

Appendix — A Description of the Schelling Model of Racial Segregation

This model was originally described in: Schelling, Thomas C. 1971. Dynamic Models of Segregation. *Journal of Mathematical Sociology* **1**:143-186.

We describe what we take to be its essence below.

Static structure

There is a large rectangular 2D grid of locations of fixed dimensions. Each location can be occupied by a black counter, a white counter, or be empty. Each location has a 'neighbourhood' of the eight adjacent locations (including diagonally). There are a fixed number of black and white counters on the grid, so that some of the locations are empty.

Temporal structure

There is a series of discrete time periods, starting at an initial period, over which the dynamics occur.

Important parameters

- The number of black counters.
- The number of white counters.
- The width and height of the grid.
- A parameter, C , between 0 and 1 for the proportion of minimum proportion of neighbours that must be the same colour in order to stay put.

Initialisation

The black and white counters are placed randomly on the grid at an initial time period so that there is at most one counter in each location.

Dynamics

For each counter, selected in turn, at each time period do the following:

1. *Count up the total number of counters in the neighbourhood, T .*
2. *Count up the total number of counters of the same colour as the selected one in the neighbourhood, S .*
3. *If S/T is less than C and there is at least one empty location in the neighbourhood, pick one such empty location at random and move to it, otherwise stay put.*

Results claimed as significant

There is a critical value for parameter C , such that if it is above this value the grid self-organises into segregated areas of single colour counters. This is lower than a half.

Intended interpretation

Even a desire for a small proportion of racially similar neighbours might lead to self-organised segregation.

Other details considered unimportant but which were necessary for the implementation

Size, shape and edge topology of the grid: the results can only be depended on when the movement of counters is not additionally constrained by the topology of the grid. This means that the grid has to be sufficiently large and not have a too extensive edge. Typically simulations have been performed on a 20x20 grid with the edges 'wrapped around' left to right and top to bottom, so that the surface has the topology of a torus and no edges.

The order in which the counters are selected: this does not seem to be significant, but either: counters are randomly selected individually; some order has to be imposed on the selection of counters (e.g. a randomly determined order); or some conflict-resolution method employed if they are processed in parallel and counters select the same location to move to.

The pseudo-random generator: this is used to decide the initial distribution of counters and the location to move to if there is more than one available. In fact, the results would probably still hold even with non-random generators as long as the movements occurred equally in all directions and were not linked to the selected counter's colour or the distribution of other counters on the board.

Source code

The source code for an implementation of this model in SDML can be found at:

<http://sdml.cfpm.org/examples/schelling.sdm>

This module requires SDML release 3.6 or later. For details of obtaining SDML see:

<http://sdml.cfpm.org>

Example output from running this code

