Vehicle License Plate Recognition by Enhanced MSER

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***Abstract* - Locating and extracting the words or sentences from the natural images is one of the main challenging area in computer vision. In that, area of automatic license plate localization and recognition has been a difficult problem for many years. Images are given as input from a dataset. Here we need to extract only number plate text even the input image may contain other text. Many challenges involved in detecting text from the images. Some challenges are low contrast, blur images, different lighting conditions and many geometrical distortions. To handle this kind of challenges and to improve the accuracy, Maximally Stable Extremal Regions (MSER) technique is used.**

***keywords* - Image, Maximally Stable Extremal Regions, Text Localization, Computer Vision, Text Recognition.**

I. INTRODUCTION

Firstly, there is a need to explore the different categories of images with respect to the color and graphics; those are natural images, document images. Traditionally text recognition was mainly focused on analysing scanned documents, but with the emergence of low-cost consumer products such as mobile phones, tablets and PCs, so the user applications related to digital image processing have become popular. However, the automatic text recognition in natural images is a still challenging one, recognizing only number plate from vehicle image is also a challenging example. Here, we are mainly focused on the vehicle images to detect and extract the license plate number of the vehicle.

License plate localization and recognition are major parts in vehicle license plate identification system. This plays a major role in many applications like automatic traffic rules monitoring. This area is very challenging because it requires only license plate number rather the other text in in image which is treated as License plate localization and character recognition is another challenging task after localising the license plate. The automatic identification of vehicles by the contents of their license plates is important in private transport applications. There are many applications of such recognition systems, some of them are speed limit enforcement, tolling, traffic control, security.

A license plate must have the below mentioned attributes. Those are size of number plate, background color, font style, font size, font color. License plate recognition system mainly consists of four phases. First step is to acquire the image and performing some pre-processing on it. Second stage is extraction of number plate from whole body of vehicle image. Third Stage is segmentation or isolation of characters from the extracted number plate and fourth stage is to recognize the segmented characters and to display the output result. From the entire input image, only the number plate is detected and processed further in character segmentation. From the extracted number plate each character is isolated by segmentation in the character segmentation phase. After the segmentation of characters, the recognition is done in last character recognition phase.

II. RELATED WORK

In [1], Median filtering is used to remove noise from the input image. Median filtering is done with the help of pixels of an image. It helps to minimise the random occurrences of black and white pixels. However, there are different edge methods are available like Roberts edge detection, Sobel edge detection and Prewitt edge detection. From those, Sobel edge detection is used to detect edges of text from an image.

In [2], number plate extraction is done by using morphological operations and Candidate Plate Area by Morphological Opening and Closing Operations. Initially, Gray scale conversion is done on image to make clear. Morphological operations used to remove noise and non-character region from license plate image. Sobel edge operator used to detect the edges of text. Binarization and thresholding are also used as pre-processing of vehicle input image.

In [3], proposes the license plate localization with integrated segmentation approach. Harris corner approach is used to extract the feature from image. After extracting all the corner point, sliding window approach is applied to find the most likely number plate region. Aspect ratio limit is set to restrict the license plate. Integrated approach is used for getting good result in segmentation.

In [4], Maximally Stable Extremal regions used to detect the Regions of Interest (ROIs) from an image. Canny edge detection used to detect the edges of text from regions of interest with the help of threshold value and noise from the image is reduced. After that, text is extracted and displayed using Optical Character Recognition. It gives the best f-score value.

III. PROPOSED METHOD

License plate recognition involves in two things which are number plate detection and number extraction. Here, Maximally Extremal Stable Regions technique is followed for license plate detection and Optical Character Recognition is used for text extraction. The process of getting license plate number is represented as a flowchart.

