

Improved Method for License Plate Recognition for Indian Road Conditions

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Abstract

The paper is presenting and evaluating the proposed methods used in LPR system against existing methods in order to justify the efficiency of proposed methods. These methods later may be used for the applications like traffic control; vehicle owner identification etc. This proposed approach split the LPR applications into three major categories: access control (AC), law enforcement (LE), and road patrol (RP). Each category is characterized by variables of different variation scopes. This proposed method consists of three modules for plate detection, character segmentation, and recognition. In this paper an additional null class is introduced for improving character recognition rate. In this paper, this proposed solution will targeted the Indian datasets. In this paper the samples from India, from various locations, time, traffic, and weather condition. During the practical evaluation measure the performance of each module and compare it against the existing technique in order to claim efficiency of proposed solution

Keywords:-Character segmentation, plate detection, vehicle license plate recognition (LPR).

1. INTRODUCTION

During the past few years, As to improve transportation safety and mobility and advanced technologies to increase productivity through the use of intelligent transport systems to their scope (ITSs) has had an extensive impact in people's lives. ITSs technology based systems 16 types of intelligent infrastructure systems and these systems. Intelligent vehicle systems are split. in many ways recently presented are based on the computer vision and a license plate recognition (LPR) character recognition algorithm for electronic Payment systems (pay toll, fee payment parking), freeway, and to monitor arterial traffic management systems like intelligent infrastructure is a key to be used as presented. As increased safety awareness vehicle arrived Edge authentication technologies have made the need for extremely important, moreover, to enter the private areas of the proposed system to unauthorized vehicles for access control systems can be employed as principal license plates. It may be deliberately altered or fraudulent circumstances (for example, with a stolen plate) that despite the fact the vehicle identifier. Therefore, ITSs quite strong LPR systems rely on the focus of this paper a novel split an LPR if properly parameterized external circumstances capable of handling system implemented in technology integration. Lack of frequent benchmark database [6], an active research topic acknowledged

although LPR has been for more than a decade, [13]. Most works proprietary data sets, which rarely are available for a performance comparison report with evaluation on performance. Several reviews cite only performance can in fact it [6], [8], [12] without being able to validate reported. The public lie among those available, a limited number of sampling or variable with a limited scope of [10]. A suitable one Anagnostopoulos et al. [6], is given by the variable scopes with different variation 741 images. It is, however, not good enough to perform in the aforementioned three major applications. In [1], recently author license plate (AOLP) application-oriented benchmark database, which is classified into three subsets 2049 images, presented the first version and each of the three major applications sample subsets representing a good scope. in various places, Taiwan time, traffic and weather conditions all samples were collected is similar to most LPR approaches.[1] in the solution presented plate detection, character segmentation and recognition consists of three modules, each module is in innovation. However [1], the author took every step or modules offer insightful analysis with attitude, and hence our proposed solution could claim to efficiency.

2. LITERATURE SURVEY

There are many methods presented for LPR, discussing them below according to their different phases.

2.1. Review of methods for Pre-processing

In [3], Otsu binarization method is used. The acquired image get s segmented into several sub-regions. Threshold value should be calculated for each sub regions. Anagnostopoulos et.al. According to [4] pre-processing ambient illumination conditions in the region of interest (ROI) are used to detect it is image masking, using binarization method with Sauvola. Sauvola method, locally adaptive Thresholding is a binary image to gray scale image is used to convert the value of the threshold range. Like the surface of the fitting, variance and parameters depends mainly on local stats. In the case of badly illuminated areas is will reduce the calculated threshold value. Chang et al, [5], for the purposes of binarization mainly two: letter to highlight and to suppress the background while some important information will be lost from images binarization, Thresholding a variable Nakagawa and employed the technique proposed by Rosenfeld [5]. This technique, so that the problem of non-uniform illumination avoid each image pixel from a local optimum threshold value is determined. Although local the adaptive Thresholding

method completely offset the loss of information, it's at least that may be lost when a constant binarization method preserves the information using. In [6], a global threshold value is chosen 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 luminance adjustment and image enhancement. T. Duan et al., [9], processing facilities to enrich the performance edge of the level histogram equalization algorithms are common and graying. Image de-noising noise applied to remove images. This procedure can be done in the broken link and tiny sudden changes of image edges soft[11]. Outline and as much as possible, increase ROI and other areas to maintain contrast between lines, to prevent the destruction of this technology is the main objective. [10], Bernsen, algorithm effectively converts a binary image to remove the shadow image from the original one.

