Modified Hough Transform for Road Lane Colorization to Prevent Accidents

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Abstract:-Lane coloration is becoming popular in real time vehicular ad-hoc network. This research work focus on providing better performance in lane coloration algorithm by using CLAHE to enhance the input image and also by modifying the Hough transform using the dynamic thresholding to detect curve lanes. Main emphasis is to improve the result of lane coloration algorithm when fog, noise or any other factor is present in the images. The methods developed so far are working efficiently and giving good results in case when the straight lane road images are there. But problem is that they fail or not give efficient results when there are curved lane road images. The experiments results for the road images have shown the significant improvement of the proposed technique over the available one.

Index Terms: *LANE, ROAD, ACCIDIENTS, HOUGH, CLAHE.*

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1. INTRODUCTION

Lane coloration plays an important role in a number of intelligent automobile applications. It is used for color the lanes to recover the human vision. It permit vehicular drivers to drive carefully by telling them that where the really lanes exist on the road and avoid disasters. As there exist much fewer possibility of disasters when vehicle not cross the lanes. The lane coloration methods can be categorized into infrastructure-based and vision-based methods. The infrastructure-based method achieve strength, build price to put coaxial cables or to locate magnetic indicators on the road plane is high. Vision based method with camera on a vehicle have benefits to use well-known existing lane recognition in the road position and to sense a road curves in front view [3].

Lane detection is one of the most significant part of the Driver Assistance System. It provides path information for driver safety with vehicle location and direction. Lane detection deal with the tracking of the lane boundaries from frame to frame given an existing model of road geometry. Lane detection in an urban street is specially a hard problem. Challenges include: poor quality lines, darkness transmit from trees, sharper curves etc. The lane departure warning system is a fundamental part within the driver assistance system, aims to provide warning messages under irregular driving behaviors due to interruption, or driver inattention [1] [2] [3].

Automatic lane recognition provide support to human driver's .The information of the lane margins relative to the vehicle allow a driver support system to aware a driver as to whether the vehicle is potentially steering off track. The lane departure warning and tracking systems have common applications in intelligent transportation system and in Vehicular Ad-Hoc Network .In intelligent transportation system, intelligent vehicle cooperate with smart infrastructure to attain a secure environment and better traffic conditions. Vanet communication is also most important in the region of wireless networking as well as in the automotive industry. The onboard sensors provide real-time information about drivers, traffic environment, and vehicles. The image system is the key element of intelligent vehicle technology, where the Lane Detection algorithm is the central part of assistant navigation in intelligent vehicle [5] [6] [7] [8].

By using visualization technology, it is possible to create a driver support system to identify lane markings on existing path infrastructure. Lane detection using Image processing is worked by setting the webcam camera to monitor the movement of vehicle throughout the lanes. The main elements of driving system detection are webcam camera and computer for store image data. The computer vision based approach become particularly significant in traffic applications generally due to their quick response, simple installation, operation and maintenance. A color camera is mounted in the vehicle at the front-view mirror. It captures the images of the atmosphere in front of the vehicle including the path, and also vehicles on the path [6] [10][11].

In general, lane marks are lines and curves like structure. The disconnected lane marks can be recognized with lane detection algorithm. The Lane detection algorithm detects the lanes, based on the image captured from a camera. In this algorithm select the region of interest from input image to identify the lane area. The road lanes can discover with Hough transformation. To decrease computation overhead, the canny edge detector is used to identify the boundary pixels. The detected boundary pixels are then follow by the Hough transform. It transforms between the Cartesian space and a parameter space in which a straight line can be define.

It usually shows lines in the image. So the path straight lines in the image are identify used the Hough transformation. The advantage of Hough transform is that the pixels lying on one line require not all be adjacent. Therefore, it is very helpful for detect lines with short breaks in them due to noise or partially occluded by objects [2] [4] [6] [9] [12].

2. PROPOSED ALGORITHM

How Modified Hough based Lane colorization works

Proposed algorithm takes following steps shown in Figure 2.1.

