Improving Lane Detection for Autonomous Vehicles Using Deep Transfer Learning

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Abstract : Autonomous Vehicles (AVs) are incorporating an increasing number of ADAS features, including automated lane-keeping systems. In recent years, many research papers into lane detection algorithms have been published, varying from computer vision techniques to deep learning methods. The transition from lower levels of autonomy defined in the SAE framework and the progression to higher autonomy levels requires increasingly complex models and algorithms that must be highly reliable in their operation and functionality capacities. Furthermore, these algorithms have no room for error when operating at high levels of autonomy. Although the current research details existing computer vision and deep learning algorithms and their methodologies and individual results, the research also details challenges faced by the algorithms and the resources needed to operate, along with shortcomings experienced during their detection of lanes in certain weather and lighting conditions. This paper will explore these shortcomings and attempt to implement a lane detection algorithm that could be used to achieve improvements in AV lane detection systems. This paper uses a pre-trained LaneNet model to detect lane or non-lane pixels using binary segmentation as the base detection method using an existing dataset BDD100k followed by a custom dataset generated locally. The selected roads will be modern well-laid roads with up-to-date infrastructure and lane markings, while the second road network will be an older road with infrastructure and lane markings reflecting the road network's age. The performance of the proposed method will be evaluated on the custom dataset to compare its performance to the BDD100k dataset. In summary, this paper will use Transfer Learning to provide a fast and robust lane detection algorithm that can handle various road conditions and provide accurate lane detection.

Keywords : ADAS, autonomous vehicles, deep learning, LaneNet, lane detection
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