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FLEXIBLE ECO-ROUTING WITH TIME WINDOW FOR ELECTRIC VEHICLES

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Abstract

The eco-routing problem, presents a dilemma in that the eco-friendliest route is not necessarily the fastest one and may exceed the travel time budget. An effective countermeasure is to find the optimal energy-efficient route given a time window constraint. Firstly, based on the multi-armed bandit (MAB), this paper proposes an eco-routing with time window (ERTW) model for electric vehicles (EVs). Secondly, an extended solution algorithm, with adding the path elimination mechanism to reduce and adding covariance estimation, is presented as well. Finally, the proposed methodology is evaluated on a real-world road network in Beijing, China. The comparisons with the shortest distance path (SDP) and shortest travel time path (STTP) algorithms illustrate the excellent performance of the ERTW algorithm. The energy consumption of the optimal path is 10.87% lower than that of the SDP path and 19.34% lower than that of the STTP path. Moreover, the numerical results show that, compared to the eco-routing (ER) without time window algorithm, the ERTW algorithm reduces travel time by 42.86%, while energy consumption only increases by 7.38%.

Key words: eco-routing, electric vehicle, multi-arm bandit, time window

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