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An Approach Towords Number Plate Extraction Using Morpholgy

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Abstract— Automatic Identification of vehicles is a very challenging area, which is in contrast to the traditional methods of monitoring the vehicles manually. Number plate detection is one of the most promising aspects towards advance transportation system. To detect Location of car number plate, a edge detection and morphology was used. In this paper main sections are preprocessing, morphological operations, number plate extraction and segmentation. Firstly input images are taken from the video. Set of two images are pre-processed. Then both the images are fused using Stationary Wavelet transform. Then morphological operations and structural element analysis can make the number plate stand out; Structural element is used to extract the edge of objects in image; then the algorithm applies the closing and opening morphology of binary image to get the image smooth contour. Then the different region properties are used for finding the number plate. The detected number plate is extracted from the image. The extracted number is then segmented. Labeling and bounding box properties are used to segments the Number plate character.

Keywords— Stationry wavelet transform, closing and opening morphology, Segmentation etc

I.INTRODUCTION

Number plate detection is a process of vehicle identification. During past few years, recognition of number plate had been used for security or traffic applications such as in traffic surveillance, parking lot access control, and information management. In present applications, requirement is to detect or correct number plate from the image [2]. Due to the diversity of parameters involved in car images, Number plate detection is considered as the most crucial stage in the whole system process. Now there are some algorithms about locating of number plate such as method based on color feature [3]. In this paper, Input number plate images are taken from video. First, the image is converted into grayscale image and then preprocessed that includes removing noise operation and making the image suitable for further processing or analysis as per the requirements [4]. Then wavelet transform is used to obtain edges from the image. Second, edge detection process is used for finding the edge where vertical and horizontal edges are detected. Morphological operations like subtracting the gray image from the original image to remove the unwanted pixel information, Then Thresholding is used to convert all pixels in 0's and 1's form and makes further processing simple. The structuring element is used to find the vertical and horizontal edges from the image. Then closing and opening operations helps to find the accurate region of number plate. [5] [6]. The character region enhancement and connected component analysis is used for enhancement and removal of noise which gives the better view of number plate. [5][7]
The flow of number plate detection process is shown below

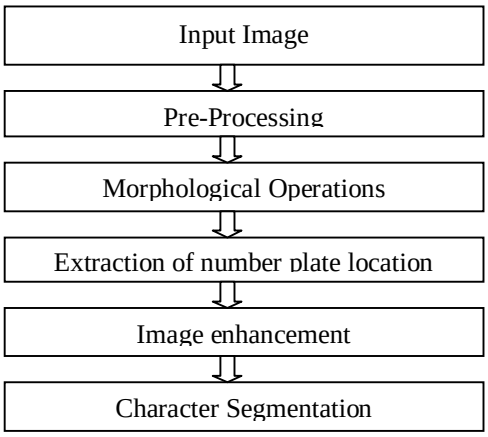

Fig 1:-Flowchart for number plate Detection

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II.PRE-PROCESSING

There are various methods that are used for number plate detection. In the detection process, set of frames are obtained from the video and two frames are selected for further processing.

A. RGB-Gray Conversion

Set of images are in RGB. For further processing, RGB images are converted into Gray images using pre-processing. Thresholding is used for removing noise from the image.

Fig 2:-Input video frames

Fig 3:-Gray Images

B. Wavelet transform (WT)

Different methods are available for image fusion.Wavelet transform is one of the method which is used for fusion[1]. In this paper, stationary wavelet transform is applied on both the input images to obtain edges from the fused image. Wavelet transform are of many types but here Symalate wavelet is used which gives wavelet coefficients.These coefficients are used for fusion process.Then the Invesrse wavelet is used for recovering the image.The recovered image is the fused image. This fused image is used in further processing of number plate extraction.

Fig.(4) Shows the two level decomposition. The decomposition is the process of filtering which gives different details of image. When decomposition is performed, the approximation and detail component can be separated. 2-D Wavelet Transformation (WT) converts the image from the spatial domain to frequency domain. [8][9]

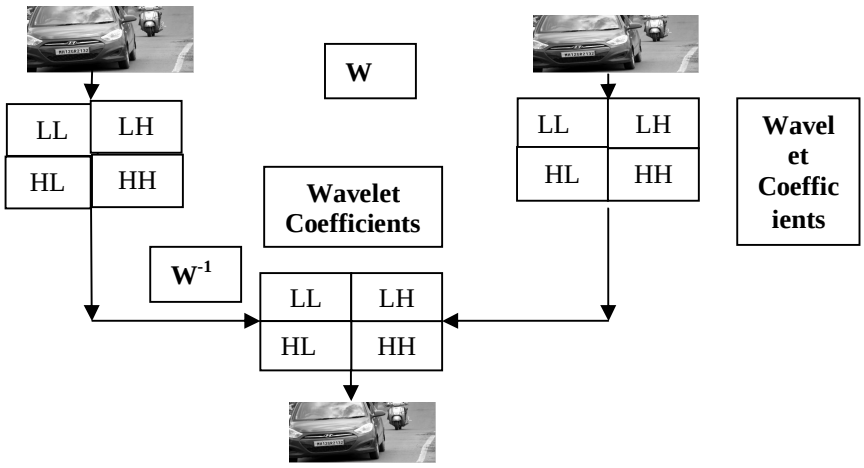

Fig4: Block diagram of WT [2]

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III.MORPHOLOGICAL OPERATIONS

C. Edge detection using Closing and Opening Operations

Firstly, the image consists with noise and unwanted objects. Image enhancement is also used to make the image with reduced noise. The extraction of the number plate Thresholding is done on the image for removing the extra unwanted elements.

