JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

License Plate Recognition based Mobile Application for Parking Systems

M. P. Borawake[1], Yashika Dhanwani[2], Rajashri Kunale[3], Namrata Vyavahare[4], Priyanka Vyavahare[5]

Computer Engineering Department,

PDEA'S College of Engineering Manjari (BK), Pune-412307, India

madhuri.borawake@gmail.com
dhanwaniyashu2201@gmail.com
rajashrikunale@gmail.com
namratavv123@gmail.com
vyavaharepa@gmail.com

***Abstract*—Most vehicle license plate recognition uses neural network techniques to enhance its computing capability. The image of the vehicle license plate is captured and processed to produce a textual output for further processing. This paper reviews image processing and neural network techniques applied at different stages which are pre-processing, filtering, feature extraction, segmentation and recognition in such way to remove the noise of the image, to enhance the image quality and to expedite the computing process by converting the characters in the image into respective text. License plate recognition can be better solved by solutions with settings oriented for different applications. Numerous techniques have been developed for LPR in still images or video sequences, and the purpose of this project is to assess and implement them as a real-world solution. This Project aims at making the databases obtained available for usage in an application for a parking system wherein the detected License plate number is matched with the pre-existing user information. This enables the application to detect the amount of time for which the vehicle was parked and generate a digital bill to the user accordingly. The experimental results show that the proposed method not only locates license plates accurately but also be robust to scenes of illumination variation, noise distortion, and blurry effects.**

Keywords - Optical character recognition (OCR), image processing, License plate recognition (LPR), Segmentation, pre-processing, filtering, feature extraction.

I. INTRODUCTION

License plate recognition (LPR) algorithms in images or videos are generally composed of the following three processing steps:

1) extraction of a license plate region;
2) segmentation of the plate characters
3) recognition of each character.

License plate recognition (LPR) algorithms in images or videos are generally composed of the same processing steps as well. Edge clustering is formulated for solving plate detection for the first time. License plate recognition can be better solved by solutions with settings oriented for different applications. Numerous techniques have been developed for LPR in still images or video sequences, and the purpose of this project is to assess and implement them as a real-world solution. It takes image of the car and searches for the number plate in the image.

Due to the mass integration of information technology in all aspects of modern life, there is a demand for information systems for data processing in respect of vehicles. These systems require data to be archived or by a human or by a special team which can recognize vehicles by their license plates in real-time environment and reflect the facts of reality in the information system. Therefore, several techniques have been developed recognition and recognition systems are license plates used today in many applications Once the probable number plate area is located it is given to OCR. If OCR doesn't recognize the characters from the image number plate area is searched again from the image. θIf characters are recognized then number plate search is terminated.

Also known as Automatic Number Plate Recognition (ANPR), LPR is a widely used technology for vehicle management operations such as Ticketless Parking (off-street and on-street), Tolling, ITS, stolen vehicles detection, smart billing and many other applications in Europe and becoming a trend in the Americas.

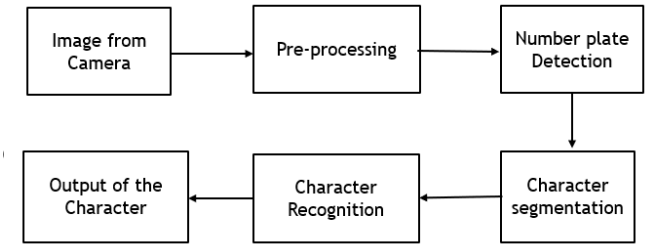
By bringing the license plate digital information (among other data such as vehicle's direction and speed) to the mix, License Plate Recognition allows operators to immediately gather and associate **more data** about every vehicle passing a control point:

1. **The action itself:** time, place, direction and speed of the vehicle
2. **The vehicle:** origin, Restrictions or security alerts.
3. The driver: License number, personal public or contact information about the driver

LPR calculations are commonly made out of the accompanying three handling steps: 1) area of the tag (LP) locale; 2) division of the plate characters; and 3) recognition of each character. The initial two stages join image handling methods on still pictures or edge groupings (recordings), whose assessment depends on the genuine acknowledgment rate and the blunder acknowledgment rate.

