

Computer Graphics

- Game Programming1

Sung Soo Hwang

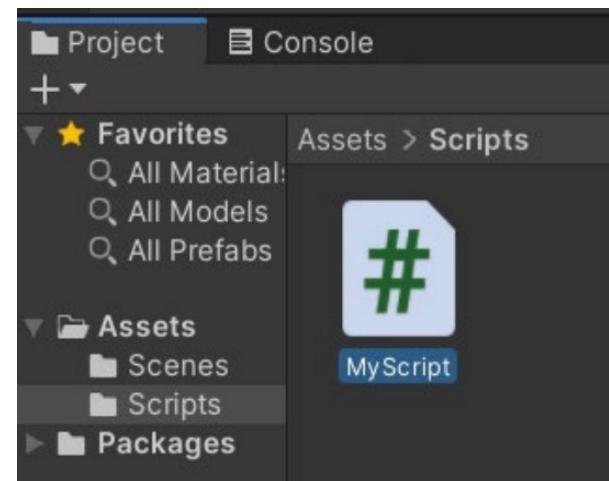
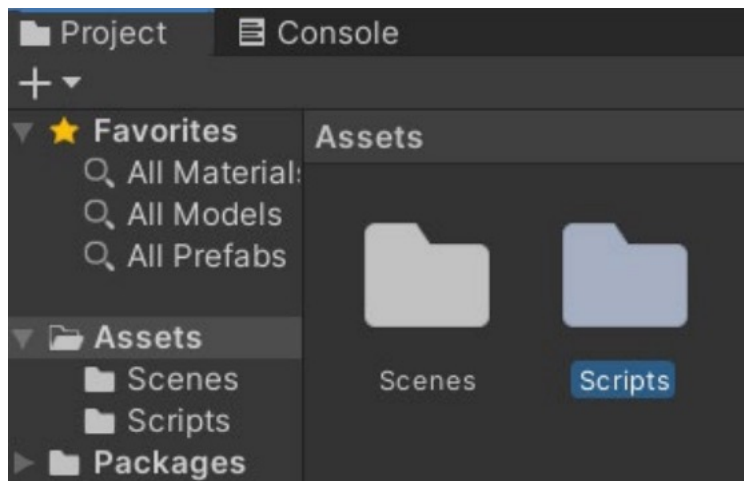
C# Programming Language



- C# is a general-purpose and objected-oriented programming language derived from C++ and Java. It was developed around 2000 by Microsoft.
- Language Features
 - It provides a variety of libraries based on the Microsoft .NET framework.
 - Its syntax is very similar to that of C++ and Java but has more diversity and flexibility.
 - Pointer supported but rarely used due to security risks and related errors
 - It needs compilation to common intermediate language (CIL) for faster execution and cross-platform support.
 - It has a garbage collector and you do not need to directly manage memory deallocation.

How to add a C# script in Unity

- To add a new script in Unity, first make a folder for script files with a proper name like “Scripts” if you do not have.
- In this folder, click the right mouse button and select Create —> C# Script to make a new script. Name it properly as you want.



How to add a C# script in Unity

- Basic structure of a Unity script

```
using System.Collections;  
using System.Collections.Generic;  
using UnityEngine;
```

Basic Libraries

```
public class MyScript : MonoBehaviour
```

```
{
```

```
// Start is called before the first frame update
```

```
void Start()
```

```
{
```

```
...
```

```
}
```

```
// Update is called once per frame
```

```
void Update()
```

```
{
```

```
...
```

```
}
```

```
}
```



MonoBehaviour is the base class from which every Unity script derives.



MyScript will be implicitly instantiated if the script has been attached to a certain game object as a component.

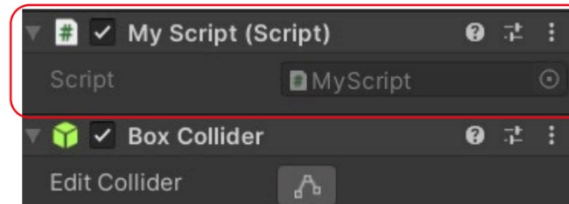
Start is called on the frame when a script is enabled just before any of the Update methods are called the first time.

Update is called every frame.

