Nonlinear Sciences > Adaptation and Self-Organizing Systems

Emergence of grouping in multi-resource minority game dynamics

Zi-Gang Huang, Ji-Qiang Zhang, Jia-Qi Dong, Liang Huang, Ying-Cheng Lai

(Submitted on 13 Apr 2012)

TheMinority Game (MG) has become a paradigm to probe complex social and economical phenomena where adaptive agents compete for a limited resource, and it finds applications in statistical and nonlinear physics as well. In the traditional MG model, agents are assumed to have access to global information about the past history of the underlying system, and they react by choosing one of the two available options associated with a single resource. Complex systems arising in a modern society, however, can possess many resources so that the number of available strategies/resources can be multiple. We propose a class of models to investigate MG dynamics with multiple strategies. In particular, in such a system, at any time an agent can either choose a minority strategy (say with probability p) based on available local information or simply choose a strategy randomly (with probability 1 - p). The parameter p thus defines the minority-preference probability, which is key to the dynamics of the underlying system. A striking finding is the emergence of strategy-grouping states where a particular number of agents choose a particular subset of strategies. We develop an analytic theory based on the mean-field framework to understand the "bifurcation" to the grouping states and their evolution. The grouping phenomenon has also been revealed in a real-world example of the subsystem of 27 stocks in the Shanghai Stock Market's Steel Plate. Our work demonstrates that complex systems following the MG rules can spontaneously self-organize themselves into certain divided states, and our model represents a basic mathematical framework to address this kind of phenomena in social, economical, and even political systems.

Comments: 10 pages,8 figures and a real word example
Subjects: **Adaptation and Self-Organizing Systems (nlin.AO)**
Cite as: **arXiv:1204.2867v1 [nlin.AO]**

Submission history

From: Jiaqi Dong [view email]
[v1] Fri, 13 Apr 2012 02:57:05 GMT (609kb)

Which authors of this paper are endorsers?