

Application of ADABOOST and HOG algorithms in ADAS intelligent driver assistance system for detecting and classifying moving vehicles

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Abstract: This study presents an intelligent driver assistance system (ADAS) that employs the ADABOOST algorithm combined with Histogram of Oriented Gradients (HOG) features for real-time detection and classification of moving vehicles. The proposed method extracts HOG descriptors from video frames to capture edge and gradient structures characteristic of vehicles, while the ADABOOST ensemble learning technique iteratively selects the most discriminative weak classifiers to construct a robust strong classifier. The system is designed to identify and categorize various moving vehicles, including cars, trucks, and motorcycles, under diverse traffic conditions. Experimental evaluations on benchmark datasets demonstrate that the HOG-ADABOOST approach achieves high detection accuracy with low false-positive rates, while maintaining computational efficiency suitable for real-time ADAS applications. The integration of this method into an ADAS framework enhances situational awareness by providing timely warnings to drivers, thereby contributing to improved road safety. The results confirm the effectiveness of combining traditional computer vision features with adaptive boosting for vehicle perception tasks in intelligent transportation systems.

Keywords: ADABOOST, HOG, ADAS, vehicle detection