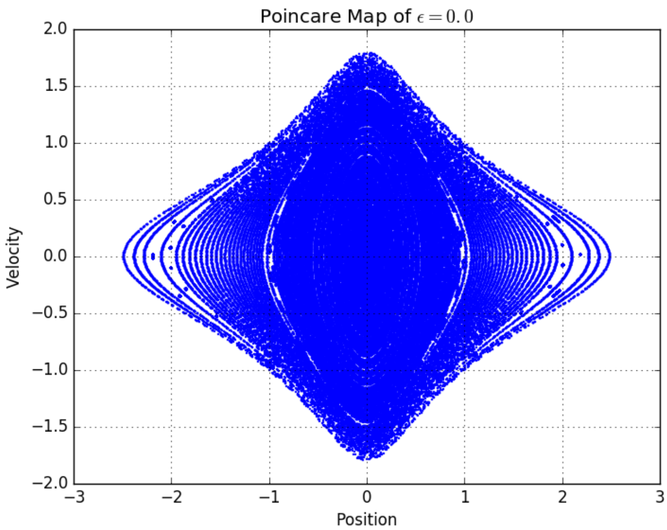
Simulations of the Sitnikov Problem

December 4, 2018

Poincaré Maps

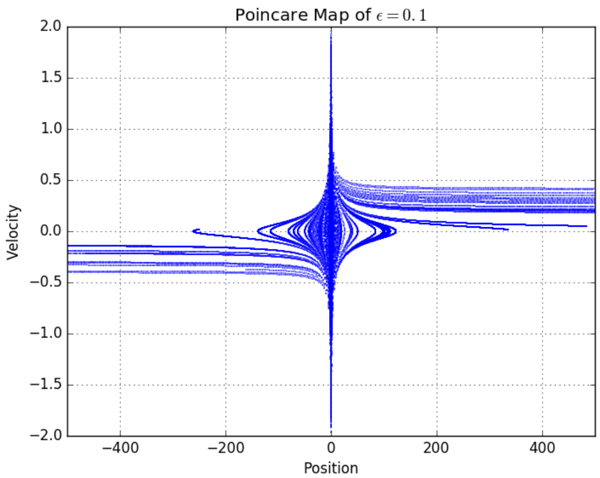
The solution of the differential equation was gotten by apply the Runge-Kutta-Fehtberg Method. For the Poincaré Map the initial conditions are the set of some points over the line $\dot{z_0} = \alpha z$ with z_0 between -1 to 1, and α be the slope of the line, in this case $\alpha = 1$. The map is composed 1000 times for each condition. We considered 200 values of the initial conditions in the interval described above.

For our Poincaré Maps we considered 10 values of the exccentricity, as follow:

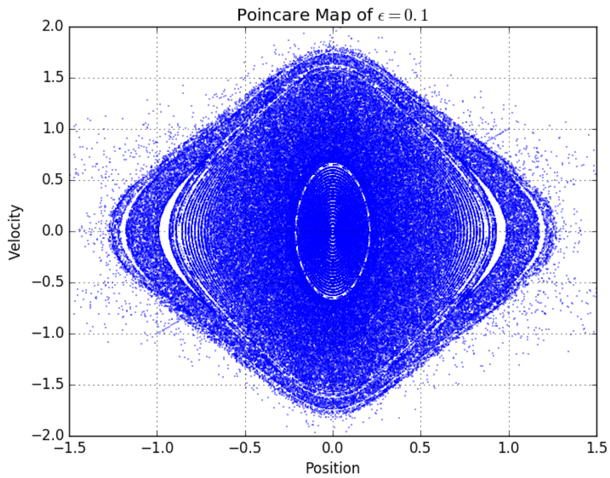


(a) Complete Poincaré Map.