How to add a C# script in Unity

- Example

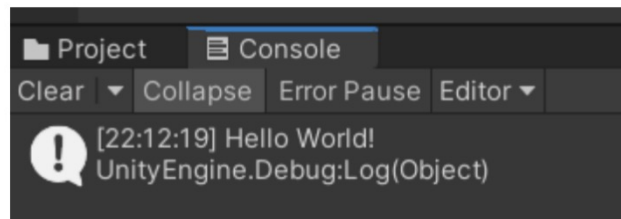
- Make any other game object like a cube and select the object.
- In the Inspector panel, click the Add Component button and choose Scripts -> MyScript.



- Then, open the MyScript script and change the Start() method as follows:

```
void Start()
{
    Debug.Log("Hello World!");
}
```

- Play the game and check what was printed on the Console pane



Practice: C# Programming

- Your First Program

```
namespace Beginning_CSharp
{
    class Program
    {
        static void Main(string[] args)
        {
            Console.WriteLine("Hello world!");
        }
    }
}
```

C# console code

```
public class MyScript : MonoBehaviour
{
    // Start is called before the first frame update
    void Start()
    {
        Debug.Log("Hello World!");
    }

    // Update is called once per frame
    void Update()
    {
    }
}
```

Unity script code

- Variables

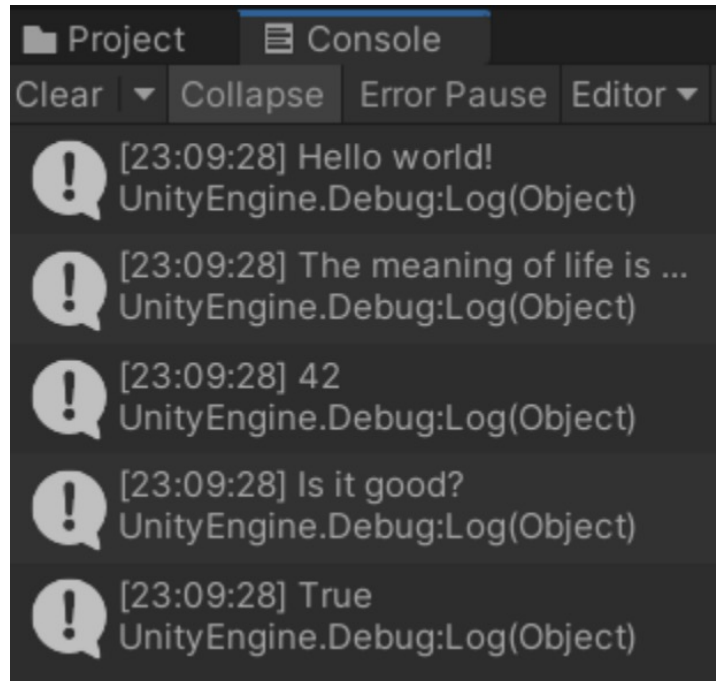
```
static void Main(string[] args)
{
    int theMeaningOfLife = 42;
    var isGood = true;
    Console.WriteLine("Hello world!");
    Console.WriteLine("The meaning of life is ...");
    Console.WriteLine(theMeaningOfLife);
    Console.WriteLine("Is it good?");
    Console.WriteLine(isGood);
}
```

→ Local variables

```
Hello world!
The meaning of life is ...
42
Is it good?
True
```

Practice: C# Programming

- Practice
 - Print out the same messages in the Console panel of Unity.



Practice: C# Programming

- Calculating the Average



300



500



700

- ⚙ Create three variables for each type of item
- ⚙ Give them meaningful names
- ⚙ Add items and divide by 3
- ⚙ Store the result in a variable
- ⚙ Print it out to the console.

- Possible solution:

```
static void Main(string[] args)
{
    var ipads = 300;
    var cars = 500;
    var consoles = 700;

    var totalItems = ipads + cars + consoles;
    var average = totalItems / 3;

    Console.WriteLine("The average is " + average);
}
```

- Note: in C#, "integer / integer" will result in "integer" dropping the fractional part, unlike Python.

Example:

In C#: $5/2 \rightarrow 2$

In Python: $5/2 \rightarrow 2.5$

Practice: C# Programming

- Example

- Declare ipads, cars, and consoles as public object variables in Unity and print out their average in the Console panel.

