Piscine Unity - Day 05

Land, camera management and 3D physics

Staff <staff@staff.42.fr>

Summary: *This document contains the subject for Day 05 for the „Piscine Unity" from* *42*

Contents

Chapter I

General Instructions

- The Unity bootcamp has to be made entirely, exclusively and mandatorily in `C#`. No `Javascript/Unityscript`, `Boo` or any other horrors.

- The use of functions or namespace not explicitely authorised in the exercise header or ini the rules of the day will be considered cheating.

- For a optimal usage of Unity, you have to work on `~/goinfre`, which is on the local drive of your computer. Remember to make appropriate backup on your own, the local goinfre can be purged.

- Unlike any other bootcamps, each day doesn't require a folder `ex00/`, `ex01/`, ..., `exn/`. Instead you'll have to submit your project folder which will be name like the day: `d00/`, `d01/`, ... However, a project folder, by default, contains a useless folder: the `"projet/Temp/"` sub folder. Make sure to **NEVER** try to push this folder on your repository.

- In case you're wondering about it, there is no imposed norme at `42` for `C#` during this bootcamp. You can use whatever style you like without restrictio. But remember that code that can't be read or understood during peer-evaluation is code that can't be graded.

- You must sort your project's assets in appropriate folders. For every folder correspond one and only one type of asset. For exemple: `"Scripts/"`, `"Scenes/"`, `"Sprites/"`, `"Prefabs/"`, `"Sounds/"`, `"Models/"`, ...

- Make sure to test carefully prototypes provided every day. They'll help you a lot in the understanding of the subject as well as what's requested of you.

- The use of the Unity Asset Store is forbidden. You are encouraged to use the daily provided assets (when necessary) or to look for additional ones on the Internet if you don't like them, exception made of scripts obviously because you have to create everything you submit (excluding scripts provided by the staff). The Asset Store is forbidden because everything you'll do is available there in one form or another.

However the use of Unity Standard Assets is authorised and event advised for some exercises.

- From d03 for peer-evaluation you'll be required to build the games to test them. `The corrector` will have to build the game, you must therefore always push projects/sources. You project must always be properly configured for the build. `No` last minute tweaks will be tolerated.

- Warning: You'll not be corrected by a program, except if stipulated in the subject. This imply a certain degree of liberty in the way you can do exercises. However keep in mind the instructions of each exercise, don't be LAZY, you would miss a lot of very interesting things.

- It isn't a problem to had additional or useless files in your repository. You can choose to separate your code in different files instead of one, except if the exercise's header stipulate a list of files to submit. One file must define one and only one behaviour, so no namespace. Those instructions don't apply to the `"projet/Temp/"` sub-folder which isn't allowed to exist in your repositories.

- Read carefully the whole subject before beginning, really, do it.

- This document could potentially change up to 4 hour before submission.

- Even if the subject of an exercise is short, it's better to take a little bit of time to understand what's requested to do what's best.

- Sometimes you'll be asked to give specific attention on the artistic side of your project. In this case, it'll be mentioned explicitly in the subject. Don't hesitate to try a lot of different things to get a good idea of the possibilities offered by Unity.

- By Odin, by Thor ! Use your brain !!!

Chapter II

Foreword

Some studios create futuristic MMOFPS with simultaneous war on several battlefields, other RPG with hours of amazing cinematics or some other adventure games in gigantic open worlds. But some studios create gold simulation games..

Today we will work on a golf simulation game.

Before beginning and to avoid tedious research here is a small simplified lexicon on rules and technical terms that you need to know to validate this day.

Goal: Complete the whole golf course in the minimum possible number of shots using several different clubs.

Golf course: Game court usually compose of 18 holes.

Tee Box The usually fat and elevated area where players tee to start a hole.

Green: Area of very closely trimmed grass on relatively even, smooth ground surrounding the hole, allowing players to make precision strokes on it.

Fairway: Main area between the tee box and the green forming the playing field of a hole. This area is usually well maintain unlike the...

...Rough: Less maintained area around the fairway where grass is higher.

Bunker: A hollow comprised of sand or grass or both that exists as an obstacle and, in some cases, a hazard.

