COMMUNITY DETECTION ALGORITHM
BASED ON LOCAL EXPANSION K-MEANS

L. Li, *K. Fan,* *Z. Zhang,* *Z. Xia*

Abstract: Community structure implies some features in various real-world networks, and these features can help us to analysis structural and functional properties in the complex system. It has been proved that the classic k-means algorithm can efficiently cluster nodes into communities. However, initial seeds decide the efficiency of the k-means, especially when detecting communities with different sizes. To solve this problem, we improve the classic community detection algorithm with Principal Component Analysis(PCA) mapping and local expansion k-means. Since PCA can preserve the distance information of every node pairs, the improved algorithm use PCA to map nodes in the complex network into lower dimension European space, and then detect initial seeds for k-means using the improved local expansion strategy. Based on the chosen initial seeds, the k-means algorithm can cluster nodes into communities. We apply the proposed algorithm in real-world and artificial networks, the results imply that the improved algorithm is efficient to detect communities and is robust to the initial seed of K-means.

1.   Introduction

Recently, many researchers notice that the complex network is a proper tools to describe variety of complex system in the real world [20–22], and thus the complex network has attracted the great attention in many fields such as physics, biology and social network et al. In complex network field, one of the important topology property is community structure which comprise of densely connected nodes, and some researchers have found that detecting community structure can reveal some valuable insights of the functional feature in the complex system [10, 17]. For example, communities in multimedia social network may imply people with the same hobby and trust relationship. Zhiyong Zhang et al. proposed an approach

*Lin Li, Kefeng Fan – Corresponding author, Research Center of Information Security, China Electronics Standardization Institute, Beijing, China, E-mail: lilincesi@126.com, kefengfan@163.com

†Zhiyong Zhang, Information Engineering College, Henan University of Science and Technology, Luoyang, China, E-mail: xidianzzy@126.com

‡Zhengmin Xia School of Electronic Information and Electrical Engineering, Shanghai Jiao tong University, Shanghai, China E-mail: zhengminxia@sjtu.edu.cn