AKSOE 8: Economic Models and Evolutionary Game Theory II

Time: Tuesday 14:00–15:30 Location: H8

AKSOE 8.1 Tue 14:00 H8

The Role of Social Structure in the Emergence of Cooperation — •Carlos P. Roca[1], José A. Cuesta[1], Ángel Sánchez[1,2], Víctor M. Eguíluz[3], and Maxi San Miguel[3] — [1]Grupo Interdisciplinar de Sistemas Complejos (GISC), Departamento de Matemáticas, Universidad Carlos III de Madrid, Spain — [2]Instituto de Biocomputación y Física de Sistemas Complejos (BIFI), Universidad de Zaragoza, Spain — [3]Instituto Mediterráneo de Estudios Avanzados (IMEDEA), CSIC-UIB, Palma de Mallorca, Spain

The emergence of cooperation is currently one of the most fundamental open questions in evolutionary game theory. Since the seminal work of Nowak and May [1] it has been widely accepted that cooperative behavior is favored by the social structure of a population. However, more recent studies [2,3] have limited or contradicted this result, showing that this enforcement varies largely with the specific game or network considered. It is then natural to ask to what extent does social structure support the emergence and stability of cooperation. To answer this, we have performed an extensive and systematic simulation of evolutionary games on networks, taking into account the different possibilities of social dilemmas, population dynamics (updating rules) and network structures. We show that the support of cooperative behavior is not universal but only occurs in particular combinations of games, updating rules and networks.

[1] M. A. Nowak and R. M. May, *Nature* **359**, 826 (1992)
[2] C. Hauert and M. Doebeli, *Nature* **428**, 643 (2004)
[3] F.C. Santos, J.M Pacheco et al, *PNAS* **103**, 3490 (2006)

AKSOE 8.2 Tue 14:30 H8

A multi-level selection model for the emergence of social norms — •Francisco Santos — IRIDIA, CoDE, Université Libre de Bruxelles, Brussels, Belgium

We develop a multi-level selection model in the framework of indirect reciprocity[1]. Using two levels of selection, one at the individual level and another at the group level, we propose a competitive scenario among social norms, in which all individuals in each group undergo pairwise interactions, whereas all groups also engage in pairwise conflicts, modeled by different games. Norms evolve as a result of groups* conflicts whereas evolution inside each group promotes the selection of best strategies for each ruling social norm.

Different types of inter-group conflict are considered[2]. The proposed evolutionary model leads to the emergence of one of the *leading eight* social norms, obtained recently by Ohtsuki and Iwasa[3], irrespective of the type of conflict between groups employed. This reputation assignment rule gives rise to a stern and unambiguous response to each individual behavior, where prompt forgiving coexists with implacable punishment.

[1] Chalub, Fabio A. C. C., Santos, F. C., Pacheco, J.M., J Theor Biol 271(2) (2006).

[2] Pacheco, J. M., Santos, F. C., Chalub, F. A. C. C., PLoS Comput. Biol. (in press).

[3] Ohtsuki H, Iwasa Y, J Theor Biol 239(4) (2006).

AKSOE 8.3 Tue 15:00 H8

Evolutionary learning in auctions — •Konrad Richter — Gardegasse 3/9 1070 Vienna; konrad_richter@mckinsey.com

Current auction theory relies crucially on the assumption that all bidders are perfectly rational and therefore bid homogeneously according to their Nash Equilibrium bidding strategies. This paper investigates computationally via an Agent Based Model whether evolutionary learning - in particular Best Response Learning - in repeated auctions could justify this assumption of NE bidding.

The simulations show that evolutionary Best Response learning does only lead for auction formats with dominant strategies to the NE. In general, however, the NE is not reached. Instead, repeated auctions show non-trivial dynamics such as clustered volatility and autoregressive behavior. This dynamics leads to greater risks for sellers and buyers and to a suboptimal allocation of goods.

In conclusion, the paper argues that auction theory could benefit from focusing more on the dynamics of repeated auctions than only on the properties of Nash Equilibria and highlights some potential future research fields