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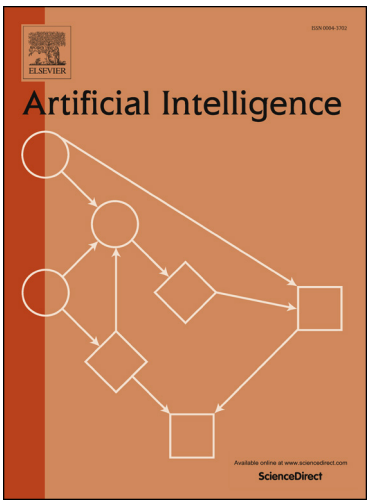

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Incentive-based Search for Efficient Equilibria of the Public Goods Game

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Abstract

The "best-shot" public goods game is a network game, defined on a social network. The simple version of the public goods game (PGG) has a fixed utility for a player who has at least a single neighbor buying the good. Players in the general version of PGG have additional utility when multiple neighbors purchase the good. The general version of the public goods game is shown to be a potential game, establishing the convergence to a stable state (i.e., a pure Nash equilibrium – PNE) by best-response dynamics. One can think of best-response dynamics as a distributed algorithm that runs in a fixed order of players/agents and is guaranteed to converge to a PNE.

A new distributed algorithm is proposed for finding PNEs with improved efficiency by the use of transfer of payoffs among players. For the simple version of PGG, it is shown that the proposed algorithm can stabilize an outcome that maximizes social welfare. For the general version of the game, the proposed procedure transforms any initial outcome into a stable solution at least as efficient as the initial outcome by using transfers. An extensive experimental evaluation on randomly generated PGGs demonstrates that whereas pure best-response dynamics converges on stable states that have lower efficiency than the initial outcome, the proposed procedure finds PNEs of higher efficiency.

Keywords: Public Goods game, Equilibria search, Payoff transfers

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