Unity Piscine - D05

Terrain, camera management, 3D PhysicsTerrain

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Summary: *Here is the D05's subject for the Unity Piscine of 42.*

Contents

Chapter I

Instructions

- Only this page will serve as reference. Do not trust rumors.

- The exercises have been ordered from easiest to most difficult. Under any circumstance you can submit or take into account an exercise if a previous one has failed.

- Be careful with the access rights of your files.

- You should follow the submit procedure for all you exercises.

- Your exercises will be corrected by your piscine peers.

- You cannot leave any extra file on your repository except the ones explicitly specify on you subject.

- Got a question? Ask your peer on the right. Otherwise, try your peer on the left.

- Everything you need can be found on the `man` or out there on Google.

- Read carefully the exercises: they may contain some features you should implement that are explicitly mentioned on the subject.

- Think about discussing on the forum Piscine of your Intra!

- Use your brain!!!

Chapter II

Foreword

Some studios create futuristic MMOFPS with several wars simultaneously going on different battlefields. Others create RPG's with hours of breathtaking cinematics. Others yet envision gigantic open worlds with scenarios worthy of the best literary sagas. And then, some other studios create golf simulations.

And this is precisely what we're about to create: a golf simulation.

But before anything, we'll save you tedious researches and offer you a simple lexicon featuring basic rules and super technical terms you will need to familiarize with to achieve today's exercises.

Game goal: Complete the course in as few strokes as possible, sending the ball in each of the course's holes thanks to a variety of clubs.

Course: The course usually has 18 holes.

Teeing ground: The flat area, usually elevated, at the beginning of each hole. This is where the players start.

Green: The area surrounding the hole. The grass is short so the ball can roll properly.

Fairway: Main area between the teeing ground and the green. This is the real playground of a hole. This area is maintained, unlike...

...Rough: Poorly maintained area with tall grass bordering the fairway.

Bunker: Sand hazard on the fairway. This is usually placed to challenge the player.

Water hazard: The name is explicit enough. Ponds, lakes, rivers and even oceans, are considered water hazards. A player whose ball falls in a water hazard gets a penalty point.

Off limit: Off the playground area - usually by the rough - considered prohibited. Like the water hazard, a ball going off limit gives a penalty point to the player.

Club - Woods: Woods are round-headed clubs that strike hard, making long strokes with low ball courses.

Club - Irons: Irons are flat-headed clubs with a more or less opened angles making ball courses higher but shorter.

Club - Wedges: Wedges are wide angle irons allowing short range bell strokes. They're ideal to pass a hazard or come out of the bunker.

Club - Putter: The putter is a flat and straight headed club that makes accurate strokes on the greens.

Score - Par: Par is the optimal number of strokes expected for a hole. It is set between 3 for a short and easy hole and 5 for a longer one.

Score - Ace: A hole achieved in one single stroke, whichever the par. It is usually impossible to make it to a par 4 or 5 green in one just one stroke.

Score - Albatross: Albatross means 3 shots under par (-3) on a hole. (completing a par 5 in 2 strokes for instance).

Score - Eagle: Eagle is 2 shots under par on a hole.

Score - Birdie: Birdie is 1 shot under par.

Score - Above par: Going above par usually is called bogey. Bogey has 3 grades (+1, +2, +3). Beyond these, the performance is considered mediocre. This gives the player a +X, X being the number of strokes above par.

Chapter III

Exercise 00: Walkabout and picnic

	Exercise : 00
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Turn-in directory : *ex00/*	
Files to turn in : `"ex00"` scene and anything useful	
Forbidden functions : `None`	

Create a gold course with 3 different holes. The terrain you will use must feature trees, bunkers and water hazards. You must also draw the teeing grounds, the greens and holes with cute little colored flags. Don't forget the fairways and the roughs filled with grass that will wave with the wind (we're serious). Hills and mountains will skillfully define the course's limits and block the line of sight.

Then create a global flying camera that the player can move to scan the course. You need keys to go up/down vertically, going forward, backward, left or right. You must also manage the mouse to spin the view.

> The idea is to create a manageable view with E and Q to go up and down, W to move the camera forward in the direction set by the mouse and intuitively fly over the terrain.

The camera must have LIMITS, even if the player can handle it the way they want. It cannot go out of the terrain, nor can it see its borders.

> You might see some bugs in the collision management of the objects handled by the player. Even if it's possible to avoid these bugs, this won't be a focus today. You camera is handled well, although it passes through some terrain elements sometimes? Don't worry about it. You will work on it furthermore if you've achieved all of today's exercises.

Chapter IV

Exercise 01: Roll, roll, roll ... roll ..... roll

	Exercise : 01
	Exercise 01: Roll, roll, roll ... roll ..... roll
Turn-in directory : *ex*01/	
Files to turn in : `Same scene as "ex00" and anything useful`	
Forbidden functions : `None`	

You must create the basic gameplay of a golf game:

- The ball appears on the first hole's teeing ground. You just need to send it on the green and in the hole.

