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A Genetic Algorithm For Finding The Semi-Obnoxious (k,l)-core Of A Network

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Abstract

Let $G = (V, E)$ be a graph, with $\mid V \mid = n$. A (k, l)-core of G is a subtree with at most k leaves and with a diameter of at most l which the sum of the distances from all vertices to this subtree is minimized. In this paper, we present a genetic algorithm for finding the (k, l)-core of a graph with pos/neg weight.

Keywords: Core, Genetic algorithm, Median subtree, Semi-obnoxious
Mathematics Subject Classification [2010]: 90B90, 90B06

1 Introduction

The core of a graph is defined in [6] as a path in the graph minimizing the sum of the distances of all vertices of the graph from the path. This problem is extended to finding a core of specied size l on tree networks in [2, 5, 7]. Peng et al. [8] considered problem with a constraint on numbers of leaves and presented an algorithm for constructing a k-tree core on trees which has time complexity of O(kn). After that, problem is extended to finding a subtree of tree with at most k leaves and with a diameter of at most l so that the sum of the weighted distances from all vertices to the subtree is minimized. This subtree is called a (k, l)-core of tree. Becker et al. [3] presented an efficient algorithm for finding a (k, l)-core of a tree with time complexity of $O(n^2 logn)$.
If some of the vertices have positive weights and some negative weights the problem is referred to as the semi-obnoxious location problem. Burkard and Krarup [4] showed that the positive or negative (for simplicity we write pos/neg) 1-median, problem on a cactus can be solved in linear time.
Many genetic algorithms are applied to solve some location problems such as median problem and hub location problem[1].
In this paper, we consider (k, l)-core of G that is a subtree with at most k leaves and with a diameter of at most l which the sum of the distances from all vertices to this subtree is minimized. Then present a genetic algorithm for finding the (k, l)-core of a graph with pos/neg weight.

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