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Titel des Beitrags: High-level Decision Making for Safe and Reasonable Autonomous Lane Changing using Reinforcement Learning

Abstract: Machine learning techniques have been shown to outperform many rule-based systems for the decision-making of autonomous vehicles. However, applying machine learning is challenging due to the possibility of executing unsafe actions and slow learning rates. We address these issues by presenting a reinforcement learning-based approach, which is combined with formal safety verification to ensure that only safe actions are chosen at any time. We let a deep reinforcement learning (RL) agent learn to drive as close as possible to a desired velocity by executing reasonable lane changes on simulated highways with an arbitrary number of lanes. By making use of a minimal state representation, consisting of only 13 continuous features, and a Deep Q-Network (DQN), we are able to achieve fast learning rates. Our RL agent is able to learn the desired task without causing collisions and outperforms a complex, rule-based agent that we use for benchmarking.

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