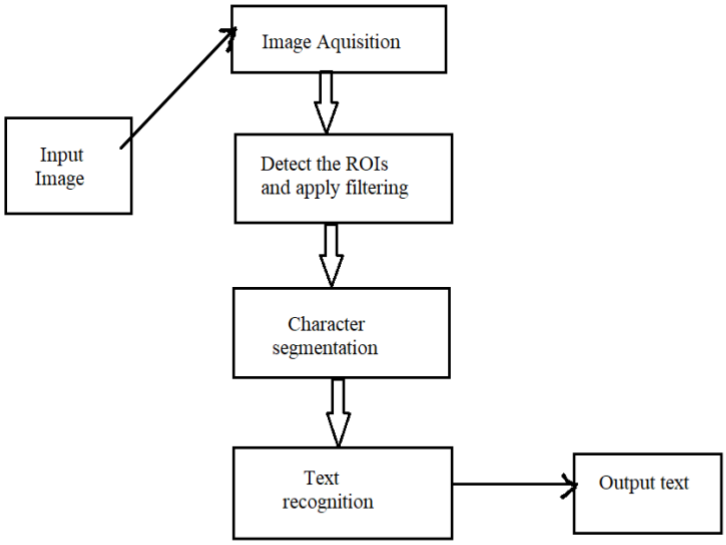

Fig.The Flowchart for proposed method.

License plate recognition system mainly consists of four phases which are mentioned below:

- Image Acquisition
- Text Detection / Text Localization
- Character Segmentation
- Text Recognition

3.1 Image Acquisition

Initial step is to acquire the image of vehicle as input. Generally, Image is acquired by high resolution digital camera, but here we are using a dataset which consists of many vehicle license plate images which are captured at different illumination conditions and in different background. Following figure shows the input vehicle image.

Fig: Input Image

3.2 Preprocessing and Text detection by MSER

Before text detection from the image, image is subjected to preprocessing. In preprocessing first color image is converted to grey scale image. After that, bilateral filtering is applied to remove the noise in the image and then edges are detected which are called as contours. Text Detection is the process of localizing various regions of the scene which contain text. Here we have to localize the number plate from the vehicle license plate image.

For license plate localization, MSER technique is used. MSER comes under the connected components method. In this approach it extracts the connected components. It uses the threshold value to detect the text regions. It helps in removing most of the non-text regions which act as noise during the extraction of required text. The detecting regions are called as Regions of Interest (ROIs). The ROIs are detected using the well-known Maximally Stable Extremal Regions (MSERs). By using this technique, all the text in image is highlighted and some non-text regions also detected as text regions. The text displayed on our ROIs adds a layer of texture that can be exploited in order to distinguish them from other objects.

Fig: Preprocessed Image

Fig: ROIs using MSER

3.3 Character Segmentation

Character Segmentation is the process of partitioning digital image into multiple segments. From the localized vehicle image, need to segment all the characters. If character segmentation fails, a character is divided into multiple segments or pieces. This tends to the wrong results. So, segmentation is the important part in text recognition.

3.4 Text Recognition

After segmentation of characters in license plate image, characters have to be recognised using any efficient algorithm and make it as text. Here, Optical Character Recognition (OCR) technique is used in text recognition stage to recognize the characters and displayed as text by grouping the characters.

Fig: License plate

From above image, Recognised license plate Number at standard output : RIP LS1

IV. RESULTS

The proposed method is for vehicle license plate extraction. Our own dataset is given as input. The dataset consists of images which have different sizes, colors and different background. Images may be in png or jpg format. The dataset consists of clear images, low contrast images, unclear images. This method shows the good results for the images in the dataset. It achieves the accuracy rate 70% for given dataset.

Total Number of Images	Successfully Extracted Number plates	Accuracy Rate
50	35	70%

V. CONCLUSION AND FUTURE SCOPE

A simple and efficient number plate extraction method is presented in this paper. The proposed method is mainly designed for extracted number plate area from image of vehicle. This extraction process is tested over more than one number plates of vehicles under different illumination and success rate achieved by using this method is good. In future, the extraction of number

plate is done in video-based ANPR. Mostly all these algorithms are image dependent. There may be the future work on the algorithm that will be image independent making the algorithms dynamic. Extracting the ROI from the image is the difficult and tricky task because the position of number plate in the image is not fixed for every vehicle image.

VI. REFERENCES

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