Automatic Number Plate Recognition System for Four Wheeler Vehicles

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Abstract- *Automatic recognition of vehicle number plate became a very important in our daily life because of the unlimited increase of vehicles and transportation systems. Automatic Number plate recognition (ANPR) system for four wheeler vehicle algorithms in images are generally composed of the following three processing steps: 1) extraction of a number plate region; 2) segmentation of the plate characters; and 3) recognition of each character. This task is quite challenging due to the diversity of plate formats and the no uniform outdoor illumination conditions during image acquisition. Therefore, most approaches work only under restricted conditions such as fixed illumination, limited vehicle speed, designated routes, and stationary backgrounds. Numerous techniques have been developed for ANPR in still images and the purpose of this paper is to recognize the number plate of Indian four wheeler vehicles.*

Keywords- *Automatic number plate recognition system, Extraction of number plate, Segmentation of numbers, Recognition of character.*

I. INTRODUCTION

Automatic number plate recognition system for four wheeler Composed of three major steps as follows.

1) Number plate Extraction.
2) Segmentation of Numbers.
3) Recognition of characters

In INDIA all motorized road vehicles are tagged with a number plate. The number plate is issued by the district level Regional Transport Office (RTO) of respective states which is the main authority on road matters. By law, all plates are required to be in modern Hindu-Arabic numerals with Latin letters. The number plates are placed in the front and back of the vehicle. Here we are able to recognize the number plate of four wheeler vehicle.

The numbers of four wheeler vehicle are written in one line.

The rules of writing the four wheeler vehicle in INDIA are as follows.

1. The first two letters indicate the state to which the vehicle is registered.
2. The third part is a 4 digit number unique to each plate. A letter(s) is prefixed when 4 digit number runs out and then two letters and so on.
3. The fourth part is an international oval "IND" and the top of it is a small blue square.

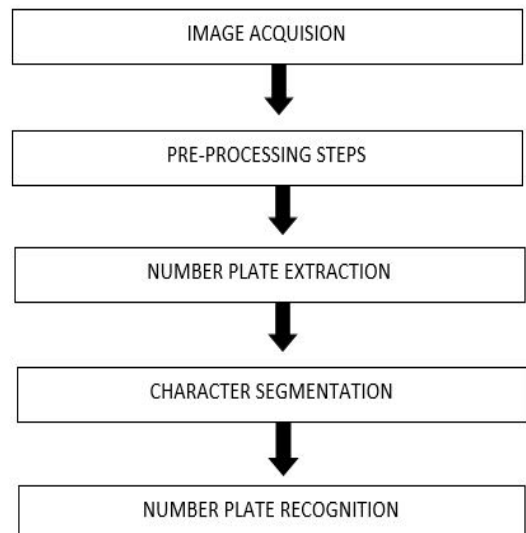Following are the steps in automatic number plate recognition system

Figure 1. Flow of ANPR system

II. LITERATURE SURVY

Aiming to present a comprehensive and critical survey of up-to-date ANPR methods, this section consist of number plate recognition system in various country conditions, also provide a detailed review of techniques to detect NPs in a single image or video sequence, Character segmentation methods and demonstrates the character classification techniques.

Finally, section concludes with a discussion of current trends and anticipated research in ANPR.

Christos-Nikolaos E. Anagnostopoulos et. al. [1], presented various methods used for number plate recognition system from online and offline Images and video sequences. In this paper author surveyed more than 100 papers related to number plate recognition system and categorized every method according to image format used. In this paper author surveyed a three phase LPR system framework consist of 1) location of the license plate (LP) region; 2) segmentation of the plate characters; and 3) recognition of each character. Here the main aim of survey to present a comprehensive and critical survey of up-to-date LPR methods, and estimate the high performance rate.

Sarbjit Kaur et.al.[2], presented an efficient approach for number plate extraction from vehicles images under image processing; here the ANPR system designed in four module and each module used an efficient approach for number plate recognition system; for preprocessing iterative bilateral filter and adaptive histogram equalization used, morphological operations and histogram equalization techniques from tracking a number plate area. Designed ANPR system tested for total 70 vehicle's images. Images are taken in different illumination conditions. The images are taken at different distances relative to camera and are of different colors and different sizes images. The proposed method works well for low contrast, noisy and low resolution input images.

Amar Bader et.al.[3], introduces an Automatic number plate recognition system for Egyptian number plate using Morphological operations, histogram manipulation & edge detection techniques for plate localization & character segmentation. Artificial neural network are used for character classification and recognition. In this paper, first of all problem statement related with number plate recognition discus briefly and then surveyed every method deeply to find out proposed solution for designing ANPR system. The proposed solution consists of three steps 1) preprocessing 2) license plate localization 3) character segmentation 4) character recognition.