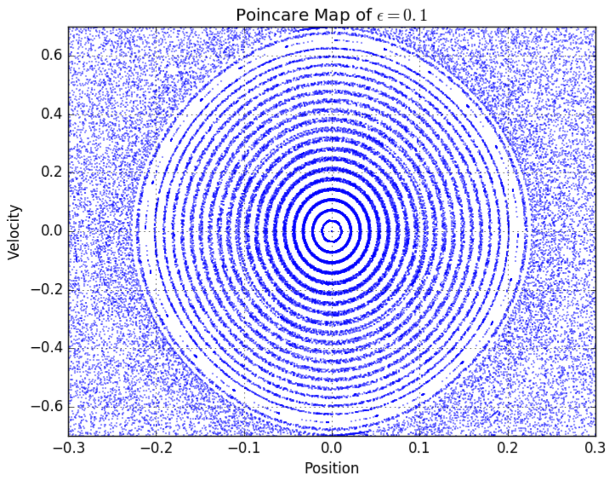
Figure 1: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.0$..



(a) Complete Poincaré Map.

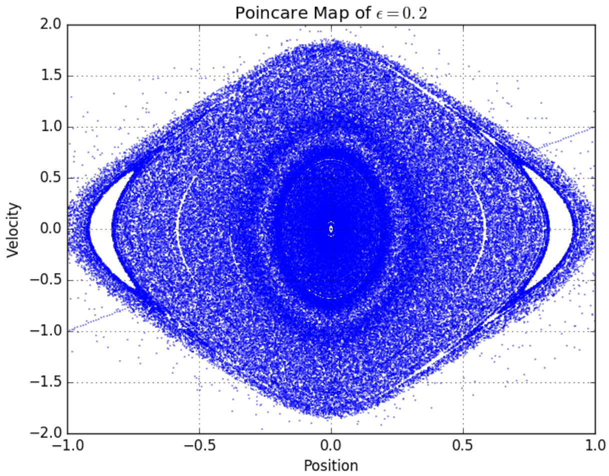


(b) Poincaré Map of position between -1 to 1.

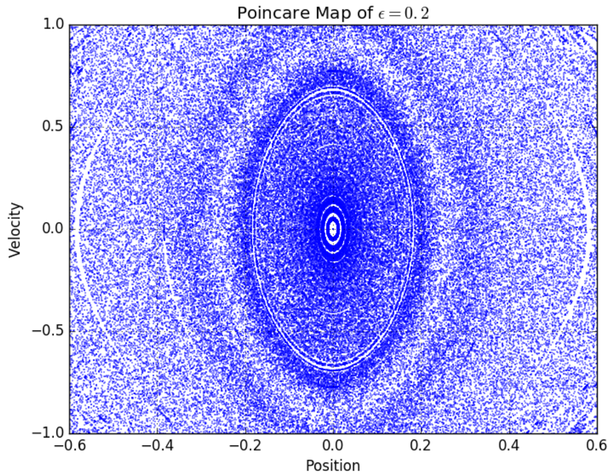


(c) Internal circle of the Poincaré Map.

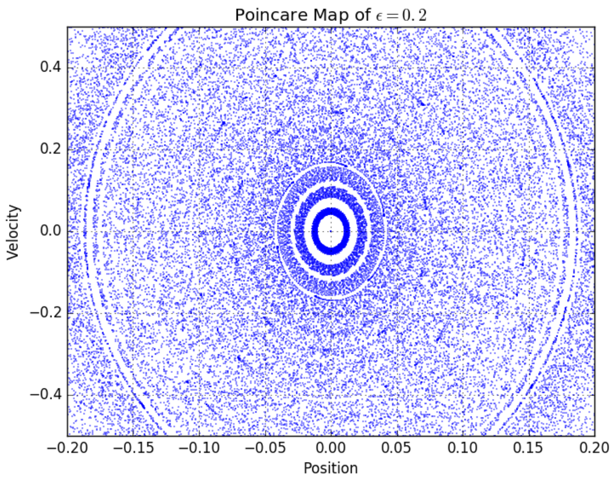
Figure 2: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.1$.



