Vehicle's RC Plate Tracking based on Image Processing Applications

Amina Khatra[1]

[1]BGIET, Sangrur, Punjab, India

Abstract: *It is observed that the vehicle's number plate consists of many a times some special characters. In order to get the correct texts from the number plate, the special characters should be extracted out and rejected while retrieving the owner's information. This kind of problem is often observed on Indian roads. This is one of the important cares that should be taken while designing the algorithm. Another important part regarding the textual information on number plate, the text style or font is not many times uniform on all plates. Therefore, the vehicle's no. plate identification system should be capable of identifying the texts written in any style and at any angular position. Even the size should not bother much. Further, the system should respond at a fast speed just after clicking of the image. Otherwise the objective is lost. In the presented approach, the design of speedy algorithm is stressed out.*

Keywords: Image Processing, vehicle's number plate, speedy algorithm

1. Introduction

Vehicle identification is an essential area in the development of intelligent traffic systems and surveillance. Given the current security situation in the country due to ethnic conflicts, this is one of the areas where there is an urgent need for the development of devices that could be used in variety of situations to ease the security concerns. In addition, the use of vehicles in Sri Lanka has increased rapidly, especially in recent years, due to urbanization and modernization, and thus, traffic congestion in cities has become a major issue. Therefore, control of vehicles and identification of traffic violators to maintain discipline, is becoming a necessary task in many cities. Automatic vehicle identification systems can be used effectively for this purpose.

From the variety of number plate systems introduced over the years by local authorities, there are several types that are still accepted as valid number plates on local roads. Essentially, it consists of plates with white background at the front and yellow background at the rear, and letters in black in both cases. The arrangement of numbers consists of two English letters followed by four digits, separated by a dash (example, GA-1234). In addition, two smaller letters are placed on plate to identify the Province of issue, namely, UP (Uttar Pradesh), PB (Punjab), MP (Madhya Pradesh), RJ (Rajasthan) etc.

2. Related Works

The automatic vehicle license plate recognition system is an extremely effective system for vehicle monitoring in automatic zone access control. This system uses two character recognition techniques namely neural network character recognition and pattern matching of characters. Multilayer feed-forward back-propagation algorithm is used. The performance of the proposed algorithm has been tested on several real life car plates and provides good results [1].

Automatic Number Plate Recognition (ANPR) is an automatic and authorized vehicle identification system which uses image processing methods to identify a vehicle's number plate. The system can be installed on the entrance of restricted areas like government buildings for security control. The developed system detects the vehicle and captures its image. The number plate region is extracted from the whole vehicle image using image segmentation. Optical character recognition method is used for the character recognition. The resulting data is then compared with the records on a database to obtain specific information like the vehicle's owner, place of registration, address, etc. The system is implemented and simulated in MATLAB, and its performance is tested on real images. Experimental results show that the system is very efficient in recognizing real images [2].

This thesis proposes an algorithm for a license plate intelligent recognition system which can be used for expressway toll collection system. The algorithm contains 4 major steps: In the first step, image preprocessing is done by combining the algorithm of first difference with the method of determining the threshold of binarization via accumulating pixel spots. The second step involves, taking advantage of the horizontal texture characteristic using aspect ratio and the physical trait in the plate area, the algorithm locates the position of the plate. In the third step the positions of left and right border of Chinese character used for division are marked in character segmentation, so that the strokes of Chinese characters cannot worsen noise. At the end, the algorithm designs different methods of recognition for different scripts, the enhanced method of BP neural network is for Chinese characters, and the method of dynamic clustering is for Arabic numbers and alphabet letters [3].

Automatic License Plate Recognition (LPR) is a technique which is used to identify a vehicle by reading its license plate using image processing methods. The system presented in this paper is capable of extracting the license plate region from a rear end image of the vehicle. The system consists of a digital camera, the software module which extracts and recognizes the license plate number and the software which

interfaces the camera with the software module. The camera captures the image of a certain resolution and passes it to the software module. The software module works in four phases: input image analysis, identification of the location of the license plate using the idea of connected components in the image, segmentation of the characters on it using digital image labeling and recognition of the characters using template matching. The algorithm was implemented in MATLAB and the test results obtained by experimental verification agreed with theoretical predictions [4].

