

Characters Recognition using Feature Extraction in License Plate

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Abstract— The main goal of my research is to provide secure and efficient way for the traffic police to recognize the number plate of a vehicle on the spot in field of either an accident or the crime. Presently the vehicle number is captured by the image camera and the image is transmitted to the traffic police central office. It requires more bandwidth to carry the poor image and more power. I want to make an idea by which the information of the owner of the vehicle is directly transmitted to the traffic police central office. This would be an automatic system which can help to reduce the man power and the faster information way to avoid more crimes or to catch the criminals. It also helps to find out the stolen vehicles. I want to use some techniques for better resolution for the poor image of the number plate and the faster and efficient way to transmit this data to the traffic police central office.

Key words: Resolution, ASCII Code, Bandwidth, ANPR, RGB Image

I. INTRODUCTION

There are numerous worldwide feature extraction method utilized in picture investigation, Computer vision, and digital image processing. The principle motivation behind the procedure is to locate the essential lines of objects inside a specific class of shapes. Firstly I will introduce a method for reorganization the numbers drawn on the number plate then I will test it on Indian license plate system, having font of UK standard and UK standard 3D, which has ten slots for characters and numbers. Surveillance cameras aren't just the bane of hardcore civil libertarians. Submitting to consistent observing feels wrong to most of us. Cameras in the sky are a definitive appearance a path for the government to watch all of you the time, all over the place. In addition to normalizing observation surveillance each open place into a scene for criminal investigation, there's likewise the potential for abuse. When a city is routinely surveilled, the government can transform each indiscretion into a criminal issue. You used to have the capacity to speed down the road when you were in a rush.

II. IMAGE DETECTION AND RECOGNITION

An input image taken is cropped and the significant blocks of information in the number plate are thus obtained. This image is then fed to a transform mechanism which will be able to extract the information related to the owner. Now this information is used for the recognition purposes. The vehicle is moving via the areas, all are identifying. It gives us the information that the vehicle is coming from which area and going towards which area.

III. BASIC METHODOLOGY OF ANPR SYSTEMS

Automatic Number Plate Recognition (ANPR) is a mass surveillance strategy that utilizes character acknowledgment on pictures to read vehicle registration plates [5]. They can

utilize existing closed circuit TV or street rule enforcement cameras, or ones explicitly intended for the task. OCR is that the system that is employed to store the quantity plate of the vehicle within the info. The quantity plate is obtained from the image of the vehicle that is then sent to OCR system that then processes the image [1].

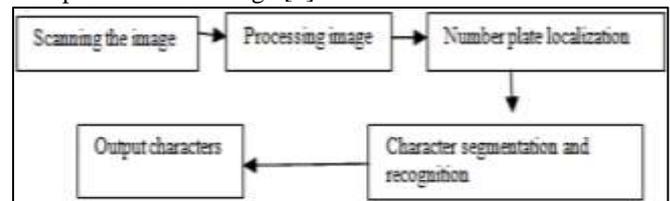


Fig. 1: OCR System

They are utilized by different police forces and as a technique for electronic toll collection on pay per use streets and indexing the developments of traffic or people and also for traffic law enforcement. ANPR can be utilized to store the pictures caught by the cameras just as the text from the text [1]. ANPR technology tends to be region specific, owing to plate variation from place to place [5]. Concerns about these systems have centred on privacy fears of government tracking citizens' movements, mis-identification, high error rates, and increased government spending. In TELNET 2017, the authors extracted number on pad of paper within the type text and when it's given to GSM for more feedback. Figure 2 shows the fine for the stoplight that is directly generated once any traffic rule violation by vehicle and the fine quantity sent on to vehicle owner mobile [2].

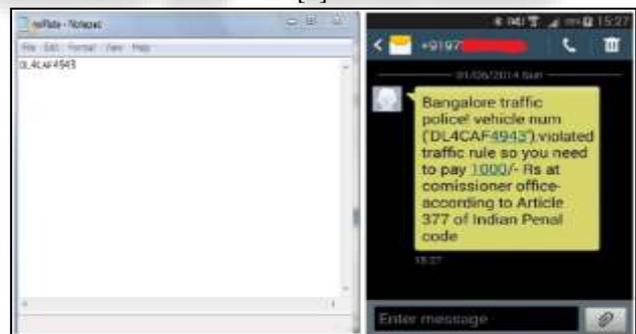


Fig. 2: Extracted Number and Message Sent to the Owner of Vehicle

Mr. Dipankar Bhattacharya gave results of projected localization gave accuracy of 96.7% whereas the character recognition technique yielded 92.2% accuracy. The entire Automatic number Plate Recognition System Gave 94.45%. Upon three hundred odd pictures of vehicles at totally different viewing angles and environmental conditions.

