Problem-based Case 02
HCI Elements in a Web-Razor .NET Projects

In this Problem-based case you will extend the functionality of the Game of Life by adding user interactions in order to have a program having "good" usability. This is not a tutorial, thus you should solve the problem. It will be possible because you understand and control the previous versions of the project. Anyway, due to the refactoring between the first version (grid full of cells, each one having status of live or dead) and the second version (grid having cells only in some positions, empty positions mean dead cells) then the implementation of the Conway's steps changes. This is the teacher's version in the Environment class:

```
118        public void nextConwayStep() {
119            int n;
120            bool[,]  aux = new bool[this.rows,this.cols];
121            for(var i=0; i<this.rows; i++)
122            for(var j=0; j<this.cols; j++) {
123                n = this.surrondingNeighborns(i,j,"BioUnit");
124                if(n==3)
125                    aux[i,j] = true;
126                else if (n==2 && this.cell[i,j]!=null)
127                    aux[i,j] = true;
128                else
129                    aux[i,j] = false;
130            }
131            for(var i=0; i<this.rows; i++)
132            for(var j=0; j<this.cols; j++) {
133                if(aux[i,j] && this.cell[i,j]==null) {
134                    this.cell[i,j] = new BioUnit(i,j,this);
135                }
136                else if (!aux[i,j] && this.cell[i,j]!=null) {
137                    this.cell[i,j] = null;
138                }
139            }
140        }
```

You have already programmed the method `surrondingNeighborns`, but anyway, it follows:

```
54        public int surrondingNeighborns(int i,int j,String specie) {
55            int ans=0;
56            List<BioUnit> surr = this.neighbors(i,j);
57
58            foreach (object unit in surr)
59            {
60                if(this.specie(unit)==specie) ans++;
61            }
62            //Console.WriteLine("cell("+i.ToString()+" , "+j.ToString()+"
63            return ans;
64        }
65
```

The way of answering is by reporting the results in the personnel chat using the usual way of pasting the screenshots which must include part of your desktop background, and, at the same time, it should include the time of the screenshot. For those problems including coding you must also to paste the images of corresponding new code.

Due to you must create new code, it is possible that you have errors and/or warnings in your code. You can share these errors and warnings in the common chat in order other classmates or the teacher can help you, BUT, you can ONLY ask for the meaning and the solution of errors and warnings, you can not ask for complete nor partial solutions to presented problems. However, you can ask for C# or Razor instructions, for example, "Do you know how I can get the selected option of the SELECT in the section of @code?".

# Problem 1 (20%). Using an existing pattern.

This is the only one problem that has the form of a tutorial. The next method is a new method in the class Environment. It puts a known Game-of-Life pattern (pentadecathlon) in some part of the grid (the target position is given by the x and y parameters).

```
142    public void put_pattern(int x,int y,string pattern) {
143        if(pattern.Equals("pentadecathlon")) {
144            for(var i=0;i<8;i++)   //rows
145            for(var j=0;j<3;j++)   //cols
146            if( !((i==1 && j==1) || (i==6 && j==1)) ) {
147                this.insert(x+i,y+j,new BioUnit(x+i,y+j,this));
148            }
149        }
150    }
```

If you call it in the initialization of the grid, for example in this way:

```
8    <h1>Game of Life</h1>
9    <p>Current count: @currentCount and current radio @theRadio</p>
10   <hr>
11   @{
12       //only the first time (initial pattern)
13       if(currentCount==0) {
14           e.put_pattern(6,6,"pentadecathlon");
15       }
16   }
```

then you should get the following output as the first, second and third image in the grid (of course you may delete the line 9 of this example):
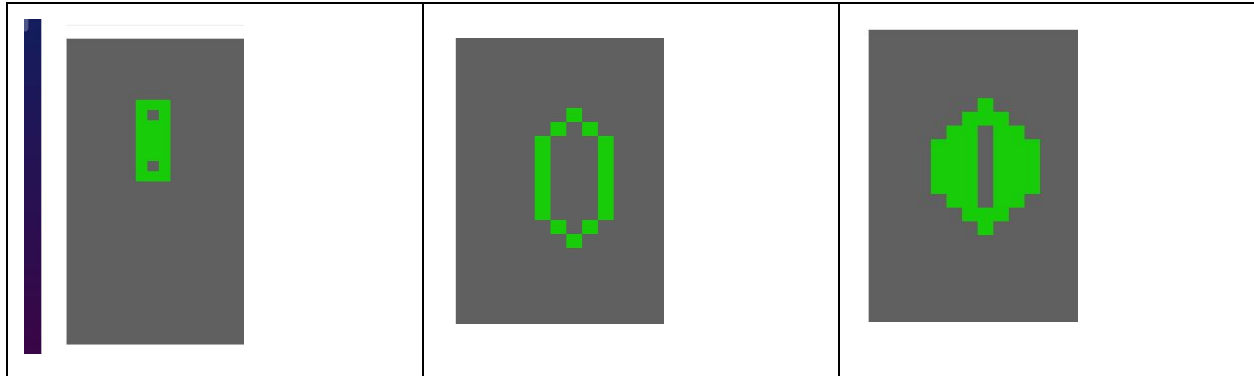
In this first problem you "only" must replicate this pattern in a 30 by 30 grid putting it in the current position (coordinate 6,6) and, AT THE SAME TIME, in the position 15,15. You should show a sequence of 4 images starting from the basic one.

