The case study of Province of Brescia: analysis, evaluation, and improvement of an interlibrary loan service

Alice Raffaele
Department of Computer Science, University of Verona,
Strada le Grazie 15, 37134 Verona, Italy
alice.raffaele@univr.it

Abstract. The *interlibrary loan* is a service allowing different libraries in the same network to share their catalogues. Here we describe the case of *Province of Brescia*, an Italian public company managing the public libraries in the provinces of Brescia and Cremona. The company has an agreement with an external logistics firm, which handles the transportation of the items in the network through a fleet of vehicles. Each library is visited by a courier a few times a week, according to a fixed calendar based on historical data. Also, libraries are divided into fixed groups, each associated with a fixed route. Every year, the company spends a fixed amount to rent the vehicles, plus some variable costs related to the length of routes. It is thus interested in evaluating its current implementation of the service in terms of routing and transportation costs, but also determining whether their approach is good. We show how to answer these questions by applying mixed-integer linear programming. First, we model the problem as a single-depot pickup-and-delivery problem with time windows and heterogeneous fleet [1, 2]. Then, we present an experimental evaluation on the real data of 2019. Finally, we discuss some possible improvements considering their applicability.

Keywords: case study, routing, mixed-integer linear programming.

References

[1] Desaulniers, G., Desrosiers, J., Erdmann, A., Solomon, M. M., and Soumis, F. (2002). *VRP with Pickup and Delivery. The vehicle routing problem*, 9:225–242.

[2] Salhi, S., Imran, A., and Wassan, N. A. (2014). *The multi-depot vehicle routing problem with heterogeneous vehicle fleet: Formulation and a variable neighborhood search implementation*. Computers and Operations Research, 52(Part B):315–325.