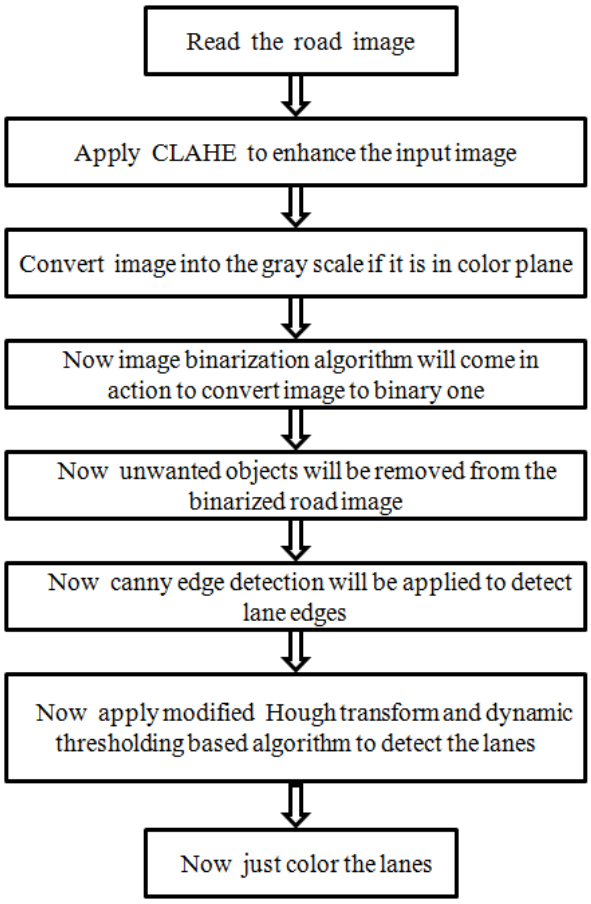


Fig-2.1: Proposed Algorithm

Step 1: Read the Road image.
Step 2: Apply CLAHE to enhance the input image.
Step 3: Convert image into the gray scale if it is in color plane.
Step 4: Now image binarization algorithm will come in action to convert image to binary one.
Step 5: Now unwanted objects will be removed from the binarized road image.
Step 6: Now canny edge detection will be applied to detect lane edges.
Step 7: Now apply modified Hough transform, and dynamic thresholding based algorithm to detect the lanes.
Step 8: Now just color the lanes.

3. EXPERIMENTAL SETUP

These are some following images which helps to compare the results of proposed algorithm with existing approach.

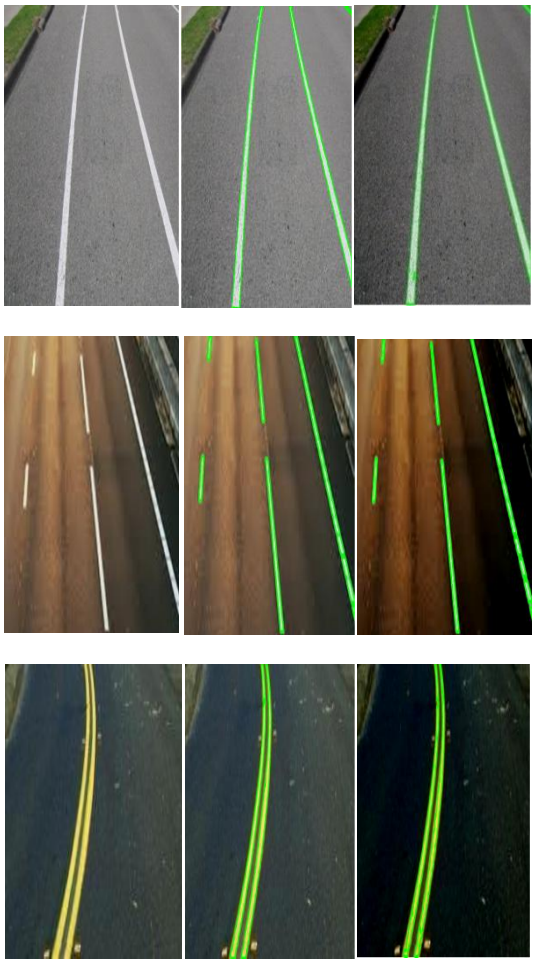


Fig-3.1: a) Input Image b) Result of existing method c) Result of proposed method

These Figures shows better human visibility of original image by using proposed algorithm as compared to previous technique and provide better visibility results with improved efficiency.

4. PERFORMANCE EVALUATION

4.1 FMeasure Analysis:

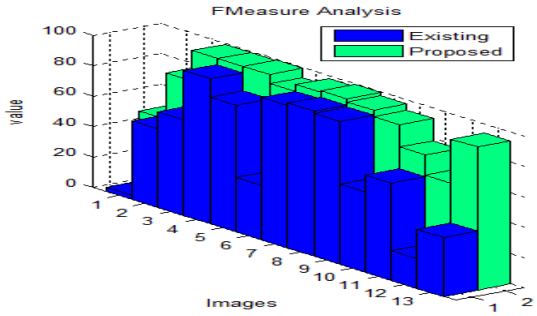
FMeasure is a measure of a test's correctness. It consider both the accuracy p and the recollect of the test to calculate the score: p is the number of correct results divided by the number of all returned results and r is the number of correct results divided by the number of correct results that should have been returned.

