# GeoInformatics · Practical 4

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In this practical, you are going to explore some principles of social networking. It builds on the model developed in practical 3 with now a distinction of agents types (three different colors) and an extension of the location rules to consider other agents types.

## 1 Schelling's paradigm

Thomas Schelling (1971) is credited for the development of the first social agent-based model in which agents represent people, and agent interactions represent a socially relevant process: segregation emerging from migratory movements of households. In his paper, Schelling showed that a small preference for one's neighbours to be of the same color could lead to total segregation. He used coins on graph paper to demonstrate his theory by placing pennies and nickels in different patterns on the "board" and then moving them one by one if they were in an "unhappy" situation. The positive feedback cycle of segregation in-group preference can be found in most human populations, with great variation in what are regarded as meaningful differences: gender, age, race, ethnicity, language, sexual preference, religion, ... Once a cycle has begun, it has a self-sustaining momentum (Schelling, 1971, and wikipedia).

**TASKS:**
(1) Modify the agents evaluation rules so they search for locations with a high local density of similar agents. Also add some code (in Agent) to check the evaluation of the current cell against a satisfaction threshold, and move if the current evaluation is too low.
(2) Now modify the evaluation function so that it uses a sum of both the type- and density-based evaluations, weighted according to the relevant parameters. Can you set up the model so that agents are divided both by density preference and type preference? Is there a conflict between the two preferences, or are they orthogonal?

## 2 Social networks: family links

Location rules leading to segregation work both way: either "I want to be the closest possible to this type of agents" or "I want to be the further away from that type of agents" (where the type is not necessarily the same of my own). Other types of relationships can be considered in the process of location decision making. An obvious one is relatives'. It is commonly accepted that most people tend to live in the same area as their parents and relative. Some may consider not living too close, others cannot imagine living that far away.

In Repast, this can be modelled with a "Network" projection, which contains edges between related agents. The links here are non-directional, so it does not matter which way round the agents are connected. By default, the model creates links between parents and their children.

**TASKS:**
(3) Complete the getSocialPreference() function so that it uses the distance from each agent in the social network to evaluate cells. You can do this in different ways, but the suggestion is that you use the distance from associates as a function to be minimised, and try to scale it appropriately, e.g.

$$1 - \frac{\sum_{i=1}^{n} d_i}{n * s}$$

(where $d_i$ is the distance between the cell and the cell inhabited by the $i$th agent in the network, and $s$ is the distance along one edge of the city grid. So $\frac{d_i}{s} \leq \sqrt{2}$ and the chances are that the function is in the range [0-1])
(4) Add the social preference result to your agent's evaluation function.
(5) Run the model and compare with previous results. Does the parental link have an influence on the segregation dynamic (acceleration or deceleration; different self-sustaining momentum)?

# 3 Social networks: friendship

Another important type of bindings human beings create is friendship. One choses one's friends, not one's family. Friends can therefore be significantly different from us, in many ways.

**TASKS:**
(5) Modify the Demographics module to create links between newborn agents according to the apropriate parameter. The Demographics module keeps a list of newborn babies each year - you should create links between these, without regard for color, in the indicated place in the module. Also, modify it to create links for any agents immigrating in, as part of the addMature() function.
(6) Experiment with the weights for the parts of the evaluation function. Try to find the boundary where friendship overcomes the segregation from type preference.

# References

Schelling, T. C., 1971. Dynamic models of segregation. Journal of mathematical sociology 1 (2), 143–186.