COMP 1451 – Assignment #4 (75 points)
Due: 11:59 p.m. the night before Session 11

Simulation Enhancement

Your client is a land-use consultant who needs to answer these questions:

1. Is it feasible to allow trapping in a particular part of the province?

2. If trapping is allowed, how many trapping licenses may be issued without killing off the wildlife in the area?

3. If trapping is allowed, how many foxes can one trapper catch per year and maintain stability in the fox population?

4. If trapping is allowed, what should be the minimum number of foxes a trapper can catch per year and retain his trapping license?

For your final assignment you will modify the Foxes and Rabbits simulation from Chapter 10 of your textbook to attempt to answer the above questions.

Functional Requirements – 30 points

Add a Trapper to the simulation. The trapper will appear in a different colour on the field. The number of trappers in the field will be displayed at each step, with the number of foxes and rabbits. Make the ages more realistic by making one year equivalent to 100 simulation steps.

A trapper has:

- a minimum age of 16 years and a retirement age of 75 years. A trapper who reaches retirement age will give up his trapping license. At this point the license will be issued to a new trapper.

- number of foxes caught, up to a maximum number per year. A trapper who catches fewer than a minimum number of foxes per year will give up his trapping license. At this point the license will be issued to a new trapper. Use constants for the minimum and maximum numbers, and experiment to see what works.

Trappers have random ages when added to the simulation.

A trapper will trap in all adjacent locations until he has caught the maximum number for the year, and will then stop trapping until the next year.

There is a bug in the original simulation such that newly-born rabbits (and foxes?) can be placed in an already-occupied location. Fix this bug so that new animals are placed only in empty locations and your trappers are never "crowded out" by the other animals.

At the end of a simulation run, report on how many trappers gave up their licenses because they were unsuccessful, and how many retired. Also report how many foxes were killed by trapping, how many died of old age, and how many died from overcrowding.

Design – 15 points

Implement an Actor interface. Also implement Predator and Prey interfaces. A Trapper is a predator only. A rabbit is a prey only. However, a fox is both predator and prey.

Perform any other refactoring that you think will improve the design of the project as a whole, i.e. decreased coupling and increased cohesion.

Experiment and Report – 20 points

Try different values for the constants in the simulation. What is the proportion of trappers to foxes and rabbits that results in a stable simulation?

Report

1. Explain <u>in detail</u> what changes you have made to the simulation, and why you made them.

2. Report on the result of your experimentation. What scenarios did you try? What were the results?

3. What will you recommend to your client?

4. What additions and/or modifications do you think would result in a more useful simulation?

Save your report as either plain text or Word 97 format. <u>Do not submit a Word file with a .docx extension.</u>

Programming Style – 10 points

- comments.
- descriptive naming.
- indentation, etc.

Create a .zip file containing your entire BlueJ project (zip the folder, not the individual files) and the report. Name the .zip file with your name and the assignment number, e.g. "Susan_Jones_Assign_4.zip". Upload the file to WebCT before the cutoff time.