2.2. Review of Methods for License Plate Detection

In [4], binary image successful CCL, orientation, aspect ratio, Euler number count for each binary object in the image are measurements. 35° , orientation, aspect ratio $2 \ll 6$ and Euler number \gg like criteria 3 candidates as in plate areas [4]. But this method that LP with dark background and white letters will be found successfully is not guaranteed. In [5] Fuzzy logic LP used to locate. To explain about some rules and some membership functions for fuzzy set-"bright", "dark", "bright and dark sequence", "texture" and "pilapa" of horizontal and vertical plate positions, but to achieve this need is very sensitive to colour and brightness LP it also compared to traditional colour based methods no longer processing time. In [6]. P. To determine the vertical edge detection method is used then the Robert edge detector vertical edges are used. There will happen sudden intensity changes, but a cluster of 10-15 fast intensity changes in plate zone is regarded as rank-filter. With $M \times N$ pixels, convolved. This is a bright spot in the area of ellipsoidal shape plate elongated. The last step is horizontal projection. Sobel edge detection in [11], apply the method after you apply certain rules to determine the area of LP.

2.3. Character Recognition Methods

In [8], vertical and horizontal scanning is used to dig out the characters. Vertical scanning scan the image vertically from [0, 0] to [height, width] .. In [2], different methods are employed for character segmentation. At first, a gray-level quantization and morphology analysis are performed to obtain the candidate characters. In [10], For character recognition, Support Vector Machine (SVM) is widely used. Before using SVM training and testing data, features are extracted using two density methods i.e. Local-Direction Contributively Density (L-DCD) and Global-Direction Contributively Density (G-DCD), SVM has less misclassification rate compared to neural network. In [8], template matching method in which the templates are matched with existing character are used for character recognition. Template matching stored with each character blocks. Priority has been assigned to each template is used when matching, the first top priority

compared to the template and if a received the priority is lowest then matching template should be ignored. Because chances are less than the number of alphabets occurrences number templates are assigned high priorities. In [6], there exist two types of template matrix: Object **Thinned Representation (OTR) and Characteristics Background Spots (CBS)**. OTR helps for representing the character shape.

3. PROPOSED APPROACH FRAMEWORK AND DESIGN

In this proposed method and its working is discussed. The proposed system contains three approaches.

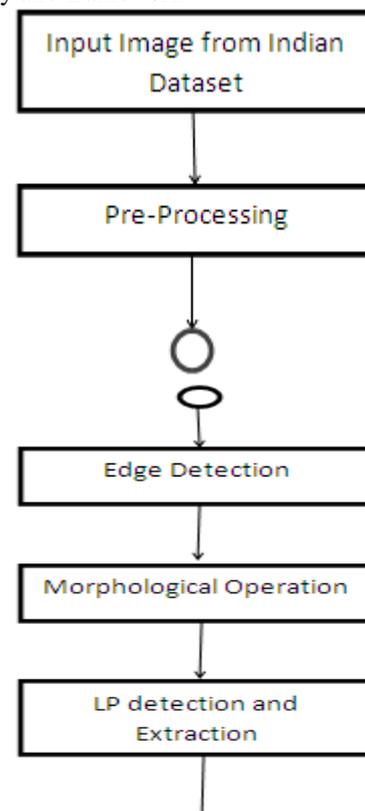
3.1. Problem Definition

The irregular shape of the shade and the vehicle license plate characters some factors, like a font and background color affect the performance of some LPR systems work only in restricted terms and adversity may not produce good amount of accuracy. systems are developed and some of the specific country are there used to poll very few systems are for India but it has been observed that Those people are not exercising more accurate then to develop a system for a country like India a comprehensive scope. In this paper the main aim is to present the extended method for LPR especially for Indian conditions with aim of improving the overall accuracy. Apart from the above discussed below are the objectives of this project:

To focus on review of different methods presented for LRP. To focus on the design of proposed methods, datasets..

