**United International University**

**School of Science and Engineering**

**Course Title: Simulation and Modeling Laboratory**

**Course Code: CSI 424**

**Lab 05**

|  |
| --- |
| **Experiment Name** : Simulating the Conway’s Game of Life |
| **What is it?**   * In 1970, mathematician John H. Conway proposed a simulation that he called the Game of Life. * The "game" is a zero-player game meaning that its evolution is determined by its initial state, requiring no further input. * There’s no way to win or lose the game. Instead, Life is more like a model or simulation in which you can play and experiment. * One interacts with the Game of Life by creating an initial configuration and observing how it evolves. * Life takes place on a two-dimensional grid of square cells. Each square cell can be either alive or dead (full or empty).      * The simulation is carried out at fixed time steps; every time step, all the cells on the grid can switch from dead to alive, or alive to dead, depending on four simple rules that only depend on a given cell’s eight immediate neighbors. Let’s take the cell x in the diagram, whose neighbors have been numbered 1 through 8 in the diagram.   **Rules :**  At each step in time, the following transitions occur:   * Any live cell with fewer than two live neighbors dies, as if caused by under population. * Any live cell with two or three live neighbors lives on to the next generation. * Any live cell with more than three live neighbors dies, as if by overpopulation. * Any dead cell with exactly three live neighbors becomes a live cell, as if by reproduction.   **See more about this game :**  <http://fiftyexamples.readthedocs.io/en/latest/life.html>  <https://en.wikipedia.org/wiki/Conway%27s_Game_of_Life> |
| **Mechanism :**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | (1,1) | (1,2) | (1,3) | (1,4) | (1,5) | | (2,1) | (2,2) | (2,3) | (2,4) | (2,5) | | (3,1) | (3,2) | (3,3) | (3,4) | (3,5) | | (4,1) | (4,2) | (4,3) | (4,4) | (4,5) | | (5,1) | (5,2) | (5,3) | (5,4) | (5,5) |   Generation : 1 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | (1,1) | (1,2) | (1,3) | (1,4) | (1,5) | | (2,1) | (2,2) | (2,3) | (2,4) | (2,5) | | (3,1) | (3,2) | (3,3) | (3,4) | (3,5) | | (4,1) | (4,2) | (4,3) | (4,4) | (4,5) | | (5,1) | (5,2) | (5,3) | (5,4) | (5,5) |   Generation : 2 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | (1,1) | (1,2) | (1,3) | (1,4) | (1,5) | | (2,1) | (2,2) | (2,3) | (2,4) | (2,5) | | (3,1) | (3,2) | (3,3) | (3,4) | (3,5) | | (4,1) | (4,2) | (4,3) | (4,4) | (4,5) | | (5,1) | (5,2) | (5,3) | (5,4) | (5,5) |   Generation : 3 | |
| **Task-1: You have to find out the generations for the given input pattern.**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Sample input :**  Number of rows and columns : 5  Number of iterations / generations : 3 | **Sample output :**  Generation 1 :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | 1 | 1 | | 0 | 1 | 1 | 1 | 0 | | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 |   Generation 2 :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 1 | 0 | | 0 | 1 | 0 | 0 | 1 | | 0 | 1 | 0 | 0 | 1 | | 0 | 0 | 1 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 |   Generation 3 :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | 1 | 1 | | 0 | 1 | 1 | 1 | 0 | | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |   **Task 2: Draw the pattern of each generation.** |
| **Marks distribution :**   1. Task-1 : 10 marks 2. Task-2 : 5 marks |