Table 4.1 demonstrates the evaluation of existing and proposed methods. By using proposed algorithm, the results of FMeasure becomes higher than previous results.

Table 4.1: FMeasure Analysis Evaluation

Images	Existing	Proposed
1	2.8254	49.0694
2	51.7557	79.3993
3	62.9877	99.3289
4	95.2634	99.1468
5	83.3526	99.5879
6	35.9087	93.3216
7	93.6793	98.1119
8	95.0817	99.3484
9	93.7963	97.1442
10	52.5398	92.9378
11	64.0087	78.2580
12	19.3373	65.0157
13	38.7586	94.0295

The following graph presents the information of FMeasure and evaluates it within two statements. Blue bar expose the existing method and green bar describe the proposed method which is improved as compared to earlier ones.



Graph-4.1: FMeasure of previous results and proposed results for different images

4.2 Bit Error Rate (BER) Analysis:

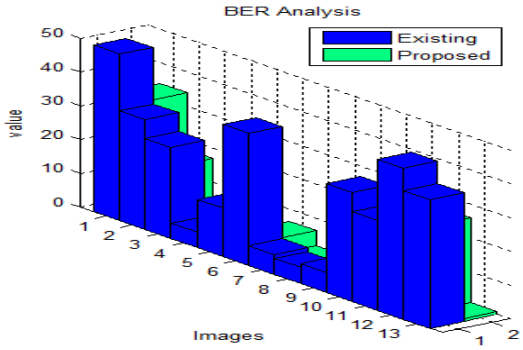
Bit Error Rate is defined as the number of bit errors divided by the total number of transferred bits during a studied time interval. BER is a unit less performance measure, often expressed as a percentage.

Table 4.2 illustrates the comparison of bit error rate between existing and proposed method. By using proposed algorithm the value of bit error rate becomes lower as compared to previous results.

Table 4.2: Bit Error Rate Evaluation

Images	Existing	Proposed
1	49.2835	33.7444
2	32.5438	17.0818
3	27.0138	0.6666
4	4.5224	0.8459
5	14.2716	0.4104
6	39.0583	6.2603
7	5.9449	1.8532
8	4.6877	0.6474
9	5.8413	2.7765
10	32.1851	6.5963
11	26.4659	17.8591
12	44.6482	25.9173
13	37.9812	0.8873

The following graph shows the representation of bit error rate value analysis between previous and proposed technique. Blue bar reveal the existing method and green bar define the proposed method which are better as compared to previous ones.



Graph-4.2: Bit Error Rate of previous results and proposed results for different images

4.3 Accuracy: Accuracy is defined in terms of logical errors. It is the proximity of measurement results to the true value.

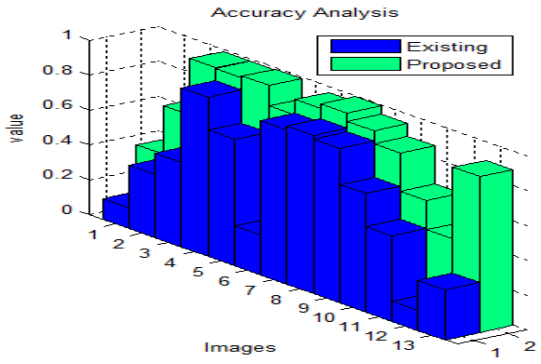
Table 4.3 shows the comparison of accuracy between existing and proposed method. By using proposed algorithm the accuracy becomes higher as compared to previous results.

Table 4.3: Accuracy Evaluation

Images	Existing	Proposed
1	0.1197	0.3857
2	0.3639	0.6638
3	0.4875	0.9873
4	0.9116	0.9834
5	0.7237	0.992
6	0.2287	0.8752

7	0.8864	0.9644
8	0.9068	0.9935
9	0.8843	0.9449
10	0.6781	0.8708
11	0.4905	0.6506
12	0.1131	0.4827
13	0.2873	0.893

The following graph shows the representation of accuracy value analysis between previous and proposed techniques. Blue bar expose the existing method and Green bar describe the proposed method which are superior as compared to previous ones.



