

Comp Econ Homework 10

Date 15th April

Due Date: 21st April

In this homework, your task is to replicate figure 9a of the paper *Globalization and Synchronization of Innovation Cycles* by Kiminori Matsuyama, Iryna Sushko and Laura Gardini. I refer in particular to the 2014-12-18 version that can be found here:

<http://www.centreformacroeconomics.ac.uk/Discussion-Papers/2015/CFMDP2015-27-Paper.pdf>

Figure 9a gives one view of the dynamics of a two dimensional dynamical system, with state variable (n_1, n_2) representing varieties of products in countries 1 and 2. The dynamics of this system are given on pages 15 and 23. One time series from this system is shown in figure 1. In this series n_{1t} and n_{2t} cycle and their cycle becomes synchronized. In figure 2, we again see cycles for each country but the cycles do not synchronize.

Returning to figure 9a, the figure shows the state space for the system, which is the unit square $[0, 1] \times [0, 1]$. Regions of the state that are colored represent initial conditions from which synchronization occurs. Regions not colored represent initial conditions from which synchronization does not occur.

As stated above, your task is to recreate figure 9a from the paper, or, equivalently, the four subfigures as individual plots. To illustrate, figures 3 and 4 show the top left and top right subfigures. (I've added in colors to show how long it takes to synchronize from different initial conditions but that's optional.)

Please submit your work as a single Jupyter notebook with the usual naming convention. Start your notebook with a brief discussion of the model that you are simulating. Please check your notebook compiles to PDF before submitting.

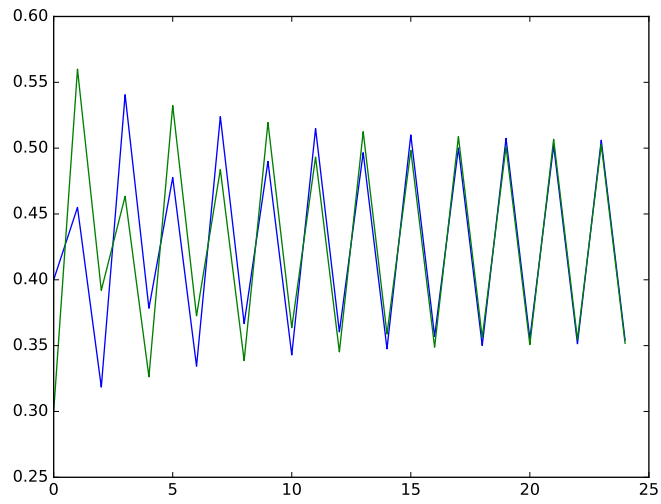


Figure 1: Time series showing synchronization

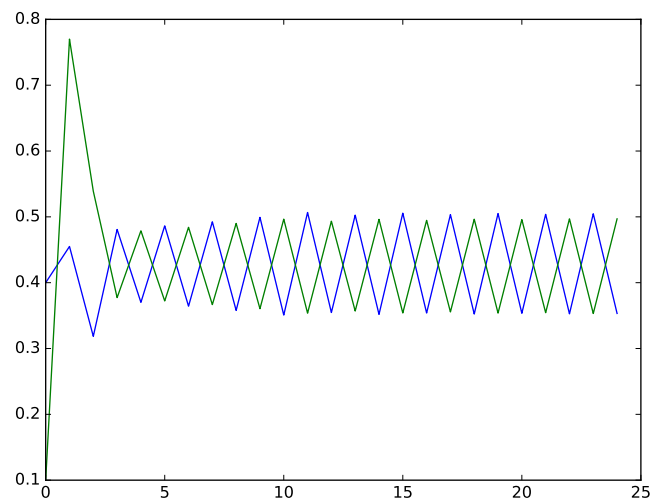


Figure 2: Time series without synchronization

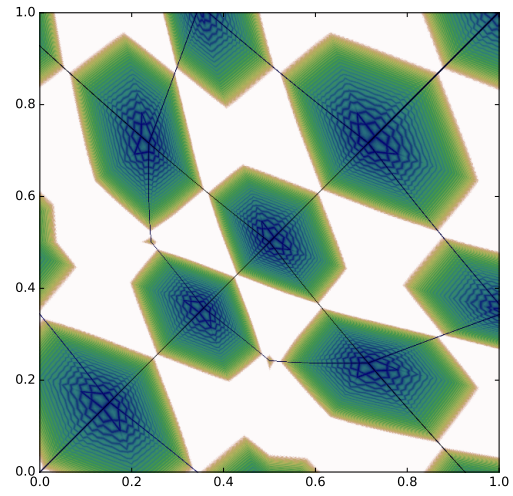


Figure 3: Basin of attraction for synchronization

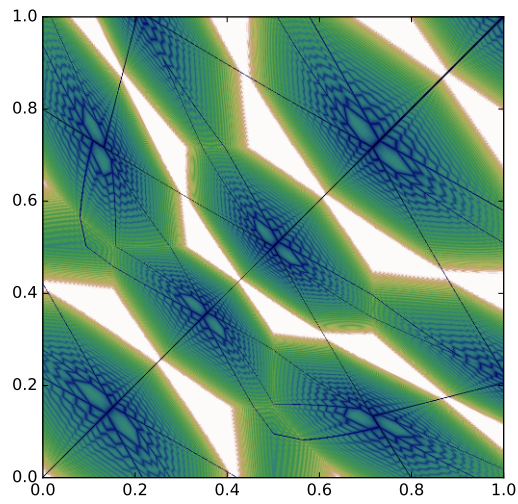


Figure 4: Basin of attraction for synchronization