
```

Creating a GUI Application

Tribbles.cs

```
using System;
using System.Drawing;
using System.Windows.Forms;

class App{
   public static void Main(){
      Application.Run(new TribbleForm());
   }
}

class TribbleForm:Form{
   TextBox generationsTextBox;
   ListBox fibList;

   // ...
```

```
c:\> csc /target:winexe Tribbles.cs
```

Creating a Code Library

FibObj.cs

```
using System;
public class Fib{
   Decimal current;
   Decimal last;
   public Fib(){
      current = 1;
      last = 0;
   }
   private Fib(Decimal last, Decimal secondToLast){
      current = last+secondToLast;
      this.last = last;
   }
   public Fib GetNext(){
      return new Fib(current, last);
   }
   public Decimal Value{
      get{return current;}
   }
}
```

```
c:\> csc /target:library FibObj.cs
```

Code that Uses a Code Library

FibTest.cs

```
using System;
class App{
    public static void Main(){
        Int32 index = 50;
        Fib obj = new Fib();
        do{
            Console.WriteLine(obj.Value);
            obj = obj.GetNext();
        }while(index-- != 0);
    }
}
```

```
c:\> csc /r:FibOjb.dll FibTest.cs
```

Language Concepts

- Syntax based on C/C++
  - Case-sensitive
  - White space means nothing
  - Semicolons (`;`) to terminate statements
  - Code blocks use curly braces (`{}`)
- Some features
  - Can create methods with a variable number of arguments
  - Parameters are passed by value (by default)
    - Can create methods that take parameters by reference
    - Can create methods with out-only parameters
  - Operator overloading and type converters
  - Type-safety and code verification
- Object oriented, code is structured using the class keyword

Primitive Types

- Signed Numeric Primitive Types
  - `Int32`, `Int16`, `Int64`, `SByte`, `Double`, `Single`, `Decimal`
- Unsigned Numeric Primitive Types
  - `UInt32`, `UInt16`, `UInt64`, `Byte`
- Other Primitives
  - `Boolean`, `String`, `Char`, `Object`
- Primitive Types are FCL Types
  - C# Aliases the primitives
  - Example: `Int32` == `int`

Conditional Statements

- C# uses `if`

```
if(y == x){
    Console.WriteLine("y equals x");
}else{
    Console.WriteLine("y does not equal x");
}
```

- C# uses `switch`

```
switch(x){
case 2:
    Console.WriteLine("x equals 2");
    break;
default:
    Console.WriteLine("x does not equal 2");
    break;
}
```

C# Loops…

- C# uses `for`

```
for(index = 0;index<100;index++){
   Console.Write(index);
   Console.Write("\t");
}
```

- C# uses `while`

```
index = 10;
while(index != 0){
   Console.WriteLine(index);
   index--;
}
```

C# Loops (continued)

- C# uses `do-while`

```
index = 0;
do{
   Console.WriteLine("Happens at least once");
}while(index < 0);
```

- C# uses `foreach`

```
Int32[] myArray = new Int32[]{10, 20, 30, 40};
foreach(Int32 i in myArray){
   Console.WriteLine(i);
}
```

C# Error Handling

- C# uses `try-catch`

```
try{
    Int32 index = 10;
    while(index-- != 0){
        Console.WriteLine(100/index);
    }
}catch(DivideByZeroException){
    Console.WriteLine(
        “Caught division by zero exception");
}
Console.WriteLine(
    “Caught; code keeps running");
```

C# Assured Cleanup

- C# uses `try-finally`

