Exercise 2 (Team Exercise, 24 Points Total)　　　　　　　**Leigh Tesfatsion**
DUE: Tuesday, Febrary 3, 11:00am　　　　　　　　　**Econ 308, Spring 2009**

** Please note: Late Assignments will not be accepted – no exceptions!
Indiv/Teams will be asked to summarize their findings in class.

So How Do YOU Think "Segregation" Should Be Measured?

As discussed in Exercise 1, Thomas Schelling's famous Segregation Model illustrates how a city comprising agents of different "classes" (e.g., religions, races, ages, castes, etc.), initially highly diversified, might suddenly "tip" into a highly segregated city if subjected to a small shock (e.g., some agents move out). Despite the tremendous interest in this model, it is still not entirely clear (a) how best to measure the degree of "segregation" exhibited by any particular locational pattern; and (b) which structural aspects of the model are essential determinants of segregation and which are merely incidental.

Chris Cook's Schelling Demo [1] permits a user to set the initial values of various key structural features (*treatment factors*) and then to watch how the agent location pattern evolves over time conditional on these initial user specifications.

This exercise first asks each team to propose two distinct quantitative measures of "segregation" that appear to be potentially compelling ways to capture the intuitive idea of "segregation." It then asks each team to run systematic experiments with the Schelling Demo to experimentally investigate the extent to which a key structural feature of the Schelling Demo affects the degree of "segregation" displayed by the agent location pattern in accordance with each of these two measures. Finally, each team is asked to compare and contrast the degree to which each measure of segregation indeed appears to be satisfactory (or not) in view of these "segregation" findings.

Team assignments for Exercise 2 are appended below after the exercise questions.

References for Exercise 2:

[1] ** Christopher Cook, "Home Page for the Schelling Segregation Model: Demonstration Software" http://www.econ.iastate.edu/tesfatsi/demos/schelling/schellhp.htm

[2] ** Leigh Tesfatsion, "Experimental Design: Basic Concepts and Terminology" http://www.econ.iastate.edu/classes/econ308/tesfatsion/ExpDesign.pdf

Part A (6 Points): Construct Two Possible Segregation Measures Given the specific structural features of the Schelling Demo [1], construct and motivate the potential usefulness of TWO different **quantitative** measures for the degree of segregation displayed by any 8×8 agent location pattern that could arise in this model. For any given 8×8 agent location pattern, each of your measures should provide an answer to the question "to what degree does this pattern exhibit segregation"? These possible answers should range from "no segregation" to "complete segregation."

Part B (4 Points): Formulate an Hypothesis Choose a treatment factor for the Schelling Demo, i.e., a structural feature of the Schelling Demo that can be systematically varied by the user. Referring to reference [2] above, carefully formulate an hypothesis (conjecture) regarding how a **systematic change** in this treatment factor might affect the degree of "segregation" displayed by the agent location pattern "in the long run."

> **Important Note:** As clarified in Part C below, the initial seed for the pseudo-random number generator should NOT be chosen as a "treatment factor."

Part C (10 Points): Test Your Hypothesis Use the Schelling Demo to experimentally test the hypothesis you proposed in Part B for EACH of the two segregation measures you proposed in Part A. Specifically, carry out the following five steps:

1. Choose a range of values (at least three) to be tested for your chosen treatment factor in Part B, and report these values.

2. Set fixed values for all OTHER structural features of the Schelling demo, to be retained throughout all experimental runs, and report these fixed values. [Naturally, these fixed values should be such that at least some agent relocation will occur for each value of your selected treatment factor!]

3. For each value of your treatment factor to be tested, conduct N experimental runs ($N \geq 10$) of the Schelling Demo using N distinct initial seed values for the pseudo-random number generator.

4. For each value of your treatment factor to be tested, and for each run $n = 1, ..., N$ conducted for this treatment factor value, report:

   (a) the value of the treatment factor that is being tested;
   (b) the pseudo-random number seed value (the identifier for the run);
   (c) the degree of segregation displayed by the agent location pattern in time step M (the "long run"), where $M \geq 100$.

5. Referring to Ref.[2] for definitions, for each tested treatment factor value report the sample mean, sample standard deviation, and histogram for the degree of segregation displayed by the N runs in step M.

Part D (4 Points): Analyze Your Findings

As best you can, provide an explanation and interpretation for the experimental findings you reported in Part C. In particular, answer the following:

1. Do these findings provide any support for the hypothesis you proposed in Part B under EITHER of your two proposed segregation measures? Explain carefully.

2. Based on your findings, what conclusions can you draw about your two different proposed measures of segregation? Are they in basic agreement or do they give conflicting answers regarding the degree of segregation? Does one measure appear to you to dominate the other in terms of providing more intuitively compelling answers? Explain carefully.