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Lane Line Detection

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Abstract - *The proposed algorithm does detection of lane lines present in road images. It includes two steps. These two steps are pre-processing and lane line detection. Lane lines are detected using Hough transform. Implementation of this lane line detection algorithm is done using MATLAB.*

***Key Words*: Edge detection, Lane line detection, Hough transform, MATLAB, Region of interest.**

1.INTRODUCTION

Advance driver assistance systems are group of electronic technologies that assist driver in driving and parking functions. Most of the vehicular accidents are caused by human error which can be avoided by advance driver assistance systems. Advance driver assistance system include lane departure correction/warning module. Lane line detection is important part of lane departure warning. Process of lane detection detects lane lines present on road and gives both the limits of detected line segments. Simple application of lane line detection is showing detected lane lines to vehicle driver on display. Lane line detection is challenging. Because image of road may contain different objects other than lane lines such as roadside area, vehicles on road, pedestrian. Also, lane lines can be covered by other vehicles.

2. Methodology

Basic block diagram for this algorithm is,

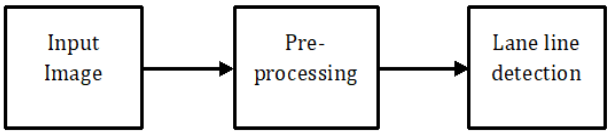

Fig -1: Basic block diagram

As in above figure first block represents input image. For this algorithm firstly images are downloaded from internet and then saved into folder. These images are used in this algorithm and given as input image to this algorithm. Second block represents pre-processing of input image. Pre-processing improves image data as well as different features. So that these features can be used for further processing of algorithm. Also, there is chance of noise present in an image it can result in false detection of lane lines. Pre-processing is used for suppressing unwilling distortions. It helps in improving lane line detection. As title of this algorithm suggests, lanes lines are important. So that edges of lane lines are main features for this algorithm. Third block represents lane line detection. Edge detected image is given as input to Hough transform. By computing Hough transform lane line detection is performed.

2.1 Flow Chart

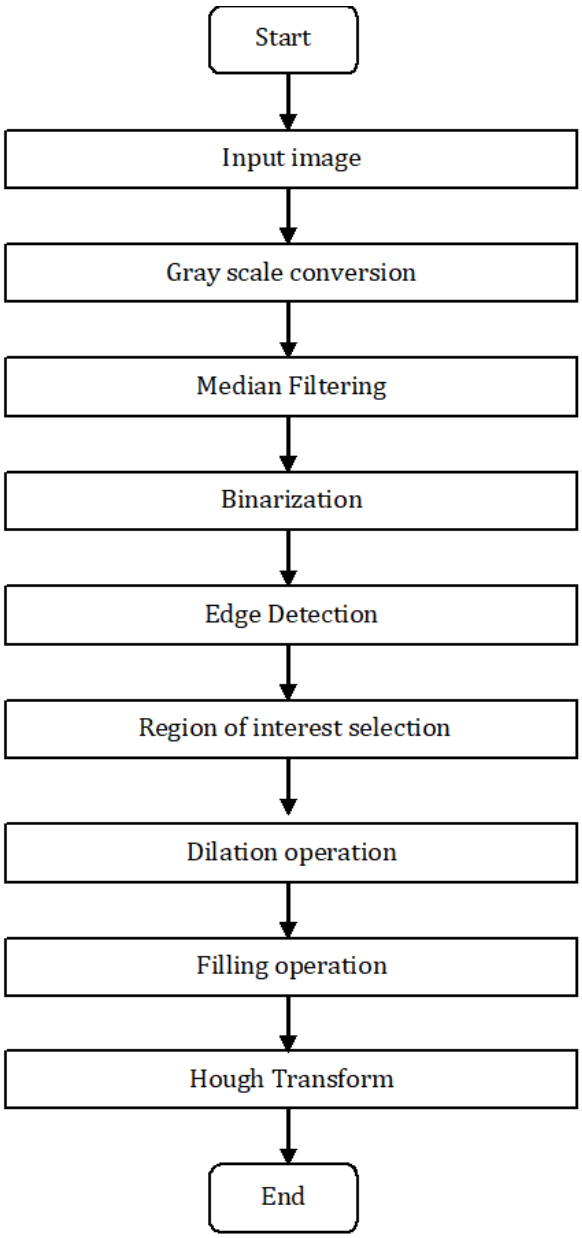

Fig -2: Flow chart

2.2 Pre-processing

1. RGB to gray scale conversion of input image:
   Input RGB image is converted to gray image. The grayscale intensity is stored as an 8-bit integer giving 256 possible different shades of gray from black to white. Grayscale images are much easier to work within a variety of task like in many morphological operation and further processing; it is easier to work with single layered image (Grayscale image) than a three-layered image (RGB color image). It is also easier to distinguish features of an image when we deal with a single layered image.

