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GRASP based metaheuristic to solve the mixed fleet e-waste collection route planning problem

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Title: GRASP based metaheuristic to solve the mixed fleet e-waste collection route planning problem

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Abstract

In today's fast-paced world, technological advancements and industrial design have led to the integration and frequent updating of innovative technologies in electronic devices. This has resulted in enhanced performance, improved user experience, and better battery life and storage capabilities. However, the rapid pace of technological change has a downside: electronic devices quickly become outdated, and as a result, the lifespan of electronic devices has decreased significantly compared to the past. This trend has created a major challenge in the e-waste disposal, as electronic devices are discarded at an alarming rate. Therefore, collecting this e-waste is a challenging problem, modelled by a Vehicle Routing Problem with Multiple Time Windows and a Heterogeneous fleet (HVRPMTW). This paper proposes an efficient metaheuristic method that embeds a heterogeneous vehicle fleet version of the Clarke and Wright savings heuristic into a Greedy Randomized Adaptive Search Procedure with path-relinking (GRASP-PR). Our experiments show that the proposed GRASP-PR method outperforms the mathematical model solved by CPLEX in both computational running time and solution quality for most test instances.

Keywords: E-waste, Vehicle routing problem with time windows, GRASP, Path-relinking