

Automatic Vehicle Identification by Plate Recognition

Serkan Ozbay, and Ergun Ercelebi

Abstract—Automatic Vehicle Identification (AVI) has many applications in traffic systems (highway electronic toll collection, red light violation enforcement, border and customs checkpoints, etc.). License Plate Recognition is an effective form of AVI systems. In this study, a smart and simple algorithm is presented for vehicle's license plate recognition system. The proposed algorithm consists of three major parts: Extraction of plate region, segmentation of characters and recognition of plate characters. For extracting the plate region, edge detection algorithms and smearing algorithms are used. In segmentation part, smearing algorithms, filtering and some morphological algorithms are used. And finally statistical based template matching is used for recognition of plate characters. The performance of the proposed algorithm has been tested on real images. Based on the experimental results, we noted that our algorithm shows superior performance in car license plate recognition.

Keywords—Character recognizer, license plate recognition, plate region extraction, segmentation, smearing, template matching.

I. INTRODUCTION

AUTOMATIC vehicle identification is an essential stage in intelligent traffic systems. Nowadays vehicles play a very big role in transportation. Also the use of vehicles has been increasing because of population growth and human needs in recent years. Therefore, control of vehicles is becoming a big problem and much more difficult to solve. Automatic vehicle identification systems are used for the purpose of effective control.

License plate recognition (LPR) is a form of automatic vehicle identification. It is an image processing technology used to identify vehicles by only their license plates. Real time LPR plays a major role in automatic monitoring of traffic rules and maintaining law enforcement on public roads [1]. Since every vehicle carries a unique license plate, no external cards, tags or transmitters need to be recognizable, only license plate.

So many researches of car identification have been approached by car license plate extracting and recognition, some of the related work is as follows. Lotufo, Morgan and

Johnson [2] proposed automatic number-plate recognition using optical character recognition techniques. Johnson and Bird [3] proposed knowledge-guided boundary following and template matching for automatic vehicle identification. Fahmy [4] proposed bidirectional associative memories (BAM) neural network for number plate reading. It's appropriate for small numbers of patterns. Nijhuis, Ter Brugge, Helmhof J.P.W. Pluim, L. Spaanenburg, R.S. Venema and M.A.Westenberg [5] proposed fuzzy logic and neural networks for car LPR. This method used fuzzy logic for segmentation and discrete-time cellular neural networks (DTCNN'S) for feature extraction. Choi [6] and Kim [7] proposed the method based on vertical edge using Hough transform (HT) for extracting the license plate. E.R. Lee, P.K. Kim and H.J. Kim [8] used neural network for color extraction and a template matching to recognize characters. S.K. Kim, D.W. Kim and H.J. Kim [9] used a genetic algorithm based segmentation to extract the plate region. Tavsanoğlu and Saatci [10] proposed an approach to form orientation map as recognition feature using a Gabor filter for recognizing characters. Yoshimura and Etoh [11] used Gabor jets projection to form a feature vector for recognizing low resolution gray-scale character. Hontani et.al. [12] proposed a method for extracting characters without prior knowledge of their position and size in the image. Park et. al. [13] devised a method to extract Korean license plate depending on the color of the plate. H.J. Kim, D.W. Kim, S.K. Kim, J.V. Lee, J.K. Lee [14] proposed a method of extracting plate region based on color image segmentation by distributed genetic.

In this study, the proposed algorithm is based on extraction of plate region, segmentation of plate characters and recognition of characters.

The paper is organized as follows: Section II provides an overview of the overall system. Extracting the plate region is explained in Section III. Section IV gives the segmentation of individual plate characters. Section V deals with recognition of characters based on statistical based template matching algorithm. Section VI discusses experimental results and the paper concludes with Section VII.

II. STRUCTURE OF THE LPR SYSTEM

The algorithm proposed in this paper is designed to recognize license plates of vehicles automatically. Input of the system is the image of a vehicle captured by a camera. The captured image taken from 4-5 meters away is processed through the license plate extractor with giving its output to segmentation part. Segmentation part separates the characters

Serkan Ozbay is with the GMYO, University of Gaziantep, Gaziantep, 27310, Turkey (phone: 0-342-3601200-1710; fax: 0-342-3601170; e-mail: sozbay@gantep.edu.tr).

Ergun Ercelebi is with the Electrical and Electronics Engineering, University of Gaziantep, Gaziantep, 27310, Turkey (phone: 0-342-3601200-2111; fax: 0-342-3601103; e-mail: ercelebi@gantep.edu.tr).