Models and Simulations: Problem Set 4

Instructions: This week, you will write your first agent-based model (ABM). By the end of this problem set, you will have programmed a model that is similar to that described in Lehrer's "When Rational Disagreement is Impossible" and Golub and Jackson's "Naive Learning in Social Networks and the Wisdom of the Crowds."

On the course website, you can find a Netlogo file called, "DeGroot-Lehrer" that contains part of the model. Some of the procedures in the code, however, are missing. The exercises below ask you to write missing procedures for the program. When you are finished, you should run the model several times (by clicking the "go" button) and convince yourself that, as long as the network contains enough edges, the agents' beliefs converge to a consensus. You can see a video of how the model works on the website.

Exercise 1: Read documentation
Before writing any code, read the documentation carefully. In particular, read the description of the model under the "Info" tab, and read the comments at the beginning of all of the procedures.

Exercise 2: Assigning weights to links
Fill in the procedure setup_link_weights. Each directed link in the network has a numerical variable weight, which is a number between 0 and 1 inclusive. For each turtle i, the sum of the weights of the directed links originating from i is equal to one. Here, you should use the reporter uniform_sample_from_simplex.

Important Note: In NetLogo, agents cannot form links with themselves. For simplicity, therefore, you can write a program in which agents only assign non-zero weights to their neighbors in the network (other than themselves). Your program, therefore, will differ slightly from the models of DeGroot, Lehrer, and Golub and Jackson, as agents in these models can assign non-zero weight to themselves.

Hint: Recall that, for each turtle i, there are is primitive agentset called my-out-links. Hence, to ask each of the directed links originating from turtle i to perform some task, you could write:

```
 ask turtle i
   [
   ...
      ask my-out-links
     [
       ;; Do some task ...
     ]
   ...
   ]
end
```

Exercise 3: Stopping

Fill in the reporter stop?. The documentation should make this exercise self-explanatory.

Exercise 4: Updating Beliefs

Fill in the procedure update_beliefs. On each stage, turtles first calculate their newbeliefs by taking a weighted average of their neighbors' oldbeliefs. The weight that turtle i assigns to a neighbor turtle j is equal to the weight of the directed link from i to j. So if turtle i and turtle j are not neighbors, then turtle j's beliefs are not used to calculate turtle i's beliefs, nor vice versa. After all agents have updated their newbeliefs, their oldbeliefs should be set equal to their newbeliefs.