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A STUDY AND COMPARATIVE ANALYSIS OF VARIOUS LANE MARKING TECHNIQUES

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Abstract- Many people's die every day because of road accidents .Lane detection is used to reduce the road accident and also helps to improve the conditions of traffics. Lane detection helps the drivers in the driving process using advanced driving assistance system. Advanced driver assistance system consists of collision avoidance system, blind spot system and many more systems. This system is developed for safety and better driving. In this paper, a comparison table is presented that show the comparison of various techniques with their limitations, issues etc. The main objective of the paper is to overcome the limitations of the existing techniques.

Keywords: lane detection, hough transform, inverse perspective mapping, RANSAC,B-snake.

1. INTRODUCTION

Lane detection is a process that is used to locate the lane markers on the road .With the help of this lane markers presents these locations to an intelligent system. This system decreases the road accidents and also helps to improves traffic conditions. Lane detection consists of specific types of primitives such as road markings etc. lane detection represents the margins of path into a single framework. It supports various applications like lane departure warning, lane keeping assists, lane centring etc. Lane departure warning gives us a warning when the vehicle is veering off the lane without signalling. Lane detection also plays an important role in advanced driver assistant system. This system helps the drivers in the driving process. This system is developed for safety and better driving. This system based upon vehicle to vehicle or vehicle to infrastructure

system etc. Advanced driver assistance system consists of collision avoidance system, blind spot system and many more systems. In lane detection there are many approaches that are applied like feature based and model based. Feature based approach are used to detect edges and model based approach is a type of curve model.

2. TECHNIQUES

2.1 HOUGH TRANSFORM

Hough transform can be used to detect lines, circles or other parameter curves. The objective of Hough transform is to locate the position of lines inside pictures. It has a capability to identify lines, circles and other structures if whose parameter equation is well known. It is able to provide strong recognition in case of sound and limited occlusion. The main goal of Hough transform is to find the location of lines in an existing image. Hough transform was introduced in 1962 and first used to find the lines in images.

The Hough transform for straight line is:

$x \cos \theta + y \sin \theta = \rho$

The Hough transform for circle is:

$(x - a)2 + (y - b)2 = c2$

2.2 RANSAC

RANSAC is a random sample consensus. It is used for estimation of parameters because it is an iterative method. It is a learning technique for estimation of parameters. Random sample consensus (RANSAC) can estimate one model at a one time. It fails to find other one. It contains both inliers and outliers. RANSAC is dependent on (inverse perspective mapping) top view of the image then filtered this image with any kind of filter. RANSAC detects straight lane and also detect correctly for curved lane.

2.3 B –SNAKE

B-snake can be used to detect the boundaries of object with in an image. It is mainly used for curved lanes. It can represent curves by control points. When control points are added the flexibility of the curves increases. Control points may be used to illustrate the mid line of the road. It is a best technique for curved lane detection. Tracking with snakes is also a technique which is used for finding the lanes and tracking the lanes on the road. With the help of this technique also extracts and tracks lane boundaries. Hough transform have a capability to extracts vanishing points of the road.

2.4 INVERSE PERSPECTIVE MAPPING

Inverse perspective mapping is a technique used to transform the binary image. It is used to remove the perspective effect from the image. Inverse perspective mapping requires the knowledge of the camera position. Inverse perspective mapping is a remapping domain. The application is that IPM requires knowledge of acquisition conditions like camera position etc.

3. LITERATURE REVIEW

Chung yi *et al.* (2015) [1] has discussed about driver assistant system that is based on various techniques of image. In this detect the road lane markings a camera is mounted on the vehicle in front window. Thus helps us to show all the position of vehicle with respect to the lane lines. Aly *et al.* (2015) [2] has shown that the Lane quest leverages the low-energy sensors that is available in smart-phones which helps to provide an accurate estimate of the car's current lane. Beyeler *et al.* (2014) [3] has presents an integrative approaches for lane detection. The aim is to be as simple as possible to enable real-time computation. While being able to adapt to a variety of urban and rural traffic scenarios. Deusch *et al.* (2012) [4] has discussed the Robust lane detection. This is the precondition for advanced driver assistance systems like lane departure warning and overtaking assistants. While detecting the vehicle's lane is sufficient for lane departure warning, overtaking assistants or autonomous driving functions also need to detect adjacent lanes. Hunjae Yoo *et al.* (2013) [5] has discussed that the Lane detection is an important in many advanced driver-assistance systems. Vision-based lane detection algorithms are widely used. However, gradient values between lanes and roads vary with illumination change, which degrades the performance of lane detection systems.