Fig -3: Gray -scale Conversion

2. Noise removal:
   It is process of removing noise from an image. Image noise is random variation of brightness or color information in the image captured. Noise reduction is very important step in digital image processing for getting better quality of images. Noise is always present in digital images during image acquisition. Coding, transmission. For removing noise filters are used in this algorithm.

   There are different filters such as average filter, median filter, gaussian filter, disk filter etc. Filter simply works by moving sliding window through an image. In this algorithm median filter is used for removing noise. It removes noise present in an image and also preserves edges. Thus, image information is preserved. For this purpose, median filter is selected among other filters and applied.

   Median filter:
   Median filter works by moving the sliding window that replaces the center value with the median of all pixel values in the window.

Fig -4: Median filtering

3. Binarization
   The main goal of binarization is the segmentation of image into foreground pixels and background pixels. It creates binary image from gray scale image I by replacing all values above globally determined threshold with 1 s and setting all values to 0 s.

Fig -5: Binarized image

4. Extracting Edges of lane lines
   In this proposed algorithm edges of lane lines are important feature. Here focus is on extracting edge information of lane lines. For edge detection Sobel operator is used.

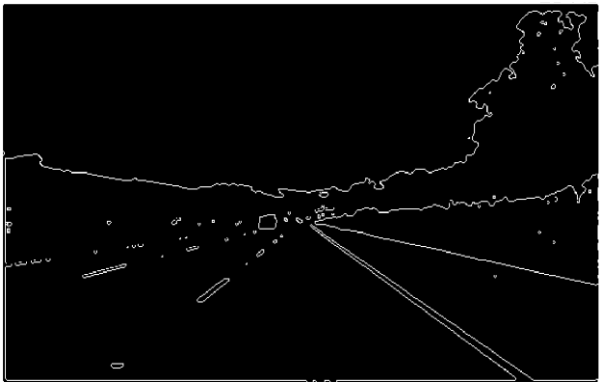

Fig -6: Edge detection

5. Selection of region of interest
For this algorithm road part having lane lines is region of interest in an image. Purpose of selecting region of interest is removing sky part, road side objects etc.

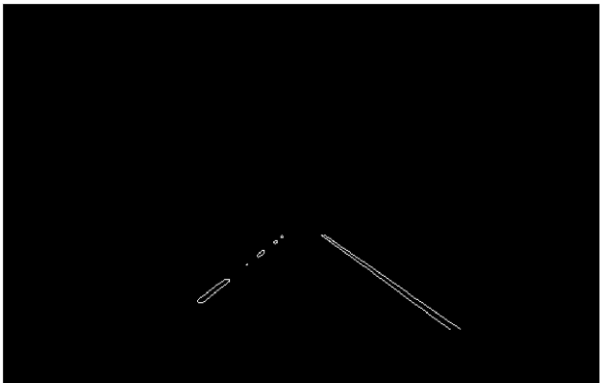

Fig -7: Selected region of interest

6. Dilation
Image is dilated by structuring element. The number of pixels added to the boundaries of object depends upon size and shape of structuring element in an image.

Fig -8: Dilation

7. Filling
Filling operation is performed for filling the distance present between lane line edges.

Fig -9: Filling operation

2.3 Lane line detection

Lane line detection is performed using Hough transform. Hough transform is a feature extraction technique.

Basic steps are done by using Hough transform are:

1. First create a Hough transform matrix.
2. Locate the peaks in the Hough transform matrix
3. Extract line segments corresponding to peaks in the Hough transform matrix.

Fig -10: Lane line detection

In above figure it is seen that lane lines are detected correctly.

2.4 Experimental Results

Different road images are given as input to this algorithm. MATLAB results of this algorithm are,

Fig -11: Lane line detection

Fig -12: Lane line detection

3. CONCLUSION

Lane line detection plays important role in intelligent transport systems. A research on lane line detection algorithm is presented in this paper. A lane line detection using different pre-processing methods and Hough transform has been proposed. This algorithm works for both type of lane lines that is for solid and dotted straight lines having less distance between dotted lane lines. This algorithm is tested for different road images. It works efficiently.

4. REFERENCES

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