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The Electric Fleet Size and Mix Vehicle Routing Problem with Time Windows and Recharging Stations - DTU Orbit (08/11/2017)

The Electric Fleet Size and Mix Vehicle Routing Problem with Time Windows and Recharging Stations

Due to new regulations and further technological progress in the field of electric vehicles, the research community faces the new challenge of incorporating the electric energy based restrictions into vehicle routing problems. One of these restrictions is the limited battery capacity which makes detours to recharging stations necessary, thus requiring efficient tour planning mechanisms in order to sustain the competitiveness of electric vehicles compared to conventional vehicles. We introduce the Electric Fleet Size and Mix Vehicle Routing Problem with Time Windows and Recharging Stations (E-FSMFTW) to model decisions to be made with regards to fleet composition and the actual vehicle routes including the choice of recharging times and locations. The available vehicle types differ in their transport capacity, battery size and acquisition cost. Furthermore, we consider time windows at customer locations, which is a common and important constraint in real-world routing and planning problems. We solve this problem by means of branch-and-price as well as proposing a hybrid heuristic, which combines an Adaptive Large Neighbourhood Search with an embedded local search and labeling procedure for intensification. By solving a newly created set of benchmark instances for the E-FSMFTW and the existing single vehicle type benchmark using an exact method as well, we show the effectiveness of the proposed approach.

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