Chang *et al.* (2013) [6] has presented a lane detection systems using around view monitoring images. That helps us for providing safe driving condition. The previous approaches that are used in this cannot detect lanes stably in low visibility condition such as foggy or rainy days. The proposed method can be split into two stages: generation of AVM images from four fisheye cameras and lane detection using AVM images. Satzoda and Trivedi (2014) [7] have discussed on-road vehicle detection. Lane detection is an important in advanced driver assistance systems. It introduces an integrated approach that approach is Vehicle detection with Integrated Synergies. By using these approach inherent synergies exploits between lane and on the road vehicle detection. Haloi and Jayagopi (2015) [15] have discussed a robust lane detection and departure warning technique. This technique helps to improve the system and used to detect the lanes. For lane detection a modified Inverse Perspective Mapping is used. yu and luen (2014)[8] has proposed the Lane detection critical to alert driver to avert car departure from driving lanes is an important issue in Intelligent Vehicle Safety System. Lane detection uses straight line detection approaches like Canny etc. These approaches are used to detect driving lanes, but it is fail to detect curvy lanes. Guo *et al.* (2015) [10] has discussed about the Lane detection based on computer vision is a technology of Automatic Drive System. This has proposed an algorithm of real-time lane detection . In order to enhance lane boundary information use adopt canny algorithm for edge detection for better points.

Baykal *et al.* (2014) [11] has discussed about a lane detection system based on one bit transform. The utilization of lane detection systems as driver assist systems is increasing. The real-time operation requirement of lane detection systems is an important aspect. If the vehicle is outside the lane boundaries is used to detect. Braga and Jung (2013) [12] has presented the method for detection and recognition of road lane markings using a camera. Lane boundaries are detected based on a linear parabolic model. Then, build a simple model to represent pixels. This model explores the pixels related to lane markings. Kang *et al*. (2014) [13] has discussed the Multi-lane detection algorithms. Feature-based algorithm is restricted to the illuminates variation and laterally adjacent regions. The proposed algorithm can covers six lanes including the driving lane and

adjacent lanes. Wang *et.al* (2014) [14] has discussed about the Urban lane detection. This also discussed an approach of lane detection algorithm based on Inverse Perspective Mapping. By using Inverse Perspective Mapping transforms binary image using algorithm k-means clustering. Chen *et al*. (2013) [9] has proposed an effective blind spot warning system. This system improves daytime and night-time conditions. Under daytime the system presents the Horizontal Edge and Shadow Composite Region method.

Table 1. Comparison of various lane marking techniques

REF. PAPER	TECHNIQUE	ISSUE(s)	BENEFIT(s)	CURVED LANES	NOISY IMAGES	LIMITATIONS
[8]	Canny and Hough transform	Curvy lane detection, Android based solution	Gradient is maximized at lane boundaries	No	No	Fail to detect curvy lanes
[2]	Current outdoor localization technique, Lane quest	Lane quest leverages, Probabilistic lane estimation algorithm	Better accuracy than others	No	Yes	Technique not provide better accuracy
[3]	RANSAC(Random Sample Consensus)	Road segmentation methods	Better speed than Hough transform	No	No	Not efficient in low intensity image
[6]	Hough transform	AVM images	Improved accuracy	No	No	Cannot detect lane in low visibility
[5]	Hough transform	Conversion of images	Good results	No	Yes	Cannot detect for curved lane

[10]	Random sample consensus (RANSAC)	Curve lane parameter model	Lane boundaries fit well in various road conditions	Yes	No	Cannot detect lane at night time
[1]	Modified Hough transform	Driver assistant system	Improved lane line detection and lane departure prediction.	No	No	Cannot detect for curved lane
[16]	Inverse perspective mapping	Urban lane detection	Reduce noise	No	Yes	Focused only on straight lanes
[15]	RANSAC	Inverse perspective mapping	Reliability detect lanes and boundaries	No	No	focused only on the straight lane marking

4. CONCLUSION

In this paper, various techniques are defined for lane detection and the comparison table of various techniques. Most of the previous work has focused only on the straight lane marking. Thus, it is required to develop the detection algorithm for curved lane markings. The previous work is done by using the Hough transform; the modification of Hough has been neglected by many researchers. The use of data parallelism is ignored in the existing lane detection techniques. In near future we will propose a parallel lane detection technique to improve the speed of lane detection. Also the additive Hough will be modified to improve the results for curved lanes.

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