II. METHODOLOGY

The entire process of ANPR can be seen . All the stages in the following are explained in detail as follows.



A. Image From Camera (Image Acquisition)

The first stage is picture capture, or acquiring an image using the computer-connected digital camera. These obtained images can be further processed for Number Plate Extraction because they are in RGB format.

The database system houses the private data of the car owners.

B. Pre-Processing

1) Gray Scale Conversion

The first and most crucial stage in image pre-processing is grey scale conversion. Numerous factors, such as optical system distortion, picture noise, motion blur, etc., have an impact on the acquired image. Instead of working directly on colourful images, the software is trained on grayscale images primarily because RGB (colour) has a 3-dimensional property (24-bit size), which requires a greater size each time.

As it is challenging for the programme to pre-process the image, colour information is noise in image processing. Grayscale, on the other hand, takes up less space and is suitable for most algorithms.

2) Binarization

The Binarization Method changes the image into a black-and-white one in which each pixel can only have one of two values—0 or 1. Binarization has a major impact on the OCR (optical character recognition) outcome. As the original image contains noise, character recognition is more accurate when using a high-quality binarized image.

A popular technique for picture detection is the Otsu Binarization Method, which uses an automatic binarization level decision and a global threshold technique based on the histogram's form.

For low light/bright circumstances, where Otsu's method fails, we have suggested a different approach.

By dividing or multiplying integers between 1.1 and 2.5 with increments of 0.1 each time, we can raise or lower the Otsu's threshold up to 2.5 times its initial value, until the desired threshold is reached. Until it reaches the requisite number of characters in the final stage, our system will evaluate a range of specified threshold values. We'll choose the cutoff that ultimately offers us the most characters possible.

C. Number Plate Localization

1) Connected Component Analysis (CCA)

The algorithm of the component attached to the binary filter is first used to remove the undesired image space. To identify the characters in the image, the related component is parsed. The fundamental suggestion is to scan the image and locate any related pixels. Every element (dot) is identified and removed. The goal of plate localization is to isolate the number plate area from the surrounding area of the image. Finding the plate size is the first step in recognising a vehicle number plate. CCA takes the image's pixelated appearance into consideration.

Since the image is binarized at this point, it can be said to be made up of the 2-pixel values 0 and 1, which stand for the image's white and black parts, respectively. In order to reveal related regions, it will aggregate regions with comparable pixel intensity levels (by default, pixels with a value of 0) together. We were able to create rectangles that represented the "connected regions" as identified by CCA by using Python's bounding box function. The region will separate from the input image after labelling the related components. The location of the licence plate is shown in the illustration. The next step is to eliminate the redundantly related sections.

D. Noise Reduction

Doing noise reduction at only the number plate will reduce the processing time. The techniques help in removing dust, water and other noise which can often appear on our number plates.

E. Character Segmentation

Each character needs to be broken apart after the licence plate has been extracted. The most important thing to keep in mind when a region has grown is one or more criteria that meet the standards of the desired region. After determining the requirements, the image is searched for any pixels that meet them. When such a pixel is encountered, its neighbours are examined. If

any of the neighbours also meet the criteria, both pixels are considered to be located in the same region. We use a vertical and horizontal scanning technique to obtain individual character and number images.

F. Character Recognition

The ANPR system's most crucial and fundamental stage is this one. The segmented characters in the licencing panel must match the existing templates in order to be recognised as characters. The licence number is returned by the recognition procedure and is saved in an excel document in ASCII format. There are two tracks in this recognition procedure.

