



## Illusory versus Genuine Control in Agent-Based Games

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In the Minority, Majority and Dollar Games (MG, MAJG, \$G), synthetic agents compete for rewards, at each time-step acting in accord with the previously best-performing of their limited sets of strategies. Different components and/or aspects of real-world financial market are modelled by these games. In the MG, agents compete for scarce resources; in the MAJG agents imitate the group in the hope of exploiting a trend; in the \$G agents attempt to successfully predict and benefit from trends as well as changes in the direction of a market. It has been previously shown that in the MG for a reasonable number of preliminary time steps preceding equilibrium (Time Horizon MG, THMG), agents' attempt to optimize their gains by active strategy selection is "illusory": The calculated hypothetical gains of their individual strategies is greater on average than agents' actual average gains. Furthermore, if a small proportion of agents deliberately choose and act in accordance with their seemingly worst performing strategy, these outperform all other agents on average, and even attain mean positive gain, otherwise rare for agents in the MG. This latter phenomenon raises the question as to how well the optimization procedure works in the MAJG and \$G. We demonstrate that the illusion of control is absent in MAJG and \$G. In other words, low-entropy (more informative) strategies underperform high-entropy (or random) strategies in the MG but outperform them in the MAJG and \$G. This provides further clarification of the kinds of situations subject to genuine control, and those not, in set-ups a priori defined to emphasize the importance of optimization.

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