Vehicle License Number Plate Recognition by Morphological Image Processing

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***Abstract*—** From the past few year, Vehicle number plate recognition has been the most interesting computer vision topic. In different countries, it is seen that the number plates are of different shape and size and also have different color. In India the most common background color used for the the vehicle number plate is yellow or white and for foreground color, it's black. In this paper we proposed a system for recognition of number plate mainly for the vehicles and segment the numbers to identify each number as separate. This is an approach based on simple and efficient morphological erosion and dilation method. A simple approach is used to segment all the letters and numbers used in the number plate. After removing noise from the input image, it will be enhanced by erosion and dilation followed by pixel removal.

***Keywords*—** *vehicle number plate extraction, recognition, binary image, morphological*

I. INTRODUCTION

The vehicle license number plate recognition systems (VLNPR) exist for a long time, but only after 2000's it became an important application because of the large increase in the number of vehicles. The information extracted from the license plates is mainly used for monitoring traffic, access control, parking, motorway road tolling, making car logs for parking systems etc. by the law enforcement agencies. Country-specific traffic norms and standards will be a guiding parameter in this regard . This helps to fine tune the system i.e. number of characters in the license plate, text luminance level etc. So the problem can then be brought down to a application in a particular country.

For example, in India the license plate numbers is printed in black colour on a white background for private vehicles and on a yellow background for commercial vehicles. The general format for the license plate is two letters for state code for state code which is followed by two nimbers for district code, then a single or double letter depending on ongoing sequence and then four digit code specific to a particular vehicle. In U.S.A there is no such strict guidelines for the fonts that can be used for this purpose.

There is large amount of variation in contrast in license plate. If the number plate is very similar to background it is difficult to identify the location of the license plate. Brightness and contrast changes as light falling on it changes.

II. LITERATURE SURVEY

S.Roy, A. Choudhury, J. Mukherjee. [1]They proposed a system to localization of number plate mainly for the vehicles in West Bengal (India) and segmented the numbers as to identify each number separately. This paper presents an approach based on simple and efficient sobel edge detection method. He also presents a simple approach to segment all numbers and letters on number plate seperately. After reducing noise from the input image is enhanced ithe contrast of the binarized image using histogram equalization. We mainly concentrate on two steps, the one is the location of the number plate and second is to segment all the number and letters to identify each symbol separately.

S. Du, M. Shehata, W. Badawy [2] proposed a comprehensive survey on existing (Automatic License Plate Recognition)ALPR Techniques by dividing them according to the features that's used in each stage. Comparisons of them in the terms of Aces, Rip-offs, results of Recognition , & speed of processing was used. At the end, a future forecast for ALPR was also given.The future research of ALPR should concentrate on recognition of multistyle plates, temporal information based video ALPR, processing of multiplates, image processing of high-definition plates, recognition of ambiguous character.

P.anishiya, prof. S. Mary joans [3] focused a number plate localization and recognition system for Tamilnadu(India) vehicles . This system is developed using digital images and can be applied easily for commercial car park systems for the use of parking services documenting access , parking houses secure usage and also to prevent car theft . The proposed algorithm uses a combination of morphological operation for number plate localization with area criteria tests. Segmentation of the plate characters was achieved by edge detection techniques, labeling and fill hole approach. The character recognition was accomplished with the use of optical characters by the process of Template matching.

S. H. Kasaei .,S. M. Kasaei [4] proposed a novel method of identifying and recognizing of car license plates of Iran. Firstly plate location was extracted, and then the plate

characters was separated by segmentation and was applied a correlation based template matching scheme for recognition of plate characters. This system is customized solely for the identification of Iranian license plates. The system is tested over a large number of images over more than 150 images, where this algorithm performs well on different vehicles including Iranian car and motorcycle plates. Finally it is proved to be 97.3% correct in the extraction of plate region and 94% correct in the segmentation of the characters and 92% in the recognition of the characters. They believe that this system can be designed again and tested even for multinational car license plates considering their own attributes in future time.