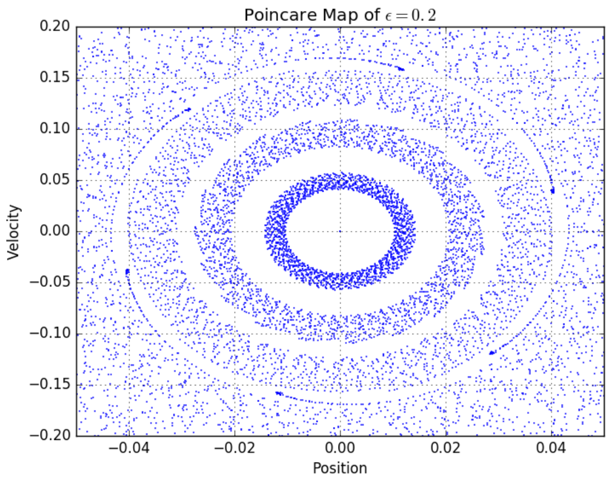
(a) Poincaré Map of position between −1 to 1.



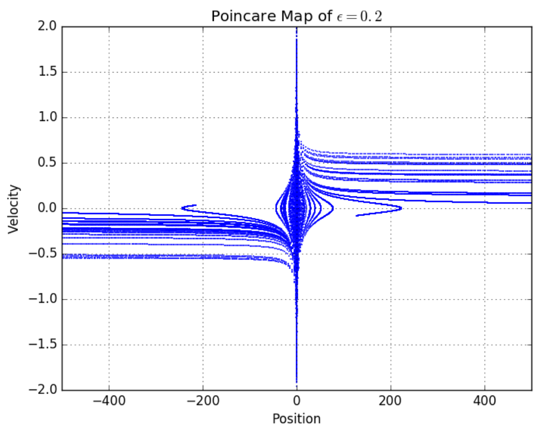
(b) First Internal circle of the Poincaré Map.



(c) Second Internal circle of the Poincaré Map.

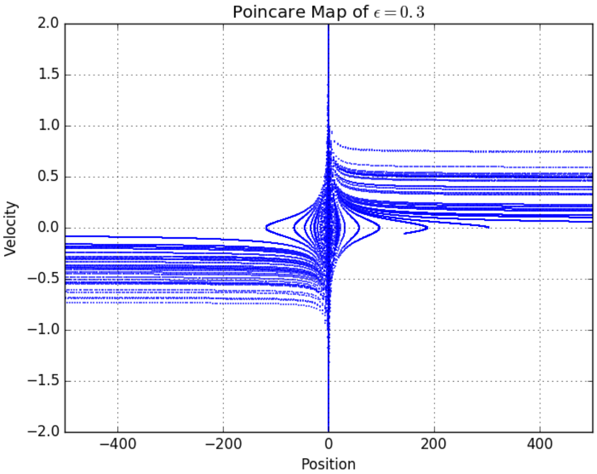


(d) Third Internal circle of the Poincaré Map.

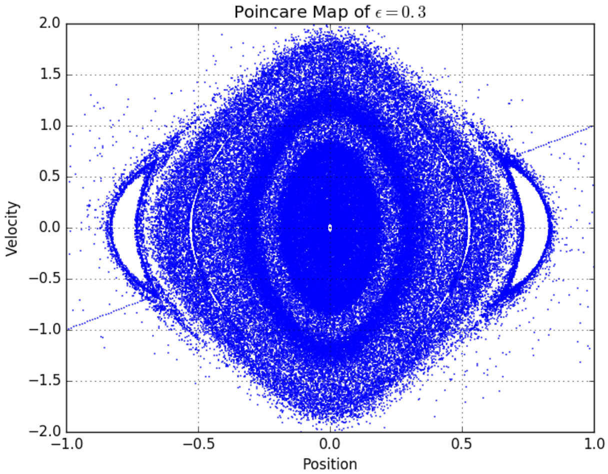


(e) Complete Poincaré Map.

