**Winter School Project: Introducing Modifications to LakeLand**

**Huayi Lin, Enver Miguel, and Claire McIlvennie**

**ABM Winter School, January 2018**

1. **Motivation and Research Question**

What is the impact of biased information on human behavior?

Introducing spatial components to the original Lakeland model

Introducing heterogeneity of utility functions through the gamma value

1. **Brief description of changes to base model (new functions, variables, entities, interface, details can be documented in Netlogo infotab)**

Introducing spatial components to the original Lakeland model

* Turtles can now move around in space. The speed at which they move is selectable by a slider.
* Turtles who are using mental models of imitation and social comparison look at a radius of turtles around them to make these decisions. This radius can be varied through a slider. In the original model turtles looked at all other turtles in the world when making decisions (perfect information).

Introducing heterogeneity of utility functions through the gamma value

* Added the ability for turtles to have different preferences in their utility function. Heterogeneity can be turned on/off through a switch in the interface. When heterogeneity is on, variability of the gamma can be determined through the slider “level\_of\_variability\_gamma”. This takes into account the gamma parameter from the interface slider and varies turtle gammas around this point.

Flocking Function

* Turtles can now moving in line with the nearest turtles with the same career.

Color and size of Turtles

* Turtles can change their colors according to their career and the size according to their time allocating to the career. The more time the turtles use on their career, the bigger the sizes.

1. **Model exploration (scenarios/experimental design, parameter settings, etc.)**

Initially sought to explore each of the changes in information on a basic version of the model

**Base version**: No variability gamma, no inequality aversion, no flocking. With variability of skills or thresholds, stochasticity, gamma = 0.5, LNS = 0.2 , Umin = 0.1,radius = 50, speed = 0.

**Test cases:**

* **Introducing spatial components:** 
  + **Movement**: Would hypothesize that introducing movement itself would not significantly change the results of the simulation since turtles are still able to see all other turtles in the world despite their location on the grid
  + **Radius**:Giving the turtles a specific radius within which they can imitate or inquire about other turtles strategies would introduce a level of imperfect information / bounded rationality - they can only seek information from a subset of the world – a small radius may not give the turtles an accurate picture of the world – can hypothesize that each turtle may be satisfied with their strategy less often (?) if they are no longer sampling with perfect information – therefore may see more switching between behavioral strategies of optimization / inquiring (?)
  + **Radius + Movement**: Combining these two could have interesting implications. The faster you move, the greater variety of turtles you will come in contact with, so perhaps this would enhance the effects of imperfect information since each turtle will constantly be sampling from a different population, potentially leading to greater fluctuations in uncertainty.
  + **Flocking:** When turtles are flocking, they may have greater chance to meeting the turtles with the same career. Thus the turtles may have bigger chance to maintain their current career than changing their career.
* **Variation in Gamma** 
  + **Variation in Gamma:** Before all turtles sampled from turtles with the same preference levels for income and leisure time. Introducing variation in these levels would mean turtles could be inquiring from or imitating turtles who have different preferences then them. Could imagine this could lead to lower levels of satisfaction (?) thus more optimization/inquiring behavior.
  + **Variation + Radius:**
  + **Variation + Fluctuations in Uncertainty or LNS Levels**

1. **Results**
2. **Reflections on results and exercise**

Even a simple model can generate unexpected results.

Future study can include following elements:

1. Add bias sampling of the information, memory, and competition into the model.

2. Consider additional spatial modifications, for example, add location of the lake and the mining site. Agents consume energy when fishing, mining or transferring from one career to another career.

3. Add other needs to the utility function, for example, environmental concerns, security, belongingness to the community.

***Please include your Netlogo code***