Mistreatment Artificial Neural network the system showed higher results on single set of templates [4].

A. Constraints

The variations of the plate types or environments cause challenges in the detection and recognition of license plates [6]. They are summarized as follows.

- 1) *Plate variations:*
 - 1) Location
Plates exist in various locations of a picture;
 - 2) Quantity
A picture may contain no or numerous plates;
 - 3) Size
Plates may have distinctive sizes because of the camera distance and the zoom factor [8];
 - 4) Color
Plates may have different characters and background colors because of various plate types or catching gadgets;
 - 5) Font
Plates of various countries might be written in various fonts and language;
 - 6) Standard Versus Vanity
For example, the standard license plate in Alberta, Canada, has three and recently (in 2010) four letters to the left and three numbers to the right.
 - 7) Occlusion
Plates might be darkened by dirt;
 - 8) Inclination
Plates might be tilted;
 - 9) Other
In addition to characters, a plate may contain frames and screws.

2) *Environment Variations*

a) *Illumination*

Input pictures may have distinctive kinds of illumination, mainly because of environmental lighting and vehicle headlights;

b) *Background*

The picture background may contain patterns similar to plates, for example, numbers stamped on a vehicle, guard with vertical patterns, and textured floors.

IV. EXISTING ANPR ALGORITHM

ANPR systems are generally deployed in one of two basic approaches: one allows for the entire process to be performed at the lane location in real-time, and the other transmits all the images from many lanes to a remote computer location and performs the recognition process.

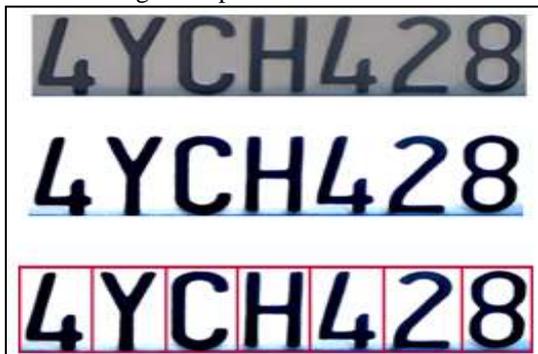


Fig. 3: Acquisition, Filtering and Segmentation of Plate
There are six primary algorithms that the software requires for identifying a license plate:

- 1) Plate Localization
Responsible for finding and isolating the plate on the picture.
- 2) Plate Orientation and Sizing

- Compensates for the skew of the plate and adjusts the dimensions to the required size.
- 3) Normalization
Adjusts the brightness and contrast of the image [8].
- 4) Character segmentation
Finds the individual characters on the plates [7].
- 5) Character Recognition
- 6) Syntactical/Geometrical Analysis
Check characters and positions against country-specific rules.

V. PROPOSED METHODOLOGY

The proposed technique hereby uses image cropping and image resizing on the original input RGB image and thus, obtaining the significant blocks of the input image needed for detection. As instead of whole image, significant blocks are used, the database management becomes compact and the technique becomes flexible, until same fonts are used. Further, conversion of these RGB sub images to binary images is done and then is fed to the algorithm to give the information.

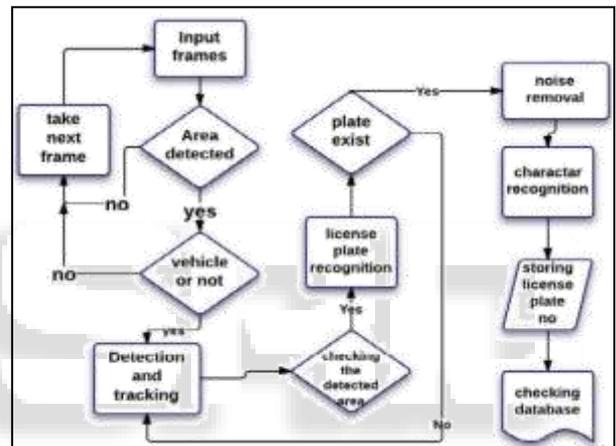


Fig. 4: ANPR Algorithm

A. Acquisition of License Plates Images

Since the quality of detection result dominantly depend on the quality of the acquisition process, the choice of acquisition system must be done carefully. Normally image acquisition by means of 2D sensors needs image processing technique. In our experimental work, online facility of generation of any license plate of standard font and size is used. The font used is standard UK, with actual plate size of 520mm X 111mm (20.5 in X 4.375 in). The size of the image used is 2018 X 503 pixels.



