CSC-103 Programming Fundamentals

Prerequisite Knowledge: Loops, Conditions, Data Types, Arrays, Functions, Pointers, printf() and scanf().

Mini Project 2: Develop Conway's Game of Life Simulation

Submission Deadline: Friday 26th April 2019, 11:59 pm

Restrictions: Do your own work. Cheating will be severely punished. CUI has zero tolerance policy for plagiarism and cheating.

Conway's Game of Life:

The *Game of Life*, also known simply as *Life*, is a cellular automaton devised by the British mathematician John Horton Conway in 1970.

The game is a zero-player game, meaning that its evolution is determined by its initial state, requiring no further input. One interacts with the Game of Life by creating an initial configuration and observing how it evolves, or, for advanced players, by creating patterns with particular properties.

Rules:

The universe of the *Game of Life* is an infinite, two-dimensional orthogonal grid of square *cells*, each of which is in one of two possible states, *alive* or *dead*, (or *populated* and *unpopulated*, respectively). Every cell interacts with its eight *neighbours*, which are the cells that are horizontally, vertically, or diagonally adjacent. At each step in time, the following transitions occur:

1. Any live cell with fewer than two live neighbours dies, as if by underpopulation.
2. Any live cell with two or three live neighbours lives on to the next generation.
3. Any live cell with more than three live neighbours dies, as if by overpopulation.
4. Any dead cell with exactly three live neighbours becomes a live cell, as if by reproduction.

The initial pattern constitutes the *seed* of the system. The first generation is created by applying the above rules simultaneously to every cell in the seed; births and deaths occur simultaneously, and the discrete moment at which this happens is sometimes called a *tick*. Each generation is a *pure function* of the preceding one. The rules continue to be applied repeatedly to create further generations.

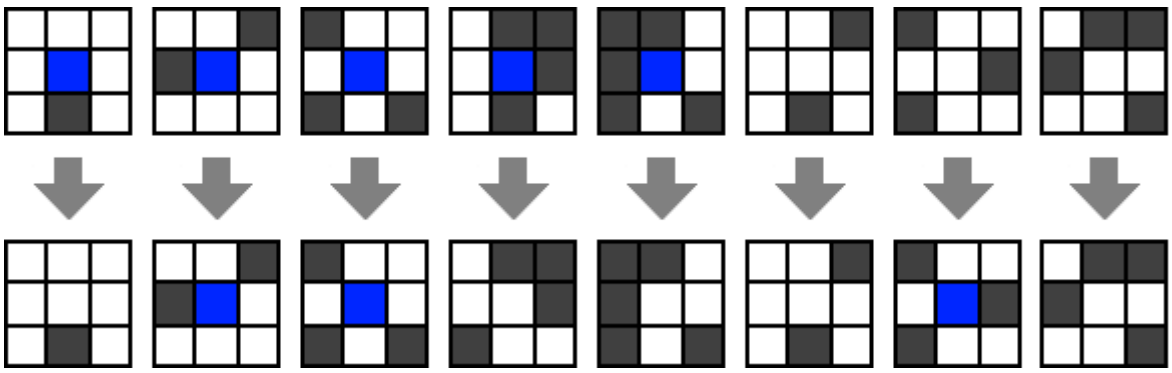

***Figure 1**: Conway's Game of Life. Depiction of Rules*

Task:

In this project you will make a simulation of the Conway's Game of Life. The rules are given in the section above and they are depicted in **Figure 1** for clarity.

Your task is to write a C program that fulfills the following requirements:

1. Declare a two-dimensional square grid (using arrays of type '**char'**) of variable size. By 'variable size' I mean that the user will have the option to select the size of the simulation grid. For example 9x9, 10x15, (m x n in general), at the start of the simulation.
2. A '***live***' cell will have a '*****' as its contents while a dead cell will have a ***'space'***.
3. For the initial state of the game the user should be given an option weather to enter the initial state himself (via keyboard) or to have it randomly generated.
4. The next states should be generated by either pressing a key (you may use the **getc()** function) or after a specific time interval.
5. You must make a function '`void` **`next_tick`** `(char * ptr_prev, char * ptr_next, int m, int n)`' that computes the next generation based on the previous one provided as argument.
6. You should place the above function in a file named '**conway.c**' and its prototype in '**conway.h**'.
7. The simulation should run until the user presses '**q**'.

Deliverables and Grading: **Total Marks (25)**

- Working C program (**15**)
- A written report presenting the details of your solution. (**03**)
- A quiz. (**07**)

The C program along with the report in soft form must be submitted via the CU-Online portal before the deadline.

Note: Negative marks for plagiarized work.

Useful Links

- https://www.geeksforgeeks.org/pass-2d-array-parameter-c/