

Feedback — Optional programming assignment 1

[Help](#)

You submitted this homework on **Thu 11 Dec 2014 12:01 PM EET**. You got a score of **0.00** out of **10.00**. You can [attempt again](#), if you'd like.

The programming assignment this week is short to give you time to start on the project.

Instructions: take the [ER diffusion model](#). This model is an SI model (nodes are either susceptible or infected). Make it an SIS model: nodes are susceptible, they become infected, and then they have a chance of recovering from the infection (at which point they are immediately susceptible again). At each time step your model should do the following: 1) Examine each node. Each node that is infected infects each of its uninfected neighbors with probability INFECTION-RATE. 2) If a node is infected, after it is done with its infection attempts, with probability RECOVER-RATE it goes back to susceptible. It may be simplest to answer this question if you do the following:

- Add a global variable RECOVER-RATE by adding a slider to the GUI
- Add a monitor variable (call it e.g. cumul-av), which records the cumulative average number of infected nodes over time.

Once done, your interface may look something like [this](#).

NetLogo is likely unfamiliar to you. Browse its documentation. You may find the built-in models library a great source of example code.

In answering the following questions, run the model repeatedly (setting up a new network topology, then reinfecting a few times, each time giving the virus a chance to infect a non-trivial fraction of the network). Once you have the virus wreaking havoc in the network, answer the following:

Question 1

Set INFECTION-RATE to 0.15, and RECOVER-RATE to 0.40. The NUM-NODES should be 200.

Repeatedly construct the network and reinfect it until you get an infection that is affecting a significant portion of the nodes. The way I like to do this is to construct the network once using SETUP-A-NEW-NETWORK, click on the SPREAD-REPEAT button, and then click on the SETUP-WITH-CURRENT-TOPOLOGY button several times until the infection takes hold.

Let x be the average number of nodes infected in the long run (after a large initial infection) when AVG-DEGREE = 5. One approach is to keep a running average of the number of infected nodes, which you would reset after the infection establishes itself to avoid averaging the initial false starts (when the infection count is 0 because the infection has died out without achieving a steady state)

Let y be the same av. # nodes infected in the long run when AVG-DEGREE = 4 (remember to click on SETUP-A-NEW-NETWORK when you change the average degree). Give the ratio x/y (as a decimal). Your answer should be accurate to within 0.2. Please use only one decimal place (to keep the grading program happy).

You entered:

| Your Answer | Score | Explanation |
|-------------|---------------|-------------|
| | × 0.00 | |
| Total | 0.00 / 5.00 | |

Question Explanation

When the average degree is higher, a higher proportion of the network will be infected at any given time.

Question 2

Keeping the settings the same, again get an infection bouncing around your network by repeatedly reinfected it until the infection spreads to some portion of the network. What is the highest value of AVG-DEGREE from this list where the infection can die out after having infected a significant portion of the network?

| Your Answer | Score | Explanation |
|---------------------------|-------------|-------------|
| <input type="radio"/> 3.0 | | |
| <input type="radio"/> 3.8 | | |
| <input type="radio"/> 3.3 | | |
| <input type="radio"/> 4.2 | | |
| <input type="radio"/> 4.0 | | |
| Total | 0.00 / 5.00 | |

Question Explanation

If you vary AVG-DEGREE, you'll notice that right around a critical point, the infection can be sustained for long periods of time, but then dies out. Any higher than that, and it can persist in

the network indefinitely.