

## An effective algorithm for balancing the assignment of customers among clusters

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### SUMMARY

A common strategy of logistics companies is to group their customers into clusters, so that they can better manage their resources and workload. The definition of clusters is, in general, a tactical decision, maintained over time in the medium term, based on geographic boundaries, levels of regular demand, etc. However, on a day-to-day basis, the number of customers requiring service in each cluster varies. As a result, the daily number of customers needing to be visited in each cluster fluctuates, which can lead to imbalances between clusters.

In this work, we study a problem posed by a consulting firm that provides services to the logistics industry. The objective is to study how some customers can be removed from their pre-assigned cluster and reassigned to a different cluster, so that the final number of customers in the clusters is balanced. Three different approaches are proposed to address such balancing. Customer transfers should be done, preferably, in such a way that they affect customers that are originally close to the area to whose cluster they are to be reassigned. In addition, this problem should be solved in a short period of time, so that it can be applied when planning the daily workload.

This problem has been modeled using lexicographic mathematical programming and a heuristic algorithm has been developed to solve it. Computational experiments using benchmark instances show that the heuristic algorithm either provides the optimal solution, if available, or the best solution, otherwise. Moreover, the computational times invested are small enough to allow the application of the heuristic in real scenarios.

**Keywords:** heuristic algorithm, cluster balancing, lexicographic optimization

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