Exercise 1: Coupled Oscillators

Read the following paper: **Mirollo, R. E., & Strogatz, S. H. (1990). Synchronization of pulse-coupled biological oscillators. SIAM Journal on Applied Mathematics, 50(6), 1645-1662.**

You're going to implement a simple algorithm to achieve global synchronization.

You have 100 agents, whose state is stored in a 10 x 10 grid. The state is binary: whether they are flashing (1) or not (0).

The paper of Mirollo and Strogatz can be summarized with this algorithm:

```
init:
  state = 0
  c = random(0, T)

step:
  c = c + 1
  if(a neighbor flashed)
    c = c + k * c
  if(c >= T)
    state = 1
    c = 0
  else
    state = 0
```

In the above algorithm, c is an internal counter; T is the maximum value the counter can assume; and k is a constant between 0 and 1.

Implement the above algorithm in any language of your choice (i.e. Python is recommended, Matlab is fine), assuming that each agent can see the neighbors on its north, east, south and west. Find a value for k that makes the algorithm work. Set T to 100 in your simulations.

Deliverables

Submit a scan of the solution of Ex1 and the code as an archive called `LastnameFirstname.zip` with the following structure:

```
LastnameFirstname/
   ex1.pdf              (MUST be a PDF!)
   README.txt           (a plain-text file that describes how to run your code,
                         along with the dependencies)
   oscillators.py
```

Please follow these instructions verbatim, so it will be easier for us to run the scripts in bulk and verify your work.