

# Automatic Number Plate Recognition Using Image Processing

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**Abstract-** *The Automatic license plate reorganization (ALPR) is one of the solutions of surveillance systems. The license plate recognition (LPR) system have many application like payment of parking fees; toll fee on highway; traffic monitoring system; border security system; signal system etc. This system first detects the vehicle and capture the image then the number plate of vehicle is extracted from the image using image Segmentation optical character recognition technique is used for the character recognition. Then the resulting data is compared with the database record so we come up with the License plate number such as is observed that developed system successfully detects & recognizes the vehicle number plate on real image even when the pixel is of low resolution*

**Keywords-** Smart City, Smart Traffic Management, Traffic Congestion, Traffic Signal Management, Vehicle Plate Detection.

## I. INTRODUCTION

The ANPR (Automatic Number Plate Recognition) plays an important role in many systems like traffic monitoring system, Crime detection system, Stolen vehicle detection etc. Thus, ANPR is used by the city traffic department to monitor the traffic as well as to track the stolen vehicle.

Though ANPR is a very old research area in image processing but still it is s evolving year by year, because Detecting the number plate from the image or from the video is not that easy task as like counting the vehicle from stream of video. So far many of the researchers came with their own algorithm to detect the number plate, but each has some limitations. For some images it works perfectly, and for some images it is not working properly. That's the reason this area is still growing and still imperfect.

Detecting the number plate is the challenging task as the number plate writing style is changing from country to country. In case of India the number plate writing style changes from state to state. In India the number plate is

different for two wheelers and four wheelers. For four wheelers the number plate's backgrounds are also different, i.e. yellow for tourist and white for private cars. These are the basic challenges keep in mind before implementing the ANPR system. ANPR has predefined four basic steps to recognize the number plate as explained in the various research papers and journal paper.

### Image Capture:

In this step video image has to Be captured by any standard camera or by extracting the interested frame from stream of video . Capturing the image from the video stream and its requires an additional work.

### Image Preprocessing:

Once the interested image is being captured in which number plate clearly visible and fine texture pattern, then the further processing of the image is carried out. It has many steps: resize the image resolution, removal of noise from image, and conversion of the image from RGB to Gray and then Binary (black and white).

### Character segmentation:

After pre-processing the number plate region of the image is extracted. It is segmented in order to recognise the number plate of the vehicle.

### Optical Character Recognition (OCR):

Electronic conversion of handwritten or printed text images into machine - encoded text. Here OCR used to recognize the number from the segmented image

## II. SCOPE OF WORK

This research presents an online highly accurate system for Automatic Number Plate Recognition (ANPR) that can be used as a basis for many real-world ITS applications. The system is designed to deal with unclear vehicle plates,

variations in weather and lighting conditions, different traffic situations, and high-speed vehicles. This paper addresses various issues by presenting proper hardware platforms along with real-time, robust, and innovative algorithms. We have collected huge and highly inclusive data sets of Persian license plates for evaluations, comparisons, and improvement of various involved algorithms. The data sets include images that were captured from cross roads, streets, and highways, in day and night, various weather conditions, and different plate clarities. Over these data sets, our system achieves 98.7%, 99.2%, and 97.6% accuracies for plate detection, character segmentation, and plate recognition, respectively. The false alarm rate in plate detection is less than 0.5%. The overall accuracy on the dirty plates portion of our data sets is 91.4%. Our ANPR system has been installed in several locations and has been tested extensively for more than a year. The proposed algorithms for each part of the system are highly robust to lighting changes, size variations, plate clarity, and plate skewness. The system is also independent of the number of plates in captured images. This system has been also tested on the three other Iranian data sets and has achieved 100% accuracy in both detection and recognition parts. To show that our ANPR is not language dependent, we have tested our system on available english plates data set and achieved 97% overall accuracy.

### III. MODULES

#### 3.1 IMAGE SEGMENTATION

As shown in Figure 1, the detection process is initiated by a gray scale image. The main reason is that color cannot be used as a discriminative feature in detecting dirty plates. Moreover, processing gray scale images not only helps to reduce the processing time, but also makes the algorithm more robust to color changes caused by different lighting condition throughout the day. Hence, detection algorithm is directly applicable to both color and monochrome cameras. In the next step, an algorithm to detect moving objects in two consecutive video frames is applied. There are a variety of methods to calculate the dynamic parts of images based on the comparison with previous video frames. The window size parameters,  $m$  and  $n$ , are chosen based on the characters size in the region. As found empirically, the thresholding window based on the local mean outperforms other methods like local Gaussian and local median windows. After thresholding, the intersection of the two images from the two last steps (morphology and thresholding) is determined. The intersection helps to eliminate irrelevant regions from further processing. In system the character size parameters must be set manually based on the setup and the application. Such possibility can be seen as a common feature in many industrial ANPR systems.

As a matter of fact, similar to other industrial ANPR systems, the character size parameters for all relevant plate formats must be specified to our system. Any plates with unspecified formats (out of the pre-known set of formats) cannot be recognized.

