

Math 140 Schooling Behavior and Predator Strategy

Next step in our schooling behavior modeling: use your imagination to develop rules for how the fish and predator(s) interact. Feel free to search the web or scientific literature for ideas, or simply try out your own ideas. Our goal is to work through the modeling process, with the focus on developing and implementing an idea for a model and then evaluating its predictions. Try to keep the model as simple as possible as you incorporate your ideas—don't add lots of detailed rules all at once. It's always better to make one change at a time and check that you understand how it's affecting the outcomes before you move on to add the next change.

Ideally, try to create a system where the fish and predator can achieve an equilibrium (which may be steady or cyclic or a randomly fluctuating pattern in the populations). You may want to track “energy” like in the sheep/wolf model, and allow the fish and possibly the shark(s) to reproduce occasionally (or a shark to die if it doesn't catch enough fish). Or you may have other ideas—try them out!

During labs, I plan to chat with each of you to check on your progress and get a sneak preview of your model. To get help on implementing your ideas, you can of course ask during lab times, and you can also email me quick questions or stop by my office to talk about how to tackle harder issues. Don't let your limited knowledge of NetLogo hinder your ideas—the ideas should come first, then we'll figure out how to carry them out in the NetLogo environment. I highly recommend searching around on the web to learn about predator-prey strategies and behaviors that have been observed, to stimulate ideas for your modeling.

For this project, please work in groups of 1-2 people.

Project deliverables:

1. Brief demonstration of your model in class on Wed Oct 31. Please email me your NetLogo code (save as yourname.nlogo and email to tleise@amherst.edu by the beginning of class on Wed Oct 31). You don't need to prepare a formal presentation. We'll just run through lots of models, doing some simulations of each to see the different types of rules and resulting behaviors.
2. Report due Fri Nov 2, which should contain the following:
 - a. **Title and abstract** with a brief overview of your work.
 - b. **Modeling section** where you explain your model using the ODD protocol.
 - c. **Results section** with illustrations of what behaviors your model can produce and any interesting conclusions that can be drawn from model. Include graphs showing some of the relationships between parameters and outcomes. If you find ways to validate your model, also include that, but I don't expect much validation, as data will be difficult to obtain.
 - d. **Reference section** listing all sources used in your modeling work.