(a)



(b)

Fig. 5: Indian License Plates (a) Standard UK font
(b) Standard UK 3D font

B. Extraction of Characters by Segmentation

The input License plate according to the Indian convention has 10 slots to convey the information regarding the details of the registration [5, 7]. The current format of the registration index consists of 3 parts. They are-

- 1) The first two letters indicate the state to which the vehicle is registered.
- 2) The next two digit numbers are the sequential number of a district. Due to heavy volume of vehicle registration, the numbers were given to the RTO offices of registration as well.
- 3) The third part is a 4 digit number unique to each plate. A letter(s) is prefixed when the 4 digit number runs out and then two letters and so on.

The input image is a RGB image, with ten slots for the character and alphanumeric characters [6, 7]. Now the input image is then cropped to get these characters and numbers which are considered to be significant blocks of the image. The format of the characters and numbers used in license plate are standard UK format, database is maintained accordingly. Since the proposed method is basically feature dependent, same database for different font is not acceptable, hence for other formats the database should be upgraded accordingly.



Fig. 6: Segmented and Cropped Images

Image scaling is the process of resizing a digital image. Finally, the cropped images were resized to 10X6 and further converted to monochrome bitmap format to obtain the bit depth of "1". The resized and binary images are show in figure. The binary image of the localized number plate contains the character with noise and special characters. The binary image is passed through a special reorganization function that calculates the features of the binary image. This algorithm uses the fact that every character has unique set of features such as corners, ending and bifurcations. Inheriting these features makes the algorithm fast and less complicated. The input character is converted to edge image and the features are extracted from it in iterative process. These features are then stored in the feature vector with the number, direction and state of the features.

ALP.	X1	X2	X3	X4	X5	X6
0	0	0	0	1	0	0
1	1	0	1	0	3	113
2	0	0	1	0	2	13
3	1	0	0	0	3	111
4	0	1	2	1	2	34
5	0	0	2	0	2	13
6	0	0	0	1	1	3
7	0	0	1	0	2	14
8	0	1	0	2	0	0
9	0	0	0	1	1	1
A	2	0	1	1	2	44
B	2	0	2	2	0	0
C	0	0	0	0	2	33
D	0	0	2	1	0	0
E	1	0	2	0	3	333
F	1	0	1	0	3	334

G	0	0	2	0	2	134
H	2	0	0	0	4	2244
I	2	0	0	0	4	1133
J	0	0	1	0	2	11
K	0	1	0	0	4	2244
L	0	0	1	0	2	23
M	0	0	3	0	2	44
N	0	0	2	0	2	24
O	0	0	0	1	0	0
P	1	0	1	1	1	4
Q	1	0	0	1	1	4
R	2	0	1	1	2	44
S	0	0	0	0	2	13
T	1	0	0	0	3	134
U	0	0	0	0	2	22
V	0	0	1	0	2	22
W	0	0	3	0	2	22
X	0	1	0	0	4	2244
Y	1	0	0	0	3	224
Z	0	0	2	0	2	13

Table 1: Recognition of Alphabets or Numeric Digits from Image

VI. COMPARATIVE ANALYSIS

The result of the localization process given by Bhavin V. Kakani is 96.7% whereas the character recognition technique is 92.2% Accuracy for ANN using Feature extraction [3]. The complete Automatic Number Plate Recognition System Gives the Accuracy given by

$$= \frac{96.7\% + 92.2\%}{2} = 94.45\%$$

In the proposed technique the localization process is kept same [3]. In the proposed character recognition technique there is a disadvantage that Digit '0 (Zero)' and alphabet 'o' is similar. Hence this method gives 97.2 % Accuracy, but it is not a severe problem because according to Indian License Plate System 1st two characters are Alphabets, 2nd two are numeric digits 3rd two are Alphabets again and last 4 digits are Numeric digits. So that Zero and Alphabet o may be clearly separated out. Now the complete Automatic Number Plate Recognition System Gives the Accuracy given by

