**CSCE 150E Matlab Programming Project 2 – Summer 2010**

**Assigned: 7/28/2010; Due: 8/5/2010 at 11:59 PM**

**Problem Statement:**

“To Eat or to be Eaten, that is the Question!”

In the classic cellular automata game of Life, cells constrained in a rectangular grid can die of loneliness (0 or 1 neighbor), die of overcrowding (4 or more neighbors), and reproduce (tri-sexually) into an open cell. Note that there can be up to 8 neighbors because the squares on the diagonals are considered to be neighboring. An initial population is tracked through multiple generations. These can appear on the screen as fascinating changing patterns.

We are going to add a bit more realism to the game, making it more of a wildlife simulation. Let's include some vegetation that grows at a steady rate in all the cells. Let's have herbivores to consume this vegetation. Then let's toss in some carnivores! Here are some possible expanded constraints. You do not have to implement them all, and you are welcome to modify them and add to them so as to improve your project.

* The rectangular grid is 30 by 30 cells, and nothing escapes beyond the boundaries of the grid.
* A generation takes one day.
* Allow the herbivores to all make their moves, then the carnivores to all make their moves, in an alternating fashion each day.
* The rule for loneliness for herbivores: Fewer than 2 neighboring herbivores results in death.
* The rule for overcrowding for herbivores: Not a problem - herbivores don't die of overcrowding.
* The rule for loneliness for carnivores: Not a problem - carnivores don't die of loneliness.
* The rule for overcrowding for carnivores: More than 1 neighboring carnivore results in death.
* Herbivores are bi-sexual and not shy. An open cell surrounded by at least two herbivores results in a birth.
* Carnivores are bi-sexual and shy. An open cell surrounded by exactly two carnivores results in a birth.
* Vegetation grows at 1 inch per day, like grass, across the entire grid after starting at 5 inches.
* Herbivores eat down the vegetation in their own cell at 2 inches per day.
* If vegetation is an inch or less in height, herbivores move, if possible, to a neighboring open cell with at least 2 inches of vegetation, or they die.
* In case of multiple candidate cells, prefer the one with the most vegetation, then choose at random.
* In case of competition for an open cell, favor the oldest, then choose at random.
* In both the two previous cases apply (in the given order), repeat as long as they apply.
* Carnivores eat the herbivores, consuming at least one herbivore every 5 days, or they die.
* If a carnivore has a neighboring herbivore, it moves to the herbivore's cell and eats it.
* In case of multiple neighboring herbivores, choose the oldest, then the youngest, then at random for being eaten.
* In case of competition among carnivores for the same herbivore, favor the oldest, then choose at random.
* If both the two previous cases apply (in the given order), repeat as long as the rules apply and there are still carnivores that have not eaten that day.

Your project should provide the user with a menu of options, including (but not limited to) specifying the number of cycles to run before showing the menu again, set or modify the pattern of vegetarians and carnivores, modify the constraints, rerun the current simulation, and quit.

**Collaboration:**

Work together as a class on any or all aspects of the research and design. Ideally take advantage of the talents of each member of the team. Form small teams to finalize each of the multiple design options. It is essential to keep track of who did what and where any useful information was found. Keeping a log is highly recommended.

**What and How to Submit:**

Read the “Program Documentation Guidelines” which will be provided.

By the deadline hand in electronically two files, life.m (the Matlab script file for the simulation), and life.doc (which contains summaries, documentation, and sample runs). In class the day after the deadline, hand in hardcopy versions of both files, stapled together with the documentation file in front.

The Word file document should contain the following, all carefully labeled:

* Cover page with name(s), title, date submitted, etc.
* Documentation of the subject research you did to prepare for the project. Cite sources and explain the formulas.
* Provide a discussion of the features you implemented in the project. Describe how they work and what Matlab options were used to program them.
* Compose an “instruction manual” that a non-programmer can use to run the life program.
* Cut and paste a sample dialog of the running of the program, including only a small sampling of the generated patterns.
* Cut and paste a sample dialog, as above, but demonstrating how your program responds to extreme and faulty input. (This could be combined with the previous section.)
* Acknowledge all collaborations, detailing what each person contributed individually, and what was done jointly.

**Grading Criteria:**

* Program functions as intended – 25%
* Program design (use functions!!!) and logic is well designed – 20%
* Documentation guidelines are followed – 25%
* Handin Documents formatted and arranged as specified – 15%
* Testing is comprehensive – 15%