

A Review-Recognition of License Number Plate using Character Segmentation and OCR with Template Matching

Mr A. N. Shah¹, Ms A. S. Gaikwad²

Student, Department of Computer Science, DIEMS, Aurangabad, India¹

Assistant Professor, Department of Computer Science, DIEMS, Aurangabad, India²

Abstract: License number plate recognition is the most interesting and challenging research topic from past few years. Number plate recognition system (NPRS) is applicable to wide range of uses such as Border crossing vehicle, Highway toll-collection, traffic management, parking management at various locations and many more. In this paper we have developed a system to detect number plate of various fonts especially in INDIA. The detection process is divided into three steps viz. Character segmentation, optical character recognition (OCR) & template matching using MATLAB. By using this we can detect number plates correctly with minimum time duration and approximation.

Keywords: Number plates, Character segmentation, OCR using Templates matching.

I. INTRODUCTION

Large integration of information & electronics technologies into all fields of day to day life caused demand for processing vehicles as related resources in information systems. Because a single information system without any data has no value, there was also a need to change information about vehicles between the reality and information systems. It can be achieved by a human agent, or by special intelligent system which is able to recognize vehicles by their number plates in a real environment and reflect it into related resources. Because of this, various recognition systems have been developed and number plate detection systems are today used in various traffic and security applications, such as parking lots and border control areas or tracking of stolen/lost cars. In entrance gate, license plates are used to identify the vehicles. When a vehicle enters at entrance gate, number plate is automatically recognized and stored in database and stolen car is not given authority to exit. When a vehicle later exits the place through the gate, number plate is checked again and paired with the first-one stored in the database and it is taken a count. Automatic number plate detection systems can be used in access control. For example, this technology is used in many localities to grant access only to vehicles of authorized users only. In some countries, NPRS systems installed on country borders areas automatically detect and verify border crossings areas. Each vehicle can be registered in a central database and compared to a black list of stolen/lost vehicles. In traffic control, vehicles can be directed to different lanes for a better traffic control in busy urban communications during the busy hours. A number plate is the unique identification of vehicle. Real time number plate recognition plays an important role in maintaining law enforcement and maintaining traffic rules. Many number plates have different styles and varying state by state.

The number plates have one row or two rows of numbers and have six to more than ten letters for example given below in figure1.[9]



Fig 1: Various number plates.

II. LITERATURE SURVEY

Abbas M. Al-Ghaili, Syamsiah Mashohor, Abdul Rahman Ramli, and Alyani Ismail [1] proposed fast method for car-license plate detection (CLPD) and presents three main contributions. The first contribution was to propose a fast vertical edge detection algorithm (VEDA) based on the contrast between the greyscale values, which enhances the speed of the CLPD method. The second contribution was proposed CLPD method processes very-low-resolution images taken by a web camera. After the vertical edges have been detected by the VEDA, the desired plate details based on color information are highlighted. The third contribution was to compare the VEDA to the Sobel operator in terms of accuracy, algorithm complexity, and processing time.

G. Abo Samra and F. Khalefah [2] applied threshold method to overcome the dynamic changes of illumination

conditions when converting the image into binary. Connected component analysis technique (CCAT) was used to detect candidate objects inside the unknown image. A scale-invariant geometric relationship matrix was introduced to model the layout of symbols in any LP that simplifies system adaptability when applied in different countries. Moreover, two new crossover operators, based on sorting, were introduced, which greatly improve the convergence speed of the system.

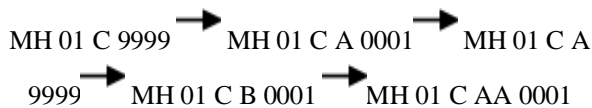
Bo Li, Bin Tian, Ye Li, and Ding Wen [3] presented a novel algorithm for license plate detection in complex scenes, particularly for the all-day traffic surveillance environment. Unlike low-level feature-based methods, their work was motivated by component-based models for object detection.

Chitode J.S [4] proposed that ANPR is real time embedded system identifies the characters directly for the image of license plate. The proposed algorithm was based on combination of morphological operation with area criteria tests for number plate localization. The character recognition was accomplished with the aid of optical character by process of Template Matching.