Lebanese License Plate Recognition is system for identify vehicles by their Lebanese license plates using image-processing techniques. The system presented uses two methods for classifying the Lebanese plate namely Labeling and K-Means. Next, the French line and the Arabic line are extracted from the plate. Each character is separated from each line using the vertical profile method. Then the characters are recognized by the K-PPV algorithm which recognizes characters with a rate of 82% for Arabic writing and of 91% for French/English characters .Finally a vote method between the two writings is used to increase the rate of recognition up to 93% [5].

This paper presents a license plate recognition system based on neural networks. The system uses a neural network chip to recognize license plates. The chip combines the video image processing module with neural network module .It uses equalized image processing algorithm and network classification algorithm. An interface circuit is developed for implementing the license-plate-number recognition. Experimental results show the system can provide a very low error rate in a satisfactory recognition time [6].

Persian License Plate Detection and Recognition System is an approach used to identify a vehicle by its license plate using image-processing techniques. In this system the first stage is the isolation of the license plate from the digital image of the car. The digital image of the vehicle is obtained by a digital camera under different circumstances such as illumination, slop, distance, and angle. The algorithm starts with preprocessing and signal conditioning. Next license plate is localized using morphological operators. The second stage is character recognition within the plate which is done using a template matching scheme. This system was implemented with help of Isfahan Control Traffic organization and showed 98.2% of correct plates identification and localization and 92% of correct characters recognized [7].

This paper describes a real time technique for identifying vehicle license-plate and interpretation of the registration code from a captured image. The proposed algorithm is divided into three stages: extraction of vehicle license plate from captured vehicle image, segmentation of license plate characters and recognition of the license plate characters for interpretation of vehicle registration code. Finally, a control algorithm is also developed to choose between the recognition processes and reconstruct the registration code from recognized characters. Most of the processes are implemented using logical operations to achieve lower execution time [8].

This paper presents an algorithm for identification of vehicle by recognizing the number plate .This vehicle number plate identification technique consists of vehicle image capture, plate localization and character recognition. In this scheme, the genetic algorithm (GA) is employed at two levels. The first level is detecting vehicle number plate from the traffic image and then recognizing the characters from the number plate. Detection of number plate is based on contour and shape information. GA controls the window size to capture each vehicle in a separate widow. Connectivity and adjacency concepts are used to locate and extract the characters. A digital board (DB) with window panes is introduced to recognize each character uniquely. At the second level GA is adopted to map character pixels into the window panes as lines. For each character in the number plate a distinct feature vector is computed. Finally, a feature based matching is adopted for character recognition. Experiments have been conducted with real images taken from varied scenes and conditions and the detection rate is found to be 92.5 %, recognition rate is found to be 91 %. The detection time is a linear function of the number of objects in the input image [9].

This system has been designed to work on the standard Islamabad Computerized Number Plates (ICT). The method used has no distance, color and single plate limitations. The system has two main modules (1) Plate Extraction Module (2) OCR Module. For the first module a SCAN_NP algorithm has been developed. For the second module, Template matching and neural networks have been used to choose the more effective method from them. 90% accuracy with 2 Mega Pixel images has been obtained in real time images. This accuracy can be increased further with a higher quality camera [10].

3. Vehicle RC Plate Image Acquisition

Vehicle's RC plate is grabbed using the CCD camera. The acquired image is in jpeg format and is converted to gray scale image using the rgb2gray command in MATLAB. Following images show the acquired images.

Figure 1: Acquired images

4. Algorithm

Finding the position of a license plate in a vehicle image is considered to be the most crucial step of the recognition system, and this in turn greatly affects the recognition rate and overall speed of the whole system.

The software aspect of the system runs on standard home computer hardware and can be linked to other applications or databases. It first uses a series of image manipulation techniques to detect, normalize and enhance the image of the number plate, and then optical character recognition (OCR) to extract the alphanumeric of the license plate.

The proposed algorithm is based on two basic processing stages; locating the license plate, and, identifying the individual digits and characters in the license plate. The algorithm takes a raster image of the rear view of a vehicle as input and yields the recognized numbers and characters in the number plate as the output. The performance of the developed algorithm has been tested on a set of real images of vehicles.

The basic method for extracting the plate region can be described by the following steps:

1) Original RGB image in jpeg format
2) Gray level conversion
3) Image Enhancement and binarization
4) Texts extraction - Segmentation
5) Feature set extraction
6) Text Recognition
7) RC Plate Info. compilation

The grabbed image is first converted to gray image in bit mapped (bmp) format (256 gray shades format). A threshold is applied using the Otsu's method. The Otsu algorithm works well for vehicle's number plate images. This is because the number plate images are normally of plain texts with primarily of two colors, however, with some noisy input like dirt or blurring due to grabbing of image of a moving vehicle. Otsu's thresholding method involves iterating through all the possible threshold values and calculating a measure of spread for the pixel levels each side of the threshold, i.e. the pixels that either fall in foreground or background. The aim is to find the threshold value where the sum of foreground and background spreads is at its minimum.

