

The Influence of Gossip on the Absorption Probabilities in Moran Process

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Abstract : Getting to know the agents, i.e., identifying the free riders in a population, can be considered one of the main challenges in establishing cooperation. An ordinary memory-one agent such as Tit-for-tat may learn “who is who” in the population through direct interactions. Past experiences serve them as a landmark to know with whom to cooperate and against whom to retaliate in the next encounter. However, this kind of learning is risky and expensive. A cheaper and less painful way to detect free riders may be achieved by gossiping. For this reason, as part of this research, a special type of Tit-for-tat agent was designed – a “Gossip-Tit-for-tat” agent that can share data with other agents of its kind. The performances of both strategies, ordinary Tit-for-tat and Gossip-Tit-for-tat, against Always-defect have been compared in the finite-game framework of the Iterated Prisoner’s Dilemma via the Moran process. Agents were able to move in a random-walk fashion, and they were programmed to play Prisoner’s Dilemma each time they met. Moreover, at each step, one randomly selected individual was eliminated, and one individual was reproduced in accordance with the Moran process of selection. In this way, the size of the population always remained the same. Agents were selected for reproduction via the roulette wheel rule, i.e., proportionally to the relative fitness of the strategy. The absorption probability was calculated after the population had been absorbed completely by cooperators, which means that all the states have been occupied and all of the transition probabilities have been determined. It was shown that gossip increases absorption probabilities and therefore enhances the evolution of cooperation in the population.

Keywords : cooperation, gossip, indirect reciprocity, Moran process, prisoner’s dilemma, tit-for-tat

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