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

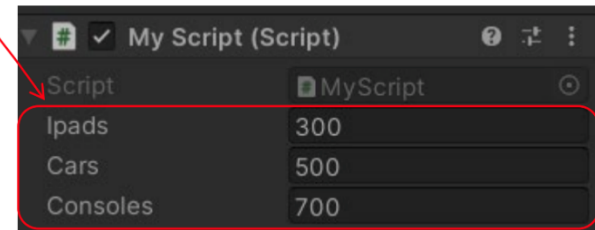
public class MyScript : MonoBehaviour
{
    public int ipads = 300;
    public int cars = 500;
    public int consoles = 700;

    // Start is called before the first frame update
    void Start()
    {
        var totalItems = ipads + cars + consoles;
        var average = totalItems / 3;

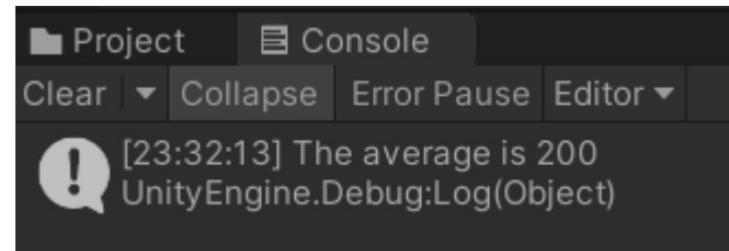
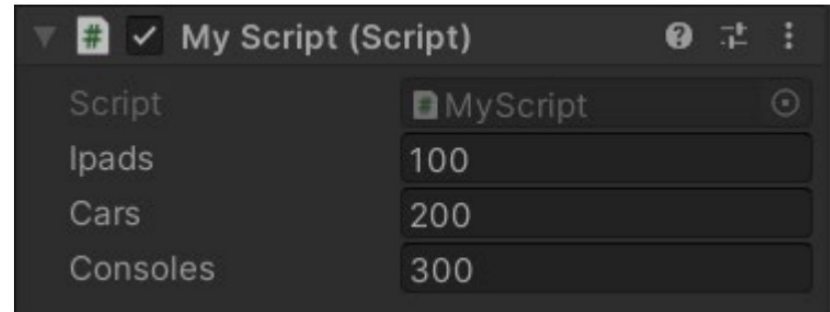
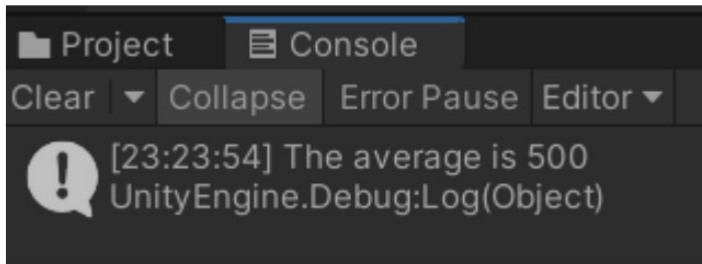
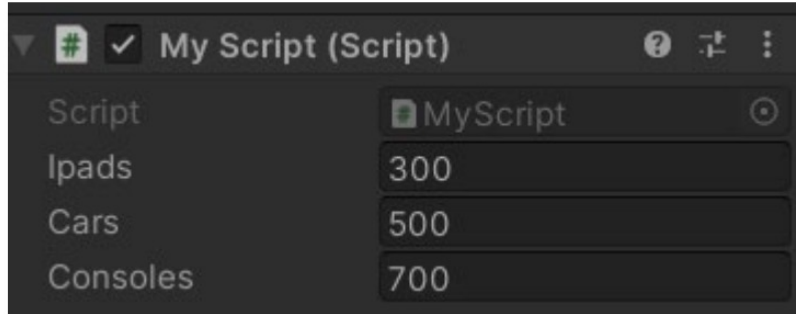
        Debug.Log("The average is " + average);
    }

