TOP TEN

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Deep Reinforcement Learning for Multimodal Urban Traffic Signal Control Using Traffic Surveillance Video Data

Metropolitan areas are witnessing a rise in diverse mobility options, but delays and congestion pose challenges to economic and sustainable growth. One approach to address these issues is an intelligent traffic signal control system. Recent advancements in hardware and computational power enable the development of high-performance signal control systems. This research utilises Deep Reinforcement Learning (DRL) to control traffic signals at multimodal intersections, allowing the responses to rapid traffic changes, optimisation of electric energy supply, and protection of pedestrians and cyclists. The state space of DRL not only involves information of motorised road users, but also that of pedestrians and cyclists to help agents in decision-making. The positional information of pedestrians and cyclists is derived from traffic surveillance videos. Finally, the simulation analyses indicate that the proposed framework significantly reduces travel delay, while ensuring safe crossing, green time for pedestrians and cyclists. This research contributes to a study framework for understanding the learning-based technology in urban multimodal traffic signal control. Moreover, a highlight is the implementation of the proposed framework at an actual urban intersection after validation in the simulation. Camera, V2X equipment, an MQTT databroker for data communication, and the proposed framework will be deployed in a real city. It may effectively support the formulation and development of signal control guidelines, strategies and operations, thereby improving crossing efficiency and advancing smart city strategies.