



Research article

On the spread of charitable behavior in a social network: a model based on game theory

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Abstract: Many people worldwide depend on charitable donations to survive. Consider a social network engaged in charitable activities. Let this network be composed of individuals with heterogeneous donation behaviors: there are individuals that are influenced by the neighborhood activity and individuals that act by themselves. In this article, a model formulated in terms of a spatial iterated game is proposed to investigate the time evolution of the number of donors in this social network. In the proposed model, the population spatial structure is represented by a three-dimensional torus and the social interactions are represented by a payoff matrix. Here, the payoffs are a measure of the feeling of personal satisfaction for making (or not) a charitable contribution. Numerical simulations are performed in order to find out how the population size, the payoff for simultaneous donations, the probability of spontaneous donation, and the proportions of the distinct charitable behaviors affect the number of donors. The simulations reveal that an increase in the proportion of impure altruistic behavior improves the engagement in charitable projects if the donations motivated by pure altruism occur with low probability. The practical implications of this study can be especially relevant in times of economic crisis, like the one we are experiencing.

Keywords: altruism; charitable behavior; game theory; population dynamics; social network

1. Introduction

In any country, there are people who are going through a difficult life situation. This difficulty can have been caused by an epidemic [1], a natural disaster [2], a war [3]; however, one of the primary reasons for a hard life is poverty [4, 5]. The scarcity of financial resources to get safe shelter, clean water, nutritious food, adequate sanitation, and medical relief can result in a life-threatening condition. In 2020, about 800 million people in the world faced hunger [6]. The recent COVID-19 pandemic pushed tens of millions of people into extreme poverty, by disrupting their livelihoods [7].