D. Jiang,T. M. Mekonnen,T. E. Merkebu,A Gebrehiwot.[5] proposed paper presents about car plate recognition system describing design, algorithm and future implementation. The system has input of colored image of a car and the output is the car's registration number . The system has three main steps to get the required information which are localization of plate, segmentation and recognition of character. First, the original image is processed to extract the number plate, followed by the isolation of characters, followed by the extraction of each characters. Set of training images is used to develop the algorithm. The final output is the extraction of desired text number with high precision an accuracy.

Z. Xu., H. Zhu.[6] proposed an efficient and full-bodied method of locating license plate . The method uses the rich corner information in the plate area and the edge information of number plates. It can easily pact with more tough site problems, particularly with a license plate existing in a complex background.

S.H. Park, K.I. Kim, and H.J. Kim [7] proposed neural networks for locating license plate. Neural networks can be used as filters to examine different small windows of an image and to decide whether each window contains a license plate or not. The inputs are HSI values. Under different illuminations, colors are changed and it creates problems.

Fuzzy logic has been applied in the problem of locating license plate by Zimic [8]. The authors made some instinctive rules for describing the license plate, and gave some membership functions for the fuzzy sets ''bright'', ''dark'' and ''bright and dark sequence'' for getting positions of the horizontal and vertical plate . The system can easily be adapted to locate other patterns by extending or changing the rules.

T. D. Duan, T. L. Hong Du, [9]proposed a method in which firstly, edges are detected and then Hough transform is used to detect the location of license plate. This method requires too much calculation and has difficulty in extracting license plate region when the boundaries of the license plate are not clear or are distorted or there are lot of vertical and horizontal edges in image.

III. PROPOSED MODEL

The work is divided into several parts:

a)Input raw image, b)Image grayscaling, c)Noise removal, d)Morphological erosion and dilation, e)Image Binarization, f)Pixel Removal

The proposed model is subdivided into 9 parts as shown below:

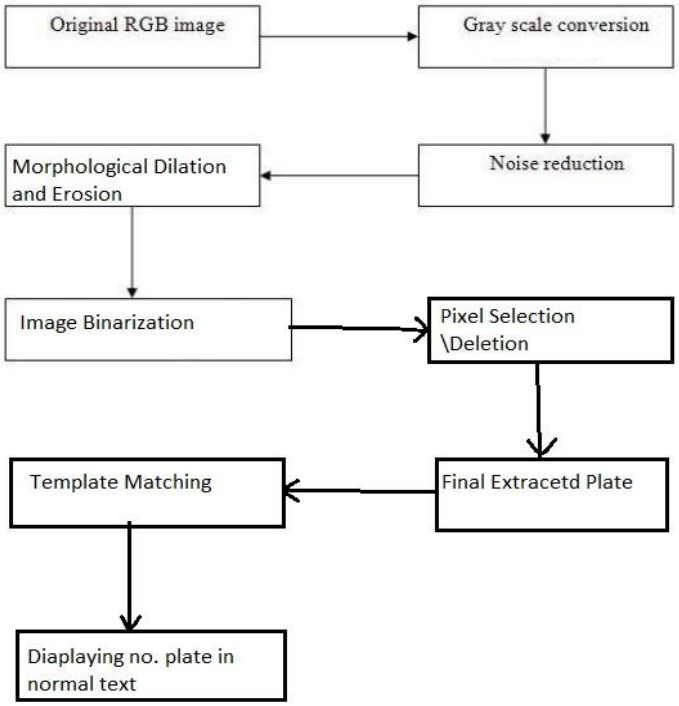


Fig.1. Schematic diagram of proposed approach.

Input raw image :-

Upload the license plate image for pre-processing and extraction.

B. Gray scale conversion:-

It is used to convert the RGB image to Gray scale image. The rgb2gray function eliminates the hue and saturation information but retain the luminance of the image.

In this method, the RGB image has to be converted to gray scale image to calculate the 8-bit gray code.

C. Noise reduction :-

Median filtering technique is used to reduce the paper and salt noise. In median filtering, the value of an output pixel is calculated by the median of the neighbourhood pixel and the mean value. To outliers i.e. the extreme values, the median is less sensitive than the mean. Therefore the median filtering is able to remove these outliers mainatining the sharpness of the image.