Graph-4.3: Accuracy of previous results and proposed results for different images

4.4 Peak signal-to-noise ratio (PSNR) Analysis:

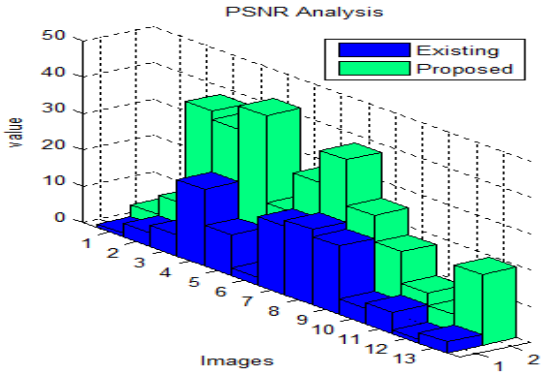
Peak signal-to-noise ratio is defined as the ratio between the maximum possible power of a signal and the power of corrupting noise that affect the reliability of its representation. It is an estimate to human view of reconstruction quality.

Table 4.4 illustrates the comparison of Peak signal-to-noise ratio between existing and proposed method. By using proposed algorithm the value of PSNR becomes improved as compared to previous results.

Table 4.4: Peak signal-to-noise ratio Evaluation

Images	Existing	Proposed
1	1.0257	4.2330
2	3.9290	9.4691
3	5.8067	37.9332
4	21.0665	35.6003
5	11.1729	41.9772
6	2.2556	18.0731
7	18.8898	28.9692
8	20.6143	37.7707
9	18.7344	25.1799
10	4.2405	17.7746
11	5.8573	9.1328
12	1.0424	5.7256
13	2.9417	19.4116

The following graph demonstrates the representation of PSNR value analysis between previous and proposed techniques. Blue bar expose the existing method and Yellow bar express the proposed methods which are advanced as compared to prior ones.



Graph-4.4: PSNR of previous results and proposed results for different images

4.5 Sensitivity Analysis:

Sensitivity is measures the proportion of actual positives which are correctly identified and is opposite to the false negative rate.

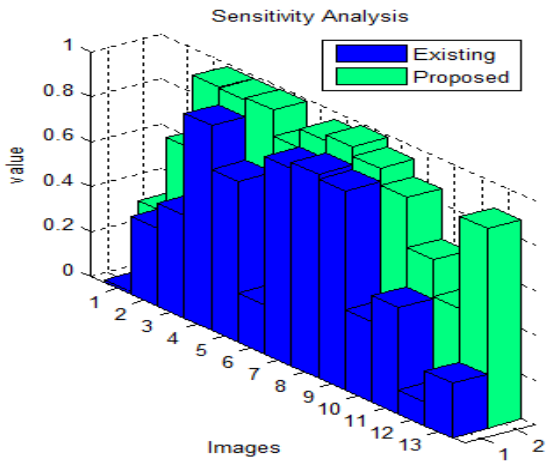
Table 4.5 shows the comparison of sensitivity analysis between existing and proposed method. By using proposed algorithm the value of sensitivity becomes better as compared to previous results.

Table 4.5: Sensitivity Evaluation

Images	Existing	Proposed
1	0.0143	0.3251
2	0.3491	0.6584
3	0.4597	0.9867
4	0.9096	0.9831
5	0.7146	0.9918
6	0.2188	0.8748
7	0.8811	0.9629
8	0.9062	0.9871
9	0.8832	0.9445
10	0.3563	0.8681
11	0.4707	0.6428
12	0.1070	0.4817
13	0.2404	0.8873

The following graph shows the representation of sensitivity value analysis between previous and proposed techniques. Blue bar reveal the existing method and Yellow bar define

the proposed method which are advanced as compared to prior ones.



Graph-4.5: Sensitivity of previous results and proposed results for different images

5. CONCLUSION

Main emphasis of this paper is to improve the result of lane coloration algorithm when fog, noise or any other factor is present in the images. The methods developed so far are working efficiently and giving good results in case when the straight lane road images are there. But problem is that they fail or not give efficient results when there are curved lane road images. The proposed technique has the ability to handle various kind of circumstances i.e. like foggy images, night time images etc. Also the proposed technique is more proficient for curved lane images. The experiments results for the road images have shown the significant improvement of the proposed technique over the available one.

This work has neglected the use of any evolutionary technique for detection of the lanes of the road images in efficient manner. So in near future we will enhance the proposed work by using the ant colony optimization based lane detection.

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