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Automated License Plate Recognition System (ALPRS) using Regular Expression

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ABSTRACT
Number plate recognition is currently a research area for much with the advent of time. Simultaneously many applications such as traffic monitoring, vehicle identification etc. are finding need of number plate recognition. Automatic number plate recognition (ANPR) is an image processing technique used to identify vehicle number on the vehicle. ANPR is a mass surveillance method that recognized the vehicle registration number from an image, captured by a camera. In this model we make use of blob detection method for detecting number plate of a vehicle. Further, this detected blob is recognized using Optical Character Recognition engine (OCR). The recognized string is searched for standard format using Regular Expression.
Keywords **-** Automated License plate recognition (ALPR), Blob Detection, Number Plate, Optical Character Recognition (OCR), Regular Expression.

I. INTRODUCTION

Traffic monitoring is a significant challenge in many countries these days. Number of systems are proposed for same. In terms of identification of vehicle license plate plays crucial role. License plate aid in identifying many details about vehicle and its concerned information. Automatic License Number Plate Recognition (ALPR) is a computer vision technology to extract the license number of vehicles from images. It is an embedded system which has numerous applications and challenges. Also, Traffic Management systems are installed on freeways to check for vehicles moving at speeds not permitted by law. All these processes have a scope of improvement. In the center of all these systems lies a vehicle. In order to automate these processes and make them more effective, a system is required to easily identify a vehicle.

Automatic number plate recognition (ANPR) is an image processing technique used to identify the vehicle and its owner by its license plate. ANPR is a mass surveillance method which recognized the vehicle registration number from an image, captured by a camera, thereby identifying vehicle.

Vehicles in each country have a unique license number, which is written on its license plate. This number distinguishes one vehicle from the other, which is useful especially when both are of same make and model. An automated system can be implemented to identify the license plate of a vehicle and extract the characters from the region containing a license plate. The license plate number can be used to retrieve more information about the vehicle and its owner, which can be used for further processing.

Portability and convenient installation are key terms in deploying such system.

ALPR systems function to automatically capture an image of the vehicle's license plate, transform that image into alphanumeric characters using optical character recognition or similar software, compare the plate number acquired to one or more databases of vehicles of interest to law enforcement and other agencies, and to alert the officer when a vehicle of interest has been observed. The automated capture, analysis, and comparison of vehicle license plates typically occurs within seconds, alerting the officer almost immediately when a wanted plate is observed.

Although the ALPR term includes a specific reference to "automated," it should be noted that human intervention is needed insofar as the officer monitoring the equipment must independently validate that the ALPR system has accurately "read" the license plate, that the plate observed is issued

from the same state as the one in which it is wanted, and to verify the currency of the alert, i.e., verifying that the reason this vehicle or the owner was wanted or of interest is still valid.

In India, basically, there are two kinds of license-plates, black characters in white plate and black characters in yellow plate. The former for private vehicles and latter for commercial, public service vehicles. The system tries to address these two categories of plates.

Automatic Number Plate Recognition (ANPR) is a mass surveillance method that recognized the vehicle registration number from an image, captured by a camera. It uses optical character recognition (OCR) to read the license plate. This technology is used by various security and traffic applications such as entrance of highly restricted areas for security like Parliament house, Supreme Court, Military zones, or any other sensitive organization. These systems are also used for the traffic prospective gathering traffic flow statistics, finding stolen car, controlling access to car parks, like in parking area vehicle number plates is used to calculate duration of the parking. When a vehicle enters in the parking area, number plate is automatically recognized and stored in database by the ANPR system. When vehicle later exits from the parking area, number plate is again recognized by the ANPR system.

II. LITERATURE REVIEW

Chui-chung et al [1] used the technique of blob analysis to locate license plates in image before identifying the plate numbers. They used the optical flow algorithm and blob analysis to locate the multiple license plates in video sequences. Use video data of surveillance systems from real cases to show the capability of the proposed method. Proposed method had capability to locate multiple license plates.

