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SMART ROAD SAFETY SYSTEM

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Abstract - Traffic control and vehicle owner identification has become a major problem in every country. Sometimes it becomes difficult to identify vehicle owners who violate traffic rules and drive too fast. Therefore, it is not possible to catch and punish those kinds of people because the traffic personnel might not be able to retrieve vehicle numbers from the moving vehicle because of the speed of the vehicle. Therefore, there is a need to develop an Automatic Number Plate Recognition (ANPR) system as one of the solutions to this problem. There are numerous ANPR systems available today. These systems are based on different methodologies but still it is a really challenging task as some of the factors like high speed of vehicle, non-uniform vehicle number plate, language of vehicle number and different lighting conditions can affect a lot in the overall recognition rate.

1.INTRODUCTION

In the last few years, ANPR or license plate recognition (LPR) has been one of the useful approaches for vehicle surveillance. It can be applied at a number of public places for fulfilling some of the purposes like traffic safety enforcement, automatic toll tax collection, car park system and Automatic vehicle parking system . The first step i.e. to capture image of vehicle looks very easy but it is quite exigent task as it is very difficult to capture image of moving vehicle in real time in such a manner that none of the component of vehicle especially the vehicle number plate should be missed. Presently number plate detection and recognition processing time is less than 50 ms in many systems. The success of the fourth step depends on how the second and third step are able to locate the vehicle number plate and separate each character. These systems follow different approaches to locate vehicle number plate from vehicle and then to extract vehicle number from that image. Most of the ANPR systems are based on common approaches like artificial neural network (ANN), Probabilistic neural network (PNN), Optical Character Recognition (OCR).

2. PROBLEM STATEMENT AND SOLUTION APPROACH

As it is not possible to judge which approach is better, different papers, which are based on steps mentioned in Fig.1, are surveyed and categorized based on the methodologies in each approach. For each approach whenever available parameters like speed, accuracy, performance, image size and platform are reported. Commercial product survey is beyond the scope of this paper as sometimes these products claim more accuracy than actual for promotional purposes.

PROPOSED WORK

Most of the number plate detection algorithms fall in more than one category based on different techniques. To detect vehicle number plate following factors should be considered:. Plate size: a plate can be of different size in a vehicle image. Plate location: a plate can be located anywhere in the vehicle.. Plate background: A plate can have different background colors based on vehicle type. For example a government vehicle number plate might have a different background than other public vehicles.. Screw: A plate may have screws and that could be considered as a character. A number plate can be extracted by using image segmentation method. There are numerous image segmentation methods available in various literatures. In most of the methods image binarization is used. Some authors use Otsu's

method for image binarization to convert color image to gray scale image. Some plate segmentation algorithms are based on color segmentation. A study of license plate location based on color segmentation is discussed in . In the following sections common number plate extraction methods are explained, which is followed by detailed discussion of image segmentation techniques adopted in various literature of ANPR or LPR.

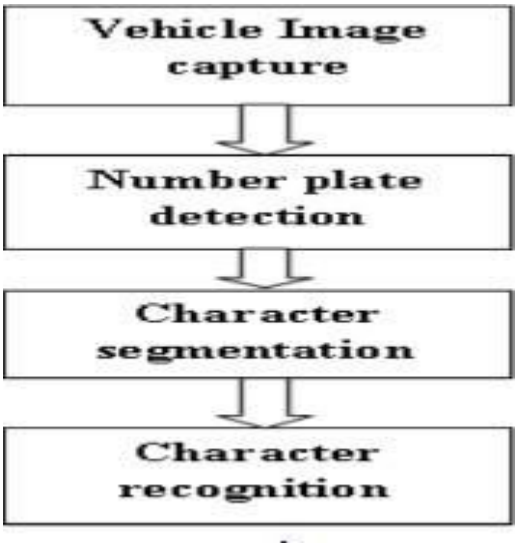


IMAGE BINARIZATION

Image binarization is a process to convert an image to black and white. In this method, a certain threshold is chosen to classify certain pixels as black and certain pixels as white. But the main problem is how to choose the correct threshold value for a particular image. Sometimes it becomes very difficult or impossible to select the optimal threshold value. Adaptive Thresholding can be used to overcome this problem. A threshold can be selected by the user manually or it can be selected by an algorithm automatically which is known as automatic thresholding.

