

Vehicle Detection and Recognition for Allowing into Premises Using OCR

Nadhiya U¹, Mahalakshmi K², Kaviyarasu P³,

^{1,2,3}Students of Electrical and Electronics Engineering Department, Dr.Mahalingam College of Engineering And Technology, Tamilnadu, India.

E-mail: ¹unadhiya3@gmail.com, ²mahalakshmikalidass20@gmail.com, ³knrkavinpt@gmail.com

Abstract

The research has proposed a system to automatically detect the number plate and recognize it using optical character recognition method. Before taking a image of the number plate, the developed system first recognizes the car. Image segmentation is used to recover the portion of an image that contains the vehicle identification number. Character recognition is accomplished using an optical character recognition technique. This involves using matching techniques to check whether the car plate image matches the data in the database. The warning sign will show when authenticity is verified, and the car will then be permitted to enter the designated area. Real-time video is captured to evaluate the system's functionality, and Python is used to create and simulate the system. Due to its promising nature the suggested method is employed in the automated vehicle authentication in universities in future.

Keywords: Number Plate Recognition, Raspberry Pi, Image Segmentation, Optical Character Recognition.

1. Introduction

In many of the campus there is no proper entrance security system to check the authentication of the vehicle that enter the premises, unauthorized vehicle enter into the premises easily at any time it could be possible to detect the unauthorized person but it is a tedious process and time consuming process. So one person for regularly monitoring of the entry and the exit of campus is essential. In order to resolve this issues the research has developed a system that is fully automated which could detect vehicles that are all entering and stops the vehicle that are all unauthorized and allows the vehicle that are authorized. Initially the method putforth will capture the vehicle which is entering into the premises, this

image will be converted into the gray scale for further image processing to filter unwanted noise (illumination, blur) etc. leaving the characters of the number plate. The characters with number plates coming in different sizes, fonts, and colours will be recognised using the Pytesseract algorithm. Additionally, the technology locates the licence plate and checks the database to see if it is authorised or unauthorised. The gate will automatically open if the number plate is approved; else, a warning message will be displayed.



Figure 1. Computer Vision-based Authentication Approach for an Intelligent Gate2.

2. Related Works

There are many studies on this topic that involve the ANPR. Together with the studies it is summarised below in specific subsections. Effective licence plate localisation is a challenging task since dirty licence plates are caused by vehicles operated in a variety of situations, and varied weather and lighting conditions also pose obstacles. The work in [1] suggested to overcome the number plate localization issue utilising the Sobel edge detection technique. The problem with the previous algorithm is the accuracy of the image deskew method which is greatly influenced by changes in the external circumstances as well as the quality of the image acquired by the device. The algorithm is implemented for skewed images up to 30 degrees (CCTV or Camera). The text on the vehicle plates is detected using the input image in [2], and this procedure requires localising the number plate region in order to recognise the letters that are there. In this study, the median filter is used as one of the operators to attempt the simple colour conversion, edge detection, and noise removal. This study proposes a method for filtering and locating related components for the localization of Indian licence plates utilising straightforward yet effective morphological techniques. It suggests identifying stolen vehicles. The authors of [3] present a ground-breaking OCR method and assert that it will accurately read digital fonts. It entails employing features to partially segment characters and matching the segment set with ASCII characters. In [4], a matrix matching-based OCR method is proposed. The OCR employing fuzzy set and fuzzy equations with non-determined solution is presented in [5]. OCR is advised for character images with low quality

or resolution while using structural analysis in [6]. Biometric authentication typically uses face detection and identification methodologies [7].

3. Proposed Method

The ultimate goal of the proposed design is to enhance the security and prevent the entry of unauthenticated vehicles. The Figure.2 shows the stages of the proposed design. The real time videos for the research are captured utilizing the HD cameras. The live video captured are processed into frames employing the OpenCV and python. The image acquired are pre-processed, and segmented to improve the accuracy of the OCR system in detecting and recognizing the vehicles.

