

A Variable Neighborhood Search with Tabu Conditions for the Roaming Salesman Problem

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Abstract : The aim of this paper is to present a Variable Neighborhood Search (VNS) with Tabu Search (TS) conditions for the Roaming Salesman Problem (RSP). The RSP is a special case of the well-known traveling salesman problem (TSP) where a set of cities with time-dependent rewards and a set of campaign days are given. Each city can be visited on any day and a subset of cities can be visited multiple times. The goal is to determine an optimal campaign schedule consist of daily open/closed tours that visit some cities and maximizes the total net benefit while respecting daily maximum tour duration constraints and the necessity to return campaign base frequently. This problem arises in several real-life applications and particularly in election logistics where depots are not fixed. We formulate the problem as a mixed integer linear programming (MILP), in which we capture as many real-world aspects of the RSP as possible. We also present a hybrid metaheuristic algorithm based on a VNS with TS conditions. The initial feasible solution is constructed via a new matheuristic approach based on the decomposition of the original problem. Next, this solution is improved in terms of the collected rewards using the proposed local search procedure. We consider a set of 81 cities in Turkey and a campaign of 30 days as our largest instance. Computational results on real-world instances show that the developed algorithm could find near-optimal solutions effectively.

Keywords : optimization, routing, election logistics, heuristics

Conference Title : ICOPRDA 2023 : International Conference on Operational Research and Data Analytics

Conference Location : Dubai, United Arab Emirates

Conference Dates : March 16-17, 2023