```
try{
    // Perhaps an exception is thrown or
    // return statement is hit
    return;
}finally{
    Console.WriteLine(
        "Code in finally always runs");
}
```

Using Types

- You will often use types from
  - The Framework Class Library (FCL)
  - Third party libraries

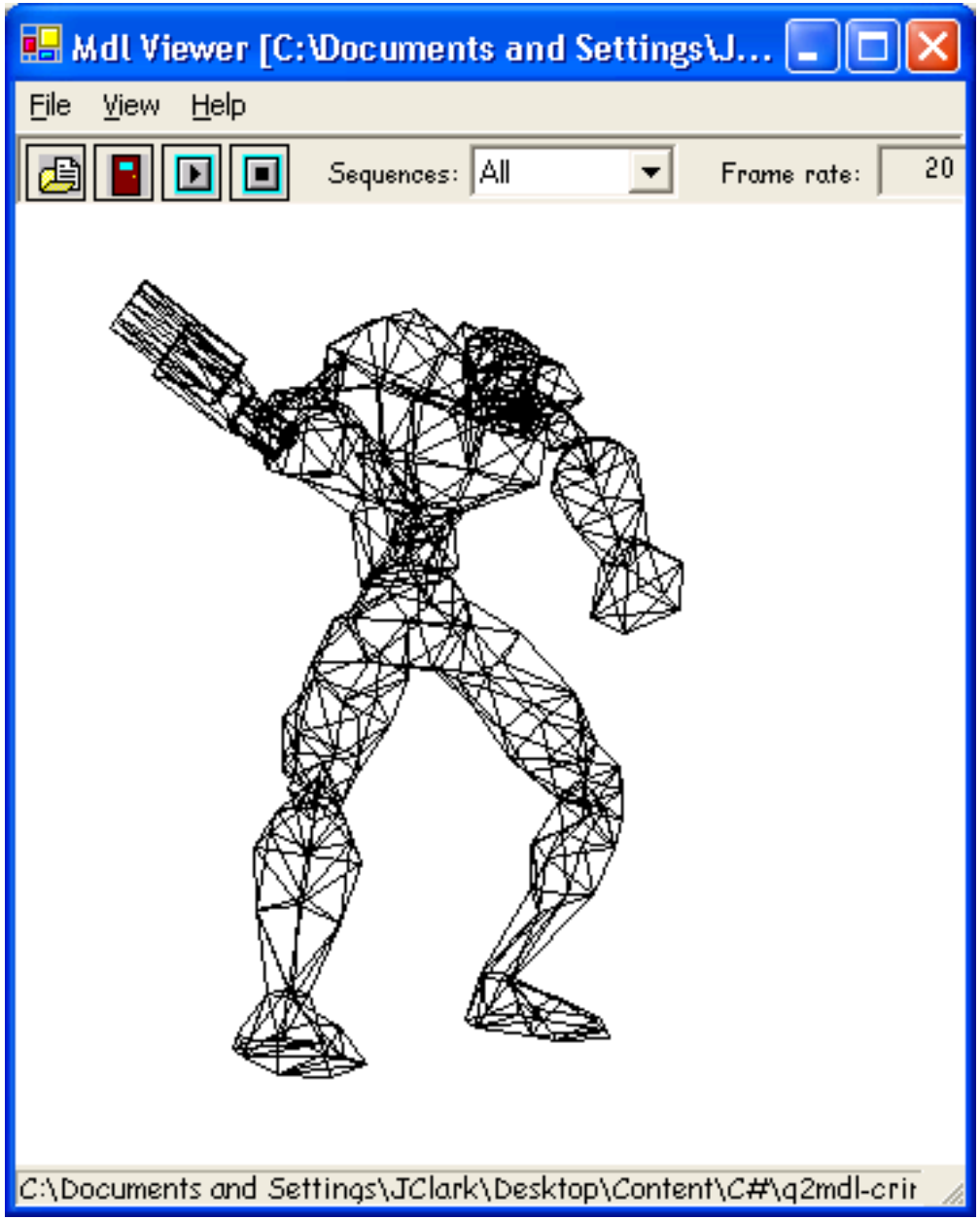
TypeFile.cs

```
using System;
using System.IO;
class App{
  public static void Main(String[] args){
    StreamReader reader =
      new StreamReader(args[0]);
    Console.WriteLine(reader.ReadToEnd());
  }
}
```

Demo C#Pad.cs

Learning C#

Demo MDLView



Demo Visual Studio.Net

Demo TerraViewer