The initial pass involved making an effort to recognise each word individually. Each acceptable word is sent as training data to the adaptive workbook. The adaptive workbook is given the chance to more precisely understand the content. It demonstrates the methods needed to arrange and then interpret the various characters. The extracted features form the basis for the classification. The statistical, syntactic, or lexical methods are then used to arrange these features. Character recognition, letters, and characters in the paper all required different approaches. Calculating the similarity of features will complete the identification. Use the highlight point matching approach to identify the second character for the similar characters. Another way is to use the line separation procedure, which is currently connected segment savvy so that individual characters can be isolated, once the lines in an extracted vehicle number plate have been separated. Afterward, the separated individual characters are kept in different variables. The characters that were extracted from the number plate and the characters that we have already saved in the database are currently synchronised.

Template matching is the next stage. An effective algorithm for character recognition is template matching. The character's image is compared to our database, and the one with the closest resemblance is chosen.

Optical character recognition (OCR), which compares each character to the entire alphanumeric database, is another method for character recognition. In order to match each character, the OCR really employs a relationship method. Once the number is detected, it is then recorded in a variable in string format. The database for vehicle authorisation is then contrasted with the character. The resulting signals are provided in accordance with the comparison's outcome. Every character, including AZ, 0-9, and other symbols, will have a template.

G. Fusion Of Above Techniques

One method to increase your dataset accuracy is to use ensembles. Here, a voting approach that combines various techniques and their predictions to provide superior outcomes is being applied. Here, an ensemble implementation of SVM (linear classifier) with KNN and a combination of logistic regression with Random Forest is used to overcome the limitations of each individual technique.

H. Identification

Identification After the successful detection of the vehicle number plate we can design the system for identification of the owner details. We can check the various databases. The identification of the vehicle owner is the part of identification model. The project is work in 3 models like recognition, identification and database registry.

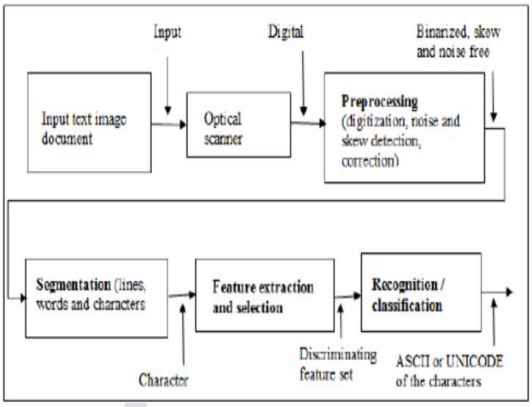


Fig. Block diagram of a typical OCR scanner system

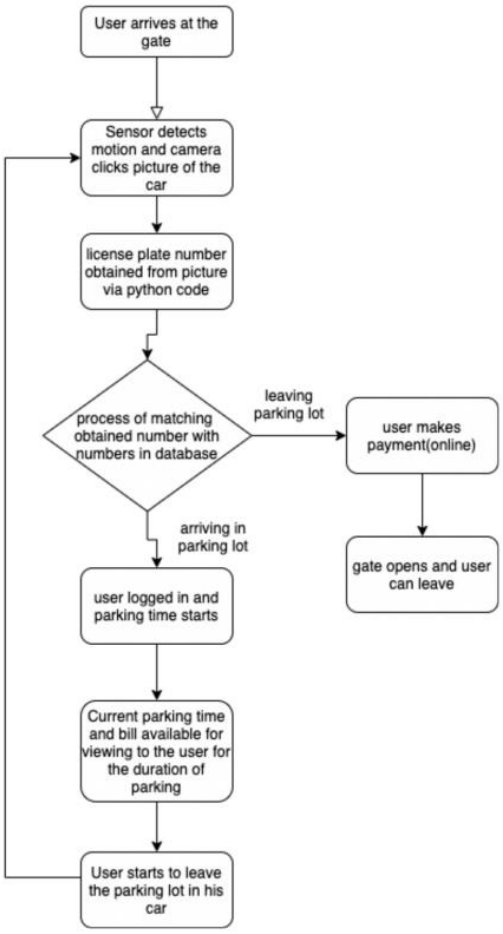
III. USER FLOW DIAGRAM

A user flow is a chart or diagram that depicts the steps a user will take to perform a task in an application. Product teams create user flows to facilitate intuitive product design, give users the relevant information at the right time, and let them finish desired tasks quickly.

