Robustness against Longer Memory Strategies in Evolutionary Games.

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Abstract

In our daily life, we have to make our decisions with our restricted abilities (bounded rationality), which may be developed through learning and evolution that utilize our *past experiences*. Recently, such evolutionary phenomena have been studied by many researchers using evolutionary game settings, where *repeated games* are played by finite state automata (players), especially after the analysis and computer experiment on the repeated prisoners dilemma by Axelrod.

In this work, we investigate the evolutionary phenomena in 2x2 games (2-player 2-strategy games) both analytically and by means of computer simulations. First, we discuss the *effective memory size* of finite automata to remember past experiences, and show that if fthere exist a Neutral Stable Strategy of the effective memory size that is also in Pareto optimal state, then it cannot be invaded by any players with longer memory size. Second, we the possibility of open-ended evolution when there isn't any effective memory size for a game. Third, we found there are three kinds of rules to form stably cooperative societies in 2x2 games.

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