GEOG 490/590 I SPATIAL MODELING I SPRING 2015

ASSIGNMENT 5: EVALUATING MODEL UNCERTAINTY THROUGH SENSITIVITY ANALYSIS

Objective: Perform a sensitivity analysis to evaluate model parameters that are most influential in determining emerging patterns.

Description: Using the model from Assignment 4, you will perform a sensitivity analysis by sweeping through the parameter settings of the model. You will learn how to use NetLogo's parameter sweep tool called Behavior Space, which will allow you to produce data that you can visualize in any data software package (we'll use Excel – but you are welcome to use any application that you are familiar with). You will utilize these graphs to answer questions regarding model sensitivity and uncertainty.

INSTRUCTIONS

PART 1: CREATING A MEASURABLE EMERGENT OUTCOME

1. Open your completed model from Assignment 4. Create a new patch variable called `nearest-neighbor-distance` (this should take place towards the top of your code).
2. Add a global variable `nnd` to your code.
3. Create a plot that will display the nearest-neighbor-distance.
4. Calculate the average nearest-neighbor distance for all developed patches and graph this value in the plot by typing in the code at the bottom of your code panel:

```
to update-plot
  if ticks > 1 [
    ask patches with [status = "home"] [
      let nd min-one-of other patches with
         [status = "home"] [distance myself]
      set nearest-neighbor-distance distance nd
    ]
    set nnd mean [nearest-neighbor-distance] of
      patches with [status = “home”]
  ]
end
```

PART 2: PERFORM A SENSITIVITY ANALYSIS

5. Go to Tools>Behavior Space and create a new experiment. Here you will define the settings of each parameter that you wish to simulate. Keep in mind that for each parameter setting you choose, NetLogo will hold all other model parameter values constant. Read the instructions in the Behavior Space dialogue box to define the parameter settings you wish to test.
6. Select your `nnd` variable as the one to be reported for measuring runs.
7. Only measure runs at the end of each run (not at every time step).
8. Perform 10 model runs per setting.
9. Determine an appropriate number of time steps to run the model.
10. Save your settings and run your model. Save the results to a table.

PART 3: ANALYZE RESULTS

11. Open the worksheet and table in a data analysis package such as Excel. Graph the time series of nearest neighbor distance values for the different parameter settings.

PART 4: DISCUSSION

12. Create an Assignment 5 page. Provide videos, text and graphs that address the following questions:

    i. What is the difference between a variable and a parameter?

    5 POINTS

    ii. Which parameter is the nearest-neighbor distance most sensitive to? Why do you think this is the case?

    15 POINTS

    iii. Which parameter is the nearest-neighbor distance least sensitive to? Why do you think this is the case?

    15 POINTS

iv. In our parameter sweep we used the mean nearest-neighbor-distance as an output descriptive statistic. Describe why nearest-neighbor-distance may be important to homeowners. List at least one other measurement that we could have used and explain how it differs from mean nearest-neighbor-distance."

5 POINTS

v. Provide a 100 word summary of what the model describes with regards to how residential decision making leads to specific patterns of urban growth.

10 POINTS

TOTAL **50 POINTS**

DUE DATE:
Tuesday, May 12th at 11:59pm
*Late submissions will be penalized 5% per day.