Pratiksha Gupta, Purohit G.N, Manisha Rathore [5] presented a new SIMULINK model in MATLAB. Template matching block of computer vision toolbox and Digital signal processing toolbox were used to detect vehicle number plate

III.METHODOLOGY

It is possible to recognize the characters of Indian number plate based on the specifications of Indian number plates. **MH 01 C 1234** Considering the standard specifications of Indian Number Plates: Here ‘MH’ that is the first 2 characters stands for the state code, ‘01’ that is a two digit number code which stands for the regional transport office where the car has been registered. ‘C’ stands for car and similarly ‘S’ for scooter and ‘P’ for public transport vehicles. Finally there comes a four digit car number (‘1234’). After the 4 digit car number reaches ‘9999’ the next vehicle number becomes [7]



A. Prototype of recognition system

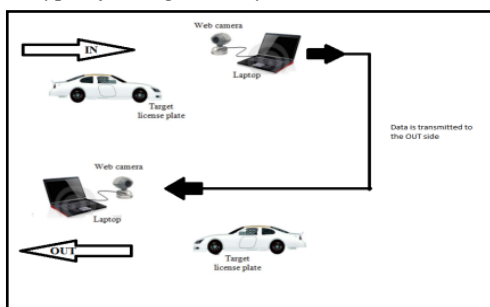
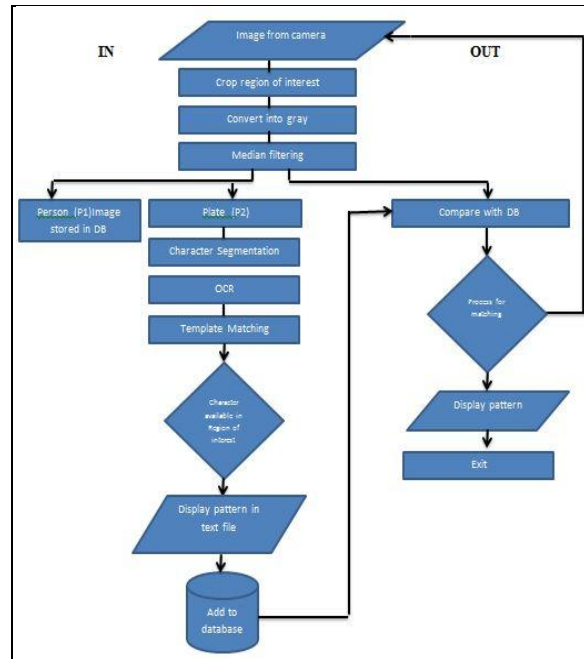


Fig 2 Prototype of Image Recognition Method.

The NPRS system is developed as a security system. The vehicle which contains number plate is detected through

Web-cam fitted at entrance gate and captures the image of number plate and person sitting on driving side (Driver). The computer is built up with setup of MATLAB-R2012a software. The benefit of using this software is that it processes and stores the image of person with current date & time and the image of driver is stored in database. Later, this data is transferred at the Exit end and the system available compares with the original data and then exits the vehicle.

B. Proposed Methodology



I. Pre-processing

i. Capture image

The first step is the capturing of an image using electronic devices such as optical (digital/video) camera; webcam etc. can be used to capture the acquired images. For this project, vehicle images will be taken with a Panasonic FX/Nikon digital camera. In this project pre-captured image will take. The images will be stored as colour JPEG format on the camera. Next, we might proceed in using the Matlab function to convert the vehicle JPEG image into grey scale format Input of this system is the image captured by a camera placed at a distance of 1-2 meters away from the vehicle as shown in following Figure3(a).

ii. RGB to Grey scale conversion

In RGB format, each Pixel has three colour components: Red, Green, and Blue.



Fig 3: (a) input image (b) Grey scale image

In pre-processing step, the colour image is given as an input and it is converted into grey scale image shown in figure3 (b). The first step to digitize a “black and white” image composed of an array of grey shades is to divide the image into a number of pixels, depending on the required spatial resolution. This range is represented in abstract way as a range from 0 (black) and 1 (white), with any fractional values.

