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Group-Based Strategy Diffusion in Multiplex Networks with Weighted Values

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HIGHLIGHTS

- Explore strategy diffusion in multiplex networks with weighted values.
- Consider the impact force and the reactive force.
- Reveal the influence of interlayer interaction tight degree.
- Propose a new perspective for community level diffusion.

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ABSTRACT

The information diffusion of multiplex social networks has received increasing interests in recent years. Actually, the multiplex networks are made of many communities, and it should be gotten more attention for the influences of community level diffusion, besides of individual level interactions. In view of this, this work explores strategy interactions and diffusion processes in multiplex networks with weighted values from a new perspective. Two different groups consisting of some agents with different influential strength are firstly built in each layer network, the authority and non-authority groups. The strategy interactions between different groups in intralayer and interlayer networks are performed to explore community level diffusion, by playing two classical strategy games, Prisoner's Dilemma and Snowdrift Game. The impact forces from the different groups and the reactive forces from individual agents are simultaneously taken into account in intralayer and interlayer interactions. This paper reveals and explains the evolutions of cooperation diffusion and the influences of interlayer interaction tight degrees in multiplex networks with weighted values. Some thresholds of critical parameters of interaction degrees and games parameters settings are also discussed in group-based strategy diffusion.

1. Introduction

With the deeper understanding of complex networks, the real social networks are regarded as networks of networks instead of as single isolated entities. The multiplex networks are composed of two or more layers of sub-networks [1,2], and their penetration properties and robustness are researched on diverse areas of complex networks [3]. Specially, social dilemmas and the strategy diffusion on the multiplex social networks have been paid greater attentions in the last years [4,5,6]. Strategy interactions on multiplex networks are generally modeled as evolutionary game theory [7,8], which helps to understand the cooperative behaviors and mechanism between selfish individuals as well as sub-networks. The network reciprocity [9,10,11,12] is explored in the evolutions of cooperation by playing two-person games in different type of networks [13,14,15,16].

There are many significant progresses in the understanding of spreads and evolutions of cooperative behaviors in multiplex networks. Z. Wang et al. showed that the interdependence between networks self-organizes so as to

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