In this short document, I introduce the little program that I have made. This program is dedicated to the simulation of billards.

1 What does it look like?

The figure 1 shows what the program looks like. The numbers on this figure refer to:

1. What kind of billard is currently used;
2. A \textit{start / stop} push button;
3. A horizontal slider to enable the user choosing the initial point;
4. A circular slider to enable the user choosing the initial direction;
5. A plot of the billard with the initial point and the trajectories;
6. A poincarré map.

2 Some pictures

The program currently supports different kind of billards: square, stadium, limacon, elliptic, circle, and sinai.

One can easily add its own billard by writing a simple python function. For instance, the code for the circle billard can be the following one:

```python
>>> from numpy import linspace, pi, cos, sin
>>> from shapely.geometry import Polygon
>>> from billard import Billard
```
>>> theta = linspace(0, 2*pi, 150, endpoint=False)
>>> x = cos(theta)
>>> y = sin(theta)
>>> circle = Polygon(zip(x, y))
>>> circle_billard = Billard(circle)

3 How to run the program?

The program is available in two versions: one with a Qt GUI (as shown in the previous pictures) and another with a CLI.

Both versions require the following Python libraries:

— Numpy (see http://www.scipy.org/), used for all vectors calculations
— Matplotlib (see http://www.scipy.org/), used for the plotting part
— Shapely (see http://toblerity.org/shapely/), used to perform operator on shapes (polygons etc)
— Descartes (see https://pypi.python.org/pypi/descartes), required to combine shapely and matplotlib.

Once those libraries are installed, one can run the CLI version of the program by calling `billard.py`

```
$ python ./billard.py
0) square
1) stadium
2) limacon
3) elliptic
4) circle
5) Sinai
Which billard do you want? (negative number to quit): 2
```

In this case, a random initial point and direction are chosen, and a simulation with the limacon billiard is performed.

If one prefers the Qt GUI version, then the PySide library is required (see http://qt-project.org/wiki/PySide). When installed, launch python ./main.py to have the Qt window opened.

1. Python 2.7 is assumed to be installed.