5. Results

Following images show the segmented characters from the RC plate:

Figure2 (a): Original Image
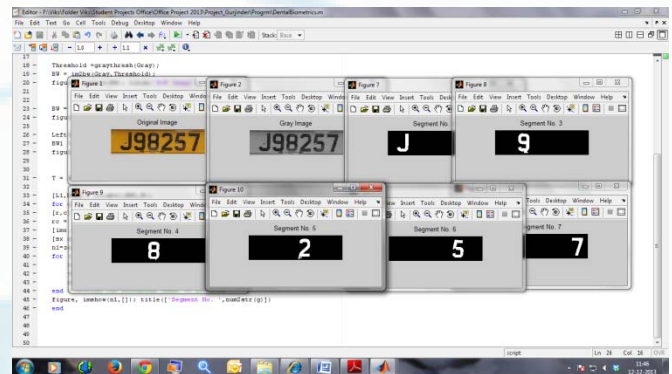

Figure 2(b): RC Plate Extraction

Figure 2(c): Segmented Images

The characters from the segmented images can be identified based on optical character recognition algorithm or template matching scheme. A text file may be generated taking the extracted characters from the RC plate and can be compiled to form a complete identified RC plate.

6. Future Scope

The presented work finds application primarily in traffic control and regulation system and is mainly focused for tracking the owner's information on roads of their respective vehicles. Further, the same may be utilized for library books keeping where the cover of the books may be taken as image and can be converted to text for automatic book keeping and recording rather than typing of the book title separately for each book.

7. Conclusion

The proposed system may be very useful in tracking the online traffic on road where a high speed tracking is required. The same may be combined with toll tax collection booth agencies where the toll tax collection may be automated by clubbing the vehicle information along with owner's information.

References

[1] Meenakshi, R. B. Dubey," Vehicle License Plate Recognition System", International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970), Volume-2, Number-4, Issue-7, December-2012

[2] Muhammad Tahir Qadri, Muhammad Asif,"Automatic number plate recognition system for vehicle identification using optical character recognition", International Conference on Education Technology and Computer, 2009.

[3] Huang Wenjie,"Automatic Vehicle License Plate Recognition System Used in Expressway Toll Collection", 978-1-4244-5540-9/10/2010 IEEE

[4] Megalingam, Krishna, Somarajan, Pillai, Hakkim," Extraction of License Plate Region in Automatic License Plate Recognition", International Conference on Mechanical and Electrical Technology, 2010 (ICMET 2010)

[5] Akoum, Daya, Chauvet," Automatic System Recognition of Lebanese License Plates", 978-1-4244-6439-5/10/2010 IEEE

[6] YiQing Liu, Dong Wei Ning Zhang, MinZhe Zhao," Vehicle-License-Plate Recognition Based on Neural Networks", Proceeding of the IEEE International Conference on Information and Automation Shenzhen, China, June 2011.

[7] Hamidreza, Kasaei,"Extraction and recognition of the vehicle license plate for passing under outside environment", European Intelligence and Security Informatics Conference, 2011

[8] Nahian Alam Siddique, Asif Iqbal, Fahim Mahmud, Md. Saifur Rahman," Development of an Automatic Vehicle License Plate Detection and Recognition System for Bangladesh", IEEE/OSA/IAPR International Conference on Informatics, Electronics & Vision,978-1-4673-1154- 0/12/2012 IEEE.

[9] P.Vijayalakshmi, M.Sumathi, "Design of Algorithm for Vehicle Identification by Number Plate Recognition", IEEE- Fourth International Conference on Advanced Computing, ICoAC 2012, MIT, Anna University, Chennai, December 13-15, 2012

[10] Nabeel Younus Khan, Ali Shariq Imran, Naveed Ali, "Distance and Color Invariant Automatic License Plate Recognition System",1-4244-1494-6/07/$25.00 C 2007 IEEE

Author Profile

Amina Khatra received her M.Tech degree in ECE from DIET, Kharar, Mohali, Punjab in 2012. Her field of interest is in image processing based application system developments. Presently the author is Asst. Prof. (ECE) in BGIET, Sangrur, India