Morphological Dilation:-

Dilation is used to add the pixels to the boundaries of objects in image.The output pixel's value is the maximum value of all the pixels in the surrounding pixel's neighborhood. In a binary image, if any pixel's value is set to maximum value say 1, then it's the output pixel value which is set to 1.

Morphological Erosion:-

Erosion works opposite to the dilation, it removes pixels from the boundaries of the object. The output pixel's value is the minimum value of all the pixels in the surrounding pixel's neighborhood.. In a binary image, if any pixel's value is set to maximum value say 0, then it's the output pixel value which is set to 0.

Image Binarization:-

The eroded is converted into binary image. In binarization, the pixel image is converted to a binary image. It is important for things like digitalising text or segmentation.

Pixel Removal and Selection:-

Pixel Removal and Selection function is used on binarized image. Two pixel threshold value has been used i.e 300 and 600.Pixels below 300 has been removed and above 600 is kept to make image more clear for extraction.

Image Segmentation:-

Image Segmentation' is the procedure of distributing an image into smaller portions. It creates several sets of pixels in same image and assigns a tag to every pixel in an image and the pixels with the similar kind of label share particular features. Segmenting makes it calmer to further examine and identify significant information from a digital image.

IV. ALGORITHM

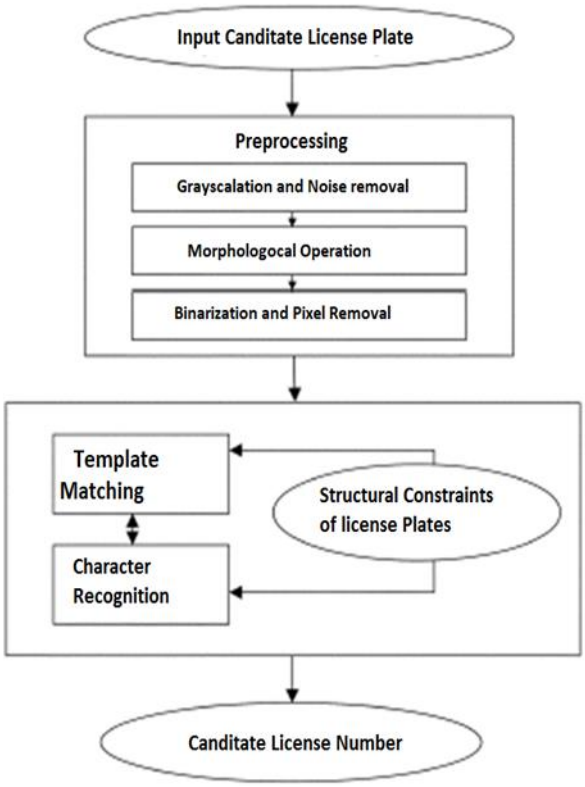
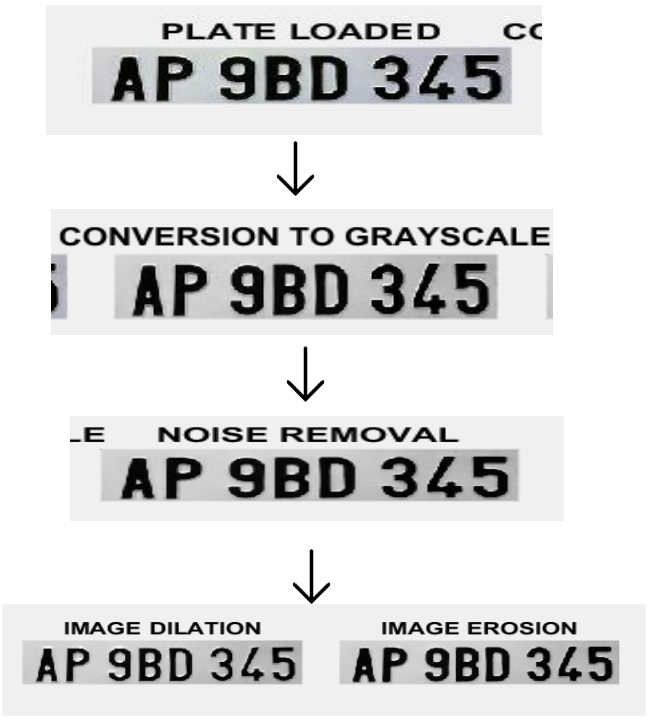
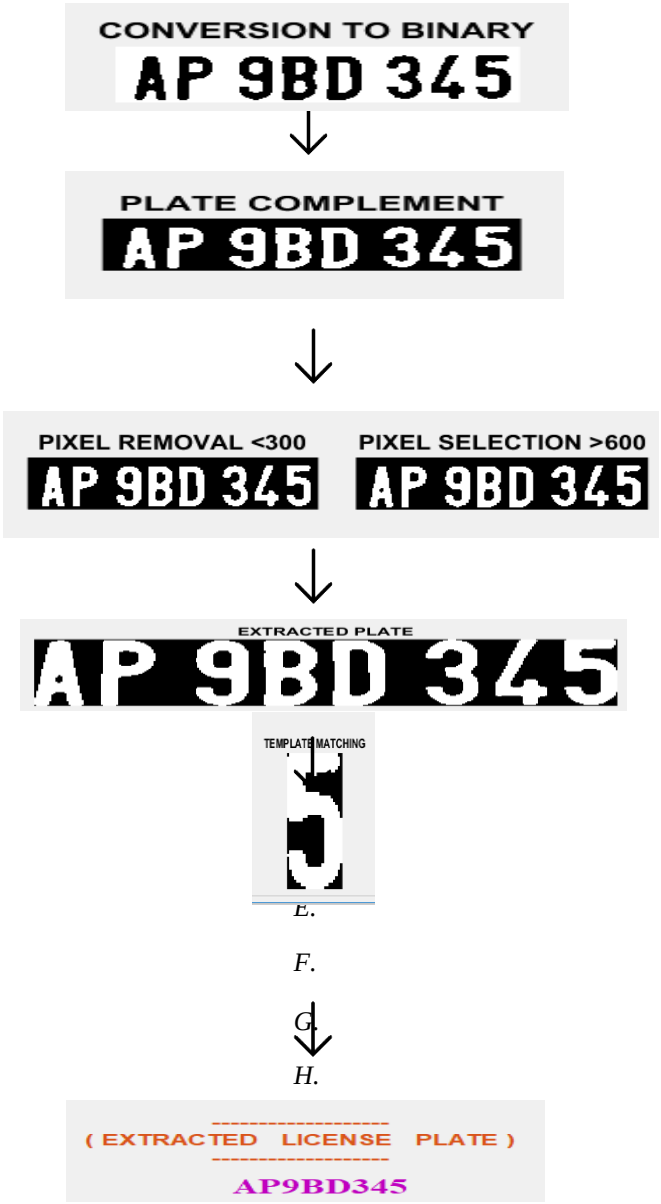