Kumar Parasuramn et al [2] proposed a smart, simple and efficient algorithm which is mainly designed for Indian license Plate Recognition. The proposed algorithm consists of three major steps: Localization of number plate region, segmenting of characters and recognition of characters. For extracting the Plate region, edge detection algorithm and vertical projection method are used. In segmentation part, filtering, thinning and vertical and horizontal projection are used. And finally, chain code concept with different parameter is used for recognition of the characters.

Anuja P. Nagare et al [3] specified that when a vehicle steps over magnetic loop detector it senses car and takes image of the car, following image pre-processing operations for improvement in the quality of car image take place. From this enhanced image, license plate region is recognized and extracted. Then character fragmentation/segmentation is performed on extracted License Plate and these segmented characters are recognized using Neural Network. It is observed that, as fan beam feature extraction method has more features for training the neural network thus its simulation accuracy is higher. Using Fan-beam for feature extraction Back Propagation and Learning Vector Quantization Neural Networks are trained.

Lekhana G.C et al [4] proposed detection steps are : Image acquisition by capturing an image of a vehicle from video . Secondly License plate detection extraction, by Spectral Analysis Approach and Connected Component Analysis. Further extract the region of license plate process use spectral analysis. Character segmentation use connected component analysis approach and SVM feature extraction techniques. Successful recognition of a moving vehicle is silent feature of this scheme.

Muhammad H Dashtban et al [5] approach involves: in plate localization Noise alleviation, Changing color space, Intensity dynamic range modification, Edge detection, separating objects from background, Finding connected component, Candidate selection, all above process are used. In segmentation part multistage model are used. (Improvement, Rotation, Binarization, Segmentation, Preparation. For the recognition artificial feed forward neural network is used. The method achieved accuracy over 91% for localizing plates. The recognition system implemented by neural networks after segmentation of characters in image plate identify alphabets and numbers separately and achieve an accuracy over 97% and 94% respectively for each. Advantage of this approach is, the image database includes images of various vehicles with different background and slop under varying illumination condition and the disadvantage is detection only for English and Parisian number plate.

Stuti Asthana et al [6] focuses on the Number plate recognition first image conversion in binary and applying to neural network, and apply mpl algorithm, then detecting individual symbol, by matrix mapping. Training by this approach obtained 96.53% average recognition rate using double hidden layer and 94% using single hidden layer. The captured image 2-3 meters taken away from the cameras.

Zhen-Xue Chen et al [7] implemented, recognition by(1) Target recognition: by using feature-salience theory, features of license plates(include shape, symmetry , height-to-width ratio , colour, texture, and spatial frequency, Character features include lines, blobs , aspect ratio of characters, distribution of

intervals between characters ,and alignment of characters) (2license plate locating by Hough transform (HT). (3) Recognizing license characters by different steps like binarization, noise removal, and orientation adjustment, Optical Character Recognition. In this paper, the success rate for the identification with the set of 1144 license plates is 95.7%. Combining this rate with the location success (97.3%), the overall rate of success for our LPR algorithm is 93.1%.As pointed out in the preceding sections, although this system is intended for the recognition of Chinese license plates only.

Muhammad Sarfraz et al [8] stresses on, license plate recognition methods are: (1) Image Acquisition: By digital camera (2) License Plate Extraction: *vertical edge detection by sobel algorithm *filtering by seed filling algorithm *vertical edge matching (3) Segmentation: (4) Character Recognition: * Normalization * Template matching using hamming distance approach. And by this paper referenced getting the result like: License Plate Extraction: 587/610, 96.22% License Plate Segmentation: 574/610, 94.04% License Plate Recognition: 581/610, 95.24%, and overall system efficiency: 95%.this approach having some problem in extracting the plate, diplomatic cars and military vehicles, are not addressed since they are rarely seen. Detection only for white, black, red, and green colour plate or numbers.

