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REVIEW OF CAR-LICENSE-PLATE DETECTION METHODS

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ABSTRACT

Now a days vehicles play a very big role in day to day life. Also the use of vehicles has been increasing because of population growth in recent years. Therefore, detection of vehicle number plates is becoming a big problem and much more difficult to solve. In recent years, Car License Plate Detection (CLPD) is one form of technology that not only recognizes and counts vehicles, it also distinguishes each as unique by recognizing and recording the license plates. It is playing an important role in different applications related to road traffic monitoring, automated transport system, detection of stolen vehicles, automatic payments of tolls on highways or bridges, parking lots access control etc. In this review paper we have discussed different techniques used for CLPD. It explains number plate localization, sizing and orientations as well as various sections of the Number Plates Detection.

Keywords- *Automatic license plate recognition (ALPR) system, Car License Plate Detection (CLPD), Character segmentation, License plate (LP).*

I. INTRODUCTION

A license plate is the unique identification of vehicle and CLPD is design to locate and recognize the license plate of a moving vehicle automatically. ANPR involves the use of specialized cameras and software that recognize a license plate, capture an image of the license plate, and identify the characters of the license plate into data that may then be used for one or more purposes. With the rapid growth in the number of vehicles, there is a need to improve the existing systems for identification of vehicles. The significant advantage of the CLPD system is that it assumes that all vehicles already have the unique license plate. So, no additional transmitter or responder is required to be installed on the vehicle. Currently, there are multiple commercial license plate recognition systems available [2, 3]. CLPD plays an important role in numerous applications. One of the key points for most of the traffic related applications, such as parking lots access control or road traffic monitoring, is the possibility to automatically detect and recognize vehicle license plate in open environments [4]. CLPD provides automated access of the content of the license plates for systems managing and processing information of vehicle movements. Extraction of plate is a difficult task. The difficulty can be due to the following reasons:

1) License plates generally, occupy a small portion of the image.

2) In most cases, the detection is performed without prior knowledge of the license plates location in the image.

3) The difference of number plates in formats, styles and colours from country to others.

4) Probability of facing some common drawbacks which could influence the efficiency of the extraction, such as, blurry image, uneven or low illumination, low resolution of the image, vehicle motion, distorted characters, dirty plate, shadows or reflection…etc.[2].

The main goal of this research paper is to study, analyze and design an efficient and optimized algorithm(s) for detection and recognition of cars by their plate numbers [1]. The algorithm(s) will provide accurate and timely alphanumeric recognition performance. Due to different working environments, CLPD techniques vary from application to application [5]. Generally, CLPD systems are composed of two units: an image acquisition unit (e.g., a camera) and the image analysis unit. The image acquisition unit is situated over a pole focusing on the adjacent road or installed above the vehicle targeting the incoming vehicles number plates so as to capture their images. The acquired images are transferred to the image analysis unit for processing and analyzing. At present, in CLPD there are different techniques used for the recognition plate's number such as, neural network character recognition [3], and image processing technology [2].which are computationally complex or use ANN which involves complex mathematics. If we consider different views and angles of cameras, then the recognition rates increases significantly

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and hence the CLPD system becomes stronger. With this addition there some other features using which we can increase the accuracy of CLPD system.

II. LITERATURE REVIEW

This section includes the work already done on CLPD system by various researchers using different methodologies and algorithms. Following is the brief explanation of some of them,

An Efficient Method of Vehicle License Plate Recognition Based on Artificial Neural Network and Sliding Concentric Windows and is proposed by Kaushik Deba, Md. Ibrahim Khana, Anik Sahaa, and Kang-Hyun Job [6]. In this paper they are using segmentation technique named as sliding concentric windows(scw).this method helps is analyse road images which are often contain vehicles And extract license plate from natural properties by finding horizontal and vertical edges from vehicle region. On the Basis of a novel adaptive image segmentation technique is used for detecting candidate region and Color verification for candidate region by using HSI colour model on the basis of using hue and intensity in HIS colour model verifying green and yellow LP and white LP, respectively.

Zhen-Xue Chen, Cheng-Yun Liu, Fa-Liang Chang and Guo-You Wang [7], License plate recognition plays an important role in various applications, and a number of techniques have been proposed. In this paper, a novel method to recognize vehicle number plates is presented. First, the license plates are located using salient features.Then each of the seven characters in license plates is segmented and finally, the character recognizer extracts some features of the characters and uses a feature silence classifier to achieve robust recognizer result.

