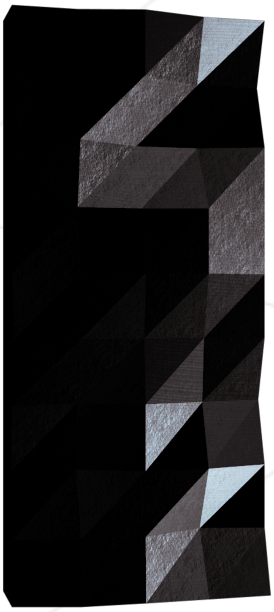


# Piscine iOS Swift - Day 06

## MotionCube

*Summary: This document contains the subject of the Day 06 for the iOS Swift piscine of 42*

# Contents

# Chapter I

# Preamble

Here is the world of **Henry Poincaré** from the 4th chapter of the book *Science et l'hypothèse*:

Suppose, for example, a world enclosed in a large sphere and subject to the following laws:

The temperature is not uniform there; it is maximum in the center, and it decreases as we move away from it, to reduce to absolute zero when we reach the sphere where this world is enclosed.

I further clarify the law that varies this temperature. Let R be radius of the boundary sphere; let r be the distance from the point considered to the center of this sphere. The absolute temperature will be proportional to R2 - r2.

I will further assume that, in this world, all bodies have the same dilation coefficient, so that the length of any rule is proportional to its absolute temperature.

I will finally assume that an object transported from one point to another, whose temperature is different, immediately balances with his new environment.

Nothing in these assumptions is contradictory or unimaginable. Par A moving object will then become smaller and smaller as we move will approach the limit sphere.

Let us first observe that, if this world is limited from the point of view of our usual geometry, it will seem infinite to its inhabitants. Par Indeed, when they get closer to the limit sphere, they cool down and become smaller and smaller. The steps they take are therefore also smaller and smaller, so that they can never reach the limit sphere. Par If, for us, geometry is only the study of the laws according to which the invariable solids move, for these imaginary beings, it will be the study of the laws according to which the solids deformed by the temperature differences which I just mentioned move. par Undoubtedly, in our world, natural solids also experience variations in shape and volume due to heating or cooling. But we neglect these variations by laying the foundations of geometry; because, apart from being very weak, they are irregular and therefore appear accidental to us. par In this hypothetical world, it would no longer be the same, and these variations would follow regular and very simple laws.

On the other hand, the various solid parts that make up the body of its inhabitants, would undergo the same variations in shape and volume.

I will make yet another hypothesis; I will assume that light crosses variously refractive media so that the refractive index is inversely proportional to R2 - r2. It is easy to see that, under these conditions, the light rays would not be rectilinear, but circular.

To justify the above, I still have to show that certain changes in the position of external objects can be corrected by correlative movements of sentient beings who inhabit this imaginary world; and this in order to restore the primitive set of impressions experienced by these sentient beings.

Suppose indeed that an object moves, by deformation, not as an invariable solid, but as a solid experiencing unequal dilations exactly conforming to the law of temperature that I assumed above. Allow me to shorten the language, to call such a movement non-Euclidean displacement.

If a sentient being is in the vicinity, his impressions will be modified by the displacement of the object, but he will be able to re-establish them by moving himself in a suitable way, the whole of the object and of the sentient being, considered as forming a single body, finally had to experience one of these particular displacements which I have just called non-Euclidean. This is possible if we assume that the members of these beings expand according to the same law as the other bodies of the world they inhabit.

Although from the point of view of our usual geometry the bodies are deformed in this displacement and their various parts are no longer found in the same relative situation, however we will see that the impressions of the sentient being have become the same.

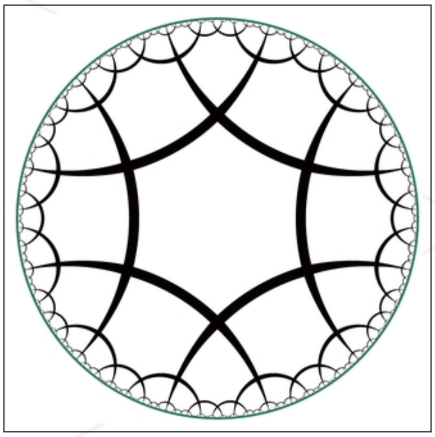
Indeed, if the mutual distances of the various parts could have varied, nevertheless the parties originally in contact returned to contact. So the tactile impressions haven't changed.

On the other hand, taking into account the assumption made above about the refraction and the curvature of the light rays, the visual impressions will also have remained the same.

These imaginary beings will therefore be, as we are, led to classify the phenomena they will witness and to distinguish among them, the "changes of position" capable of being corrected by a correlative voluntary movement.

