Assignment 2a

COMP 2526 Object-Oriented Programming with Java

Milestone 1 due via email by Sunday October 23rd at 11:59:59 PM
Complete assignment due on Sunday November 6th at 11:59:59 PM

1 Purpose

Use object oriented programming techniques to design and implement a solution that will be flexible and easy to modify in future iterations. You will apply what you have learned in COMP 1510 and COMP 2526 to a larger and more difficult program that we will develop over several assignments. After each submission, you will be provided with a sample solution that is flexible enough to continue into the next iteration.

2 Description

You are going to create a simulation of a simple world. A simulation like this is often referred to as the "Game of Life" (unrelated to the Parker Brothers board game).

The world simulation begins by placing Plants and Herbivores (plant eaters) on a two-dimensional grid of Cells. The grid displays the Plants (green) and Herbivores (yellow) by filling in the Cells where they are found with the appropriate colour. Blank Cells represent empty areas. Herbivores "graze" (feed) by moving around the grid eating Plants they find. Herbivores must find a Plant to eat before 5 "turns" have passed, or they die. A "turn" is a step in time which occurs when the user clicks anywhere on the window displaying the world. Herbivores move by looking for an empty neighbouring Cell (the Cell may have a Plant or it may not, but it may not have another Herbivore) and randomly picking one to enter. They move 1 Cell per turn. Plants do not move.

It is important that you consider future changes before building your simulation. Future changes might include any or all of or none of: movement patterns, reproduction, rules governing behaviour, physical representations, inhabitants, geographic disturbances, and more. By carefully thinking about what could be added or changed and designing with that flexibility in mind, you will find it easier to implement future iterations.

Your program must contain these seven (7) classes:

1. Plant
   (a) Displayed as a green Cell
   (b) Cannot move
   (c) Initial placement is random
2. Herbivore
   (a) Displayed as a yellow Cell
   (b) Moves into "empty" adjacent Cells randomly (an empty cell is a cell that does not contain another Herbivore)
   (c) Eats the Plant in its Cell, if any

    (d) Must find a plant to eat before 5 “turns” have passed or it dies
    (e) Must find a plant to eat within 4 “turns” after being born or it dies
    (f) Initial placement is random

3. Cell
    (a) Can hold a Plant or an Herbivore or nothing
    (b) Represented as a square in the world

4. World
    (a) Holds Cells
    (b) No wrap around on the world (it’s flat, but nothing falls off the edge either)
    (c) When creating a new World, each new Cell has a 10% chance of containing a Herbivore and a 30% chance of containing a Plant

5. Main
    (a) Drives the program
    (b) When user clicks on the game window, a turn passes
    (c) **This class is provided, and you must use it**

6. GameFrame
    (a) Frame of program
    (b) **This class is provided, and you must use it**

7. TurnListener
    (a) extends MouseAdapter
    (b) implements the mouseClicked method (when the mouse is clicked, the GameFrame must take a turn)

3 Requirements

This assignment should demonstrate how expanding and maintaining a software system can be easier with a well planned design. You must adhere to these rules:

1. Create a new Eclipse Java project called COMP 2526 Game Of Life Part A
2. Create a single package: ca.bcit.comp2526.a2a
3. Copy the two furnished classes to the new package
4. Setup Checkstyle to use the furnished 2526 Google Checkstyle.xml file
5. You may NOT modify the Main.java or GameFrame.java files.
6. Cell must contain:
    (a) constructor that accepts three parameters: public Cell(World world, int row, int column)
    (b) public void init() sets up the layout
    (c) public Point getLocation() returns the location of the Cell on the World
    (d) public Cell[] getAdjacentCells() returns the adjacent Cells – corners only return 3 Cells, sides only return 5, and all others return 8
7. World must contain these methods:
    (a) constructor that accepts two parameters: public World(int rows, int columns)
    (b) public void init() puts the Cells on the world and adds the appropriate number of Herbivores and Plants
    (c) public Cell getCellAt(int row, int column) retrieves the requested Cell from the specified location in the World
    (d) public void takeTurn() removes dead herbivores and then moves remaining living Herbivores one Cell (and they eat, if possible)

8. Plant must contain these methods:
   (a) constructor that accepts one parameter: public Plant(Cell location)
   (b) public void init() sets the background to be green
   (c) public void setCell(Cell location) puts the Plant on the specified Cell
9. Herbivore must contain these methods:
   (a) constructor that accepts one parameter: public Herbivore(Cell location)
   (b) public void init() sets the background to be yellow
   (c) public void setCell(Cell location) puts the Herbivore on the specified Cell
   (d) public void move() moves the Herbivore one cell (where it eats a Plant if the Cell contains a Plant)
10. Things to consider
    (a) The TurnListener class extends MouseAdapter (overrides mouseClicked) and will call the takeTurn method in GameFrame and
    (b) Cell needs methods to set/get/remove Plants/Herbivores
    (c) Herbivore needs methods to figure out where Plants and empty cells are.

4 Milestone 1

Milestone (10% of mark): Before Sunday October 23rd at 11:59:59 PM, you must email your lab instructor (cthompson98@bcit.ca):

1. The email subject must be [COMP 2526 A2a milestone] (anything else will not be marked)
2. You must send me a screen print of Eclipse showing me that your 7 classes have all been created
3. You must send me a screen print of your Game when it starts, **with Plants and Herbivores displayed in your GUI**
4. You are not required to demonstrate movement, eating, dying, turn taking, or reproduction. I just want to see your game displayed (like this):

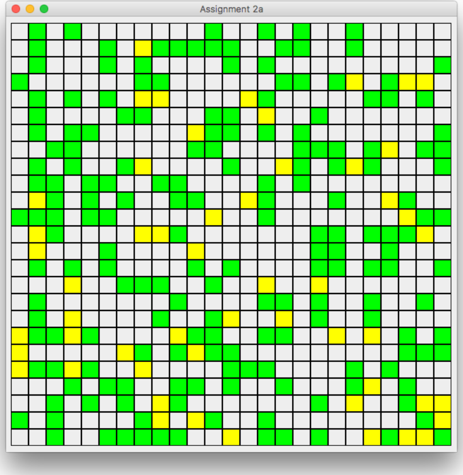

Figure 1: Your milestone must look like this (a GameFrame that contains cells which contain Plants and Herbivores)

It is likely you will want to add more classes and methods. Document any changes you make (it's always a good idea to include a readme.txt). Good luck, and have fun!

5 Marking Guidelines

50%	Functionality (does it work)
20%	Good object oriented design
20%	Comments and style (use Checkstyle and Find Bugs)
10%	Milestone by end of Sunday October 23rd at 11:59:59 PM