## In-Class Assignment

Complete the following question.

#### One-dimensional Game of Life

[A10]

In Conway's Game of Life, **N** cells in a grid are used to simulate **biological cells**. Each **cell** is either **alive** or **dead**. At each step of the simulation each cell's current **state** and **number of living neighbors** is used to determine the **state** of the cell during the **following step** of the simulation.

In this one-dimensional version, each cell **i** is adjacent to cells **i-1** and **i+1**, and the **cells at the ends** *(position zero and position N-1)* are also **adjacent** to each other. At each step of the simulation,

* **cells** **with exactly one living neighbor change their state**. For example, *alive cells become dead, dead cells become alive*. Otherwise, the cell maintains its current state. For example, a living cell *(1)* with zero or two living neighbours will stay alive. A dead cell *(0)* with zero or two living neighbours will remain dead.

For example, if we represent **dead cells** with a **'0'** and **living cells** with a **'1'**, consider the **current state** with 8 cells:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |

* Cells 0 and 6 have two living neighbors.
* Cells 1, 2, 3, and 4 have one living neighbor.
* Cells 5 and 7 have no living neighbors.

Thus, at the next step of the simulation, the **future state** would be:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |

#### Tasks:

#### Using the rules and example described above, **write Rust code** that uses the values in the **current** array/vector *(that represent live and dead cells)* to calculate the new values in the **future** slice, **after one step** of the simulation. *(5 marks)*

1. **Modify the program** so that it will output the initial state of the cells and the current/future state of the cells **after each** of the first **10 iterations** of the simulation. *(2 marks)*
2. Modify the **Rust program** so that the **current** array/vector begins with 0’s and 1’s that are **randomly** chosen. *(3 marks)*