Solving the p-median problem via a radius formulation

S. García[1], M. Labbé[2] and A. Marín[3]

[1] Departamento de Estadística, Universidad Carlos III de Madrid, Spain
sergio.garcia@uc3m.es
[2] Département d'Informatique, Université Libre de Bruxelles, Belgium
mlabbe@ulb.ac.be
[3] Departamento de Estadística e Investigación Operativa, Universidad de Murcia, Spain
amarin@um.es

Given a set of nodes, the p-median problem consists of determining p nodes (called median nodes) where to locate p facilities and allocate the other nodes to these ones in such a way that total distance be minimal.

To overcome the difficulties of solving large problems, different techniques can be found in the literature: set partitioning formulation and column generation ([2]), Lagrangian relaxation reduced costs ([3]) or branch-and-cut-and price ([1]) are just three examples.

In this paper, a radius formulation is proposed to solve the problem: for each potential facility, the distances to the other nodes are ordered increasingly. Then, the p-median problem is formulated by using a family of two-index variables which, for each node, state how far is the open facility the node has been allocated to.

The problem is solved with a branch-and-cut-and-price technique, whose advantage is that the pricing can be done in a very easy way, fastening so the resolution of the problem. A computational study will show the performance of this approach.

References

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