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Advanced Driver Assistance System

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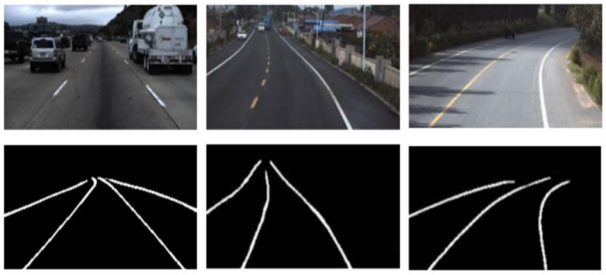
Abstract: ***Many people die each year in roadway departure crashes caused by driver inattention. Lane detection systems are useful in avoiding these accidents as safety is the main purpose of these systems. Such systems have the goal to detect the lane marks and to warn the driver in case the vehicle tends to depart from the lane. A lane detection system is an important element of many intelligent transport systems. Lane detection is a challenging task because of the varying road conditions that one can come across while driving. In the past few years, numerous approaches for lane detection were proposed and successfully demonstrated. In this paper, a comprehensive review of the literature in lane detection techniques is presented. The main objective of this paper is to discover the limitations of the existing lane detection methods.***
Keywords: Lane detection, Lane Colorization, Raspberry-Pi, Hough Transformation

I. INTRODUCTION

With the rapid raise of urban traffic, the traffic safety becomes more and more significant. Leaving the lane causes about 30% of all accidents in the highway, and most of these are resulted from the distraction and fatigue of the driver. Therefore, a system that could provide a warning to drivers of a danger has a great potential to save many lives. Systems that are designed to help the driver in its driving process are known as advanced driver assistance systems (ADAS). Many systems like adaptive cruise control, collision avoidance system, night vision, blind spot detection and traffic sign detection are a part of ADAS [1]. Lane departure system is also a part of this category. This system has a goal to detect the lane marks and to advise the driver in case the vehicle tends to leave the lane. Lane detection is the process to locate lane markers on the road and then present these locations to an intelligent system. In intelligent transportation systems [2], intelligent vehicles cooperate with smart infrastructure to achieve a safer environment and better traffic conditions. The applications of a lane detecting system could be as simple as pointing out lane locations to the driver on an external display, to more complex tasks such as predicting a lane change in the instant future to avoid collisions with other vehicles. Some of the interfaces used to detect lanes include cameras, laser range images, LIDAR and GPS devices [3].

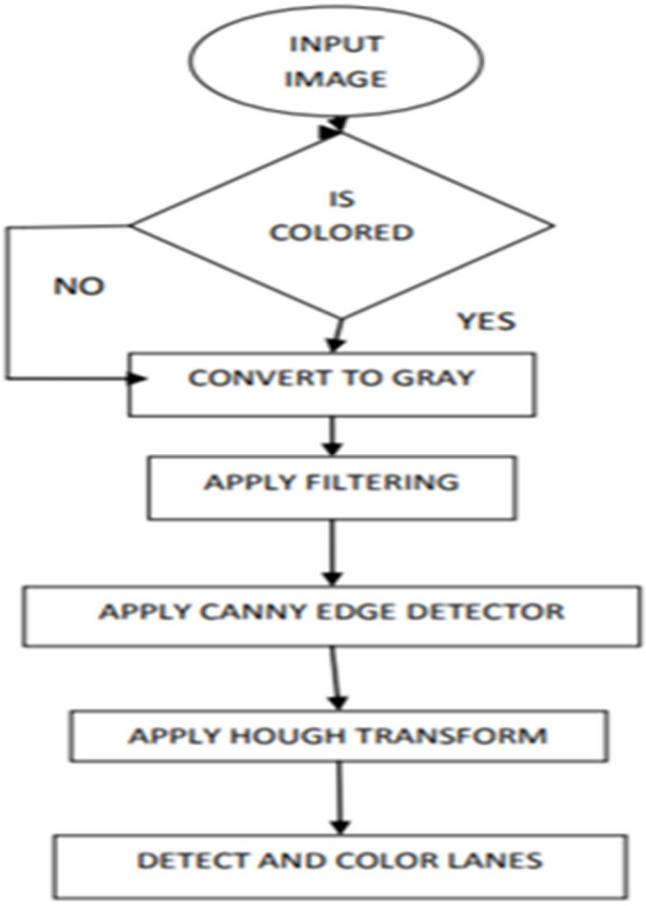


II. LITERATURE SURVEY

In many proposed systems [4], the lane detection consists of the localization of specific primitives such as road markings of the surface of the painted roads. Various challenges like parked and moving vehicles, bad quality lines, shadows of trees, buildings and other vehicles, sharper curves, irregular lane shapes, merging lanes, writings and other markings on the road, unusual pavement materials and dissimilar slopes causes problems in lane detection. There has been active research on lane detection and a wide variety of algorithms of various representations, detection and tracking techniques, and modalities have been proposed [5].

Many approaches have been applied to lane detection, which can be classified as either feature-based or model-based. Feature-based methods detect lanes by low-level features like lane-mark edges. The feature-based methods are highly dependent on clear lane-marks, and suffer from weak landmarks, noise, and occlusions. Model-based methods represent lanes as a kind of curve model which can be determined by a few critical geometric parameters. The model-based methods are less sensitive to weak lane appearance features and noise as compared to feature-based methods. But the model constructed for one scene may not work in another scene, which makes the method less adaptive. Additionally, for best estimation of model parameters, an iterative error minimization algorithm should be applied, which is comparatively time-consuming.