Manisha Rathore et. al. [4], presents a new algorithm in MATLAB which has been used to extract the number plate from the vehicle in various environmental conditions. In this offline NPR system is designed, in which algorithm worked on images which have been captured from fixed angle parallel to horizon in different luminance conditions. It is also assumed the vehicle is stationary and images are captured at fixed distance .Here an automated system is developed using MATLAB in which static image is captured from camera and Converted that captured RGB images in Gray scale image for preprocessing. After conversion, dilation process is applied on image and unwanted

holes in image have been filled. After dilation, horizontal and vertical edge Processing has been done, calculates horizontal and vertical histograms and passed these histograms through low pass filters. Low pass filters filter out unwanted regions or unwanted noise from image. After this filtering, image is segmented and region of interest is extracted and image is converted into binary form. Binary images are easily processed as compared to colored images. After Binarization, each alphanumeric character on number plate is extracted and then recognized with the help of template images of alphanumeric characters. After this, each alphanumeric character is stored in file and whole number plate is extracted successfully. Hence whole system uses systematic approaches foe designing an ANPR system.

Phalgun pandya et. al.[5], designed ANPR system that implements a method efficient in recognizing license plates in Indian conditions. An approach based on simple but efficient morphological opening and closing operations. Designed ANPR work any kind of number plate of vehicles including all font i.e. the number plate which are not in standard format also detected.

Yungang Zhang et. al.[6], implements a new algorithm for character segmentation of license plate, The LPR algorithm consist of license plate locating, character segmentation and character recognition. In this paper author presents a new algorithm for character segmentation; mainly focus on the difficulties arise in the character segmentation algorithm like image noise, plate frame,rivet,space mark, plate rotation and illumination variance. In this Hough transformation and prior knowledge in horizontal and vertical segmentation reduces the above difficulties. The preprocessing steps consist of size normalization and determination of plate kind. Mainly focus on object enhancement for further segmentation process. Then horizontal segmentation and vertical segmentation using Hough transformation is carried out. Experimental result shows that, method segments the characters exactly from number plate. The algorithm for horizontal Segmentation, using Hough Transformation, can solve the problem of rivet, rotation, and illumination variance. S. Krahi et. al. [7], implements an ANPR system that captures images of a vehicles and recognizes the vehicle. The number plate area is localized using a novel "feature-based number plate localization "method which consists of many algorithms. In this author mainly focusing on the two fast algorithms i.e., Edge Finding Method and Window Filtering Method for the better development of the number plate detection system.

L.Angeline et. al. [8], implements smearing algorithm for Vehicle Parking Management System. Most of the shopping malls, provide users with larger vehicle parking

area. So it became very difficult to find out vehicle in such huge parking area. Thus, a proper vehicle parking management system is needed to overcome the problem. There are some techniques used for detecting license plate, here sobel vertical edge filter and canny edge detection operator is used. The formats of number plate is different for different countries, it can be in one-row or two-rows and so on. Thus, Sobel vertical edge filter and Canny edge operator are not suitable approaches to overcome the limitation of the frameless license plate. Here Smearing Algorithm is used to detect number plate of vehicle. Frameless Number Plate is also detected using smearing algorithm.

Karthikeyan T et. al. [9], implements, a smart and simple algorithm is presented for Vehicle's license plate recognition system. The proposed algorithm consists of four major parts: Image Pre Processing &Integral Edge Image, License Plate Localization, segmentation of the characters, recognition of the characters. Here dilation process is used for preprocessing, horizontal and vertical edge processing histogram is used for number plate localization, horizontal and vertical scanning is used for character segmentation and template matching is used for character recognition.

Prathamesh Kulkarni et. al. [10], Automatic Number Plate Recognition (ANPR) is a real time embedded system works under the Indian conditions who automatically recognizes the license number of vehicles. This paper introduce, the algorithm for recognizing the number, where number plate standards are rarely followed. The system consists of integration of algorithms like: 'Feature-based number plate Localization' for locating the number plate, 'Image Scissoring' for character segmentation and statistical feature extraction for character recognition; which are specifically designed for Indian number plates. This system is used to recognize single and double line number plates under widely varying illumination conditions with a success rate of about 82%.

III. SYSTEM DEVELOPMENT

Now actual implementation of system consists following step:

A.   Implementation

1.   Number plate extraction.

Steps:

a)   Image Acquisition.
b)   Convert RGB image into Gray image.
c)   Remove noise from an image. D)

d)   Calculate horizontal and vertical edge processing histogram.
e)   Both horizontal and vertical histograms passed to the low pass filter.
f)   Segmentation of Region of interest as per high histogram value.
g)   Extraction of exact number plate.
h)   Convert Grayscale image into binary form.

2.   Character Segmentation.
3.   Number Recognition.

Figure 2.

Figure 3. Recognition Process.

B.   Use of Simulation software

MATLAB multi-paradigm numerical-computing environment and fourth-generation programming language. Developed by Math Works , MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. An additional package, Simulink, adds graphical multi-domain simulation and Model-Based Design for dynamic and embedded systems.

IV. CONCLUSION

The objective of this paper was to study and resolve algorithmic and mathematical aspects of the automatic number plate recognition systems. The problematic has been divided into several modules, according to a logical sequence of the individual recognition steps. Even though there is a strong succession of algorithms applied during the recognition process, chapters can be studied independently. This work also contains demonstration of ANPR software, which comparatively demonstrates all described algorithms. MATLAB is been used for the development whole environment of NPR system. The accuracy of this developed NPR system is 82%. This system is able to recognize all the number plates which followed rules and regulation given by RTO.

V. ACKNOWLEDGMENT

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