Automatic Number Plate Recognition (ANPR)

R. R. Raskar¹, Prof. R. G. Dabhade²
¹²Dept. of Electronics and Telecommunication Engg., SND College of Engineering and Research Center, Yeola, Nashik, Maharashtra, India

Abstract — The Automatic Number Plate Recognition is a system which is designed to help in recognition of number plates of vehicle. The purpose of designing this system is to develop security system. This system performs the various functions like number plate detection of vehicles, then processing them and using the processed data for storing and allows the vehicle to enter or reject the vehicle. This system is based upon the image processing technology which involves the number of image processing algorithm. The objective of this ANPR system is to design an efficient automatic vehicle number plate and used the system for various application like Toll collection, Parking System, border crossing, traffic control, stolen cars, etc. The ANPR system consist of mainly four stages to implement the system which are Image acquisition, Number plate extraction, Number plate segmentation and Character recognition. In this paper we consider the system only for Indian vehicle condition where number plate standard are rarely followed.

Index Terms — Automatic Number Plate Recognition (ANPR), Vehicle plate recognition (VPR), Optical character recognition for vehicles (OCR), Number plate Extraction, Number plate identification, Back propagation neural network (BPNN).

I. INTRODUCTION

The Automatic Number Plate Recognition (ANPR) system was first invented in 1976 at Police Scientific Development t Branch in the UK. In recent years Automatic Number Plate Recognition systems (ANPR) have become a reliable and more securable. They are used by the police for the enforcement of traffic rules or for crime detection. In other country ANPR-systems are applied to register the vehicles entering the congestion charging zone.

The ANPR system of vehicle number plate consists of two main modules. First is a camera which detects the vehicle passing on road and sends an image of that vehicle continuously to a computer. Second is the software that recognizes number plate with characters on them and store into a database.

1.1 Existing systems:

Recently ANPR systems have been implemented in many countries like Korea, Australia and few others. In these countries there are strict and standard implementations of number plate is helped to development of NPR system. The dimensions of plate, colour and font of characters, border for the plate, etc. which are helping to locate the number plate easily and identify the number plate of the vehicle.

1.2 Proposed systems:

Figure 1 shows system in which various image Processing algorithm were designed in MATLAB and implemented on ARM 7 processor. Initially when vehicle enters an image is capture by camera and that image is processed by various algorithms. Firstly, the number plate area of vehicle is located using feature-based Number plate localization method which consists of many algorithms. This algorithm removes all background noise and save only the area of number plate of vehicle. Then character segmentation is done using Artificial Neural Network (BPNN) and template matching.

II. SYSTEM OVERVIEW

From figure 2.1 images are collected from roadside. Then a backside image of vehicle is captured and processed using algorithm. The gray scale of capture image is then converted into binary image using pre-processing technique. The number plate detection is carried out to locate the number plate.

Further character recognition is used for character segmentation.
In this paper a high resolution camera we used to capture image at different distances of camera to vehicle. It improves the contrast of image and reduced the noise in the image.

After these two steps the gray scale image is converted into binary image using Otsu’s method which is more suitable for Indian number plate than other Binarization methods for the the reduction of a gray level image to a binary image.

IV. IMAGE PROCESSING

The processing basically consists of two steps as follows.

1) **Binarization**: This is the necessary part of ANPR. The Image capture by camera as shown in fig 3.1 is a RGB image which must be converted into gray scale level. After converting RGB image into gray scale we used Sobel operator for edge detection of an image. It is a 2D measurement on an image. The Sobel operator is 3*3 masks with the whole image to produce the detected edge. For this system we used vertical and horizontal edge detection as shown in fig.

2) **Noise Removal**: The image captured by camera is affected by many factors like system noise, lack of exposure or excessive relative motion of camera or vehicles. So the captured image is the degradation of system. So to improve the quality of the image we used Median filtering to remove the noise.
V. CHARACTER SEGMENTATION

In order to recognize the number plate it is necessary to separate out the each character from the number plate of the vehicle. This is the main function of character segmentation.

Each individual character has to be separate or distinguishes from each other. Then the character of number plate of vehicle is segmented and saves as different image. To divide the each character from number plate Lines function are used. This function crops black letter with white background. After cropping the image then it can be resized to specific size.

![Character Segmentation of an Image](image)

VI. CHARACTER RECOGNITION

This is the most difficult step in ANPR. The Optical character recognition (OCR) is used to compare each individual character against one of the other. Then to ensure any false character is not to be recognized, syntax checking is made. OCR is the mechanical or electronic translation of images of handwritten or typewritten text (usually captured by a scanner) into machine readable form. Then we scanned number plate when we get 1 value for character identification because we use black and white pixel. After that we stored all the characters which are identified in the form of string and stored in the database. So check out ,if the vehicle pay toll amount then vehicle may allowed to go but if they do not paid amount then first they have to paid amount and then allowed to go.

6.1 Pre-processing Steps:

- a) Binarization.
- b) Inversion of intensity of the characters.
- c) Finding the connected component that represents the character.
- d) Normalization of the image to size 15 X 15.
- e) Storing the intensity values of each character.

6.2 Creating the template:

In order to create the template for each character we consider as each white pixel as’ 1’ and each black pixel as’ 0’. We tested for each and every character and calculate the weights to get the template.

VII. EXPERIMENTS AND RESULTS

In this paper we tested the system with different images of vehicles having different colours and structures are taken and store in computer. But In system some cases are found where number plate script is in Non-English or badly distorted are included. Then we get 82% for number plate location, 90% for character segmentation and 85% for character recognition. The Template matching method may replaced by the Artificial Neural Network (ANN) to classify the characters.

VIII. CONCLUSION AND FUTURE SCOPE

Our aim was to simplify the process and to develop an application which is more users friendly. We tried to develop cost effective and space effective solution. The setup has been tested for number of vehicles containing different number plates with different parameters. So we works for different illumination condition with different parameters of number plate found in India. So ANPR is definitely an efficient system than existing system.

The System can be upgraded for following things:

- a) To work on images that contains more noise.
- b) To work with the regional Indian languages like Marathi, Bengali…etc.
- c) To extract the number plate from moving vehicle.

REFERENCES


