The Game of Life

The game of life takes place on a rectangular grid of cells. Each cell may or may not contain an organism. Every cell in the rectangle has eight neighbours apart from those at the edge of the rectangle.

The expression occasions(k) is used to denote the number of cells adjacent to the cell k that are occupied by an organism. Every new generation of organisms is obtained from the previous generation by applying two simple rules.

The Two Rules

1. An organism in cell k survives to the next generation if

2 <= occasions(k) <=3

otherwise the organism dies.

2. An organism is born in an empty cell k if occasions(k) = 3 otherwise the cell remains empty.

Figure 1 shows six generations of organisms. The production of each new generation has been based on the two rules shown above.

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|  | **\*** | **\*** | **\*\*\*** | **\*\*\*** | **\*\*\*** |
| 1st | 2nd | 3rd | 4th | **\***  5th | **\*\*\***  6th |
| Generation | Generation | Generation | Generation | Generation | Generation |
| **Figure 1** |  |  |  |  |  |

Your brief

You are to develop design artefacts and programs to implement the game of life.

Create a console application called Stage1. Within the console application have code that allows the use to enter the configuration of the first generation. Store the configuration as appropriate.

Add appropriate class(es) to the console application that will apply the two rules such that the next generation is generated by an instance of this/these class(es). Have the console display each generation in turn.

Once you have completed the console application create a windows forms application called Stage2. Add the class(es) developed for the Stage1 console application to the Stage2 windows form application. Create a suitable GUI that allows for first generation configuration entry and for the displaying of the various generated generations.

Ensure you use the same class(es) developed for the Stage1 console application for the generation of the various generations. In addition add another class that allows its instance to store the first generation configuration that can then be loaded at any time to start a new set of generated generations. Also have this class contain behaviour that allows the reading of a text file that contains the rules for the generation of the game of life. Have the file contents displayed as appropriate on the GUI.

Upon completion of the Stage2 windows form application create another windows form application called Stages3. This application should have the identical functionality as the Stage2 windows form application with the additional features:

1. As the generations are being displayed a figure showing the number of births and deaths is displayed underneath the colony of organisms.

2. Examples of first generation configurations are available to the user from a menu. These configurations must be stored in an appropriate file.

3. Any births occurring between generation n and n+ 1 are to be displayed in a different colour. These births would revert to the normal colour when displayed in generation n+2.

4. The generated generations is searched to find out the peak number of deaths and/or births between any two generations.

Repeated process.