

Pietro Terna

Agent-based models for exploring social complexity, with a final example on simulating groups' behavior, via rules and scenarios

Abstract

Thinking to agent-based models as artifacts, useful to explore economic complexity, means to introduce three concepts: (i) on the technical side, the agent-based methodology; (ii) in the social science perspective, the idea of building artifacts also in the social domain; (iii) in a more general view, the idea of complexity. With an impressive image, this way of researching involves the application of the Galileo's method in social sciences.

Remembering the theoretical roots in cybernetics and, more recently, in complexity science, we need also technical roots, with the capability of building models that could be accepted by a wide audience, comparing classical model and new ones, or proposing as well hybrid structures.

Finally, we need to have a close look to agent-based models and their structures, with simple and complicated methodologies and to pay a lot of attention to the abilities of the agents, mainly in mimicking the human capability of learning and adapting.

Accompanying material for the introductory part:

-P. Terna (2013), A Complex Lens for Economics, or: About Ants and their Anthill, in "Spazio filosofico", 7, pp. 167-177 <http://www.spaziofilosofico.it/wp-content/uploads/2013/01/Terna-English.pdf>

-P. Terna (2013), Learning agents and decisions: new perspectives, in "Law and Computational Social Science", upcoming, http://eco83.econ.unito.it/terna/materiale/terna_def.pdf

An application: moving from the fascinating complex system of actions and counteractions designed by the collective behavior of a modern society, we propose a quite simple simulation model, to reason about people changing their mind about opinions, decisions, reference groups. The model has two underpinning structures: (i) groups of people and (ii) rule systems, to which people belong. To cope with this kind of subjects, it is natural to employ the agent-based simulation technique.

We propose a *machine* useful to experiment with the effects of different situations, described by the system of rules. The *machine* is running on-line at <http://goo.gl/IFjJm>, without installing anything locally, or you can download it from the same address.

The ruleScenarios.nlogo model is built with NetLogo (<http://ccl.northwestern.edu/netlogo/>) and can generate very different situations. The current application is about two groups: one based upon a bad way of behaving (an example: using public resources for personal and private advantages) and the other one following the correct way of behaving. We have from two to four systems of rules, with people adopting each specific system with different dynamics of the opinions about the two groups, reinforcing the first one or the second one or being neutral. The reinforcement perspective is realized punishing/rewarding badly/well behaving groups or vice versa.

The scenarios emerging from simple systems of rules are surprisingly realistic and can explain several current political situations around the world.