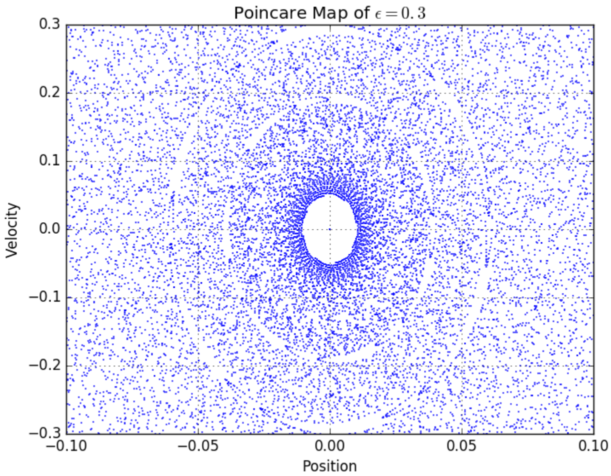
Figure 3: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.2$.



(a) Complete Poincaré Map.

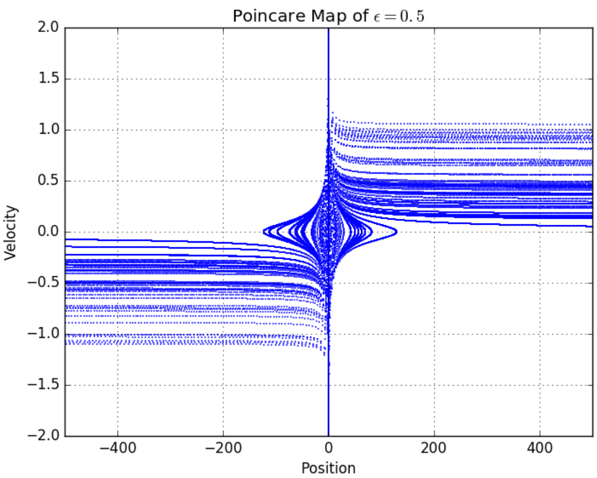


(b) Poincaré Map of position between -1 to 1.

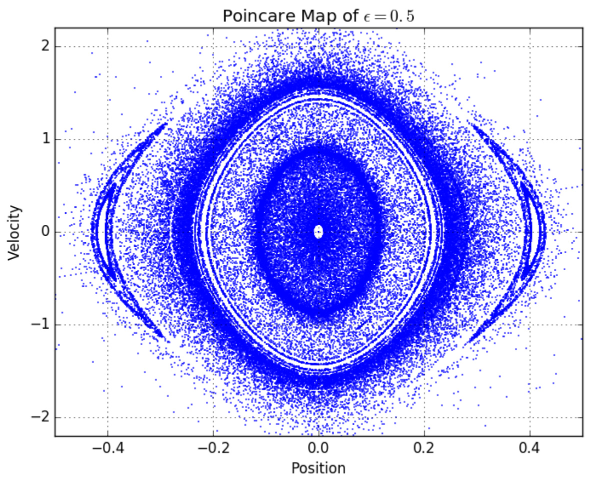


(c) Third Internal circle of the Poincaré Map.

Figure 4: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.3$.

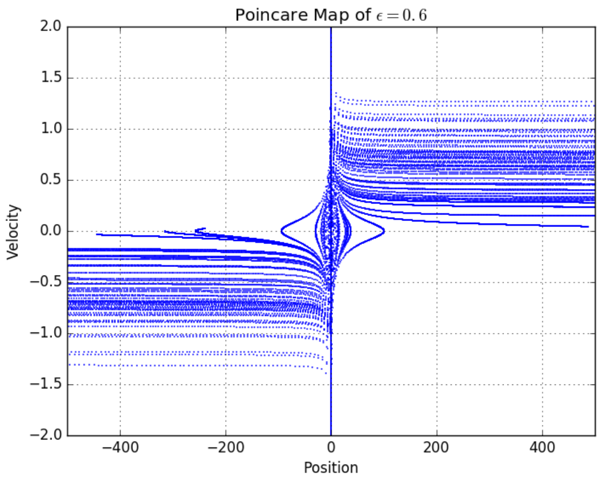


(a) Complete Poincaré Map.

