

Using Exact Sciences Modeling Tools to Understand Social Phenomena

Course #: 55772

Homework #1: The Schelling model

General Instructions:

- Unless stated otherwise, submission is done individually. We rely on trust. You may discuss assignments verbally, but do not share solutions with other students.
- You may use examples from the Internet, but use them as an inspiration and make them your own.
- Your homework should be submitted through Moodle. Please zip your files to ex_1_First_last.zip (with your first and last name). The zip should include: 1) a PDF document (no .docx and no jpg) with your responses, pseudo code, explanations, insights etc. 2) Your code files. Your code will not be tested, but we might use it as a reference in case we need clarifications. Please keep good coding standards, and document your code properly. You may use MatLab, Python, C/C++, or Java. If you want to use other programming language, please get our approval first.
- Please use proper language and correct grammar (Hebrew or English), explain clearly what you do, use graphs and charts if needed.
- No scanned handwritten works please.
- We respect the business etiquette: No late submission.

Grading

The homework grading will be based on the following parameters:

1. Model compatibility: how does your model matches the description?
2. Implementation: Based on the pseudo-code (we might use the code if clarifications are needed).
3. Insights quality: Try to find non-trivial insights.
4. Creativity
5. Visualization: Your insights should pop-out of the figures you choose.

Tips for visualization:

- Label each figure
- Explain each figure in the text
- Label each axes + what are the units?
- Clean figures: Avoid unnecessary details in figures.

Task 1: Recalling the basic Schelling model

Think about the Schelling model studied in class. Describe what the model's building blocks are: purpose, assumptions (that's tricky!), parameters, and variables. Be accurate and comprehensive as possible.

Task 2: Implementing the basic Schelling model

Please implement the Schelling model as studied in class. For the sake of uniformity use a "town" of 30X30. Start with two populations "yellow" and "blue" with symmetric preferences (yellow prefer blue in the same way that blue prefer yellow). Start with a random allocation of people in the town.

- The "threshold" is the percentage of neighbors like you, below which a person is unhappy and wants to move.
 - Define the level of segregation as the number of people surrounded only by people from their type (ignore the empty places).
 - Make sure your model counts the number of time periods till it converges.
- a. Test the model to see you obtain results similar to what we saw in class.
 - b. Write a pseudo code describing how you implemented the model
<https://www.wikihow.com/Write-Pseudocode>
 - c. Run the model multiple times and see how the level of segregation and the time to convergence depend on the following parameters:
 - 1. Number of empty places.
 - 2. The threshold.
 - 3. The initial proportion between yellow and blue units.

Draw graphs to describe each of these dependencies and explain your insights.

Task 3: Expanding the basic Schelling model

Think of one way to expand the model, based on a realistic behavior. For example, you can choose asymmetric preferences, people who can randomly relocate also if they are happy, relocation in a certain radius, or any other behavior that might be relevant and interesting.

- a. Describe the extension and why it is important.
- b. Implement the extension in the code.
- c. Run the code for multiple times and explain your insights. Think of interesting and meaningful ways to present the results. What do you see? What are the managerial implications?

Be creative, use your modeler's mind, and have fun!