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Approaching traffic congestion with Double Deep Q-Networks

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One of the recurring problems of everyday life in big urban areas is the traffic congestion. Nowadays advance in the technologies powering the Internet of Vehicles together with state-of-the-art artificial intelligence algorithms offer the means to improve traffic flow with little changes to the existing infrastructure. This paper proposes a reinforcement learning based solution to traffic light scheduling with a case study on four notoriously congested traffic areas from Bucharest, Romania. The selected areas were imported from OpenStreetMap (OSM) files and modeled using SUMO (Simulation of Urban Mobility). We propose a C-ITS based protocol for information exchange between cars and infrastructure (Vehicle-To-Infrastructure - V2I communications) and we generate data for training a semi-centralized reinforcement learning agent that is able to change the traffic lights from its designated area. We compare our solution with fixed time slice traffic light scheduling (considered baseline performance) and we report the results. This comparative analysis shows that the proposed approach outperformed the baseline.

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