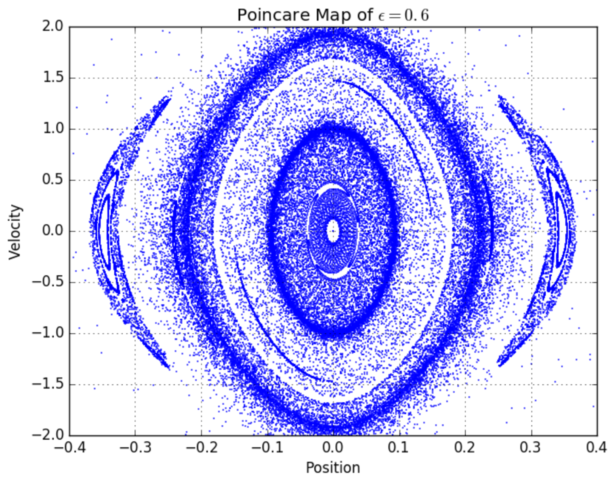


(b) Poincaré Map of position between -1 to 1.

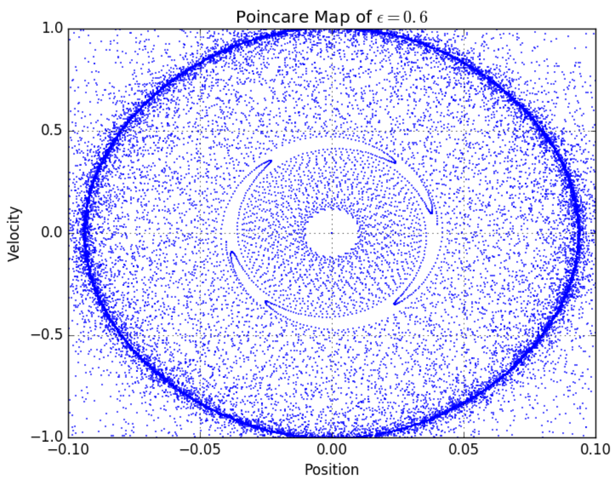
Figure 5: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.5$.



(a) Complete Poincaré Map.

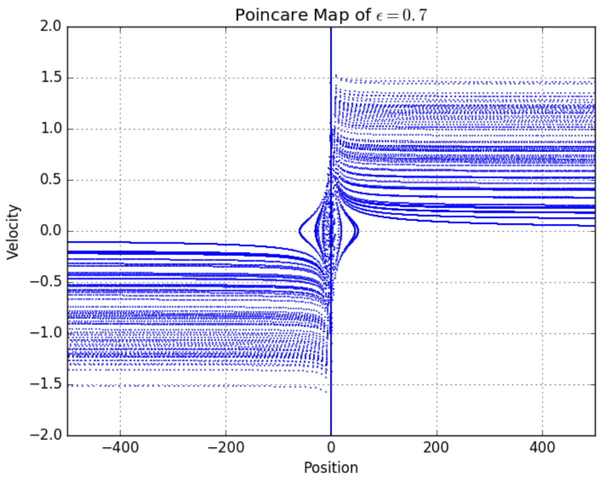


(b) Poincaré Map of position between -1 to 1.

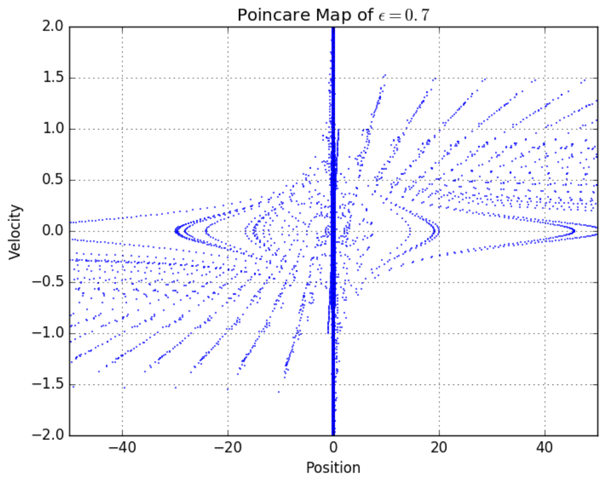


(c) Third Internal circle of the Poincaré Map.