Water hazard: As its name suggests, are considered water hazard every ponds, lakes, rivers and ocean in some cases. Interesting rule stipulate that the player whose ball lands in a water hazard gets a penalty point.

Out-of-bounds: Area outside of the playing field - often further than the rough - considered forbidden. Like water hazard a ball falling there will give a penalty point.

Club - Wood: The woods are the clubs with the largest heads (typically hollow, extending a few inches from side-to-side and a few inches from front to back, with rounded lines) and with the longest shafts. Golfers can swing them the fastest, and they are used for the longest shots, including strokes played from the teeing ground.

Club - Iron: They have smaller clubheads than woods, especially front to back where they are comparitively very thin. They are generally used on shots from the fairway, or for tee shots on short holes. As the number of an iron goes up (5-iron, 6-iron, etc.), the loft increases while the length of the shaft decreases.

Club - Wedges: Wedges are their own type of golf club, but also are a sub-set of irons because they have the same clubheads as irons - just more severely angled for more loft. They are used for shorter approach shots into greens, for chips and pitches around greens, and for playing out of sand bunkers.

Club - Putter: Putters are the most-specialized golf clubs, and the type of club that comes in the widest varieties of shapes and sizes. Putters are used for, well, putting. They are the clubs golfers use on the putting greens, for the last strokes played on a golf hole - for knocking the ball into the hole.

Score - Par: "Par" refers to the number of strokes an expert golfer is expected to need to complete the play of one hole on a golf course. It usually varies between 3 for short and easiest holes to 5 for more difficul ones.

Score - Ace: A hole made in one shot regardless of its par. That being said it's usually impossible to ace a par-4 or par5 hole.

Score - Double Eagle (or Albatross): Is a 3-under par shot and very rare (finish a par-5 in 2 shots for example).

Score - Eagle: Is a 2-under par shot.

Score - Birdie: Is a 1-under par shot.

Score - Over par: If the player shots more than the par we call that respectively Bogey, Double Bogey et Triple Bogey for +1, +2 et +3. There is no names over this as the performance is considered really poor. In these cases it's just noted +X where X is the nomber of shots over the par.

Chapter III

Exercise 00 : Stroll and picnic

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Turn-in directory : *ex*00/	
Files to turn in : `An ex00 scene file and everything that seems relevant`	
Forbidden functions : `None`	
Remarks : `n/a`	

Create a golf course made of 3 different holes. The court used must countain trees, bunkers and water hazard. You must also design the teeing grounds, greens and put a hole per green with a beautiful flag of the color you like. Don't forget to create fairways and roughs that must be made of grass that moves to the wind (yes we are completely serious). Hills and montains will skillfully define the map and block the line of sight.

Then create a global flying camera that the player can move around to see the whole course. You must bind keyboard keys to move up and down vertically move the view forward and backward as well as left and right. You can also manage the mouse to direct the viewpoint.

> The goal here is to create an adjustable view with E and Q to go up
> and down, W to move the camera forward in the direction pointed by
> the mouse and fly over the course intuitively.

The camera must be LIMITED and even if the player can direct it the way he wants he cannot be able to go over the course or see its limits.

You might face in some situation small bugs in the collision
management. Even if it's possible to improve this management, it's
out of topic today. Your camera works properly but sometimes go
through the course when you really try to make it bug? It will be
considered a success. You can always come back to it when you're
done with every other exercises.

Chapter IV

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

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Turn-in directory : *ex*01/	
Files to turn in : `The same ex00 scene avec everything that seems relevant`	
Forbidden functions : `None`	
Remarks : `n/a`	

You must create a basic golf gameplay:

- The ball appear on the tee box of the first hole, you simply have to shot it to the green and in the hole.

- To shot you have to press the space bar once. A GUI power bar appear increasing and when pressing the space bar a second time the ball is shot with the power selected.

- The bar must move between empty and full and vice-versa, the idea being to make it difficult to chose the right power.

- To shot is great but to aim is better... You have to implement in the game a 3D direction arrow (provided in the assets) and allow the player to move around the ball using "A" and "D". The ball must go in the direction indicated by the arrow.

- As soon as the ball is in the hole, the player must press "Enter" to have his ball in the second tee box. And so on until he played every holes.

