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**Comparative analysis for p-median problems: A Position Statement**

P-median problem is widely used for location analytics in business. The p-median problem has attracted more attentions\(^1\). There are hundreds of methods for solving p-median problems\(^2\). Heuristic methods can get approximate solution for p-median problems within short time. Integer linear programming and formulation method can be used for finding an optimal solution via linear programming solver over long time. It is important to analyze efficiency of different p-median problems. We explore a benchmark framework to comparative analysis for p-median problems.

There are four types of methods were implemented for benchmark of comparative analysis for p-median problems, including open source linear programming solvers, commercial linear programming solvers, heuristic methods and formulation methods. In this study, we used open source solver (Google Or-Tools, Soplex, Qsopt), commercial solvers (Gurobi, Cplex 12.7.1) for get an optimal solution. Teiz_bart, Simulation Annealing\(^3\), Variable neighborhood search\(^4\) and GRASP\(^5\) are tested as heuristic methods for approximate solution. BEAMR\(^6\) and Radius\(^7\) are used as formulation methods. 40 files test data set came from Beasley files.
Flowchart shows how these steps interacting in the benchmark framework (Figure 1).

![Flowchart of benchmark framework for p-median problem](http://people.brunel.ac.uk/~mastjb/jeb/orlib/pmedinfo.html)

Results show that Soplex works best from open source solvers, Gurobi performs much faster than Cplex, GRASP is the fastest algorithm among heuristic methods, BEAMR is better than Radius method. GRASP can be used for finding approximate solution for p-median problem. Gurobi is first choice to solve p-median problem as integer linear programming method. We can use BEAMR to solve a huge p-median problem. GRASP can be used for finding approximate solution in the first phrase, Gurobi can be used for integer linear programming.

In this research, the benchmark framework was able to provide comparative analysis of the efficiency for p-median problems. Further work in this area will implement methodology of BEAMR for solving huge p-median problem (over 10000 nodes). In addition, we can use hybrid parallel framework to improve performance for p-median problems. Pointer networks[8] of machine learning framework for the p-median problem will be evaluated in the future work.

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References


