Need-based transfers and account-keeping in social networks:

How do alternative cooperative strategies scale-up?

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Results

NBT strategy outperformed AK strategy in small networks (i.e., \( N \leq 10 \), but not \( n = 100 \) – see Fig. 1 below). Moreover, for small networks (i.e., \( N = 6 \)) the AK strategy makes the system collapse for all topologies, except for the preferential attachment network. These results suggest that in volatile environments the resilience of a social network is determined by the nature of connections more than by the randomness of the distribution of them. The analysis of the transactions in networks has shown that there is significant difference between the average number of transactions per capita per round in networks of agents adopting NBT strategy and AK strategy (see Fig. 2 below). Finally, the Gini coefficient (Gini 1909) analysis has shown that the inequality of the distribution of resources (see Fig. 3 below) is lower in small networks of agents adopting NBT strategy than in networks of agents adopting AK strategy.

Methods & Materials

We use an agent-based model (Railsback and Grimm 2012) extending Aktpis et al 2011 to a multiplayer network where agents may interact with one another in different network topologies; simulations were run using NetLogo 4.0.1 (Wilensky 1999). Statistical analyses were performed using R 3.1.3 (R Core Team 2014).

Transfer Algorithms

Need-based transfers
Ask when in need
Give if able

Account-keeping
Accounting system with memory for
• Size of debt/credit
• Time incurred
Specified parameters for:
• Maximum tolerated delay
• Probability of repayment (given sufficient resources)

References


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