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A Deep Reinforcement-Learning-based Driving Policy for Autonomous Road Vehicles

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Abstract: In this work we consider the problem of path planning for an autonomous vehicle that moves on a freeway. The most common approaches that are used to address this problem are based on optimal control methods, which make assumptions about the model of the environment and the system dynamics. On the contrary, we propose the development of a driving policy based on reinforcement learning. In this way, the proposed driving policy makes minimal or no assumptions about the environment, since a priori knowledge about the system dynamics is not required. We consider driving scenarios where the road is occupied both by autonomous and manual driving vehicles. To the best of our knowledge, this is one of the first approaches that propose a reinforcement learning driving policy for mixed driving environments. The derived reinforcement learning policy, firstly, is compared against an optimal policy derived via dynamic programming, and, secondly, its efficiency is evaluated under realistic scenarios generated by the established SUMO microscopic traffic flow simulator. Finally, we present some initial results regarding the effect of autonomous vehicles' behavior on the overall traffic flow.

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