CS 3710 Vocational Languages
Assignment 5

Due date: October 29, 2012
Submit your source code to d2l and bring a hard copy to the class.

1 Recursion (30 marks)

Implement a JavaScript recursive function to compute the greatest common divisor (gcd) of two integers, \( x \) and \( y \):

\[
\text{gcd}(x, y) = \begin{cases} 
  x, & \text{if } y = 0 \\
  \text{gcd}(y, \text{remainder}(x, y)), & \text{if } x \geq y \text{ and } y > 0
\end{cases}
\]

You are free to explore any web interface you like to obtain the \( x \) and \( y \) values from the users and to display the result. The simplest way to do this is the “text” and “button” FORM shown in the class.

2 Game of Life (70 marks)

Implement a JavaScript program to simulate Conway’s Game of Life. In this game, the universe is a \( N \times N \) 2-dimensional Cellular Automaton (CA) where each cell can be either alive or dead. At each time step, each cell interacts with its 8 neighbors, which are the cells that are horizontally, vertically, or diagonally adjacent, to determine its next state based on the following rules:

- Any live cell with fewer than two live neighbors dies, as if caused by under-population.
- Any live cell with two or three live neighbors lives on to the next generation.
- Any live cell with more than three live neighbors dies, as if by overcrowding.
- Any dead cell with exactly three live neighbors becomes a live cell, as if by reproduction.
There are many ways to implement the program. I would suggest breaking down the code into the following modules:

1. Web interface that queries users to provide the dimension of the cellular automaton and the number of living cells at the initial configuration.

2. One or two “button“ for the users to decide if the evolution would continue or terminate.

3. A creation function that returns a new CA based on the user provided information. You can use a random number generator to decide where to place the living cells in the initial configuration.

4. A evolution function that returns a new CA based on the mentioned rules.

5. A display function that outputs the CA on the screen.