Introduction to Complexity (Spring 2013)

8.7 Submit Unit 8 Homework » Unit 8 Homework

Instructions 1

You can download the questions for this homework from the Course Materials page. The models Flocking.nlogo and Fireflies.nlogo Netlogo models library, and are also downloadable from the Course Materials page.

Question 2

Run Flocking.nlogo with the default parameters (the values that the parameters are initially set to when you open the model) for abo ticks. What kind of behavior do you see? (Use the speed slider to increase the speed of the simulation.)

- The flocks eventually fall apart and the birds move around in random-looking directions
- Multiple flocks are still seen by 3000 ticks, with birds often moving between different flocks.
- A single flock is seen, in which all the birds are very close together.

Question 3

The flocking algorithm in Flocking.nlogo is for each bird to do the following at each time step:

If distance between self and nearest neighbor is smaller than *minimum-separation*, then separate; else align and then cohere.

Modify this in the code to get rid of the "separate" clause.

To do this, go to the code tab, find the "to flock" procedure, and change this code:

```
[ find-nearest-neighbor
  ifelse distance nearest-neighbor < minimum-separation
[ separate ]
  [ align
    cohere ] ]
```

To this:

```
[ find-nearest-neighbor
  align
  cohere ]
```

What happens when you run this new code for a long time (e.g., 3000 ticks)?

- Multiple flocks are still seen by 3000 ticks, with birds often moving between different flocks.
- The birds just fly around randomly and never seem to flock.
- All birds coalesce into one single line (or a few single lines).

Question 4

Run Fireflies.nlogo a few times with the default parameters to get a sense of how many ticks it takes for the population to synchroniz or all fireflies flashing at the same time). Remember to click *go* both to start and stop the model, and to do *setup* before each run.

Then run it again a few times, but with *flashes-to-reset* set to 2 instead of 1. (Recall that *flashes-to-reset* gives the number of other fireflies a firefly needs to see on a given time step in order to reset its clock.)

Then run it again with *flashes-to-reset* set to 3. What is the effect? [In addition to answering this question, take some time to think a the effect you see happens.]

- As *flashes-to-reset* increases, the time for the population of fireflies to synchronize increases.
- As *flashes-to-reset* increases, the time for the population of fireflies to synchronize decreases.
- Increasing *flashes-to-reset* has no effect on the population's time to synchronize.

Question 5

Set Fireflies.nlogo back to use its default parameters (*flashes-to-reset* = 1). Now change *flash-length* from 1 to 2 and run the simula times to see about how many ticks it takes for the population to synchronize. (Remember to click *setup* before each new run.) What effect? ? [Again, in addition to answering this question, take some time to think about why the effect you see happens.]

- Time to synchronize is greatest for *flash-length* = 1, and least for *flash-length* = 2
- Time to synchronize is greatest for *flash-length* = 2, and least for *flash-length* = 1

Question 6

Now set *flash-length* = 5 and run the simulation for about 3000 ticks. What happens? [Think about why you see what you do.]

- The population synchronizes much faster than it did for *flash-length* equal to 1 or 2.
- The population does not seem to synchronize at all.

Question 7

Download AntsNew.nlogo from the Course Materials page (in Unit 1). Test the effect of "no pheromone" vs. pheromone, similar to w video 8.4. In particular, do the following (read carefully): (1) Set population to 100, diffusion rate to 10, and evaporation rate to 99, a runs (with *setup* before each new run). At the end of each run, write down the number of ticks it takes for the ants to eat all the food doing six runs, average these numbers. (2) Do the same thing, except with evaporation rate set at 2. Which of the following is true?

- The two average times are nearly equal.
- The average time with pheromone is about half the average time without pheromone.
- The average time with pheromone is about one-tenth the average time without pheromone.