- To strike, you must press on the space bar once. A power bar GUI increases until you press a second time on the space bar. This is when the ball is hit with the selected power.

- The bar must alternatively fill up and down until the player decides to hit the ball. Of course, the challenge is to press space at the right moment.

- Hitting the ball is cool, but aiming is better... You must implement an 3D direction arrow (provided in the assets) and allow the player to move around the ball with the A and D keys. The ball will have to go in the arrow direction.

- Once the ball is in the hole, the player must press Enter so the ball is automatically placed on the teeing ground of the following course until they completed the totality of the holes.

The terrain is opened, which allows for an interesting level design with parallel holes, common hazards and so on. But then the player could hit the ball and reach the 3rd green from the first teeing ground. You must manage this hazard and make sure the ball falls into the current hole.

You must also manage the camera. At the beginning of each stroke, it must be placed behind the ball, aiming the current hole. You still can take the aerial view pressing E (to check where your want to hit next ball). If you do so, when you press space, the camera returns behind the ball and the power bar is not triggered.

> The difficulty of this exercise is to find the right setting for the physics. We don't demand ultra-realism, but it's got to remain believable. You will especially need to find a way to stop the ball from rolling for 30 seconds after landing. You will understand what I mean.

Chapter V

Exercise 02: A few cosmetic touches

	Exercise : 02
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Turn-in directory : *ex02/*	
Files to turn in : `Same scene as "ex00" and anything relevant`	
Forbidden functions : `None`	

Now you've got your base, you will have to add a visual feedback so the player knows where they're at.

Add an interface to your game. It will display the current hole, its par and the number of hits.

Create a transition screen at the end of each hole displaying the player's score as well as the matching name (see the lexicon in the prologue for the names assigned depending on the score). You will be able to retrieve the input of the entry key of the previous exercise to close this screen and go to the next one.

Also add a course sheet recapitulating the number of hits for each hole. You must be able to access it pressing and holding the Tab key in-game. It must appear at the end of the course to recap the player's performance and show their final score compared to the cumulated par of each hole.

Chapter VI

Exercise 03: Game strategy

	Exercise : 03
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Turn-in directory : *ex03/*	
Files to turn in : `Same scene as "ex00" and anything relevant`	
Forbidden functions : `None`	

One stake of the golf is the strategic side of the game. A well designed course must force the player to choose. Is it more interesting to secure a hole going around a lake even if it means losing a stroke or trying to pass it in one hit... taking the risk of missing it. And what about going above those trees?

This is where the clubs come into play. They help hitting the ball high or far with more or less accuracy.

You must implement the various clubs in your simulation allowing the player to choose among 3 clubs + 1:

- The wood: it allows powerful hits. But the hovering hits it produces don't suit the damaged terrains.

- The iron: produces shorter but higher strokes. This is a fine compromise between distance and handling.

- The wedge: not a long shooter, but a very high one. This is usually the club you will use if you don't want the ball to roll too far after landing.

- The putter: this is the +1 club since it's the only one that's allowed on the green. It must hit straight balls with a lot of accuracy while keeping them on the ground. Let's leave it aside for this exercise. We'll come back to it in the next exercise (for now, we'll play on the green with the other clubs).

You must allow the player to switch clubs pressing the "+" key on the numeric keypad and any other key.

You must also add the name of the selected club to the UI and update it with each new club selection.

> Usually, the wood will be the default club at the beginning of a
> hole.   This is indeed the most logical club to start with since it
> has the longest range.

Chapter VII

Exercise 04: Ultimate Golf Simulator 3k

	Exercise : 04
	Exercise 04: Ultimate Golf Simulator 3k
Turn-in directory : *ex*04/	
Files to turn in : `Same scene as "ex00" and anything relevant`	
Forbidden functions : `None`	

The goal of the exercise is to finalize all the surfaces to get the early stages of a complete simulation. Terrains created by Unity are unique entities that cannot be split in zones or have different tags. You will have to use tricks and operate otherwise... Having said that, you must:

Create green areas. For now, your greens are just fragments of terrains with a clearer grass texture and a flag stuck in a hole. Now, when the ball hits the green, the game must automatically select the putter. You must not change the club once you're on the green. And you must not be able to select the putter when you're not on the green.

Create the bunkers. For the moment, your bunkers are just fragments of terrains with a sand texture. To make it a little more realistic, you must find a way to significantly slow down the ball rolling in the sand. It should stop almost instantly. You must also force the player to use the wedge when they're in the bunker and apply a malus on the hit power and the distance the ball will go when exiting the bunker.

Finally, create water hazards because for now, they must look like some kind of half pipes where the ball rolls endlessly. When the ball falls in the water, a screen appears to notify the player. They must press enter to return to the location where they last hit the ball. Don't forget to add a penalty point to the player's score on the current hole. The same rules apply if the ball goes off-limit.