Discrete Simulation Lab # 4b

Implementing a simple Cellular Automata

2D Cellular Automata

They have been invented by John Conway a Cambridge mathematician. A cellular space is populated with living cells (in black). Each cell has 8 neighbours (Moore neighbourhood). To extend this neighbourhood concept to cells on the border or the edge of a cellular space, we can consider that this space is folded in a Torus like universe (figure 1).

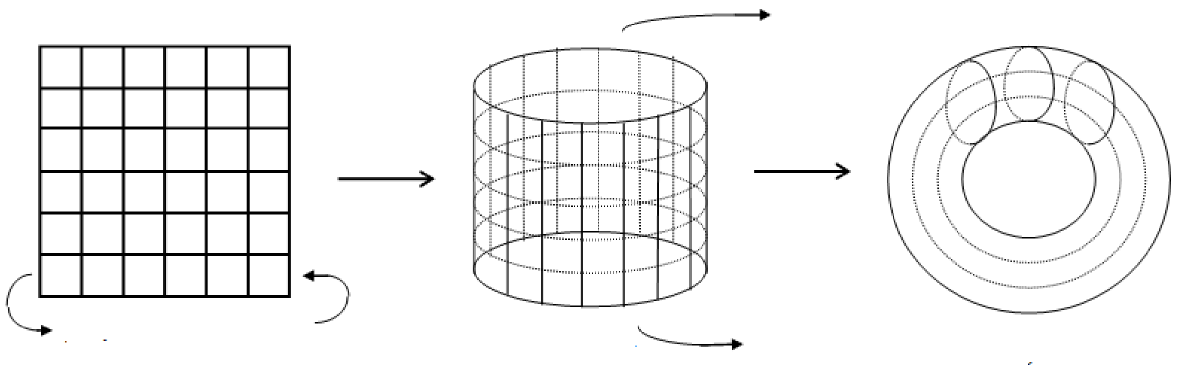

Figure 2: Torus like universe

Reminder – "the Game of Life rules":

"For a cell space that is 'populated':

1. *Each cell with one or no neighbours dies, as if by loneliness.*
2. *Each cell with four or more neighbours dies, as if by overpopulation.*
3. *Each cell with two or three neighbours survives.*

For a cell space that is 'empty' or 'unpopulated'

4. *Each cell with three neighbours becomes populated."*

1) Implement a game of life in "text" mode. Test it with a glider. use 2 cell boards: one at time 't' is considered as the reference board and a future board that is built for time 't+1'. Check with a glider configuration on a 10 x 10 cell space in text mode (use a cross X for a living cell and a dot ' . ' for a dead cell. Display the state of your automata at each time step. Program first without a torus neighbourhood and next with a torus universe. For both variants, test your results. With the torus universe, you can check your implementation by seeing the glider coming back on the upper left of the universe after many steps.

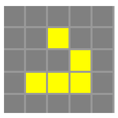

Figure 2: A cell configuration named "glider"

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Figure 3 – Sample display in text mode under Linux

2) Implement a bigger Grid.

Try different size of grids (from 10^2 to 50^2), and different random initialization of living cells and run the simulations until you obtain stabilized states. Make observations.

3) Write a report presenting your work and observations.