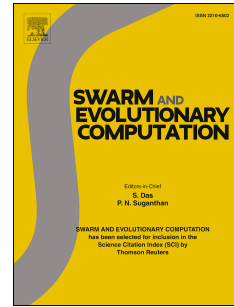


Accepted Manuscript

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PII: S2210-6502(17)30136-0

DOI: [10.1016/j.swevo.2017.10.009](https://doi.org/10.1016/j.swevo.2017.10.009)

Reference: SWEVO 324

To appear in: *Swarm and Evolutionary Computation BASE DATA*

Received Date: 25 February 2017

Revised Date: 12 October 2017

Accepted Date: 29 October 2017

Please cite this article as: S. Rahimi, A. Abdollahpouri, P. Moradi, A multi-objective particle swarm optimization algorithm for community detection in complex networks, *Swarm and Evolutionary Computation BASE DATA* (2017), doi: 10.1016/j.swevo.2017.10.009.

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A Multi-objective Particle Swarm Optimization Algorithm for Community Detection in Complex Networks

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Abstract

Community structure is an interesting feature of complex networks. The problem of community detection has attracted many research efforts in recent years. Most of the algorithms developed for this purpose take advantage of single-objective optimization methods which may be ineffective for complex networks. In this article, a novel multi-objective community detection method based on a modified version of particle swarm optimization, named MOPSO-Net is proposed. Kernel k-means (KKM) and ratio cut (RC) are employed as objective criteria to be minimized. Our innovation in PSO algorithm is changing the moving strategy of particles. Experiments on synthetic and real-world networks confirm a significant improvement in terms of normalized mutual information (NMI) and modularity in comparison with recent similar approaches.

Keywords: Community detection; Complex networks; Particle swarm optimization; Multi-objective optimization, Pareto-optimal front.

1. Introduction

Networks are utilized in many fields such as computer science, physics and mathematics to represent various types of complex systems. Several examples of complex systems include: biological networks, technological networks, social networks and even political election networks. A network, mathematically, can be represented as a graph where the vertices indicate the network objects and edges represent the relation between them. An interesting property of complex networks, which attracted many researchers

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