The content needs for websites or app screens are based on the user flow. The product team may create a user flow and experience that is tailored to satisfy user demands by starting with a knowledge of those needs.

You should think about the following questions for each user flow:

What does the user hope to achieve?
What will the user find important and give them the confidence to continue?
What further details would the user need in order to complete the task?
What reluctances or obstacles do users have in completing the task?
The answers to those queries will help you create the pages and choose the navigational links and material to use. If a user's main objective is to browse different things,



IV. ACKNOWLEDGMENT

We take this opportunity to thank the teachers and senior authorities whose constant encouragement made it possible for us to take up a challenge of doing this project. We expressour deepest sense of gratitude towards our Hon'ble Head of department **DR. R. V. PATIL** for giving permission to use the college resources and his constant encouragement for thiswork.

We are grateful to **Dr. Prof. M. P. Borawake** for her technical support, valuable guidance, encouragement and consistent help without which it would have been difficult for us to complete this project work. She is a constant source of information to us. We consider ourselves fortunate to work under the guidance of such an eminent personality.

Last but not the least; we are thankful to our entire staff of COMPUTER ENGINEERING DEPARTMENT for their timely help and guidance at various stages of the progress ofthe project work.

V. CONCLUSION

This is a very easy, efficient, and low-cost method for license plate recognition and optical characters recognition in general. In the future, this application/system will be modified and improved to have more accuracy. LPR, as a means of vehicle identification, may be further exploited in various ways such as vehicle model identification, under-vehicle surveillance, speed estimation, and intelligent traffic management. For the vehicle model identification task, the position of the LP could play an important role in segmenting a distinctive reference area of the frontal view of the vehicle. Moreover, for under-vehicle inspection, it is assumed that a template under-vehicle image for each inspected vehicle has been archived into a database in advance. Based on the incoming vehicle LP, the respective template image is retrieved from the database and then compared to the one acquired during real-time under-vehicle inspection. Using the methodologies mentioned in references and making different applications out of it is step forward for the scientific community to utilize the findings of others.

In addition, assuming that LP regions are detectable even in very low resolution, an open topic for future research is the readability improvement of LP text using image processing techniques. Research for improving degraded plates has lately been directed to super resolution methods for video sequences or to blurred plate images with promising results. LPR, as a means of vehicle identification, may be further exploited in various ways such as vehicle model identification, under vehicle surveillance, speed estimation, and intelligent traffic management. For the vehicle model identification task, the position of the LP could play an important role in segmenting a distinctive reference area of the frontal view of the vehicle.

.

VI. REFERENCES

[1] "Pansare, J.R. and Ingle, M., 2016, August. Vision-based approach for American sign language recognition using edge orientation histogram. In 2016 International Conference on Image, Vision and Computing (ICIVC) (pp. 86-90). IEEE.

[2] F. Martin, M. Garcia, and J. L. Alba, "New methods for automatic reading of VLP's (Vehicle License Plates)," in Proc. IASTED Int. Conf. SPPRA, 2002.

[3] B. Hongliang and L. Changping, "A hybrid license plate extraction method based on edge statistics and morphology," in Proc. ICPR, 2004, pp. 831–834.

[4] D. Zheng, Y. Zhao, and J. Wang, "An efficient method of license plate location," Pattern Recognition. Lett., vol. 26, no. 15, pp. 2431–2438, Nov. 2005.

[5] S. Wang and H. Lee, "Detection and recognition of license plate characters with different appearances," in Proc. Conf. Intel. Transp. Syst., 2003, vol. 2, pp. 979–984.

[6] C. Arth, F. Limberger, and H. Bischof, "Real-time license plate recognition on an embedded DSP-platform," in Proc. IEEE Conf. CVPR, Jun. 17–22, 2007, pp. 1–8.