$$= \frac{96.7\% + 94.44\%}{2} = 95.57\%$$

Technology Used	Kartikeya Jain [1]	R Shreyas [2]	Bhavin V Kakani [3]
	OCR	OCR	OCR
Extraction of Number Plate Region of the vehicle	88% Accuracy	800 x 600 Pixels Medium Resolution	15 x 10 Pixels Low Noise images required
Character Recognition	96% using Sobel edge detection	using match with the stored template images	using Boundary distance of character and Sobel edge detection

Complete ANPR Process	92%	95%	0.01% Errors
Tools Used	MATLAB	MATLAB	MATLAB
Channel Used	GSM or RFID	SMS on GSM at 900 MHz	GSM

Table 1: Literature Work Comparison

VII. CONCLUSIONS & FUTURE WORKS

In this work, existing methodologies and algorithms proposed in literature for Vehicle Number Plate recognition were reviewed. Due to the requirement of bandwidth for ANPR system, it is my endeavor to customize an ANPR system for future applications. Template matching will be conducted automatically in the police central office accurately and with fast rate. The accuracy can be improved greatly by the proposed method. In the near future I will use some effective coding method rather than ASCII code to provide more security and less memory space.

REFERENCES

- [1] Kartikeya Jain, Tanupriya Choudhury and Nirbhay Kashyap, "SMART VEHICLE IDENTIFICATION SYSTEM USING OCR", 3rd IEEE International Conference on "Computational Intelligence and Communication Technology" (IEEE-CICT 2017).
- [2] R Shreyas, Pradeep Kumar B V, Adithya H B, Padmaja B and Sunil M P, "Dynamic Traffic Rule Violation Monitoring System Using Automatic Number Plate Recognition with SMS Feedback", 2017 2nd International Conference on Telecommunication and Networks (TEL-NET 2017).
- [3] Mr. Bhavin V Kakani, Divyang Gandhi and Sagar Jani, "Improved OCR based Automatic Vehicle Number Plate Recognition using Features Trained Neural Network", 8th ICCCNT 2017, IIT Delhi, India, July 3-5, 2017.
- [4] Mr. Dipankar Bhattacharya and Anjan Bikash Maity, "A Study on Vehicle Number Plate Identification by Morphological Edge Detection and Template Matching", International Journal of Information and Education Technology, Vol. 1, No. 3, August 2011.
- [5] Amr Badr, Mohamed M. Abdelwahab, Ahmed M. Thabet, and Ahmed M. Abdelsadek, "Automatic Number Plate Recognition System", Annals of the University of Craiova, Mathematics and Computer Science Series Volume 38(1), 2011, ISSN: 1223-6934.
- [6] Shan Du, Member, IEEE, Mahmoud Ibrahim, Mohamed Shehata, Senior Member, IEEE, and Wael Badawy, Senior Member, IEEE, "Automatic License Plate Recognition (ALPR): A State-of-the-Art Review", IEEE TRANSACTIONS, VOL. 23, No. 2, FEBRUARY 2013.
- [7] Ms. Sushama H. Bailmare, Prof. A.B.Gadicha, "A Review paper on Vehicle Number Plate Recognition (VNPR) Using Improved Character Segmentation Method", International Journal of Scientific and Research Publications, Volume 3, Issue 12, December 2013 ISSN 2250-3153.
- [8] Manoj D. Chaudhary and Jitendra B. Chinchore, "Towards Multiple License Plate Localization in Indian Conditions: An Edge Density Based Approach", 2014, International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), Kanyakumari, 2014.
- [9] Anisha goyal and Rekha Bhatia, "Automated Car Number Plate Detection System to detect far number plates", IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 18, Issue 4, Ver. III (Jul.-Aug. 2016), PP 34-40.
- [10] Wu Dingyun, Zhang Lihong and Liang Yingbo, "A new algorithm for license plate recognition based on improved edge detection and Mathematical morphology", IEEE.
- [11] Jin Chong, Chen Tianhua and Ji Linhao, "License Plate Recognition Based on Edge Detection Algorithm", 2013 Ninth International Conference on Intelligent Information Hiding and Multimedia Signal Processing.