BB/BCB 3010 Simulation in Biology

Netlogo Bootcamp Week 1

Due in class by Friday, March 16th.

100 points total.

Download Netlogo from the site:

<https://ccl.northwestern.edu/netlogo/>

The Netlogo User Manual is here; it includes the web tutorials mentioned below:

<https://ccl.northwestern.edu/netlogo/docs/>

1. (5 points) Take a look around the site and manual. In the Manual, take a look at the Introduction on the left hand side, including the Sample Model: Party. Then briefly answer these questions in the ‘Challenge’ part of the Sample Model. (You can show Ashley or me your answers when we come by to check out Tutorial #3 below).
2. How high does the tolerance value have to be before you get mixed groups?
3. To make sure all groups of 10 have both sexes, at what level should we set the tolerance?

Even a simple model like this can give you results you may find a bit surprising.

1. (5 points) Then do web tutorial #1, working with the Wolf Sheep Predation model. Note that because Netlogo has changed a little since the tutorial was written, grass is no longer controlled with a switch; instead, you choose whether to include it with a Chooser. Run the model without grass a few times. Is the result always the same? Now try adding grass. What is different? Play around a bit with the model, and complete the tutorial. Again, just talk with Ashley and me about this when we check out tutorial #3 below.
2. Complete web tutorial #2. These will give you a good feel for the kinds of things you can do with Netlogo.
3. (15 points) Work your way through web tutorial #3. Once your group has gotten this far, ask Ashley or me to come by and check that you have completed the tutorial, and discuss your answers for 1) and 2).
4. (25 points) Go back to the Wolf Sheep Predation tutorial. Take a look at the code if you haven’t already. This should look very familiar after completing tutorial #3! One thing that is missing from the Wolf Sheep Predation is the age of the wolves and sheep. Rename the Wolf Sheep Predation model and save it in a folder. Then make the following changes to it. When your group has completed this, ask Ashley or me to come by and check it out.
   1. Give both the sheep and the wolves an age variable. You can do this either by giving all turtles age as a variable, or making two variables, naming them something like ‘wolf-age’ and ‘sheep-age’. Make sure to initialize age appropriately, both at the start of the simulation and when a new wolf or sheep is born.
   2. Have the animals age at each tick.
   3. Create a graph that shows you something about the ages of the wolf and sheep populations over time.
   4. Only allow animals to reproduce if they are over a certain age. Have that age controlled by a slider.
   5. Play with the model a bit. Does adding in age make it behave any differently? More or less realistically?
5. (25 points) Implement the Mushroom Hunt, following the instructions in the tutorial posted on Canvas: 2.3 A Demonstration Program: Mushroom Hunt. Next, make the following small changes to the Mushroom Hunt. When your group has completed all of them, ask Ashley or me to come and check your work.
   1. Instead of 4 clusters that each have 20 mushrooms, make 8 clusters of 10 mushrooms. Each cluster has a radius of 3 patches.
   2. Make each hunter count how many mushrooms it catches. This requires a new turtle variable that must be incremented each time a mushroom is found.
   3. Have each hunter write out how many mushrooms it has found to the Command Center (see the primitives print, write, type, and show, in the User Manual.) Choose the command that shows the agent number, so that you can see how many mushrooms each hunter has found.
   4. Create a plot that shows the number of red mushrooms that remain. You will need to use “with” (as in count patches with [pcolor = red]).
   5. When the hunter has not recently found a mushroom, have it turn by a random angle between -45 and +45 degrees instead of between -10 and +10.
6. (25 points) Implement the Butterfly Hilltopping model, following the instructions in the handout: 4.3 Butterfly Hilltopping: from ODD to NetLogo. Next, make the following small changes to the Butterfly model. When your group has completed all of them, ask Ashley or me to come and check your work.
   1. Make the number of butterflies a slider that goes from 1 to 100. Make q a slider that goes from 0 to 1.
   2. Modify the model so that you can start your butterflies at any desired location using sliders.
   3. Run the model with 50 butterflies, varying q from 0 to 1 by small amounts. Note what happens to the corridor width.
   4. Most hills do not increase completely smoothly in height! Try adding some variability into the elevation of your patches just after patch elevation is set, by using

set elevation elevation + random 10.

How is the corridor width different from part b? Think about why this happens.