EDGE DETECTION

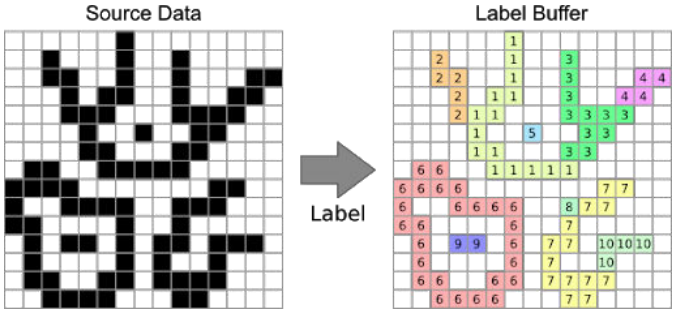
Edge detection is a fundamental method for feature detection or feature extraction. In general case the result of applying edge detection of an algorithm is an object boundary with connected curves. It becomes very difficult to apply this method to complex images as it might result in an object boundary with not connected curves. Different edge detection algorithms / operators such as Canny, Canny-Deriche, Differential, Sobel, Prewitt and Roberts Cross are used for edge detection.

HOUGH TRANSFORMATION

Hough Transform It is a feature extraction technique initially used for line detection. Later on it has been extended to find positions of arbitrary shapes like circle or oval. The original algorithm was generalized by D.H. Ballard.

BLOB DETECTION

Blob detection is used to detect points or regions thatdiffer in brightness or color as compared to surroundings. The main purpose of using this approach is to find complementary regions which are not detected by edge detection or corner detection algorithms. Some common blob detectors are Laplacian of Gaussian (LoG), Difference of Gaussians (DoG), Determinant of Hessian (DoH), maximally stable extremal regions and Principal curvature based region detectors.



CONNECTED COMPONENT ANALYSIS

CCA or blob extraction is an approach to uniquely label subsets of connected components based on a given heuristic. It scans binary images and labels pixels as per connectivity conditions of current pixels such as North-East, North, North-West and West of the current pixel (8-connectivity). 4-connectivity is used for only the north and west neighbour of the current pixel. The algorithm gives better performance and it is very useful for automated image analysis. This method can be used in plate segmentation as well as character segmentation

MATHEMATICAL MORPHOLOGY

Mathematical morphology is based on set theory, lattice theory, topology, and random functions. It is commonly applicable to digital image but can be used in other spatial structures also. Initially it was developed for processing binary images and then extended for processing grayscale functions and images. It contains basic operators such as Erosion, dilation, opening, closing.

RELATED WORK IN NUMBER PLATE DETECTION

The methods discussed in preceding sections are common methods for plate detection. Apart from these methods, various literature discussed methods for plate detection. As most of the methods discussed in these literatures use more than one approach, it is not possible to do category wise discussion. Different number plate segmentation algorithms are discussed below. In [5],Then statistical measurements in both windows were calculated based on the segmentation rule which says that if the ratio of the mean or median in the two windows exceeds a threshold, which is set by the, then the central pixel of the windows is considered to belong to an ROI. The two windows stop sliding after the whole image is scanned. The threshold value can be decided based on trial and error basis.

(a) Skewed image (b) Number plate with lines

3. CONCLUSIONS

ANPR can be further exploited for vehicle owner identification, vehicle model identification traffic control, vehicle speed control and vehicle location tracking. It can be further extended as multilingual ANPR to identify the language of characters automatically based on the training data It can provide various benefits like traffic safety enforcement, security- in case of suspicious activity by vehicle, easy to use, immediate information availability- as compare to searching vehicle owner registration details manually and cost effective for any country For low resolution images some improvement algorithms like super resolution of images should be focused. Most of the ANPR focus on processing one vehicle number plate but in real-time there can be more than one vehicle number plate while the images are being captured.

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