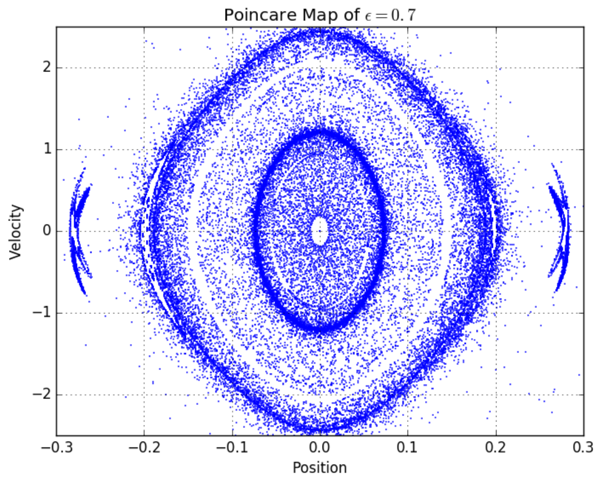
Figure 6: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.6$.



(a) Complete Poincaré Map.

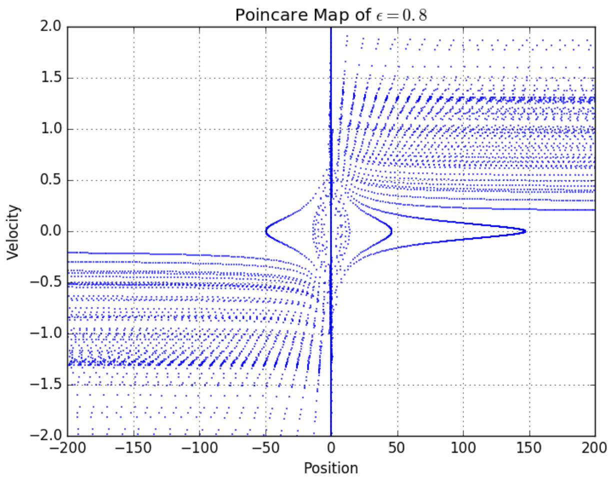


(b) Complete Poincaré Map near to initial conditions.

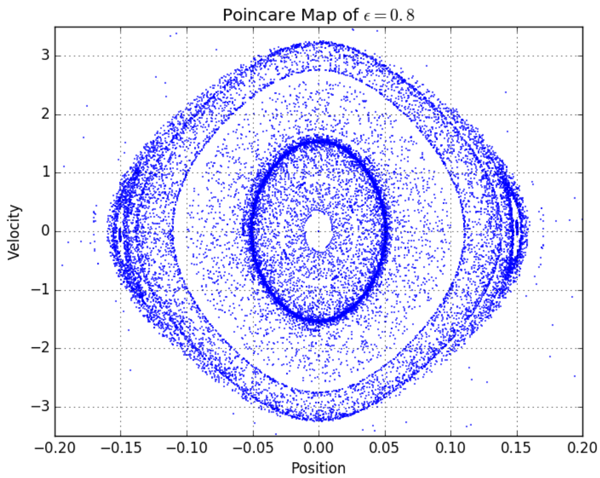


(c) Third Internal circle of the Poincaré Map.