If they found a geometry, it will not be like ours, the study of the movements of our invariable solids; it will be that of the changes of position which they will have thus distinguished, and which are none other than "non-Euclidean displacements", it will be non-Euclidean geometry.

Thus, beings like us, whose education would take place in such a world, would not have the same geometry as ours.



# Chapter II

# Instructions

- Only this page will serve as reference. Do not trust rumors.
- Read attentively the whole document before beginning.
- Your exercises will be corrected by your piscine colleagues.
- The document can be relied upon, do not blindly trust the demos which can contain not required additions.
- You will have to deliver an app every day (except for Day 01) on your git repository, where you deliver the file of the Xcode project.
- Here it is the official manual of Swift and of Swift Standard Library
- It is forbidden to use other libraries, packages, pods...before Day 07
- Got a question? Ask your peer on the right. Otherwise, try your peer on the left.
- Think about discussing on the forum Piscine of your Intra!
- Use your brain!!!

⚠ The videos on Intra were produced before Swift 3. Remove the prefix "NS" which you see in front of the class/struct/function in the code in the videos to use them in Swift 3.

⚠ Intra indicates the date and the hour of closing for your repositories. This date and hour also corresponds to the beginning of the peer-evaluation period for the corresponding piscine day. This peer-evaluation period lasts exactly 24h. After 24h passed, your missing peer grades will be completed with a 0.

# Chapter III

# Introduction

Has anyone ever told you "Don't touch the screen!"? Of course, today, this warning is obsolete. Keyboards are now useless and they were replaced by touch screens that helped applications further their interfaces, going beyond the simple use of a keyboard. Indeed, you just need 4 keys to play Snake on a Nokia 3310. The others are simply useless.

Apple also stuffed their devices with different sensors such as accelerometer, gyroscope, a proximity sensor and a barometer.

Thus, the device can take different user inputs or surrounding data thanks to the screen and the device's various sensors.

Today, you will learn how to use the **UIGestureRecognizer** to gather the user's actions on the screen and **CoreMotion** for the device orientation in an application that will make you toy with squares and circles. These shapes will be subject to physical laws such as gravity, elasticity and collisions using a **UIDynamicAnimator**.

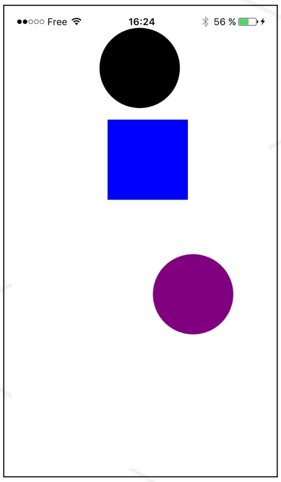
# Chapter IV

# Exercise 00 : TapGesture

| | Exercice : 00 |
|---|---|
| TapGesture | |
| Files to turn in : `Swift Standard Library, UIKit` | |
| Authorised functions : `n/a` | |
| Notes : `n/a` | |

This exercise aims to make you add a shape in an empty view touching the screen. To do so, you will create a class that inherits the **UIView** class that will represent a shape.

- It must be a square or a circle.
- Its size must be 100 x 100.
- Shapes and sizes must be random.
- When you touch the screen, the shape must pop under the tip of your finger.



