

# Billiard Project

## Software Development

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Master MIND

May 5, 2020



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# Abstract

The goal of this project is to be able to produce videos and widgets representing a point/ball in a billiard with a simple shape and showing its trajectory.

More information can be obtained here :

<https://jakevdp.github.io/blog/2012/08/18/matplotlib-animation-tutorial/>

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# Square Case

Let us start we the simplest case : The square billiard

## Remark

In this example, we assume that there is no friction and the Descartes rules are satisfied

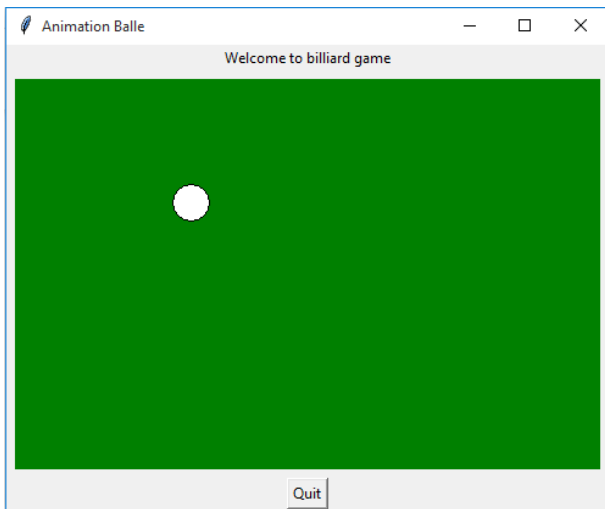
## Important theorem

Sample text in red box

# Square Case

We start by creating a window by using "tkinter" inside which we create a square shape which represent our billiard and a ball. We also create a button "quit" to quit the game. After running the code, we get the figure below:

# Square Case



## Square Case

Then, we use python to create a code that we allow us to move the ball into the square billiard. After running the code, we get the animation below:



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# Torus Case

## Remark

A Torus  $T$  can be defined by the set :

$$T = \left\{ (x, y, z, w) \in S^3 \mid x^2 + y^2 = \frac{1}{2}, z^2 + w^2 = \frac{1}{2} \right\}$$

where  $S^3$  is a 3-sphere.

# Flat Torus Case

Now, we are going to create also with "tkinter" a window. Into this window we are going to create an oval shape which represent our flat torus (torus in 2D) and a ball into this torus. We also, create a button "quit" to quit the game. After, running the code we get the figure below:

# Flat Torus Case

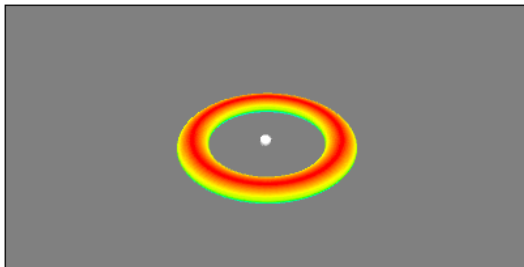


## Flat Torus Case

We create a code in python to move the ball into the flat torus billiard. After running the code we get the animation below:

## 3D Torus Case

Now, we create a ball into a torus in 3d and we get the figure below:



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