FIG. 2. ALGORITHM OF PROPOSED APPROACH.

V. RESULTS AND ANALYSIS

This section presents the simulation results of the developed VLNPR system. Each function's output is shown stepwise





E.

F.

G.

H.

Fig.3.Output images as a flow chart

VI. FUTURE SCOPE

This can be further be modified in many different ways for direct application for RTO services. It can be made for automatically and less manually. It can be modified as to check whether the recognized license plate is registered to the RTO or not, for this one can calibrate it with the microcontroller. With this it can be given live access of the RTO registered vehicle database so that it can directly check for registered and unregistered vehicles.

Further it can be merged with the CCTV cameras on the signal to automatically capture the vehicle and from that, it's number plate and check the database for it's authorization and also the owner's info if anything goes against the laws.

VII. CONCLUSION

An effective less time consuming vehicle number plate detection method is proposed which performed on many-sided image. In this method, we have used multiple processing techniques such as dilation, erosion, greyscaling, binarization, noise removal and pixel selection which makes the image more clear and enhanced to extract the symbols i.e. both numbers and and letters more easily. Template matching has also been used which displays the no. on license plate in text format in GUI more correctly. If the algorithm is concerned with only a specific state or region ,the data sets required will be reduced. The numbers on the plate has to be more simple and less fancy to be detected.

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