[7] V. Shapiro, G. Gluhchev, and D. Dimov, "Towards a multinational car license plate recognition system," Mach. Vis. Appl., vol. 17, no. 3, pp. 173–183, Aug. 2006.

[8] J. Cano and J. C. Perez-Cortes,Vehicle License Plate Segmentation in Natural Images, vol. 2652, F. J. Perales et al., Eds. New York: Springer-Verlag, 2003, pp. 142–149.

[9] N. Zimic, J. Ficzko, M. Mraz, and J. Virant, "The fuzzy logic approach to the car number plate locating problem," in Proc. IIS, Grand Bahama Island, The Bahamas, 1997, pp. 227–230. 10. A. Rahman, W. Badawy, and A. Radmanesh, "A real time vehicle's license plate recognition system," in Proc. IEEE Conf.Advanced Video Signal Based Surveillance, pp. 163–166.

[10] D.-S. Kim and S.-I. Chien, "Automatic car license plate extraction using modified generalized symmetry transform and image warping," in Proc. ISIE, 2001, pp. 2022–2027. 15. [28] L. Dlagnekov, License Plate Detection, Mar. 2004, San Diego, CA: Comput. Sci. Eng. Dept., Univ. California, San Diego. [Online]. Available: http://www.cse.ucsd.edu/classes/fa04/cse252c/ projects/louka.pdf 16.

[11] M. H. ter Brugge, J. H. Stevens, J. A. G. Nijhuis, and L. Spaanenburg, "License plate recognition using DTCNNs," in Proc. IEEE Int. Work- shop Cellular NNs Using AdaBoost Appl., 1998, pp. 212–217. 17.

[12] K. K. Kim, K. I. Kim, J. B. Kim, and H. J. Kim, "Learning-based approach, for license plate recognition," in Proc. IEEE Signal Process. Soc. Workshop, NNs Signal Process., 2000, vol. 2, pp. 614–623. 18.

[13] T. Naito, T. Tsukada, K. Yamada, K. Kozuka, and S. Yamamoto, "Robust license-plate recognition method for passing vehicles under outside environment," IEEE Trans. Veh. Technol., vol. 49, no. 6, pp. 2309–2319, Nov. 2000. 19.

[14] A. Broumandnia and M. Fathy, "Application of pattern recognition for Farsi license plate recognition," in Proc. Int. Conf. GVIP, Cairo, Egypt, 2005. 20.

[15] P. Comelli, P. Ferragina, M. N. Granieri, and F. Stabile, "Optical recognition of motor vehicle license plates," IEEE Trans. Veh. Technol., vol. 44, no. 4, pp. 790–799, Nov. 1995. 21.[8] K. I. Kim, K. Jung, and J. H. Kim, Color Texture-Based Object Detection: An Application to License Plate Localization, vol. 2388, S.-W. Lee and A. Verri, Eds. New York: Springer-Verlag, pp. 293–309. 22.

[16] S. Draghici, "A neural network based artificial vision system for license plate recognition," Int. J. Neural Syst., vol. 8, no. 1, pp. 113–126, Feb. 1997. 23. [55] R. C. Gonzalez and R. E. Woods, Digital Image Processing. MA: Addison-Wesley, 1993. 24.

[17] C. Wu, L. C. On, C. H. Weng, T. S. Kuan, and K. Ng, "A Macao license plate recognition system," in Proc. 4th Int. Conf. Mach. Learn. Cybern., Guangzhou, China, Aug. 18–21, 2005, pp. 4506–4510. 25. [78] N. Bellas, S. M. Chai, M. Dwyer, and D. Linzmeier, "FPGA implementation of a license plate recognition SoC using automatically generated streaming accelerators," in Proc. 20th IPDPS, Nice, France, Apr. 2006, pp. 8–15. 26.

[18] P. Zhang and L. H. Chen, "A novel feature extraction method and hybrid tree classification for handwritten numeral recognition," Pattern Recognit. Lett., vol. 23, no. 1–3, pp. 45–56, Jan. 2002.