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Survey for Vehicle Number Detection Technique

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***Abstract*—** There are very large number of vehicles in India as it is very densely populated country across world. So, there is a need of detecting vehicles accurately using traffic management system. This system detects the image of the number plate of a vehicle from video using video processing with raspberry pi and the number is extracted using different methods and algorithms. The system is applicable for entrances of gates in colleges and highly restricted areas. When any vehicle passes by the system the video is captured and then video is converted into images. In this review paper for number plate recognition of vehicles we had discussed various techniques that were used in to achieve recognition.

***Keywords*—** Vehicle Number Plate Recognition

I. INTRODUCTION

Vehicle Number Plate Identification (VNPI) is a part of digital image processing which is generally used in vehicle transportation system to categorize the vehicle. Number plate recognition systems are having varieties of application such as traffic maintenances, tracing stolen cars, automatic electronic Toll collection system etc. But the main aim is to control the traffic management system. In India the traffic management system is developing day by day. In India, the number plate containing white background with black foreground color is used for private cars and for the commercial vehicles yellow is used as background and black as foreground color.

The information extracted from the license plates is mainly used for traffic monitoring, access control, parking, motorway road tolling, and border control, making car logs for parking systems, journey time measurement etc. by the law enforcement agencies. The recognition problem is generally subdivided into 5 parts:

1. image acquisition i.e. capturing the image of the license plate
2. pre-processing the image i.e. normalization, adjusting the brightness, skewness and contrast of the image
3. localising the license plate
4. character segmentation i.e. locating and identifying the individual symbol images on the plate,
5. optical character recognition.

There may be further refinements over these (like matching the vehicle license number with a particular database to track suspected vehicles etc.) but the basic structure remains the same. A guiding parameter in this regard is country-specific traffic norms and standards. This helps to fine tune the system i.e. number of characters in the license plate, text luminance level (relative index i.e. dark text on light background or light text on dark background) etc. So the problem can then be narrowed down for application in a particular country. For example, in India the norm is printing the license plate numbers 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) followed by district code, then a four digit code specific to a particular vehicle.

II. TECHNIQUES

Deep semantic segmentation:
Deep semantic segmentation neural networks such as FCNs, SegNET, and U-NET have been widely studied and applied by the remote sensing image classification research community. During the training stage, a set of remote sensing images ImageSet = {I1, I2, …, In} is adopted and manually interpreted into a ground truth set GroundTruthSet = {Igt1, Igt2,…, Igtn}; then, the GroundTruthSet is separated into patches to construct the training dataset. The classification model Mendtoend is obtained based on this training dataset. During the classification stage, the classification model is utilized to classify a completely new remote sensing image Inew (not an image from ImageSet). This strategy achieves a higher degree of automation; the classification process has no relationship with the training data or the training algorithm, and newly obtained or other images in the same area can be classified automatically with Mendtoend, forming an input-to-output/end-to-end structure. Thus, this strategy is more valuable in practical applications when massive amounts of remote sensing data need to be prcessed quickly.

However, the classification results of the end-to-end classification strategy are usually not "perfect", and they

are affected by two factors. On the one hand, because the training data are constructed by manual interpretation, it is difficult to provide training ground truth images that are precise at the pixel level (especially at the boundaries of ground objects). Moreover, the incorrectly interpreted areas of these images may even be amplified through the repetitive training process. On the other hand, during data transfer among the neural network layers, along with obtaining high-level spatial features, some spatial context information may be lost. Therefore, the classification results obtained by the "end-to-end classification strategy" may result in many flaws, especially at ground object boundaries. To correct these flaws, in the computer vision research field, the conditional random field (CRF) method is usually adopted in the post-processing stage to correct the result image.

