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Partition signed social networks via clustering dynamics

Jianshe Wu*, Long Zhang, Yong Li, Yang Jiao
Key Laboratory of Intelligent Perception and Image Understanding of Ministry of Education of China,
Xidian University, Xi'an 710071, China
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Abstract

Inspired by the dynamics phenomenon occurred in social networks, the WJJLGS model is modified to imitate the clustering dynamics of signed social networks. Analyses show that the clustering dynamics of the model can be applied to par tition signed social networks. Traditionally, blockmodel is applied to partition signed networks. In this paper, a detailed dynamics-based algorithm for signed social networks (DBAS) is presented. Simulations on several typical real-world and illustrative networks that have been analyzed by the blockmodel verify the correctness of the proposed algorithm. The efficiency of the algorithm is verified on large scale synthetic networks.

Keywords: Graph partitioning; Signed social networks; Clustering dynamics; Community detection; Complex dynamical networks.

1. Introduction

Social relations/links between actors may be positive or negative, for example, friendship/hostility, attract/exclude, like/dislike, and respect/disrespect between individuals [1,2]. The networks that include both positive and negative links are called signed social networks in the field of social science, and the networks with only positive links are called positive social networks [3,4]. Partitioning the signed social networks is quite different from partitioning the positive social networks, where the network is partitioned into several communities with dense links in each community and sparse links between communities [5-7]. By maximizing one of several cautiously defined criterion functions [8-10], the positive social networks can be properly partitioned via dedicatedly designed algorithms (known as community detection) [11-14]. On the other hand, it is well known that the dynamics of a network is correlated with its structure [15-17]. The community structure of a positive social network may be observed from the network dynamics [18-26] or cluster synchronization [27-30]. In cluster synchronization, the nodes in the same cluster are synchronized but desynchronized with respect to different clusters. Strict cluster synchronization usually requires a control scheme [27-30], thus it is difficult to be applied to community detection directly. In Ref.[24], the WJJLGS model is proposed to imitate the clustering dynamics of positive networks and used for community detection.

*Corresponding author. Tel.: +86 29 88202279.
E-mail: jshwu@mail.xidian.edu.cn.