

Coding Projects

Project 1 - Game of life

Game of life is a cellular automaton devised by John Conway in 70's:

http://en.wikipedia.org/wiki/Conway's_Game_of_Life

The game consists of two dimensional orthogonal grid of cells. Cells are in two possible states, alive or dead. Each cell interacts with its eight neighbours, and at each time step the following transitions occur:

- Any live cell with fewer than two live neighbours dies, as if caused by underpopulation
- Any live cell with more than three live neighbours dies, as if by overcrowding
- Any live cell with two or three live neighbours lives on to the next generation
- Any dead cell with exactly three live neighbours becomes a live cell

The initial pattern constitutes the seed of the system, and the system is left to evolve according to rules. Deaths and births happen simultaneously.

In a git repository implement the Game of Life using Numpy. Try first 32x32 square grid and cross-shaped initial pattern:

Try also other grids and initial patterns (e.g. random pattern). Try to avoid for loops. For visualization you can use Matplotlib: `import matplotlib.pyplot as plt` `plt.imshow(array)`

Make a pip package out of it including dependencies. Add CI using Travis, testing installation from pip and running one game of 1000 iterations checking that it matches a pre known pattern.

References: http://science-it.aalto.fi/wp-content/uploads/sites/2/2016/06/numpy_exercises.pdf

Project 2 - The Traveling Salesperson Problem

Consider the [*Traveling Salesperson Problem*](#):

Given a set of cities and the distances between each pair of cities, what is the shortest possible tour that visits each city exactly once, and returns to the starting city?

Create a package that tries to find a good solution for the traveling salesperson problem which takes a matrix with the distances between the points and outputs the best solution found. Try it out on the 10 largest Swedish cities.

Make a pip package out of it including dependencies. Add CI using Travis, testing installation from pip and running the 10 cities example.