Pramukh Kulkarni, Ashish Khatri, Prateek Banga, Kushal Shah [8]In this paper author shows recognizing number plate in INDIA .Feature-based license plate localization for detecting the number plate, Image scissoring for character segmentation and statistical feature extraction for character recognition method used which specially designed for Indian number plates.

Prasanth Krishna, Rajesh Kannan Megalingam ,Pratheesh Somarajan,Vishnu A Pilani, Reswan Ul Hakim [10], in this paper, author produce system which is capable of extracting the number plate region from the image taken from its rear end. The system consists of digital camera, software to interface the camera with software module. Digital camera captures the image and passes it to the software module. The software module analyses the input image, identifies the location of the license plate, segment the character on it and recognize the character.

In[4],Target recognition: by using feature-salience methodology, features of number plates(include colour, texture, shape, symmetry , height-to-width ratio and spatial frequency, Character features includes blobs, lines, aspect ratio of characters, alignment of characters and distribution of intervals between characters) (2license plate locating by Hough transform (HT). (3) Recognizing license characters by different steps like noise removal, binarization, and orientation adjustment, Optical Character Recognition.In this paper , the success rate for the identification with the set of license plates is very high. Combining this rate with the location success (97.3%), the overall rate of success for our CLPD algorithm is 93.1%.This system is intended for the recognition of Chinese license plates only

In [6], a threshold value is chosen globally instead of an adaptive one. To minimize the processing time, the original image is getting down sampled to 120 columns.G.Sun et al., in [7] divided the pre-processing task into image enhancement and luminance adjustment. T.Duan et.al. , [9], processing facilities to enrich the performance edge of the level histogram Equalization algorithms are common and greying.

III. SYETEM OVERVIEW

The purpose of this paper is to provide researchers a systematic survey of existing CLPD research by categorizing various existing methods according to the features they used, by analyzing the pros/cons of these features, and by comparing them in terms of processing speed, recognition performance and to open some issues for the future research. Basic block diagram of the CLPD system is shown in fig 1.for above steps different techniques used by different author which are studied in literature review.

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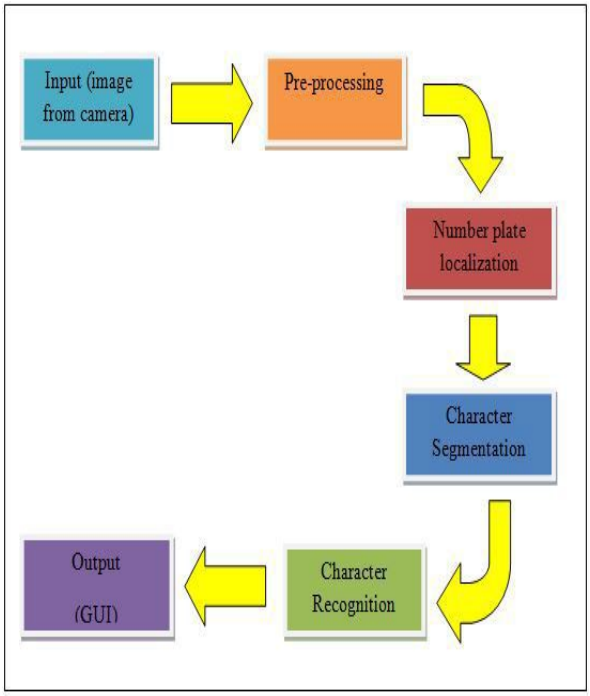

Figure (1): Basic block diagram of CLPD system [12]

A) Acquiring an image:

In image acquisition images are acquired, and acquired Images can be input to the system by different methods by cameras, but nowadays digital cameras has their advantages so better input method is by direct digital photos or by digital cameras

Fig 2:-Captured image by digital camera.[2]

B) Image Pre-processing:

This is the phase in which the quality of input image is improved using the different algorithms. The pre-processing step is having many steps involved which are used to improve the images quality, to remove the noises from images (De-noising) and minimize the shadows. Due to this process, the accuracy of CLPD system is improved. In this section we study the different algorithms those are used for pre-processing are discussed. Computation locally adaptive thresholding is used to convert a grey scale image to a binary image. The value of threshold mainly

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depends on the local statistics like variance, range and surface fitting parameters. In the case of badly illuminated areas, calculated threshold value will be low.

