# Lab 3: Instantiate, Invoke, and Object Lifetime

#### **Setup:**

1. Clone the repository:
   * Open this link : <https://classroom.github.coam/a/UOppABh8>
   * Follow the instruction to clone the repo with Github Desktop
2. Open the sample scene in scene folder   
   

### **Task 1: Create a Bullet/Canonball Prefab**

1. **Create a new GameObject**:
   * Right-click in the *Hierarchy* and select Create > 3D Object > Sphere.
2. **Add Rigidbody Component**:
   * Select the sphere in the *Hierarchy*.
   * In the *Inspector* panel, click Add Component and search for Rigidbody.
   * Make sure the Rigidbody's Use Gravity checkbox is ticked to allow gravity to affect the bullets and make sure it is not a Kinematic object by making sure that the IsKinematic Checkbox is NOT ticked.
   * 
3. **Add Tag**:
   * Click the sphere again, go to the *Inspector*, and click on the Tag dropdown.
   * Select or add a new tag called "Projectile" by clicking Add Tag, then choose Projectile from the list.
   * 
   * 
   * Make sure you choose projectile for your bullet after creating the tag.
4. 
5. Apply the bullet material





* + Your bullet should look something like this :
  + 

1. **Save it as a Prefab**:
   * Drag the sphere from the *Hierarchy* into the *Project* panel to save it as a prefab.
   * 

### **Task 2: Create a BulletComponent Script**

1. **Create a Script**:
   * In the *Project* panel, right-click and select Create > C# Script.
   * Name it BulletComponent.
2. **Edit the Script**:
   * Open BulletComponent.cs in the code editor.
   * The bullet component will contain the code for destroying the ball

using System.Collections;

using System.Collections.Generic;

using UnityEngine;

public class BulletComponent : MonoBehaviour

{

void Start()

{

// Destroy object after a few seconds

Destroy(gameObject, 5f);

}

}

1. **Attach the Script**:
   * Attach the BulletComponent script to your bullet prefab by dragging it from the *Project* panel to the prefab's *Inspector*.
   * 





### **Task 3: Modify the Gun component to Spawn the bullets**

1. **Edit the Script**:
   * Open GunComponent.cs and implement the following:

using UnityEngine;

public class GunComponent : MonoBehaviour

{

public GameObject bulletPrefab;

public Transform bulletSpawnPoint;

public float bulletMaxImpulse = 100.0f;

public float maxChargeTime = 3.0f;

private float chargeTime = 0.0f;

private bool isCharging = false;

void Update()

{

// TODO add the logic to track player keeping the input down.

if (Input.GetButtonUp("Fire1"))

{

ShootBullet();

}

}

void ShootBullet()

{

GameObject bullet = Instantiate(bulletPrefab, bulletSpawnPoint.position, bulletSpawnPoint.rotation);

Rigidbody rb = bullet.GetComponent<Rigidbody>();

// TODO change that equation so that it adds an impulse that follows charge time

float bulletImpulse = bulletMaxImpulse;

// An impulse is a force you apply on a object in a single instant.

rb.AddForce(bulletSpawnPoint.forward \* bulletImpulse, ForceMode.Impulse);

}

}

1. **Configure the Gun**:
   * The gun component should already be assigned to the Gun gameObject ( A child of the player ) You will need to assign the bullet prefab and the bullet spawn point in the *Inspector*.
   * 

Assign **the tip of gun transform** as the bullet spawn point.



And the bullet prefab as the Bullet Prefab Proprety



### **Task 4: Modify the Gun Component**

You will need now to modify the gun component Update function to add a charging mechanic for bullet speed. ( IE Charge longer, Bullet goes further )  
**Here are few hints :**

* This will be done within the Update() function.
* You need to detect when the player starts holding the fire button. Use an if condition with the boolean Input.GetButtonDown("Fire1") to detect when the button is initially pressed.
  + When a player first press down the button the chargetime should reset to 0.
* Using the boolean Input.GetButton("Fire1") increments the charge time every frame the button is held down. By adding the Time.deltaTime to the charge time.
  + You should increase the chargeTime value over time using Time.deltaTime, which gives you the time passed between each frame.
* To avoid excessively fast bullets, you can apply a maximum limit to the chargeTime.
  + Use Mathf.Clamp to keep the chargeTime between 0 and a certain max value (like 3 seconds).
    - chargeTime = Mathf.Clamp(chargeTime, 0, maxChargeTime);

**Copy the code you came up with here :   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

using UnityEngine;

public class GunComponent : MonoBehaviour

{

    public GameObject bulletPrefab;

    public Transform bulletSpawnPoint;

    public float bulletMaxImpulse = 10.0f;

    public float maxChargeTime = 3.0f;

    private float chargeTime = 0.0f;

    private bool isCharging = false;

    void Update()

    {

        // TO DO: Add the logic to track player by keeping the input down.