# Chapter V

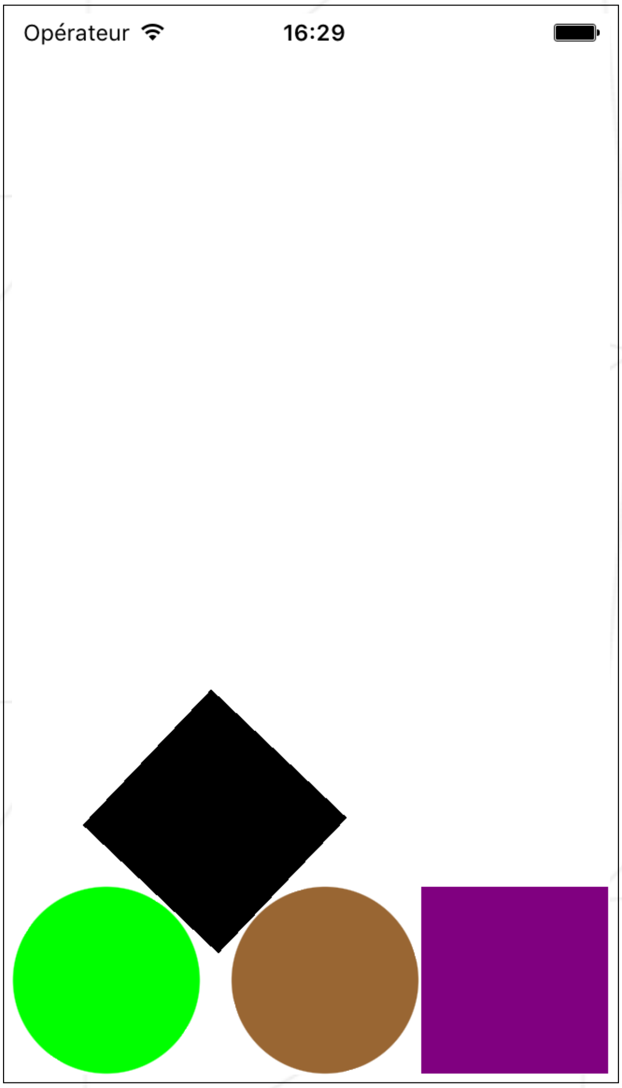
# Exercise 01: Dynamic Behavior

| | |
|---|---|
| | Exercice : 01 |
| Dynamic Behavior | |
| Files to turn in : `Swift Standard Library, UIKit` | |
| Authorised functions : `n/a` | |
| Notes : `n/a` | |

Add a little physics to your shapes. They must be subject to several **UIDynamicBehavior** :

- Fall when subject to gravity.
- Collide without going out of their "superview".
- Being elastic, they must bounce.

`Shapes must bounce on the edges of the view. They must not disappear.`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# Chapter VI

# Exercise 02: Gestures

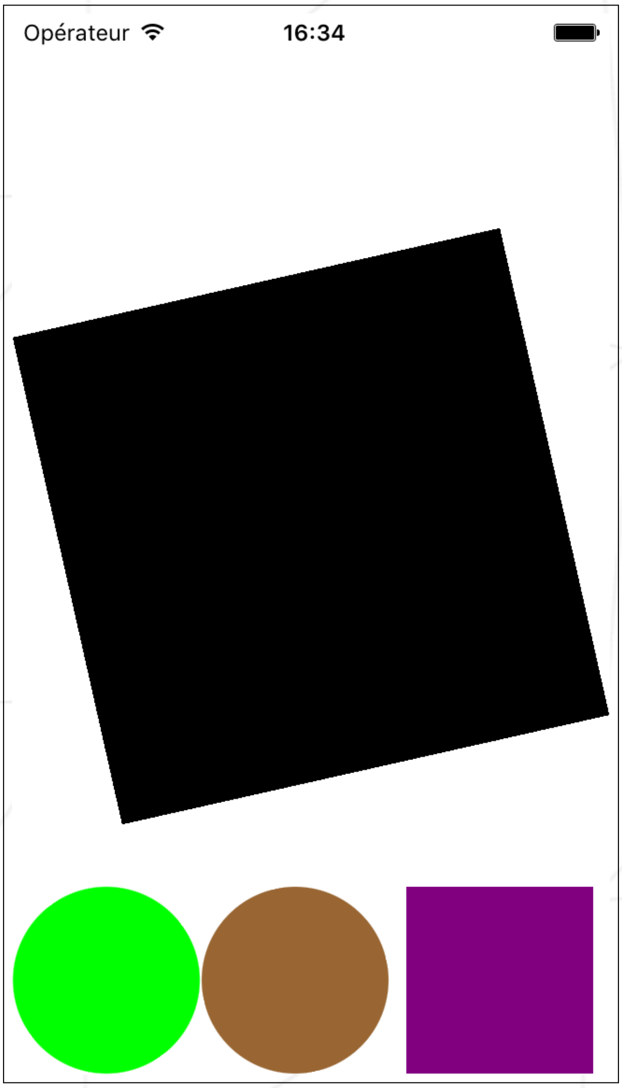
| | |
|---|---|
| | Exercice : 02 |
| Gestures | |
| Files to turn in : `Swift Standard Library, UIKit` | |
| Authorised functions : `n/a` | |
| Notes : `n/a` | |

How fun would it be to interact with these views!

Now, add **Gesture** to your shapes:

- **UIPanGestureRecognizer** to move them around.
- **UIPinchGestureRecognizer** to expand it or reduce them.
- **UIRotationGesture** to rotate them.

⚠ When you interact with the shape, you can cancel its gravity effect but neither the collision nor the elasticity. When you drop the object, it must be subject to gravity again.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# Chapter VII

# Exercise 03: CoreMotion

| | Exercice : 03 |
|---|---|
| CoreMotion | |
| Files to turn in : `Swift Standard Library, UIKit, CoreMotion` | |
| Authorised functions : `n/a` | |
| Notes : `n/a` | |

In the project setting, portrait mode must not be authorized.

You will now modidy the gravity setting according to the accelerometer data using **CoreMotion**. The shapes must fall in different direction according to the device's orientation in space.

> The iOS simulator doesn't yet allow to simulate the sensor data, hence you should test this application on a real Apple device. If you don't own any, ask one of your neighbors to lend you one. If you REALLY cannot find any Apple device, don't worry, this exercise is quite simple and the evaluation will not take that in account.