#### 3.2 IMAGE DETECTION

After extracting the regions that are most likely to include plates, as explained in previous section, a more accurate vehicles plates localization is performed based on the concept of Random Sampling Consensus (RANSAC). RANSAC is an iterative algorithm used to fit a robust mathematical model to a set of observed data [40]. This method ignores the outliers and finds the best model to the rest of the given data. The main application of RANSAC in machine vision field is in stereo vision, and specifically in finding the Fundamental Matrix [50]. In this paper, a revised version of RANSAC algorithm is designed and exploited in license plate localization process.

#### 3.3 IMAGE RECOGNITION

Connected Component Analysis, CCA, is one of the most widely selected algorithm for the initial step of character recognition in various segmentation methods. After detecting the exact location of the plates in a captured image, a binarization process is performed on the detected plates. Several thresholding methods have been proposed for the binarization process at this step. In the results of applying some state-of-the art thresholding algorithms on clean and dirty plates Therefore, a small deviation from  $\alpha$  value leads to desired results. According to Fig. 8, for clean plates all the thresholding methods achieve the same character segmentation results, however, for the dirty plates, the segmentation process using the proposed method outperforms the conventional algorithms. The proposed thresholding Algorithm helps to increase the detection accuracy for dirty plates. The advantage of the proposed thresholding method lies in its adaptive nature for setting different parameters of clean and dirty plates.

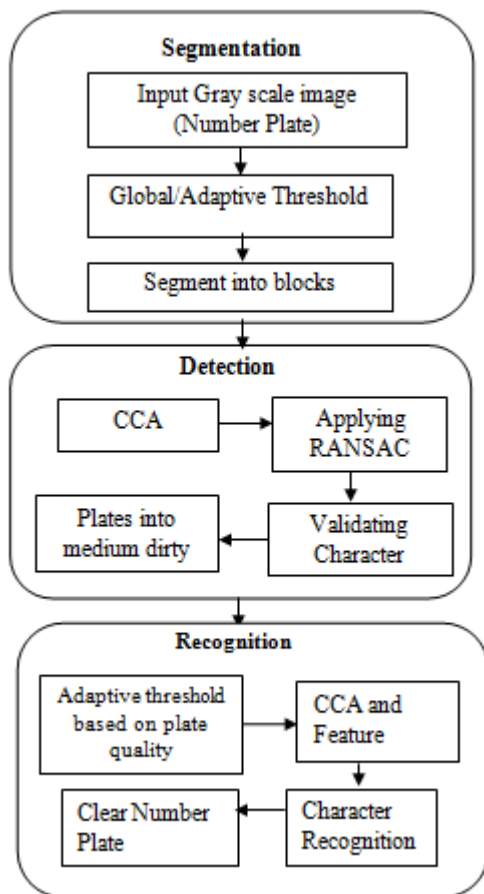


Fig.1 Image processing architecture

IV. ANALOG AND DIGITAL PROCESSING:

Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing. Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to have to undergo while using while using Preprocessing enhancement, display and information extraction.

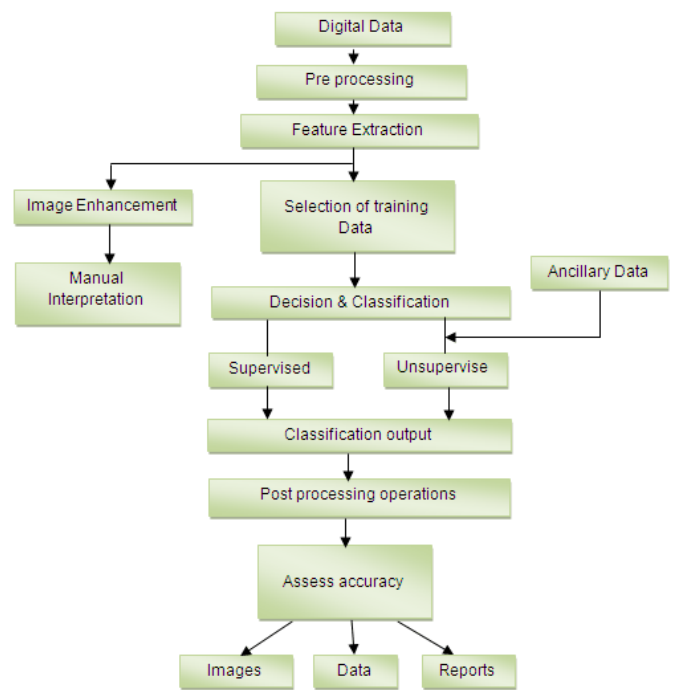


Figure 2. Analog and Digital Processing

V. CONCLUSION

Automatic number plate detection designs a number plate recognition system which mainly consists of four steps such as vehicle image capture from video, preprocessing, character segmentation and character recognition. Various Number Plate Identification strategies have been examined in subtle elements which were utilized by several researchers. The Vehicle Number Plate Identification (VNPI) framework predominantly includes three noteworthy strides, number plate localization, character division and character identification. The basic and common steps involved in the vehicle number plate identification are mentioned. Characters are recognized and template matching are used for dirty picture eradication.

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