Evolution Methods:

The majority of evaluation methods for classification results require samples with category labels that allow the algorithm to determine whether the classification result is good; however, to achieve an end-to-end classification results evaluation, samples cannot be required during the evaluation process. In the absence of testing samples, although it is impossible to accurately indicate which pixels are incorrectly classified, we can still find some areas that are highly suspected of having classification errors by applying some conditions. Therefore, we need to establish a relation between the remote sensing image and the classification result image and find the areas where the colors (bands) of the remote sensing image are consistent, but the classification results are inconsistent; these are the areas that may belong to the same object but are incorrectly classified into different categories. Such areas are strong candidates for containing incorrectly classified pixels. Furthermore, we try to correct these errors within a relatively small area.

We use four steps to perform localized correction:

(1) Remote sensing image segmentation

(2) Create a list of segments with suspicious degree evaluations

(3) Analyze the suspicious degree

(4) Localized correction

Template Matching

In ALPR system, the most significant and critical stage is to generate proper output. The previous stages are responsible for detecting the pattern of characters from captured image. The segmented number plate characters are rescaled to resemble the characters within a window. Each vehicle number plate character is converted to binary image with proper size and standard dimension before additional processing steps are applied. Recognizing the characters is the final stage in ANPR system. In addition, determining the accuracy level of recognition for the system is very important to implement the most applicable approach for recognition processes. In order to do so, a template matching technique is applied to the segments (objects) that are attained from the previous step. In this technique characters are identified by comparing the similarity of object or character element. Template matching is the process of finding the exact location of segmented characters inside the template images. The inputs to this phase are segmented characters and output of this phase is license plate number. The character recognition is done using correlation. Correlation checks the degree of similarity between the segmented characters and the template characters. In the character recognition step firstly, a database that consists of 42X24 pixels A to Z alphabet and 0 to 9 number images is generated. Read all image and store them in database and this result into 36 character templates. After the loading of templates, character normalization is done. In character normalization, all the segmented characters are resized to template size 42X24. Sometimes the segmented characters do not have the same size so the better way to overcome this problem is to resize the characters into one size (equal to template size) before actual recognition starts.

Support Vector Machine

The basic issue in number recognition is shape analysis. Here we use Support Vector Machine (SVM) algorithm to train character samples and obtain the rules that are used to recognize the numbers on number plates and classifies them. A Support Vector Machine (SVM) recognizes the pattern and classifies data without making any assumptions about the underlying process by which the observations were granted. The SVMs use hyper planes to separate the different classes. Many hyper planes are fitted to separate the classes, but there is only one optimal separating hyper plane. The optimal hyper plane generalizes with comparison to the others. The hyper plane is constructed so as to maximize a measure of the margin or the boundary between classes. A new data sample is classified by the SVM according to the decision boundary defined by the hyper plane.

Artificial Neural Network (ANN)

Artificial Neural Network (ANN) also known as neural network is a mathematical term that contains interconnected artificial neurons. The feed forward back propagation artificial neural network is created with the set of inputs, outputs and sizes of hidden layers. It contains input layer for decision making, hidden layer to compute more complicated associations and output layer for decision results. Also transfer function of each layer and training function of ANN is defined. The default weights and biases are initialized. After this, the network is trained with the training data set which includes feature value as input and desired output in the system. Once the system is perfectly trained, it is tested for the test data set and accuracy is calculated. For this, it will first calculate the feature vector. This feature vector value will be given to artificial neural network for testing. The artificial neural network will decide upon the feature vector input and recognize characters from the number plate successfully.

III. GRAB CUT

GrabCut algorithm for LP localization and also discuss some image processing stages performed in the process. The stages involved in the process are: preprocessing; which includes resizing the image to a certain size, the introduction of shape prior information into the traditional GrabCut algorithm to perform localization, converting the Graph-Cut image to grayscale to remove luminance and brightness, removing noise from the resultant grayscale image and converting the filtered image to a binary image so as to provide easier interpretation and computation with a computer system.