The playground is open allowing you to make and interesting level design such as parallel holes with common obstables but nothing should prevent the player to aim for the 3rd green from the first hole. You have to manage this case properly and check that the ball falls into the current hole.

You must also manage the camera. At the beginning it must be placed behind the ball aligned with the hole. It must be possible to switch to aerial view by pressing "E" for example (to be able to see where to aim the next shot for example). In this case pressing the space bar return to the view behind the ball and the power bar isn't activated.

> The main difficulty in this exercise will be to find the appropriate settings for physics. Without pushing it to the ultra-realism the aim is to have something realistic. You must find a way to avoid the ball rolling for 30 secondes, you will soon find out what we mean.

Chapter V

Exercise 02 : Some additional cosmetic touches

![]	Exercise 02
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Turn-in directory : *ex02/*	
Files to turn in : `The same ex00 scene avec everything that seems relevant`	
Forbidden functions : `None`	
Remarks : `n/a`	

Now that basics are set you will have to add visual feedback so the player knows where he is at.

Add an ingame interface, displaying the current hole's number, its par and the number of shots made.

Create a transition screen between each hole displaying the player's score on the hole as well as the corresponding name (check out the lexicon in the foreword). You can get the "Enter" key input of the last exercise to close this screen and move on to the next hole.

Add a course sheet as well summing up the number of shots made on each holes. It must be possible to access it by pressing the "Tab" key during the game. It must also be displayed at the end of the course to recap the player's perfomance as well as his final score calculated with his score on each holes.

Chapter VI

Exercise 03 : Game stategy

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Turn-in directory : *ex03/*	
Files to turn in : `The same ex00 scene avec everything that seems relevant`	
Forbidden functions : `None`	
Remarks : `n/a`	

One of the golf's aim is its strategic aspect. A well designed course must force the player to make choices. Is it more interesting to bet on safety by going around the lake even though it costs an extra shot or to cross fingers and try to go over it, or maybe a curved shot over the trees?

These stategies are possible thanks to the choice of clubs which allows to shot higher or far with precision.

You must implement the possibility to choose a club in your simulation. There must be 3 + 1 clubs available:

- A wood: to shoot far but of low trajectory inapropriate for uneven courses.

- An iron: that shoots less far but higher. It's a compromise between distance and handling.

- A wedge: that doesn't shoot far but very high. It's a club that usually doens't make the ball roll once it touches the ground.

- A putter: It's the +1 club because it's the only one allowed on the green. It must shoot straight balls with a high precision without making it fly of the ground. It will be put aside in this exercise, we will go back to it after. (We will then play with others clubs on the green in the meantime).

You must allow the player to switch between clubs by pressing the "+" key on the numeric keypad as well as any other key of your choice.

You must also to your UI the display of which club is currently equipped and update it after each change.

> Usually the wood is selected by default in the tee box of each hole. It's the most logical club because it's the one with the biggest range.

Chapter VII

Exercise 04 : Ultimate 3k Golf Simulator

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Turn-in directory : *ex*04/	
Files to turn in : `The same ex00 scene avec everything that seems relevant`	
Forbidden functions : `None`	
Remarks : `n/a`	

The aim of this exercise if to finalise everything to have a full simulation. Lands created by Unity are a unique entity that cannot be split into different areas or have different tags. You will therefore have to be clever and do it another way ... That being sayd you have to:

Implement the green. For now your greens must be just a piece of court with a lighter green texture and a flag in the hole. Now when the ball lands on the green, the game must automatically select the putter. It must be impossible to change club once on the green and it must be impossible to chose the putter outside of the green.

Implement bunkers. For now your bunker must be just a piece of court with a sand texture. To make the realistic you have to find a way to greatly decrease the speed of a ball rolling in the sand, which is supposed to stop almost instantly. You must also force the player to use the wedge when he is in a bunker and apply a penalty on the power and the distance of the shot when going out of the sand.

Finally implement water hazard. For now your water obstacles must be some kind of half pipe where the ball roll infinitely. When the ball lands in water there must be a screen to tell the player he was bad and allow him to play again from the last position he shot the ball. Don't forget to add the penalty point to his score on the current hole.