Although locally adaptive thresholding method cannot completely compensate the loss of information, it at least regains the information that may be lost when using a constant binarization method. To minimize the processing time, the original number plate image is down sampled to some extent of columns by preserving the original aspect ratio. Main advantage of top hat transform is that it enhances the hot region by differentiating the foreground and background while weakening the other regions at the same time. Image de-noising is applied to remove noises in the images. In this procedure, tiny abrupt changes can be softened and subtle fractures can be linked. The main aim of this technique is to prevent the soften of image edges, to retain the image outline and lines as much as possible, increasing the contrast between the ROI and other regions. Each pixel of the original image is compared with these threshold values to convert it to a binary image.

Fig 3:- Pre-processed image [3]

C) Plate Localization:

As a second step in CLPD system processing, the CLPD software should locate the possible license plate of vehicle and then extracted from the image for further processing. The initial phase in localization of vehicle license plate is by detection of the number plate size. The challenge is to include an algorithm that is able to detect the vehicles rectangle license plate region in the image which is called as Region of interest (ROI). For extraction of the number plate region, algorithm based upon combinations of edge statistics and mathematical morphology is applied to detect that region. In this method gradient magnitude and their local variance in the vehicle license plate image are computed. They are based on the property that the brightness variation in the number plate region is more repeated and more remarkable than elsewhere. Block-based processing is also useful in plate localization [5].

D) Image Segmentation:

Segmentation means partition an image into its constituent parts or objects. In general, autonomous segmentation is very difficult tasks in digital image processing. A segmentation procedure brings the process a long way toward successful solution of imaging problems that requires number plates to be identified individually. On the other hand, erratic or weak segmentation algorithms almost always guarantee eventual failure. Segmentation is one of the most important processes in the automatic number plate recognition. In this segmentation we use two types of segmentation:

1. Horizontal segmentation: Vertical scanning method is employed to dig out each character from the image found on first and last column pixel. It looks into the image by pixel vertically from [0, 0] until [width, height] which is executed in column by column scanning. At last, every character or number will be slice to split it from the plate background. Each element of the image will be stored in array separately for next horizontal scanning process.

b. Horizontal Scanning:

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E) Plate Localization:

After segmentation of the characters, the next step is character recognition. There are several methods have been proposed for character recognition. Some of them are discussed below.

Artificial Neural Network (ANN) is one of the method used to recognize character. A neural networks based on Kohonen's self-organized feature maps can be implemented to handle broken ,noisy, deformed or incomplete characters acquired from LPs that were bent or tilted with respect to the camera. This method focused on accuracy at the cost of execution speed and increased complexity. The success rate for character identification, in a large set of 1061 number plates in various viewpoints (combinations of distance and angle) is around 95.6%. This section presents the algorithms that were used to classify and then recognize the individual characters of LP. The classification is based on the extracted features. These features are then classified using either the syntactic, statistical or neural approaches. Their approach identifies the characters based on the number of black pixel columns and rows of the character and comparison of those values to a set of templates or signatures in the database.

Template matching involves the use of a database of characters or templates. There is a separate template for each possible input character of LP. Recognition is achieved by comparing the current input character to each of template in order to find the one which matches the best. This approach is based on the detection of holes and concavities in the four directions. (Left and right, Up and down,), which permits the classification of characters into different classes. Template matching is useful for recognition of fixed sized characters in LP's. It can be also used for detection of objects generally in medical image processing and face detection. It is further divided in two parts: template based matching and feature based matching. Feature based approach is useful when template image has strong features otherwise template based approach can be useful.

IV. CONCLUSION

CLPD provide various benefits like traffic safety enforcement, security- in case of suspicious activity by vehicle, information availability- for searching vehicle owner registration details manually and economical for low resolution images, some improvement algorithms like super resolution of images should be focused. From review of various papers, we conclude that there are different methods are available for recognition of car number plate. As we discussed all this phases in this review paper, the concept of Automatic license plate recognition is becomes more complex in case there are different angels of vehicle images and different conditions. Thus for the future work we suggest to work on improved CLPD in which different conditions as well as angels of vehicles are considered for recognition of license plate of vehicle.

The whole system is divided into four parts: image acquisition, character isolation, license plate localization and character recognition. Among them, a robust vision system and a robust recognition algorithm still need to be improved. Moreover, vehicle color recognition is also of interest to some customers as a further verification of the vehicle.

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