IV. RELATED STUDY

In this section, we have a tendency to summarize and discuss connected authentication ways employed in follow or projected within the literature to boost positive identification authentication on the net and gift their limits.
Salau, A.O. et al. [1] presented a modified GrabCut algorithm for localizing vehicle plate numbers. In contrast with the traditional interactive GrabCut technique, a modified GrabCut algorithm was designed to identify and extract vehicle plate numbers in a completely automatic manner. Our approach extends the use of the traditional GrabCut algorithm with addition of a feature extraction method which uses geometric information to give accurate foreground extraction. Finally, to evaluate the performance of the proposed technique, the localization accuracy is tested with a dataset of 500 vehicle images with vehicle plates from different countries. An accuracy of 99.8% was achieved for the localization of vehicle plates. Comparative analysis is also reported.

Kukreja, S.; et al. [2] proposed a system for localization of number plate for vehicles in India and segmented the numbers as to identify each number separately. We generally focus on two steps; one is to locate the number plate and second is to segment all the number and letters to identify each number separately. Vehicle number plate recognition is the most exciting and challenging research topic from past few years. Number plates are of different shape, size and also have different color in different countries. In India the most common vehicle number plate used have yellow or while as background and black as foreground color.

Bailmare, S.H. and Gadicha, A.B. [3] 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 and presented an approach based on simple and efficient morphological operation and sobel edge detection method and presented a simple approach to segmented all the letters and numbers used in the number plate. After reducing noise from the input image we try to enhance the contrast of the binarized image using histogram equalization. We mainly concentrate on two steps; one is to locate the number plate and second is to segment all the number and letters to identify each number separately.

Kumar, K.; et al. [4] provided overall accuracy and the average processing time with the images processing during day and night. This system works well in different illumination conditions and used in the implementation of the designs are gray scale conversion, black and white image conversion, filling holes, border detection and image segmentation. This is helpful to easily detect the license plate and identify the vehicle details. This is implemented on the real images.

Gaikwad, D.Y. and Borole, P.B. [5] designed an efficient automatic vehicle identification system by using the vehicle number plate, and to implement it for various applications such as automatic toll tax collection, parking system, Border crossings, Traffic control, stolen cars etc. The system has color image inputs of a vehicle and the output has the registration number of that vehicle. The system first senses the vehicle and then gets an image of vehicle from the front or back view of the vehicle. The system has four main steps to get the required information. These are image acquisition, plate localization, character segmentation and character recognition. This system is implemented and simulated in Matlab 2010a.

Bagade, J.V.; et al. [6] made use of various algorithms in each category from number plate detection to actual recognition of characters which enhances the performance of the system up to the maximum extent possible with less efforts and use of computational resources. The acquisition of the image takes place with any camera with capability of capturing image with good quality. The emphasis of this paper is on the localization of number plate using contours tracing technique along with edge detection and sharpening of edge using Canny's edge detection algorithm.

Goyal, A. and Bhatia, R.; [7] produced a different approach for number plate recognition systems are today used in different movement and security applications, for example, parking, access and border control, or tracking of stolen autos. ANPR can be used to store the pictures caught by the cameras and in addition the content from the tag with some configurable to store a photo of the driver. Systems ordinarily use infrared lighting to permit the camera to take the photo whenever of the day. A capable blaze is included in no less than one form of the intersection monitoring cameras, serving both to illuminate the photo and to make the offender mindful of his or her slip-up. ANPR innovation tends to be district particular, owing to plate variety from spot to put.

Patel, C.; et al. [8] discussed different approaches of ANPR by considering image size, success rate and processing time as parameters. Towards the end of this paper, an extension to ANPR is suggested. These systems are based on different methodologies but still it is 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.

V. FEATURE EXTRACTION

The different methods based on features are used to extract the images. The main features based methods are described as following.

Color: Color is the feature of content based image retrieval systems for retrieve the image. First a color space is used to represent color images. The RGB space where the gray level intensity is represented as the sum of red, green and blue gray level intensities. Variety of color spaces include, RGB, LUV, HSV (HSL), YCrCb and the hueminmax-difference (HMMD).Common color features or descriptors in CBIR systems include, color-covariance matrix, color histogram, color moments and color coherence vector. The Color Structure Descriptor (CSD) represents an image by both the local structure of the color and the color distribution of the image or image region.