Humayun Karim Sulehria [9] proposed, recognition steps are as follow:(1)Image Enhancement: by histogram equalization method (2)Structuring Elements : by thickening, (3) Hat transformations: which is use for contrast, enhancement(top has & bottom has)setting (4) Morphological Operations like dilation and erosion (5) Plate region confirmation (6) Character Segmentation and Recognition by neuron implementation model .by this reference 250 colour images were used for testing the technique, These results report a high accuracy rate of above 95%.Although the technique is quite efficient enough to work very well in the real time environment but currently the technique proposed lays more emphasis on the accuracy of the overall system, while the some more work is to be done to make the technique more efficient.

By Chetan Sharma et al [10] delineates about (1)Pre-processing of Image by histogram equalization(2)Extraction of plate region by edge detection algorithm(canny operator) and Plate Area Detection by various morphological operations (3)Segmentation of characters by *connected component *bounding box method , *Median filter, all above methods. And observed final result as Extraction: 71/78 which gives 91.02% efficiency, Segmentation 69/78 which gives 88.46%efficiency. Overall accuracy of our system is 89.74%.proposed method is sensitive to the angle of view, physical appearance and environment conditions.

P.Sandhya Rani et al [11] proposes scheme that, (1) detect a license plate region by vertical or a horizontal edge based method (2) pre-processing: is also needed in this approach .so first converted in to binary image then eliminate noise using morphological operation (3) character segmentation by thresholding method (4) feature extraction and character recognition by Euler number formation .Advantage of this approach that skew ness is not present in the detected vehicle number plate compare to other methods and Disadvantage is it limits the efficiency of the total system.

III. PROPOSED WORK

In this section, we explain the step performed to recognize plate number from a frame captured by a video camera. Figure-1 shows the model of License Plate Recognition System used in this paper.

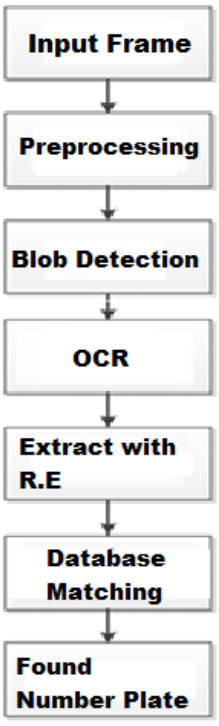

Fig 1-ALPR System

1. *Input Frame*

Here we make use of camera to capturing the video. In this session frames are processed continuously to retrieve apt image for further processing.

Fig 2- Captured Frame

2. Pre-processing

The session consists of morphological operation which is combination of dilation and erosion along with grey scale conversion. After the grey scale conversion the image is converted into black and white format i.e. binary format using the specific/mentioned threshold limits.

Fig 3-Dilated frame

Fig 4-Erode frame

Fig 5-Gray Scale frame

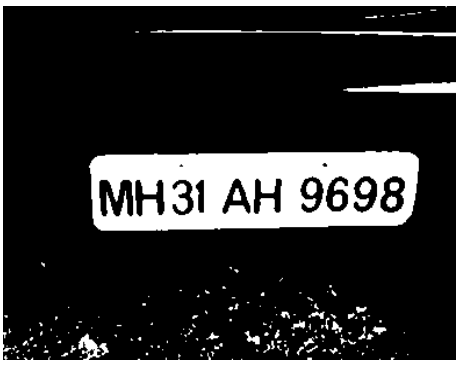

Fig 6-Binary frame

3. Blob Detection

It consists of connected component analysis which is responsible for segmenting the image into different components. The segmentation of image into different components depends on the threshold value specified. In this session all components are added into a list. Each component is treated as blob and checked for the specific area of blob. If the area is above the specific value mentioned then the only the blob is accepted and processed further else rejected.

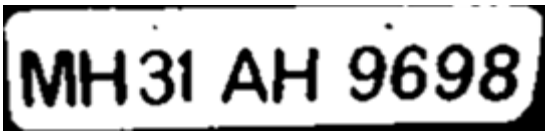

Fig 7- Detected Blob

4. OCR

OCR i.e. optical character recognition engine is used for extracting characters from the blob received. The characters string is containing required Number Plate including some unwanted characters.

