A DSP-BASED LANE RECOGNITION METHOD FOR THE LANE DEPARTURE WARNING SYSTEM OF SMART VEHICLES

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ABSTRACT. *This paper describes a lane recognition method for the lane departure warning system of smart vehicles and the algorithm implemented in a dual core ADI-BF561 600MHz DSP embedded system to verify the functionality. Since the computing power and memory size of the embedded system are not as good as those on a personal computer, special techniques have been applied in the algorithm to enhance the performance of lane recognition while maintaining the reliability of the results. The applied median filter can obtain the median element of a 4-by-3 array using only 19 comparison operations. Furthermore, the edge enhancing filter can washout the foreign objects in the region of interest and keep the lane marks with tilt/slope pattern. Using these two tools as the basis, the applied algorithm can detect the event of lane-departure and alarm the warning to assist drivers for driving safety on the road. Besides the basic techniques, the lane mark enhancement is implemented to improve the accuracy of detection and double-line detection is also added to alert the driver for eventual traffic rule violation. The system has been implemented and tested on a DSP-based embedded platform. It can perform the required processes in real-time under various weather conditions.*
Keywords: DSP, Lane departure warning (LDW), Image processing, Smart vehicle

1. **Introduction.** According to the United States National Highway Traffic Safety Administration (NHTSA), 41% of the total traffic accident casualties are the results of the abnormal lane switching/departure on the road, which is also the major cause of the traffic accident in the list [1]. Driving under intoxication, tiredness, inattention, etc. are among the common causes of abnormal lane departures. Thus, developing a method to keep the vehicles on the normal lane and path is an important issue of the research and development of the intelligent transportation system. A Lane Departure Warning (LDW) system is a utility which can assist drivers to maintain proper driving within the lane and also warns them when the vehicle is departing from the current lane so that the driver is alerted in time to make appropriate actions, such as checking the neighboring objects and signaling the turning lights. The system can also alarm the drivers with lights and sounds to recover the drivers from unexpected/abnormal driving situations as mentioned earlier so as to minimize the accidents caused by this kind of abnormal driving.

In the earlier studies of the LDW system, a powerful computing machine and large-size memory are required to conduct the heavy calculation of the computer vision and graphic