A Matheuristic Algorithm for the School Bus Routing Problem

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Abstract : The school bus routing problem (SBRP) is a variant of the Vehicle Routing Problem (VRP) classified as a location-allocation-routing problem. In this study, the SBRP is decomposed into two sub-problems: (1) bus route generation and (2) bus stop selection to solve large instances of the SBRP in reasonable computational times. To solve the first sub-problem, we propose a genetic algorithm to generate bus routes. Once the routes have been fixed, a sub-problem remains of allocating students to stops considering the capacity of the buses and the walkability constraints of the students. While the exact method solves small-scale problems, treating large-scale problems with the exact method becomes complex due to computational problems, a deficiency that the genetic algorithm can overcome. Results obtained from the proposed approach on 150 instances up to 250 stops show that the matheuristic algorithm provides better solutions in reasonable computational times with respect to benchmark algorithms.

Keywords : genetic algorithm, matheuristic, school bus routing problem, vehicle routing problem
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