        // Task 4:

        // Detect when the player starts holding the fire button.

        if (Input.GetButtonUp("Fire1"))

        {

            chargeTime = 0.0f;

            isCharging = true;

        }

        // While the fire button is held down, increasse charge time

        if (Input.GetButton("Fire1") && isCharging)

        {

            chargeTime += Time.deltaTime; // accumulate time

            chargeTime = Mathf.Clamp(chargeTime, 0, maxChargeTime); // limit charge time

        }

        // When the player releases the fire button, shoot the bullet

        if (Input.GetButtonUp("Fire1") && isCharging)

        {

            isCharging = false; // stop charging

            ShootBullet(); // Fire the Bullet

        }

    }

    // This method is responsible for creating a bullet object and applying physical force to it so it shoots forward from the gun.

    void ShootBullet()

{

    // Cretaes a new buller in the game by using the bulletPrefa and placing it at the bulletSpawnPoint's position and rotation.

    GameObject bullet = Instantiate(bulletPrefab, bulletSpawnPoint.position, bulletSpawnPoint.rotation);

    // Get the RigidBody Component from the bullet.

    Rigidbody rb = bullet.GetComponent<Rigidbody>();

    // Calculate impulse based on charge time.

    float chargeRatio = chargeTime / maxChargeTime;

    float bulletImpulse = bulletMaxImpulse \* chargeRatio;

    // Apply force to the bullet in a forward direction of the gun.

    rb.AddForce(bulletSpawnPoint.forward \* bulletImpulse, ForceMode.Impulse);

}

}

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* Now change the ShootBullet function to

void ShootBullet()

{

GameObject bullet = Instantiate(bulletPrefab, bulletSpawnPoint.position, bulletSpawnPoint.rotation);

Rigidbody rb = bullet.GetComponent<Rigidbody>();

// Scale bullet force based on charge time

float bulletImpulse = (chargeTime / maxChargeTime) \* bulletMaxImpulse;

rb.AddForce(bulletSpawnPoint.forward \* bulletImpulse, ForceMode.Impulse);

}

In the end your GunComponent should look something like this **( NOTE : the next code snippet is a picture)**

### **Task 5: Target Interaction and Scoring**

1. **Create TargetComponent Script**:
   * In the *Project* panel, create a new C# script called TargetComponent.
2. **Edit the Script**:
   * Open TargetComponent.cs and implement collision handling:

using UnityEngine;

public class TargetComponent : MonoBehaviour

{

private Renderer targetRenderer;

private Color originalColor;

public Color hitColor = Color.green; // Change to any color you want

private void Start()

{

targetRenderer = GetComponent<Renderer>();

if (targetRenderer != null)

{

originalColor = targetRenderer.material.color;

}

}

private void OnCollisionEnter(Collision collision)

{

if (collision.gameObject.CompareTag("Projectile"))

{

GameManager.Instance.IncrementScore();

// Change color

if (targetRenderer != null)

{

targetRenderer.material.color = hitColor;

}

// Restore color and hide target after 5 seconds

Invoke("ResetColor", 5f);

}

}

private void ResetColor()

{

if (targetRenderer != null)

{

targetRenderer.material.color = originalColor;

}

}

}

1. **Attach the Script**:
   * Select the target prefab in your Prefab folder and double click it.  
     
   * It will change the viewport to a blue background with only your prefab where the scene would be
   * 
   * Now click on the parent object and add the TargetComponent to it
   * 
   * This will add the target component on all the Target object in your scene.

You can go back to your scene by pressing the arrow



1. **Connect to GameManager**:
   * Ensure your GameManager script has an IncrementScore() method. This will update the score when a bullet hits the target.

Make sure the GameManager IncrementScore Is properly implemented



### **Submission**

1. **Add this file to your Asset folder and commit to your repo.**