Texture: The notion of texture generally refers to the presence of a spatial pattern the has some properties of homogeneity. Texture measures look for visual patterns in images and how they are spatially defined. Textures are re-presented by Texel's which are then located into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located. Texture is a difficult concept to represent. The ID of specific textures in an image is achieved mainly by modeling texture as a 2-dimensional gray level variation. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality may be estimated (Tamura, Mori & Yamawaki, 1978). However, the problematic is in identifying patterns of co-pixel variation & associating them with particular classes of textures such as silky, or rough.

Shape: Shape is also one of the important features of an image. Shape does not mention to the shape of an image but to the shape of a specific region that is being sought out. Shapes will often be determined first applying segmentation or edge detection to an image. Other methods like [Tushabe & Wilkinson 2008] use shape filters to identify given figures of an image. In some case accurate shape detection will require human intervention because methods like segmentation are very difficult to completely automate. Image queries in CBIR structures are traditionally performed by using an instance image or a series of images. Generally we can divided the shape into two categories, region-based and boundary-based. In the late years we just uses only the outer boundary of the shape while the current uses the entire shape region.

VI. CONCLUSION AND FUTURE SCOPE

From review of various paper we conclude that there are different techniques are available for recognition of car number plate. Automatic license plate recognition, Novel method used for detects edge & fill holes less than 8 pixels only, categoring features in each stage ,identifying & recognizing car license plate.

Here we have discussed various character recognition algorithms used in Automatic License Plate Recognition (ALPR). This system can be used in many applications, such as electronic payment systems, and traffic surveillance. Character Recognition is the final stage of ALPR system. Template Matching, OCR, ANN, SVM are widely used methods to recognize the characters on the vehicle plate detection. It is clear that ALPR is difficult system because of much number of phases and presently it is not possible to achieve 100% accuracy of character recognition as each phase is dependent on previous phase. Certain factors like different illumination conditions, shadow and non-uniform size of license plate characters, different font and background color affect the performance of ALPR system. For an effective ALPR system we have to improve the recognition algorithms by increasing the accuracy of the plate recognition.

REFERENCES

[1]. Salau, A.O.; Yesufu, T.K.; Ogundare, B.S.; "Vehicle plate number localization using a modified GrabCut algorithm", Journal of King Saud University – Computer and Information Sciences, **2019**

[2]. Kukreja, A.; Bhandari, S.; Bhatkar, S.; Chavda, J.; Lad, S.; "International Research Journal of Engineering and Technology", International Research Journal of Engineering and Technology, vol: **4**, pp: **1825-1831, 2017**.

[3]. Bailmare, S.H.; Gadicha, A.B.; "A Review paper on Vehicle Number Plate Recognition (VNPR) Using Improved Character Segmentation Method", International Journal of Scientific and Research Publications, vol: **3**, pp:**1-3, 2013**

[4]. Kumar, K.K; Sailaja, S.; Khadheer, S.; Viswajith, K.; "Automatic Number Plate Recognition System", Indian Journal of Science and Technology, vol: **10**, pp: **77967, 2017**.

[5]. Gaikwad, D.Y.; Borole, P.B.; "AReview Paper on Automatic Number Plate Recognition (ANPR) System", International Journal of Innovative Research in Advanced Engineering, vol: **1**, pp: **88-92, 2014**.

[6]. Bagade, J.V.; Kamble, M.; Pardeshi, K.; Punjabi, B.; Singh, R.; "Automatic Number Plate Recognition System: Machine Learning Approach", IOSR Journal of Computer Engineering, pp: **34-39. 2016**.

[7]. Goyal, A.; Bhatia, R.; "Automated Car Number Plate Detection System to detect far number plates", IOSR Journal of Computer Engineering, vol: **18**, pp: **34-40, 2016**.

[8]. Patel, C.; Shah, D.; Patel, A.; "Automatic Number Plate Recognition System (ANPR): A Survey", International Journal of Computer Applications, vol: **69**, pp: **21-33, 2013**.