    // Update is called once per frame
    void Update()
    {
    }
}
```

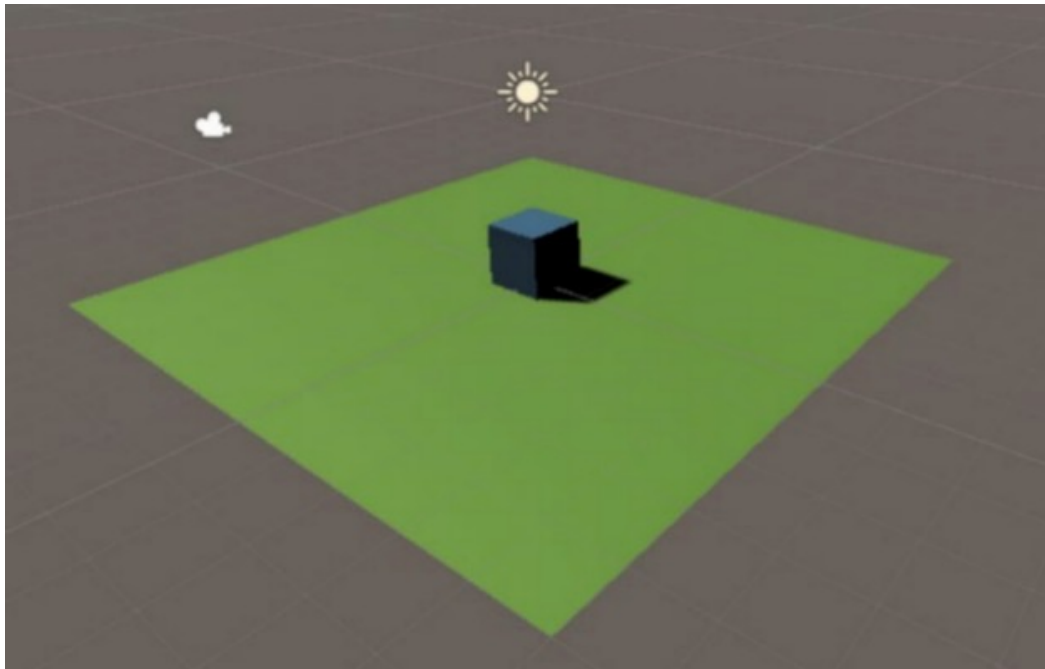
Notice that the values of the public object variables are now editable in the Inspector panel.



Practice: C# Programming



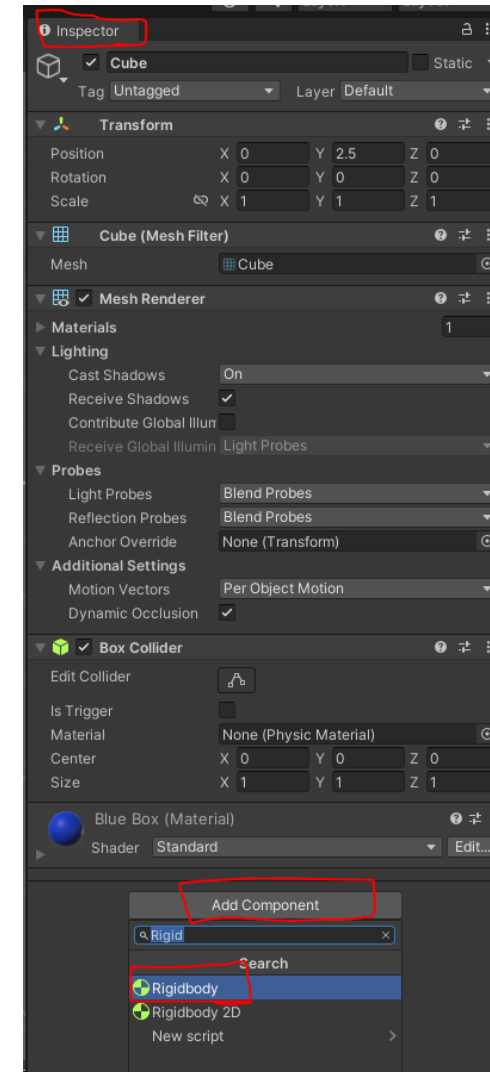
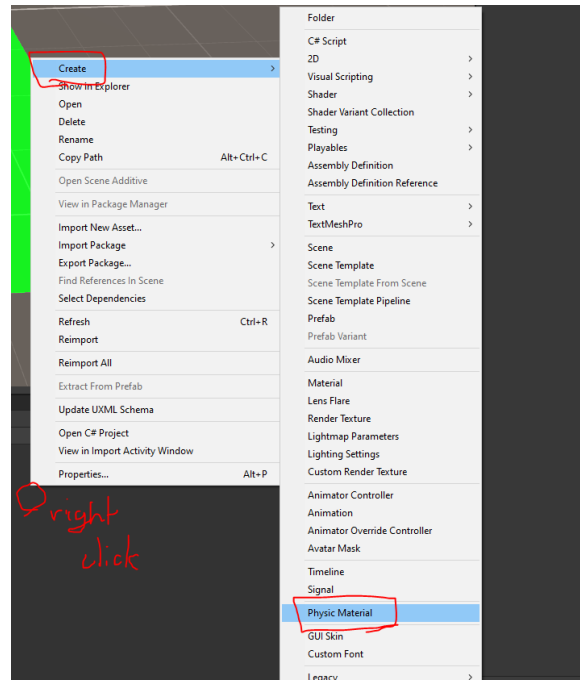
- Simple Interactive Cube
 - Make a scene with a cube and a plane similar to the followings:



Practice: C# Programming

- Simple Interactive Cube

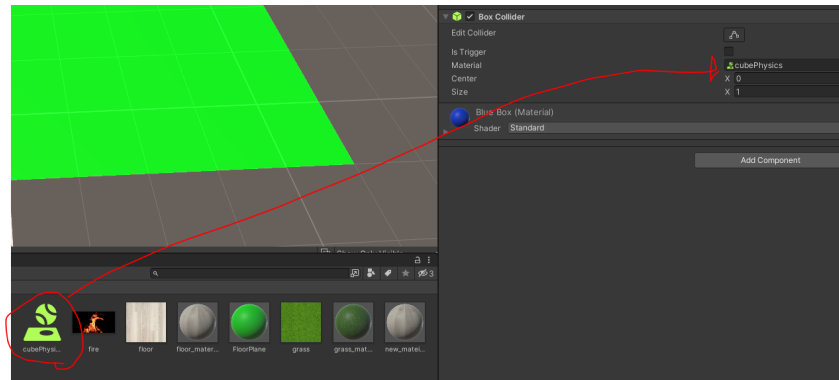
- Add a Rigid Body component and a Physic Material to the cube so that it has some bounciness.
- 1. Add Rigid Body component by clicking "Add Component" Button.
- 2. Create Physics Material in the Materials folder



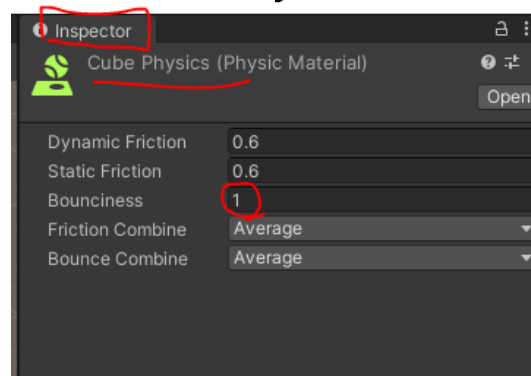
Practice: C# Programming

- Simple Interactive Cube

- Add a Rigid Body component and a Physic Material to the cube so that it has some bounciness.
- 3. Assign Physics material in the Box collider



- 4. Apply bounciness in the Physics material inspector



- Make a new script and add it to the cube. And type in the following script code:

```
void Update()
{
    var pos = transform.position;

    if (Input.GetKeyUp(KeyCode.LeftArrow) || Input.GetKeyUp(KeyCode.A))
    {
        pos.x -= 1;
    }
    if (Input.GetKeyUp(KeyCode.RightArrow) || Input.GetKeyUp(KeyCode.D))
    {
        pos.x += 1;
    }
    if (Input.GetKeyUp(KeyCode.UpArrow) || Input.GetKeyUp(KeyCode.W))
    {
        pos.z += 1;
    }
    if (Input.GetKeyUp(KeyCode.DownArrow) || Input.GetKeyUp(KeyCode.S))
    {
        pos.z -= 1;
    }
}
```

(Continued in the next slide...)


```
if (Input.GetKeyUp(KeyCode.DownArrow) || Input.GetKeyUp(KeyCode.S))
{
    pos.z -= 1;
}
if (Input.GetKeyUp(KeyCode.Space))
{
    pos.y = 3;
}
if (Input.GetKeyUp(KeyCode.Space) && Input.GetKey(KeyCode.LeftShift))
{
    pos.x = 0;
    pos.y = 0.5f;
    pos.z = 0;
}

transform.position = pos;
}
```

- Watch the video course about the C# basics.
 - Visit <https://www.kodeco.com/603984-beginning-programming-with-c> to take video courses for Unity, entitled "Unity for Beginners".
 - Watch the course: Beginning Programming with C#: Control Flow (1:03:10)

