Variable Neighborhood Search Algorithms for Competitive p-Median Facility Location Problem

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The facility location problems are one of the most studied areas of operations research. The essence of these problems is to locate facilities in some points and assign the consumers to them for service. The goal is to minimize the total cost. There are a number of models that take into account the market competition. Aboolian R. et al. [1] formulated a facility location and design problem (CFLDP) in which the facilities compete for the serviced market share. Such share is elastic and depends on where and which kind of facility is located. In this paper, a new formulation of the problem is given, in which the restriction on the quantity of open facilities is added. The number of new facilities is fixed and is equal to p, so competitive p-median facility location and design problem is derived (CPFLDP).

Because of the non-linear objective function of corresponding mathematical models, it is particularly hard to find the optimal solutions in large-dimensional cases. As our computational experiment showed, fixing the number of opened facilities in CFLDP significantly increases the runtime of commercial software. Therefore, the development of approximate methods of solution is particularly is important. Previously, a number of approximation algorithms were proposed for CFLDP, including a variable neighborhood search method (VNS) [1, 2]. In this paper, we develop VNS approach for CPFLDP. Variants of VNS algorithms for the specified problem are offered and a new kind of neighborhood is proposed. Series of testing instances are conducted, the obtained results are discussed.

References

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