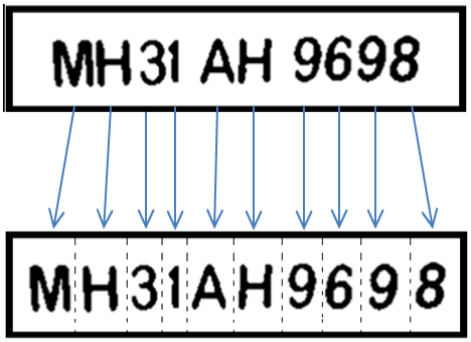

Fig 8-OCR

5. Extract with R.E.

It is a string matching technique which can be used to extract the correct format substring from a string. This expression is used to get the string in a

particular format. We use Regular Expression to extract the required pattern of substring from given string. For Indian Number Plate system the Regular Expression is:

A-Z]{2}[0-9]{2}[A-Z]{1,2}[0-9]{3,4}

6. Database Matching

The matched regular expression is checked for details in database and the number is shown along with the details.

IV. CONCLUSION

In this model we proposed and implemented automated license plate recognition system. We made use of regular expression for license identification. This was achieved using OCR, Blob Detection & Database matching. The model and the experiments performed make the implementations of the scheme used, apparent for future applications. Future applications refer to building intelligent dash boards for car, smart web cams etc.

REFERENCES

Journal Papers:

[1] Chiu-Chung Yu, Che-Yen Wen, *"Multiple License Plates Location", Forensic Science Journal 2012;11(1):17-24*

[2] Kumar Parasuraman, Member, P.Vasantha Kumar, *"An Efficient Method for Indian Vehicle License Plate Extraction and Character Segmentation", 2010 IEEE International Conference on Computational Intelligence and Computing Research*

[3] Anuja P. Nagare, *"License Plate Character Recognition System using Neural Network", International Journal of Computer Applications (0975 – 8887)Volume 25– No.10, July 2011*

[4] Lekhana G.C, M.Tech; R.Srikantaswamy, Professor, *"Real time license plate recognition system", International Journal of Advanced Technology & Engineering Research (IJATER) National Conference on Emerging Trends in Technology (NCET-Tech) ISSN, Volume 2, Issue 4, ISSN No: 2250-3536, July 2012.*

[5] Muhammad H Dashtban, Zahra Dashtban, Hassan Bevrani, *"A Novel Approach for Vehicle License Plate Localization and Recognition", International Journal of Computer Applications (0975 – 8887), Volume 26– No.11, July 2011.*

[6] 6. Stuti Asthana, Niresh Sharma, Rajdeep Singh, *"Vehicle number plate recognition using multiple layer back propagation neural networks", International Journal of Computer Technology and Electronics Engineering (IJCTEE), Volume 1, Issue 1, July 10, 2011.*

[7] Zhen-Xue Chen, Cheng-Yun Liu, Fa-Liang Chang, and Guo-You Wang, *"Automatic License-Plate Location and Recognition Based on Feature Salience", IEEE Transaction on vehicle technology, VOL. 58, NO. 7, september 2009.*

[8] Muhammad Sarfraz, Mohammed Jameel Ahmed, and Syed A. Ghazi, *"Saudi arebian licence plate recognition system", International Conference on Geometric Modeling and Graphics (GMAG'03), 2003.*

[9] Humayun Karim Sulehria, Ye Zhang, Danish Irfan, Atif Karim Sulehria, *"Vehicle Number Plate Recognition Using Mathematical Morphology and Neural Networks", WSEAS TRANSACTIONS on COMPUTERS, Volume 7, ISSN: 1109-2750, Issue 6, June 2008.*

[10] Chetan Sharma1 and Amandeep Kaur2, *"INDIAN VEHICLE LICENSE PLATE EXTRACTION AND SEGMENTATION", International Journal of Computer Science and Communication, Vol. 2, No. 2, pp. 593-599, July-December 2011.*

[11] P.Sandhya Rani1, Vara Prasad, *"License plate character segmentation based on pixel distribution density", [IJESAT] International journal of engineering science and advanced technology, Volume-2, Issue-5, 1539 – 1542, Sep-Oct 2012.*