The general method of lane detection is to first take an image of road with the help of a camera fixed in the vehicle. Then the image is converted to a grayscale image to minimize the processing time. Secondly, as presence of noise in the image will hinder the correct edge detection. Therefore, filters should be applied to remove noises like bilateral filter, Gabor filter, trilateral filter Then the edge detector is used to produce an edge image by using canny filter with automatic thresholding to obtain the edges. Then edged image is sent to the line detector after detecting the edges which will produces a right and left lane boundary segment. The lane boundary scan uses the information in the edge image detected by the Hough transform to perform the scan. The scan returns a series of points on the right and left side. Finally, pair of hyperbolas is fitted to these data points to represent the lane boundaries. For visualization purposes the hyperbolas are displayed on the original colour image.



III. GAPS IN EXISTING LITERATURE

By conducting the literature survey, it has been found that the most of the existing literature has neglected one of the following:

1) The survey has shown that the existing methods provides good accuracy for high quality images but sometimes provide poor results for poor environmental conditions like fog, haze, noise, dust etc.
2) Most of the existing techniques are best for straight lanes, but they provide poor results for curved roads.
3) Most of the lane detection techniques are based on standard Hough transform, so it can be modified for improving the accuracy further.

IV. CONCLUSION AND FUTURE WORK

The lane detection techniques play a significant role in intelligent transport systems. In this paper, lane detection methods have been studied. Most of them resulted in inaccurate results. Therefore, further improvements can be done to enhance the results. Soon, one can modify the existing Hough Transformation so that it can measure both the curved and straight roads. Various steps should be taken to improve the results in different environmental conditions like sunny day, foggy day, rainy day etc.

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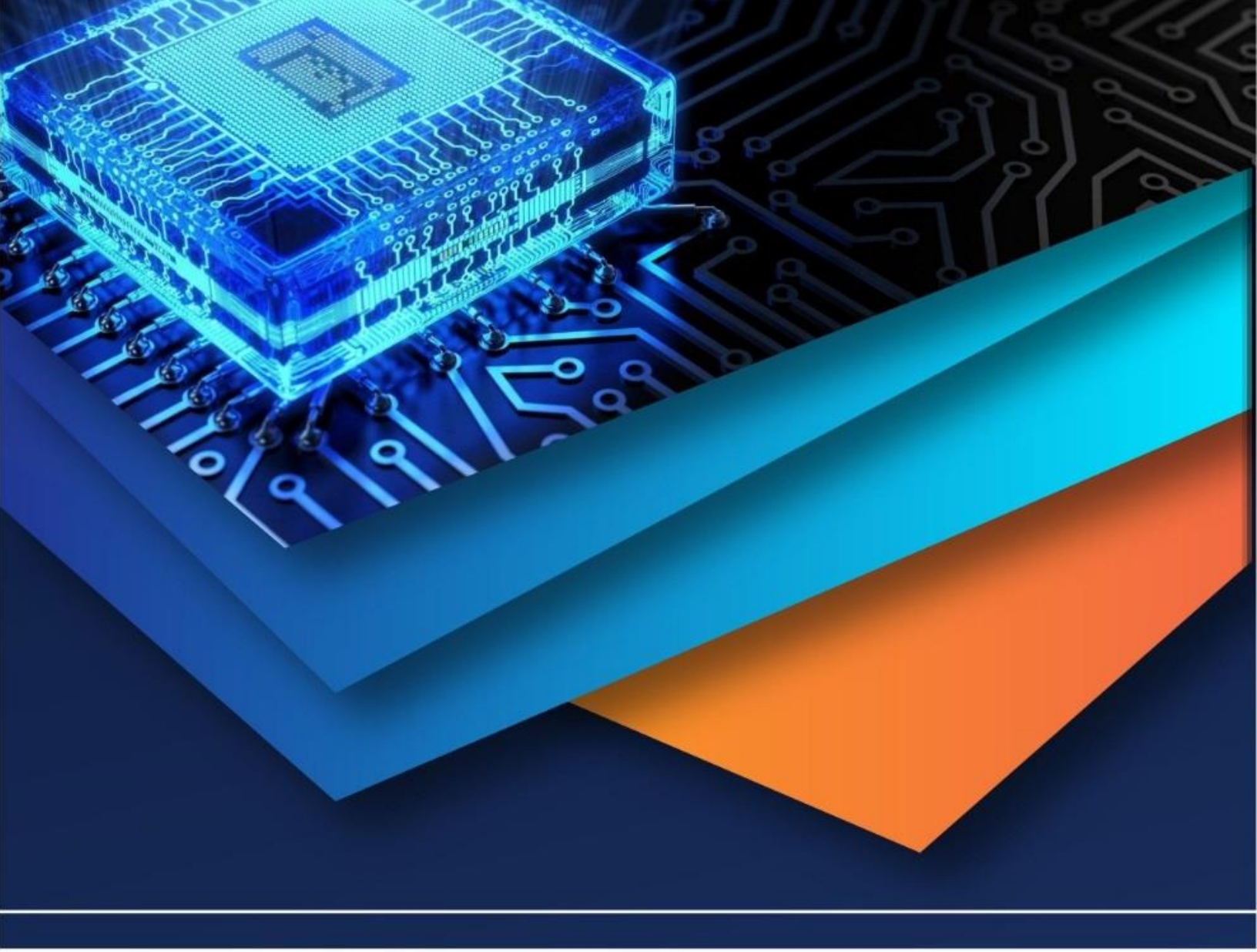

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