

Conducting Experiments with Chris Cook's Schelling Demo

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 (chrisdcook@gmail.com) has developed demonstration software for the Schelling Model, hereafter referred to as the "Schelling Demo." Automatic installation software for installing the Schelling Demo on a pc is available for downloading at the ACE Interactive Demos site at <http://www.econ.iastate.edu/tesfatsi/acedemos.htm>.

The Schelling Demo 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 asks each team to use 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 the long run."

References for Exercise 2:

- [1] ** Leigh Tesfatsion, "Experimental Design: Basic Concepts and Terminology", linked in section I.A of my syllabus, accessible at <http://www.econ.iastate.edu/classes/econ308/tesfatsion/expdesign.pdf>
- [2] ** Christopher Cook, "Home Page: The Schelling Segregation Model Demo" (htm), ON-LINE at <http://www.econ.iastate.edu/tesfatsi/demos/schelling/schellhp.htm>

Part A: Construct a Measure of Segregation

Given the specific structural features of the Schelling Demo, construct a simple but informative measure for the degree of segregation (zero, low, moderate, or high) displayed by any 8×8 agent location pattern that could arise in this model. That is, given any 8×8 agent location pattern, your measure should answer the question “to what degree (zero, low, moderate, or high) does this pattern exhibit segregation?”

Part B: 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 reading [1] 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: Do **NOT** choose the initial seed value for the pseudo-random number generator as your “treatment factor.” As your measure of segregation, use the measure you constructed in Part A above. If either of the two hypotheses you formulated for Exercise 1:Q5 meets the stated requirements - that is, it involves a carefully formulated conjecture regarding how a systematic change in a treatment factor affects the degree of segregation - you can use this hypothesis here for Part B.

Part C: Test Your Hypothesis within an Experimental Design

Use the Schelling Demo to experimentally test the hypothesis you proposed in Part B. Specifically:

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 $n = 1, \dots, N$ 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. For each tested treatment factor value, report the mean and standard deviation for the degree of segregation displayed by the N runs in step M .

Part D: Analysis of Findings

As best you can, provide an explanation and interpretation for the experimental findings you reported in Part C. Do these findings provide any support for the hypothesis you proposed in Part B? Or does your hypothesis in Part B appear to be inconsistent with these findings? Explain carefully.