Remember to identify the number of work that you are presenting, in this case, by sending W1 before to the screenshots.

Problem 2 (20%). New function of adding patterns in the grid - part 1

In this problem you must add a button having the name "Add pattern ...", when the user clicks the pattern, the system must open a small section having the title "Add the pattern pentadecathlon". AT THE SAME TIME, tha title of the button MUST change to "Add pattern (-)". The three points normally means that there is an additional input interface, and the minus, normally means that you can hide the section. If the user clicks the button when it has the second message, then the section must come back to its hidden status and the title of the button must change again to "Add pattern …".

Show the corresponding code section with the required definitions, and the HTML (view) section (one or two screenshots). Regarding the output you must show at least two screenshots, when the section is hidden and when the section is shown.

Remember to identify the number of work that you are presenting, in this case, by sending W2 before to the screenshots.

Problem 3 (20%). New function of adding patterns in the grid - part 2

In this problem you should add two text fields for entering a coordinate, it means a x and y value (row and column) and a "Add" button in the following order:

The correct functionality is that: first the grid starts empty, and the section of adding patterns is hide (previous answer).

After that you can show the section of adding patterns by clicking the button "Add pattern …" (also this is the previous problem). Now, the new dialog appears. Then in the selected coordinate you should add the existing pattern (automatically of course). But, once a time the pattern has been added, the text fields come back to an empty state and the pattern can be added again.

In this problem you must show the code for handling the click event of the "Add" button and test the functionality adding the pattern in the coordinates (5,5), (5,25), and the (15,20). For this test you must show the screenshots having the pattern in the first position, then advance ONE Conway's step, then add the pattern in the second position, then advance to the next Conway's step, and then add the third pattern. Show these three screenshots.

Remember to identify the number of work that you are presenting, in this case, by sending W3 before to the screenshots.

Problem 4 (20%). New function of adding patterns in the grid - part 3

In this problem you must extend the method `put_pattern` by adding TWO (2) new patterns. You can choose any existing pattern from, for example, Wikipedia explanation of Conway's game of life. Such as the existing pattern, the new patterns must be localized in the position specified in the parameters.

In order to use this method, the interface of the problem 3, must be extended, and now, the user must choose the pattern to be inserted from a SELECT element OR from a RADIO-BUTTON element. The selected pattern must be added in the specified position when the "Add" button is clicked.

You must show:

W4-A) The new version of the method put_pattern (CODE)
W4-B) The new function for handling the click event of the "Add" button (CODE)
W4-C) The HTML view of the <DIV> representing the section for adding patterns (CODE)
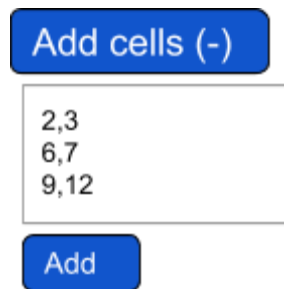W4-D) The output showing the three different patterns in the positions (5,5), (4,25),(15,15)
W4-E) The output showing the same three patterns one Conway's step after.

Remember to identify the number of work that you are presenting, in this case, by sending W4 before to the screenshots.

Problem 5 (20%). New function of adding cells

In this problem you will create a way of adding cells in the grid. In the next line of the already created "Add pattern …" button, you must create another button having the text "Add cells …". This button will open a section (<div>) containing a textarea HTML element and a button with the text "Add". When the section is shown the "Add cells …" button must change to "Add cells (-)". When this section is open the user would specify coordinates inside the text, in this way:

After that the user can click the button, then, in all specified positions will be new cells. These functions can be jointly used with patterns.

You must show:

W5-A) The new function for handling the click event of the "Add cells ..." button (CODE)
W5-B) The new function for handling the click event of the "Add" button (CODE). If inside this function you call other functions or methods they must be shown too.
W5-C) The HTML view of the <DIV> representing the section for adding cells (CODE)
W5-D) The output showing the case of the example, i.e., you must add the coordinates (2,3), (6,7) and (9,12).
W5-E) The output showing these   three cells plus the pentadecathlon pattern starting in the position (13,13).
W5-F) The same output but now with the section closed.

Remember to identify the number of work that you are presenting, in this case, by sending W5 before to the screenshots.