Morphological operators are used to detect edges from image. The number plate has the shape and size and to detect this shape and size, we required to detect horizontal and vertical edges from the image. The dilation and erosion are the combinations of Opening and closing operations. Opening and closing operators are used for removing elements (objects, noise) respectively lighter and darker than the background [10].

In this extraction Process, closing operation is performed to get neighbors connected pixels. The closing operation is performed horizontally and then for vertically by using line as a structuring element.

Using the structuring element B for closing operation on the set A, Expressed as A•B defined as,

$$f \bullet b = (f \oplus b) \ \Theta b \tag{1}$$

In this process, line structuring elements is used which comes in 8 connected pixel group (horizontal, vertical etc.) Directional structuring elements are consisting neighbors for clearing the objects from image using directional properties like (e.g. lines of given thickness or length [10]. The different shapes of structuring elements are presented for this process Such as line, diamond etc. In number plate extraction, Line structuring element is used which gives the horizontal lines in the image and secondly vertical lines in the image.

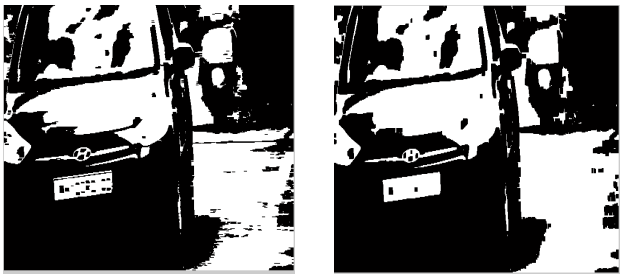

Fig 5:-Closing operation with structuring elements horizontal and vertical.

Fig. (5) Shows closing operation horizontally and vertically using line as structuring element. The 8 connected pixel group will made the number plate area visible in the image with white pixels. The opening operation is performed on image next to the closing operation. In closing operation, image is preserved with the horizontal and vertical lines.

Using the structuring element B for Opening operation on the set A, Expressed as A•B defined as,

$$f \circ b = \left(f \Theta b\right) \oplus b \tag{2}$$

Now the task remaining is to remove the unwanted elements from image which is larger in size than the number plate. The black and white area is opened with certain threshold. The threshold will be set to remove the area consists with unwanted objects near number plate.

Fig 6:-Image after opening operation

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III. NUMBER PLATE EXTRACTION

D. Extraction of Number plate Location

The opening operation is done with some threshold; this will show the difference between the previous images Fig. (5) image and Fig. (6) Image. In next scenario, finding the location of number plate, different parameters are calculated. The region properties (centroid) and connected components are used to locate number plate area.

The unwanted areas also get selected when the number plate extraction process is carried out. To select the exact location of number plate area, aspect ratio is defined for the number plate. After the opening operation, the connected components are used with region properties to find the location of number plate. Now by using region properties, it gives the exact position of number plate. It will search for the connected components means the bunch of 8 connected pixels and it will measures a set of properties for each connected component or object. Then by using the centroid property the bounding box is created for the number plate area.

Fig 7:-located number plate image

Fig. (7) Shows the located number plate area with red edge bounding box. Now the rectangle shape is used by bounding box property to show the number plate in image. The red edge bounding box shows the number plate in the image

Fig 8:-Extracted number plate from image

Fig (8) shows the Extracted number plate image. After getting the exact location of number plate, by using the aspect ratio the number plate is extracted from the image. Fig. (9) (a) Shows the extracted number plate.

E. Number Plate Segmentation

The next step is to segment the characters of number plate. Number plate characters are gets separated by bounding box. Again gray thresholding is used for removing the unwanted elements. The next process is giving the black and white labels. Labels are used to apply the bounding box to each characters.This will gives the segmented number plate image.

(a)

(b)

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(c)

(d)

Fig 9:- (a), (b), (c) shows the Number plate segmentation

And (d) segmented number plate

IV.PROPOSED WORK

This paper shows the results up to the number plate extraction. The extension for this work is to recognize the number plate which gives the detail information about owner of vehicle and speed measurement application is the advantage for the system, Using these measurements, speed violation will be minimize. The image fusion is an extra advantage in these types of applications.

V.CONCLUSION

The proposed method is very efficient and flexible. It detects the correct location of number plate and gives the segmented number plate. In this number plate extraction process, the input image are carried out from video. The wavelet is used to get the finer image with the edges. The morphological approach will gives the region of interest. The morphology filtering is very good to get the location of number plate. It gets easier to find edges by using the morphological operators with line structuring element. The morphological operators are used for detecting the horizontal and vertical edges from the image. These edges are used for detecting the location of number plate from the image. The extraction process is carried out using the centroid and connected component analysis. The aspect ratio is used after the detection of area of number plate. These properties are used for detecting the exact location and extracting the number plate. Then the extracted number plate gets segmented.

In this paper extraction is done on the set of images carried out from the video. The advantage of taking input images from video which will give the better results of extraction. The set of images with wavelet will give the finer image for the detection process than by using a single image from the camera.

The process of number plate extraction is applied on 25 still images results are shown below,

TABLE I. RESSULTS OF NUMBER PLATE DETECTION FOR STILL IMAGES

Test Images	**Results**		
	Correct results	***Wrong results***	***% of success***
25	**23**	**02**	**92%**

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