3.2. Proposed Architecture and methodology

Following figure 1 showing the proposed project methodology and framework:



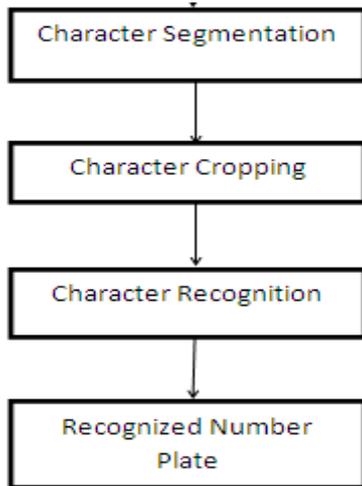


Figure 1: Flowchart of the overall proposed system with three modules for plate detection, character segmentation, and recognition.

The proposed system contains image collection from various Indian datasets. Preprocessing can be done by using various methods. Edge detection carried out using sobeledge detector.LPdetction and extraction should be done by GMM and EM clustering.Character segmentation is done by MSER method and character recognition can be done by OCR methods.

4. SPECIFICATIONS

This paragraph contains the specification of hardware and software.

4.1. Input:

The Input Image for Processing License Plate Detection capture from Indian Dataset.

4.2. Hardware and Software Configuration

Hardware Specification:

- Processor : Pentium IV 2.6 GHz
- Ram : 512 MB DD RAM
- Monitor : 15" COLOR
- Hard Disk : 20 GB

Software Specification:

- Front End : Matlab
- Tools Used : Matlab 2012
- Operating System : Windows 7/8

4.3. Pre-processing

PreProcessing includes converting the image into grey scale ,image is converted into grey scale by setting up the threshold and image sharpening and smoothingoperation is carried out. The converted image is converted into binary image and preprocessed image is provided to edge detection algorithm for locating the plate.

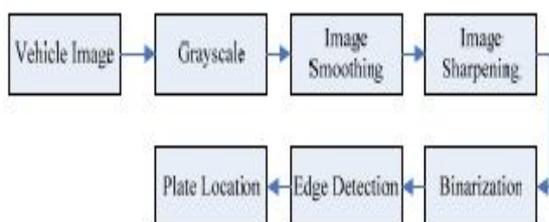


Fig 2: Preprocessing flow chart of vehicle image



Fig 3:Input image and preprocessed image

4.4. Detection of plate candidate:

The output of the preprocessed image given to sobel edge detector .Edge detection is the process of localizing pixel intensity transitions. There exists several edge detection methods Prewitt, Sobel,Robert.From this we are using Sobel edge detection for its simplicity and easy to use . Sobel edge detector uses two masks one horizontal and other is vertical.Sobel edge detection requires grey scale image.



Fig4:Edges extracted by Sobel edge detector.

The output of the sobel edge detector is given to GMM and EM clustering algorithm and output is detected as a plate candidates. Clustering can be used because of its extensive coverage of different scales, orientations, and rotations in one session. The output of clustering is look like as follows.we are increasing the clusters one by one and selecting the most appropriate output.The clusters which are accepted by size, shape,density and orientation.The clusters which are staying Stationary even with the number of clusters are increasing.

