Q-Routing Algorithm for Self-adaptive Vehicle Route Planning with Multiple Constraints

Computation of vehicle routes in urban road networks is challenging due to the dynamics inherent to vehicle traffic patterns. New transportation technologies impose additional challenges as routes should not only minimize traveling times but also meet several constraints, such as electric vehicle battery recharging time and recharging cost. Q-routing is a reinforcement learning routing algorithm that can be exploited to compute vehicle routes in dynamic traffic scenarios. However, to date, no Q-routing algorithm has been proposed that addresses multi-constrained vehicle routing. In this context, the objective of this thesis is to design and study a variation of the Q-routing algorithm that self-adaptively produces vehicle route paths that comply with multiple constraints. To this end, the proposed algorithm will exploit De Neve's non-linear energy function, which has proven useful in heuristically searching multi-constrained paths, an NP-complete combinatorial optimization problem. The proposed Q-routing algorithm will be assessed on real-world road network datasets by using the SUMO traffic simulator.

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