

Enhancing Decision-Making in Highway Overtaking Scenarios with Graph Convolution Reinforcement Learning

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Abstract

Autonomous vehicles have a number of open challenges, one of which is decision-making regarding motion, particularly while operating in an environment that is both complex and diverse. Within the scope of this work, a model for motion decision-making that is founded on deep reinforcement learning (DRL) is proposed. In order to achieve the best possible results from the driving policy, a multi-objective reward function has been developed. This function is intended to direct the autonomous driving system toward the investigation of the best possible decision policy, with the objectives of maximizing both safety and efficiency. As the backbone network of the DRL model, a convolutional neural network, also known as a CNN, has been created. This allows the model to make optimal use of the information gleaned from observations of the surrounding environment. In order to improve overall safety, a safety check module that helps users identify and prevent potentially hazardous behaviors has been developed. It is shown that the suggested method gives good model performance when used in the DeepTraffic simulation environment by doing several tests that compare everything. The tests showed that the DRL-based model works well at making safe, efficient, and smooth decisions about mobility, and it also works well in a wide range of traffic situations.

(Keywords:)

decision-making , deep reinforcement learning , graph neural network , autonomous vehicles , multi-agent

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