

A Biased Random-Key Genetic Algorithm for the Vehicle Routing Problem with Occasional Drivers and Time Windows

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Abstract. In this work, we address a variant of the Vehicle Routing Problem (VRP) with time windows, in which the deliveries are carried out by company drivers and some occasional couriers, named occasional drivers (VRPTWOD). The main aim is to minimize the total cost, given by the sum of the cost of regular vehicles and the compensation paid to the occasional drivers, while respecting time windows and capacity constraints. To solve this problem, we develop a version of the Biased Random-Key Genetic Algorithm (BRKGA) that employs multiple parents to pass alleles to the offspring in the next generation and implements a restarting strategy. To handle time window constraints a new decoder, tailored to the VRPTWOD is defined. To evaluate the performance of the proposed approach an extensive computational study was conducted considering instances of increasing size. A comparison with a Variable Neighborhood Search (VNS) approach drawn from literature was also carried out. The computational results show that the proposed BRKGA is more effective than the VNS.

Keywords: Occasional drivers; Vehicle routing problem; Biased random-key genetic algorithm; Restart strategy.

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