Solving the Share-A-Ride Problem by A Matheuristic Algorithm

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Abstract. This research studies the share-a-ride problem (SARP) that aims to maximize profit, without violating SARP constraints, when a fleet of taxis serves a set of package and passenger requests. Based on the column generation technique, we develop a two-phase matheuristic algorithm. The first phase employs simulated annealing with mutation strategy (SAMS) algorithm to generate a set of feasible candidate routes. SAMS consists of a time-slack strategy, neighborhood moves, a mutation strategy that depends on the time-slack strategy, and a penalty mechanism for the infeasible solutions. Solving the set partitioning model in the second phase determines the final solution. We then compare the proposed matheuristic algorithm to state-of-the-art algorithms based on small and large SARP benchmark instances. For small instances, the proposed algorithm achieves the optimal solutions to all instances. For large instances, the proposed algorithm outperforms existing algorithms in terms of solution values.

Keywords: Matheuristic, Share-a-ride problem, Set partitioning formulation, Simulated annealing, Mutation strategy