II. Median Filtering

The median filter is a non-linear filtering technique used to remove noise from image under consideration. While it helps in removing the impulse noise it preserves the edges. After segmentation filtering was used for remove all lines expect characters. It is take consider noise. It is widely used and it is very effective at removing noise while preserving edges. It is particularly effective at removing 'salt and pepper' type noise



Fig 4: Filtered Image

III. Character Segmentation

The goal of this phase, given the dilation image, is to segment all the characters, without losing features of the characters. Segmentation is one of the most important processes in the automatic number plate recognition. If the segmentation fails, a character can be improperly divided into two pieces, or two characters can be improperly merged together. In order to recognize the vehicle number plate characters afterwards, each character must be divided respectively. The individual characters have to be distinguished (segmented) from each other. In Character Segmentation, the characters & digits of the plate are segmented and each is saved as different image. Matlab toolbox function provides a function called region props. It measures a set of properties for each labelled region in the label matrix. The bounding box is used to measure the properties of the image region. This technique used for check the numbers with template used by template matching algorithm in Optical Character Recognition (OCR).

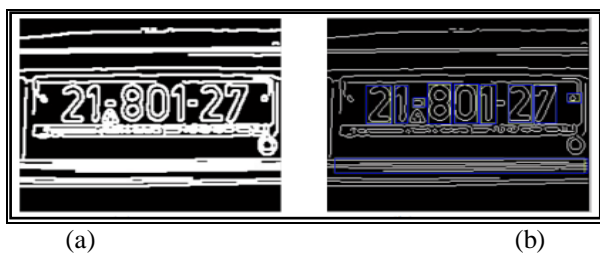


Fig 5: (a) Dilated image (b) Segmented image

IV. Optical Character Recognition

The goal of Optical Character Recognition (OCR) is to classify optical patterns (often contained in a digital image) corresponding to alphanumeric or other characters.

The character has been extracted after the filtering. This character has been matched with the pre-defined characters. The predefined characters have the data like Alphabets A-Z, numeric character 0-9. This pre-defined data are in the form of the images. Using these images the template has been matched with the segmented characters of the number plate

Template Matching:

Template Matching is one of the most common classification methods. In Template Matching, the features that the classification is based on are the individual pixels. An image is compared with predefined images, which are referred to as templates. The template is given below in figure 6.



Fig 6: Template

V. Number Plate Extraction

The character segmentation algorithm is used to segment the character. Due to this character segmentation process noise is added and that noise is removed using the filter. The noise removed character is matched with template using template matching algorithm and finally the character is extracted in notepad.

IV. APPLICATIONS

- a) For Security Purpose
- b) As Border crossing vehicle
- c) For Toll ways
- d) Finding stolen cars
- e) For Parking area management
- f) Traffic signal violation

Monitoring traffic activity such as red light adherence in an intersection

V. FUTURE SCOPE

The system can be able to work where the number plate, the colour and the font of the plate is identical with varied font sizes. The system should not compromise and it should be sensitive and should be able to locate the plate at any conditions as tracking stolen vehicles and monitoring vehicles for homeland security.

VI. CONCLUSION

The proposed work presents the automatic vehicle number plate identification system using vehicle number plate. The system was implemented in Matlab and its performance was tested on real images. A number plate recognition system is one kind of an Intelligent Transport System. Also the template matching algorithm has been used to extract the vehicle number plate. The automatic vehicle number plate identification system plays an important role in detecting security threat. Here, character segmentation for separating individual characters. Finally,

match with template using template match algorithm and extract the number plate in notepad.

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BIOGRAPHIES



Mr. Apurva. N. Shah is currently studying in Masters of Computer Science and Engg.at DIEMS, Aurangabad. He has completed his B.E from MSSCET, Jalna in 2012.His research field includes image processing, OCR and transformation.



Ms. Ashwini Sanjay Gaikwad has received the B.E. degree in Computer Science & Engineering from Jawaharlal Nehru Engineering College, Aurangabad in 2002 and M.E. degree in Computer Science & Engineering from Government Engineering College, Aurangabad in 2008. Currently she is pursuing her Ph.D in Computer Science & Engineering with the topic 'Gender and Age Recognition System based on Fingerprints' and is working as Assistant Professor in Deogiri Institute of Engineering and Management Studies. Her areas of specialization include Digital Image Processing, Artificial Intelligence, Computer Vision.