

# [1110] The Ingredients of Life

## The Ingredients of Life:

In order to program the Game of Life, you need to use the following concepts:

- Multidimensional Arrays
- for loops
- Array copying
- Sleeping
- How to detect a Keypress

## Multidimensional Arrays

```
int[,] grid = new int[20,30];
```

## Copying Arrays

```
int[,] grid2 = (int[,])grid1.Clone();
```

## Displaying a Multidimensional Array Quickly

Life requires you to display your grid quickly. The best way to do that is to build an entire line of text inside of a string and then output that string all at once. (Note: This is required for Windows users.) Like this:

```
string line;
for (int y = 0; y < maxY; y++)
{
    line = "";
    for (int x = 0; x < maxX; x++)
    {
        line += grid[x,y] == ALIVE ? "*" : " ";
    }
    Console.WriteLine(line);
}
```

## Sleeping

In order to have the illusion of animation that happens when we print out the changing grid quickly, we will probably need to insert a short delay after displaying each grid. 40 to 60 milliseconds should do the trick. Here's how you do that:

```
Thread.Sleep(numMilliseconds);
```

## How to Detect a KeyPress

```
if (Console.KeyAvailable) {  
    ConsoleKey key = Console.ReadKey(true).Key;  
    switch (key)  
    {  
        case ConsoleKey.Q:  
            quit = true;  
            break;  
        default:  
            break;  
    }  
}
```

## The Algorithm for Conway's Game of Life

- Create 2 Grids - current grid and new grid
- Populate the new grid randomly with 1's and 0's
- (To make things easier/faster, we'll use "static" borders - no wrapping.)
- Loop "forever"
  - Copy the new grid into the current grid
  - Display the current grid
  - For each cell in the current grid (ignoring the borders)
    - Count neighbors by adding up the values of the cells adjacent to the current cell
    - Use the Rules of Life to set the value for the cell in the new grid
  - Look for any "command" key presses and execute the appropriate command if found
  - Sleep for ~50 milliseconds
- End Loop

"Static" borders means that the cells located on the 4 edges of the grid do not change from their initial state. If they were alive when the game starts, they remain alive forever. If they were dead, they remain dead. This simplifies the calculation process and increases performance since we can eliminate those cells from our "life" calculations.