Evolutionary IPD Lab

Name_____, Section_____

The Game

In a standard prisoner's dilemma game played as a one-shot non-cooperative game, both players have a dominant strategy of playing defect. But in many situations we do not strategically interact with another person only once. Axelrod (1984) asked a very natural question: "When should a person cooperate, and when should a person be selfish, in an ongoing interaction with another person?" (Axelrod, 1984, p. vii). In a previous lab you explored Axelrod's IPD tournaments and saw that tit-for-tat was a strategy that did well. In this lab the focus changes to one of can a tendency to cooperate or defect in IPD situations spread among players. A simple agent-based model is used where each agent repeatedly plays a PD game with his/her 8 neighbors.

Each agent will randomly choose to either cooperate (blue) or defect (red) in the initial start of the model. At each cycle, each agent will interact with all of its 8 neighbors to determine the score for the interaction. Should an agent have cooperated, its score will be the number of neighbors that also cooperated. Should an agent defect, then the score for this agent will be the product of the Defection-Award multiple and the number of neighbors that cooperated (i.e. the agent has taken advantage of its neighbors that cooperated). In each subsequent round, the agent will remember its strategy from the previous round. For the next round, the agent will adopt the strategy of its neighbor that scored the highest in the previous round. Thus, agent's mimic the behavior of their neighbor who does well. We can then explore how the number of initial cooperating agents and the role of the defection-award multiple in influence whether cooperate or defect spreads through the society.

Lab Exercise

1. Go to http://mcbridme.sba.muohio.edu/ace/labs/

2. Click on the "EvolPD" link to call up the information page on the model.

3. You can run the model in your browser by click on the link or if you've downloaded NetLogo, you can run the model from the included NetLogo models library (File Menu: Models Library, then choose Social Science/Unverified/Prisoner's Dilemma/PD Basic Evolutionary) and run it from the desktop.

4. The controls in the model are:
   - *Setup Button*: Generates an initial random setup of the model. If you want to restart the simulation with a new random setup, make sure the simulation is not running before pressing the button.
   - *Go Button*: Starts the simulation running. Pressing "Go" a second time stops the simulation from running.
   - *Initial-Cooperation*: Sets the percentage of agents who initially select cooperate when setting up the simulation.
   - *Defection-Award*: Sets the multiplier that defectors receive, their payoff is the number of neighbors cooperate times the defection-award multiplier.

5. Play with the model. Press Setup and watch what happens. Adjust the Defection-Award slider while the simulation is running and note what happens. If you end up with all defect or all cooperate, just press "Go" to stop the simulation, press "Setup" to reset the simulation, and then "Go" to start again.

Things to Try:

Restart the simulation with a very low percentage initial-cooperation and a very low defection-award. What happens?

Restart the simulation with a very high percentage initial-cooperation and a very high defection-award. What happens?

Restart the simulation with initial-cooperation set to 50% and defection-award set to 1.50. What happens? Adjust the defection-award up and down as the simulation is running. What happens?

Things to Consider:

What determines when defection spreads through the society instead of cooperation (and vice-versa)?

Is it possible for a "stable" situation to exist in the society where defection and cooperation co-exist?