Exercise 1 (Individual Exercise, 12 Points Total)   **Leigh Tesfatsion**
DUE: Thursday, January 22th, 11:00am   **Econ 308, Spring 2009**

** Please Note: Late Assignments Will Not Be Accepted – No Exceptions.

INTRODUCTION TO THE SCHELLING SEGREGATION MODEL

Back in the early 1970s, before the advent of commercially available personal computers circa 1974, Thomas C. Schelling (2005 Nobel Laureate) devised deceptively simple models to investigate ideas on complexity and self-organization.

In particular, Schelling devised a checkerboard model to demonstrate 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). The interesting aspect of this model is that the tipping can occur even if each individual agent has only a mild preference for not becoming isolated among neighbors of a different class. This famous model is now referred to as the "Schelling Segregation Model" or, alternatively, as the "Schelling Tipping Model."

Chris Cook (Econ 308 student, 2002; ISU B.S. Comp S, 2004) has developed an open-source interactive computer demo of the Schelling Segregation Model. Exercise 2 will ask you to use this demo to conduct systematic experiments testing the implications of different possible quantitative measures of "segregation." In preparation for Exercise 2, this first warm-up Exercise 1 asks you to explore the demo's structural features and capabilities.

Chris's Schelling Segregation Model Demo [2], developed in $C\#$/.Net, is freely available for downloading and installation (with an automated installation wizard). It comes with a ready-made and easy to use graphical user interface; no programming of any kind is required for its use. However, it does require a prior installation of .Net (now commonly pre-installed on many Windows-based pcs); directions for accessing and downloading .Net are also available at [2].

References for Exercise 1:

[1] ** Thomas C. Schelling, *Micromotives and Macrobehavior*, W. W. Norton & Company, New York, 1978, **Chapter 4 ("Sorting and Mixing: Race and Sex"), pages 137-155** ATTACHED

[2] ** Chris Cook, **"Homepage for the Schelling Segregation Model: Demonstration Software"** http://www.econ.iastate.edu/tesfatsi/demos/schelling/schellhp.htm

[3] ** Leigh Tesfatsion, *"Introduction to Cellular Automata,"* Syllabus Section I.A, http://www.econ.iastate.edu/classes/econ308/tesfatsion/CellularAutomataIntro.LT.pdf

Exercise Questions (12 Points Total):

Q1: (2 Points) Carefully describe (in words) the essential structural features of Schelling's original segregation model (hereafter referred to as the *Schelling Model*) as set out by Schelling in the attached reading [1], pages 147-155. In particular:

- (i) discuss the extent to which the Schelling Model satisfies (or differs from) the standard definition of a 2D cellular automaton as described in Ref.[3].
- (ii) clarify what important social issue(s) the Schelling Model was meant to address.

Important Note: Here you are being asked to clarify the *structural features* of the Schelling Model (e.g., permitted agent types, etc.) and to discuss its intended purpose. You are *not* being asked to summarize the results of any experiments run with the Schelling Model.

Q2: (4 Points) Briefly but carefully answer the following four questions:

- (i) Carefully describe (in words) the general structural features of Chris Cook's Schelling Segregation Model Demo [2], hereafter referred to as the *Schelling Demo*.
- (ii) In what ways, if any, does the Schelling Demo *capture* the general structural features of the Schelling Model described in Q1?
- (iii) In what ways, if any, does the Schelling Demo *fail to capture* the general structural features of the Schelling Model described in Q1?
- (iv) In what ways, if any, does the Schelling Demo include *additional* structural features not envisioned in the original Schelling Model?

Important Note: Here you are being asked to discuss the *structural features* of the Schelling Demo in comparison with the Schelling Model. You are *not* being asked to summarize the results of any experiments run with the model or the demo.

Q3: (2 Points) In the Schelling Demo, various parameter values (i.e., *initial conditions*) must be specified by the user before any experiments can be run. Carefully identify what types of parameter values a user must specify (either by default or by an active setting) prior to running an experiment with the Schelling Demo.

Q4: (4 Points) Carefully construct a *flow diagram* for the Schelling Demo, i.e., a diagram consisting of boxes and directed arrows among the boxes that explains the basic flow of events in the Schelling Demo once a user has specified all needed initial conditions. Try to make your flow diagram efficient as well as accurate, i.e., try to minimize the number of boxes/arrows you use to represent the flow of events.