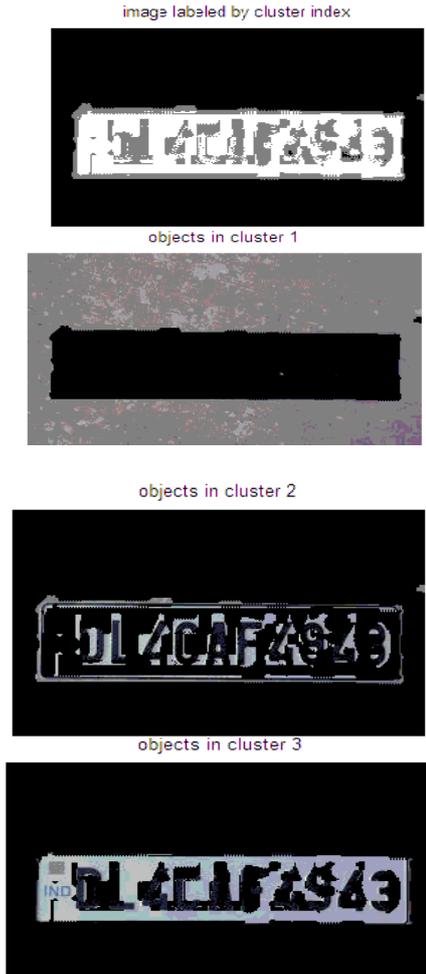


Fig5: Objects in cluster1 and Objects in Cluster2 and Objects in cluster 3

4.5. Character Segmentation:

A plate candidate from the detection module, is given to an MSER detector forexploiting possible characters. The MSER was originally proposed for finding correspondences across viewpoints .It can render the persistent edges around objects as illumination changes, it was proven to be effective in segmenting the characters that often reveal edges robust to illumination variation.The detection algorithm is based on analysing the results of Maximally Stable External Region (MSER) detection [8]. MSERs denote a set of distinguished regions and have proven to be one of the best interest point detectors in computer vision [9]. All of these regions are defined by an external property of the intensity function in the region and on its boundary, MSERs are detected in every scale. We predominantly exploit these properties for segmentation purposes. In general, two variants of MSER detection can be distinguished denoted as MSER+ and MSER-. While MSER+ detects bright regions with darker boundary, MSER- finds dark regions with brighter boundary . The license plate itself is identified as MSER+, whereas the characters on the plate are detected as MSER-1. MSER detection results can be used for detecting license plates in video sequences. MSER+ finds the license plate, whereas MSER- identifies the characters on it. The underlying idea of our novel license plate detection

scheme is to analyze the MSER+ and MSER- detection results. We are looking for a larger MSER+region (license plate) that contains a set of smaller MSER- regions (characters).Such a combination is considered as license plate detection result. After verification, the MSER+ is returned as license plate localization and additionally segmentations of the characters are provided by the corresponding MSER- detections.

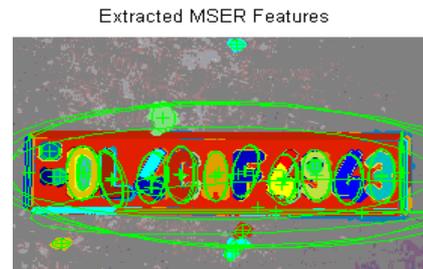


Fig6: Extracted MSER features.

4.6. Character Recognition

The optical character recognition (OCR) is a recognition method in which the input is an image and the output gives us a string of character. OCR is a process which separates the individual characters from image. Template matching is one of the approaches of OCR. The cropped image is compared with the template stored in database .OCR automatically identifies and recognizes the characters. The characters on the number plate have their uniform fonts and sizes then the OCR for number plate recognition is less complex as compared to other methods. After Preprocessing of characters we have to do the template matching so that we can match the individual score of the letters and identify the numbers and letters on license plate. With the inbuilt imcrop() function of matlab we can crop the image and the result is written in a text file.



Fig7: Bounded Box Cropping



Fig8: Detected License Plate

5. CONCLUSION AND FUTURE WORK:

The proposed approach is divided into three major categories: LPR applications AC, traffic LE and RP. Each category is characterized by variable scopes different variation. The results of edge detection is satisfactory but the time required of it is high it is more than 14 sec and secondly if the image quality is not good that is when the

the focus varies we will not get very accurate results. so the algorithms should be improved. The MSER is proven effective in character segmentation in this paper, and other interest region detectors deserve to be studied for their potential in improving LPR performance.

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