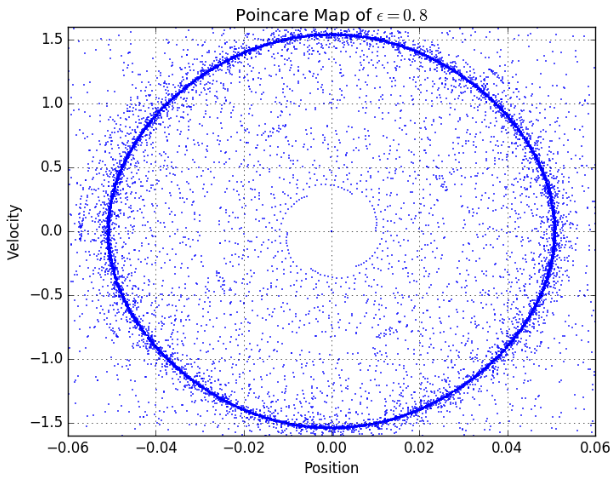
Figure 7: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.7$.



(a) Complete Poincaré Map.

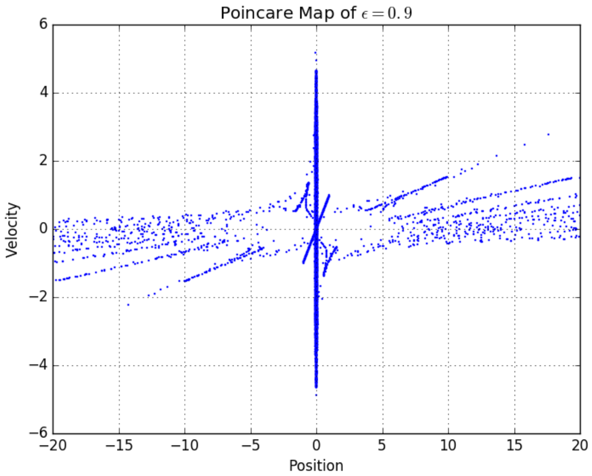


(b) Complete Poincaré Map near to initial conditions.

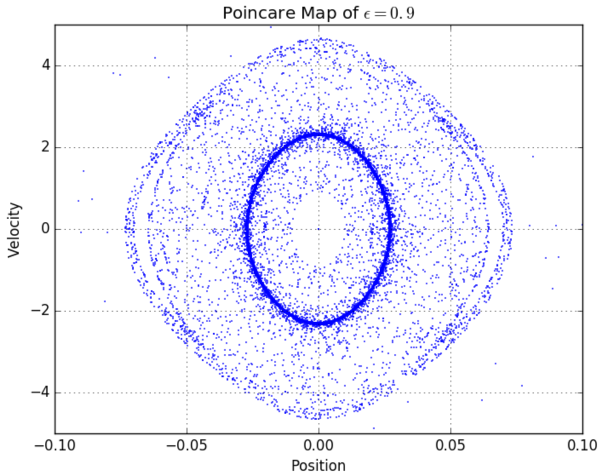


(c) Third Internal circle of the Poincaré Map.

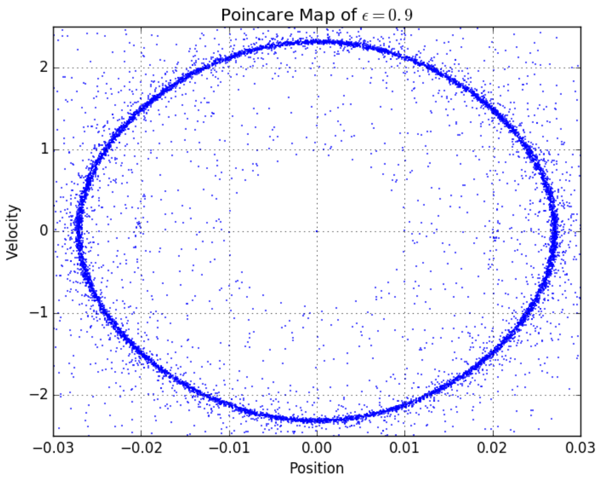
Figure 8: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.8$.



(a) Complete Poincaré Map.



(b) Complete Poincaré Map near to initial conditions.



(c) Third Internal circle of the Poincaré Map.

Figure 9: Graphics of numerical solution and Poincaré Map with $\epsilon = 0.9$.