

# GAME2005 – Game Physics

## Final Test

### 3D Collision Detection and Response

**Due:** week #15 (Saturday December 19, 2020) @ midnight.

**Value:** 20%

**Maximum Mark:** 100

#### Overview:

Working alone you will build on the Demo Project provided in class.

#### Programming Required:

This is a programming assignment. You will be required to use the **Unity Game Engine**.

#### Project Assets:

You will be required to use the Unity Template provided for your Final Test. Your First-Person Character has now been reduced to custom scripts (so no Standard Assets used).

#### Project Constraints:

You are **NOT permitted** to use the following:

- Unity's Physics Engine
- any Physics Plugin
- Scripting Plugins from third-party sources
- Rigid Body Components (3D and/or 2D)
- Collider Components (3D and/or 2D)
- Raycasting or Linecasting
- any other Unity Component, Script or system that provides physics simulations, collision detection or collision responses.

**Important Note:** using any of the above components, systems scripts or tools will automatically result in a **zero grade** for this assignment.

## Instructions :

### Base: Project Setup and UI

1. You will use **C# and the Unity Game Engine** to create a **new scene** and connect to the existing **Main Scene** (25 points).
  - a) Your application should include a **Start Scene** with **labels** that displays your full name and student ID. Include a **Button** control which allows the user to go to the **Main Scene** (10 points)
  - b) **The Main Scene** will contain the Physics Simulation (Simple 3D Collision Detection and Response). You must use the Main Scene in the Template provided. (5 points)
  - c) Let the user “activate” the play scene with a button or other control (5 points)
  - d) Provide the User with a button or other control within the **Main scene** to go back to the **Start Scene** (5 points).

### Part 1: Simple 3D Collision Detection and Response

1. **Task 1.** Modify the scripts provided (or add new scripts) to enable the First-Person player controller provided to “interact” with the blocks in the scene . **Note:** The First-Person player controller **does not use** the Standard Assets Prefab. (30 Marks: Functionality)
  - a) Modify the scripts provided (or add new scripts) to enable the player to “push” the blocks around in the scene (10 points).
  - b) A simple **RigidBody3D** Script has been included. It includes a **BodyType** option (either *Static* or *Dynamic*). When **Static** is selected, any GameObject that the Script is attached to will not be affected by Gravity. Add / arrange several blocks in the scene to create a series of Floating Platforms or “stairs”. These blocks are required for part c. (10 points).
  - c) Modify the scripts provided (or add new scripts) to enable the player to **jump onto** the Floating Platforms or “stairs” from part b (10 points).
2. **Task2.** Modify the Bullet so that the Collision Shape changes from a Sphere to a Cube (30 points).
  - a) Change the Bullet Prefab so that it uses a **smaller Cube** instead of a Sphere (hence a “Cube-Bullet”). This can be accomplished by creating a new GameObject and attaching the BulletBehaviour Script onto it and then Dragging the new GameObject into the Prefabs folder or modify the Mesh in the Pre-existing Prefab (10 points).
  - b) Modify the scripts provided (or add new scripts) to perform AABB collision detection between the Cube-Bullet and the Blocks in the scene (10 points).
  - c) The Reflect method has been provided for you to use in the **CollisionManager** Script. Use this method (or create other structures) to have the new Cube-Bullet reflect from the surface of other AABBs (10 Points).

## Part 2: Video Demonstration

2. Create a Short Video presentation with your favourite screen capture and streaming tool (OBS Recommended) and upload it to Blackboard. You must also include a short PowerPoint (or Google Slides) **Slide Deck** that includes a **single slide** to start your video (10 Points)
  - a) The first (and only) Slide of your Slide Deck must include a **current image** of you (no avatars allowed) that is displayed appropriately on the page. You must also include your **Full Name, Student ID, the Course Code, Course Name, and your Assignment information.** (2 Points)
  - b) You will demonstrate each of your app's **Scenes**. Your UI must be **clearly visible** (2 Points)
  - c) You will describe the **code** and **functionality** of your application (2 Points).
  - d) **Sound** for your Video must at an appropriate level so that your voice may **be clearly heard**. Your Screen should be **clearly visible** (2 Points).
  - e) Your Short Video should run no more than 5 minutes (2 Points).

## Part 3: Version Control

3. Share your files on **GitHub** to demonstrate Version Control Best Practices
  - a) **Create** an appropriately named repository on GitHub (1 Point)
  - b) Your repository must include your code and be well structured (2 Points).
  - c) Your repository must include commits that demonstrates the project being updated at different stages of development – each time a major change is implemented (2 Points).

**Note: Your project will not be accepted without your video demo**

## Evaluation Criteria

Feature	Description	Marks
Base Scene	Your Project Base includes a Start Scene that displays your Name and StudentID. A button (or another UI Element) allows the user to navigate to the Main Scene.	25
Physics Simulation Functionality	Your Simulation works without errors. Controls are available for the user to modify the initial values and restart the simulation with those values.	60
Version Control	GitHub commit history demonstrating regular updates.	5
Video Presentation	Your short video must demonstrate your app working in the simulator and discuss each of your designs	10
<b>Total</b>		<b>100</b>

Please see **next page** for how to submit your work.

## **SUBMITTING YOUR WORK**

Your submission should include:

1. A link to your working GitHub repository for your simulation. Your GitHub repository should be appropriately named (e.g., **GAME2005-F2020-FinalTest-[YourStudentID]**)
2. A zip archive of your project uploaded to Blackboard. Please name your file **GAME2005-F2020-FinalTest-[YourStudentID]**
3. A link to your Video Demonstration. Please **do not** upload a video file.

This assignment is weighted **20%** of your total mark for this course.

**Late submissions:** will not be accepted as this is your Final Exam.