
The technician routing problem with conventional and electric vehicles

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Abstract

The technician routing problem (TRP) consists in routing a set of technicians to serve a set of geographically scattered requests. This problem considers time windows, and the working schedule and skills of the technicians. Existing TRP studies assume that the technicians ride conventional internal combustion vehicles. However, nowadays, some companies are using electric vehicles on their operations of maintenance and repair. In this research, we introduce the technician routing problem with conventional and electric vehicles (TRP-CEV). This problem is an extension of the TRP, arising when the technicians use a mixed-fleet of conventional and electric vehicles (EVs). In the TRP-CEV decisions involve not only the routes but also the vehicle-to-technician assignment and the battery charging program for the EVs (where and how much to charge). The objective function of TRP-CEV seeks to minimize the total cost, defined as the sum of the energy and fuel costs, the fixed cost of battery charging, and the fixed cost of using each vehicle. We propose a mixed-integer linear programming formulation of the TRP-CEV that, running on a commercial optimizer, can solve small instances of the problem. To tackle large-scale instances we propose a metaheuristic approach. We present computational experiments on both randomly generated instances and real-world data from a public utility.

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