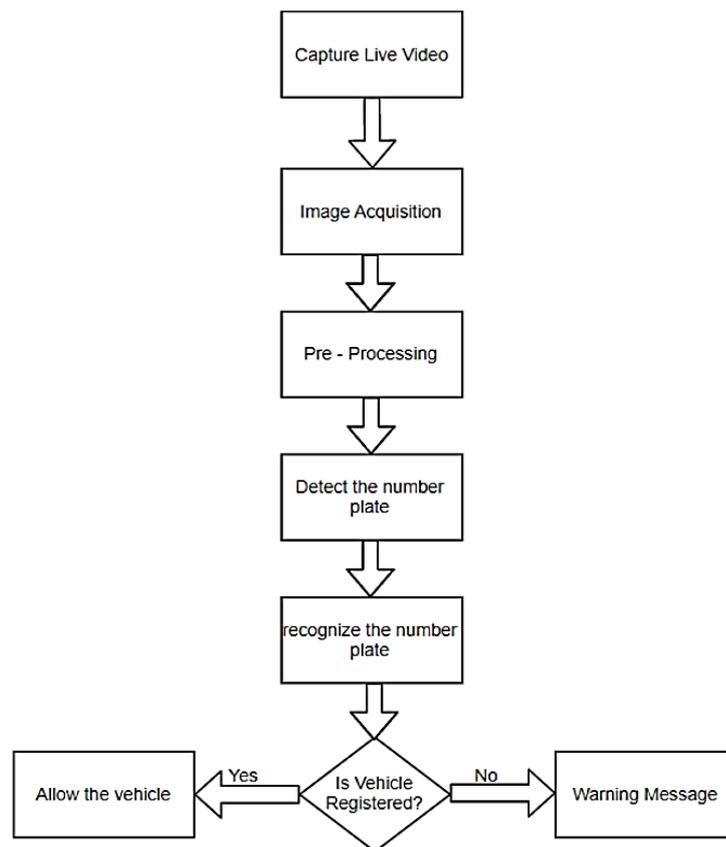


Figure 2. Flow Chart for Proposed Method

3.1 Pre-Processing and Localization

Before sending an image to the following stage, pre-processing is the process of improving the image. Image sharpening and filtering are two techniques for improving images. The input image is originally cropped with fixed positions during the pre-processing step using the imcrop function in edge detection. The image's resolution is downgraded from 3264 x 2448

to 969 x 445. According to [6], decreasing the image resolution speeds up computation. Furthermore, cropping the photograph eliminates the busy background, making it easier to later pinpoint the area containing the licence plate.

Figure 3 shows the initial input picture. (a). the following Pre-processing is the process of image enhancement before delivering a picture to the next step. Some image improvement methods include picture sharpening and picture filtering. The input image is originally cropped with fixed positions during the pre-processing step using the imcrop function in edge detection. The image's resolution is decreased from 3264 x 2448 to 969 x 445. Apparently, reducing the image resolution speeds up calculation. Additionally, cropping the image gets rid of the cluttered background, which makes it simpler to locate the region with the licence plate afterwards. Figure 3 shows the initial input image. (a). the following

A) Edge Detection

The dimensions of the image that function f represents are w and h.

A convolution matrix, which differs for various edge detection approaches, defines each edge detection filter. The neighbors of the pixel in the matrix's center are represented by individual cells in the matrix. the pixel depicted by cell y in the final image

$$“y = x0X m0 + x1X m1 + x2X m2 + x3X m3 + x4X m4 + x5X m5 +x6Xm6 +x7Xm7 +x8Xm8”$$

B) Gray Scale Image

By dividing the R, G, and B channels, the 8 bit Grayscale pixel for every (i, j)th 24 bit RGB pixel is computed using the following formula:

$$“ gray(i,j)=0.59*R(i,j)+0.30*G(i,j)+0.11*B(i,j)”$$



Figure 3. (a) Input Image, (b) Gray-Scale Image

3.2 Character level Segmentation

More characters are taken from the licence plate. The supplied image has been completely cropped, with all white areas eliminated, on that image. Following the character level segmentation stage, the character recognition step uses the template matching method and starts with an image that has been normalised into the database characters set. The main operation used for recognition is the correlation in two dimensions. A value showing how similar two matrices are is provided by this operation(images.)

$$r = \frac{\sum_m \sum_n (A_{mn} - \bar{A})(B_{mn} - \bar{B})}{\sqrt{[\sum_m \sum_n (A_{mn} - \bar{A})^2][\sum_m \sum_n (B_{mn} - \bar{B})^2]}}$$

3.3 Optical Character Recognition

The proposed method finally employs Optical Character Recognition (OCR) method to identify the number in the vehicles. The colouring of the images is inverted. The lettering on the plate is currently white with a black background. Before employing OCR, the line separation technique separates the text into its constituent lines. The line spacing increases each pixel's value in a row. There are no text pixels in a row if the resultant total is zero; conversely, if it is greater than zero, there are text pixels in that row. The first resultant sum that is greater than zero and the first resultant sum that is equal to zero are used to indicate the beginning and end of the line, respectively. The start and end values of the line are used to crop the first line of the respective image.

4. Results and Discussion

The proposed method is developed to detect the number plates applying the OCR technology in real time. The number plates images are subjected to letter segmentation to process each character and the extracted data are stored in the excel in .CSV format. The following figure .4 shows the character level segmentation achieved using the optical character recognition.

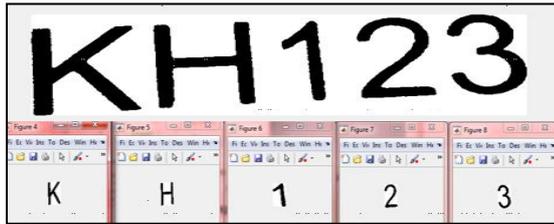


Figure 4. Character Segmentation

Following graphical representation in figure.5 shows the accuracy of the OCR approach in recognizing the numbers from the image frame gathered from the real time videos captured using the HD camera.

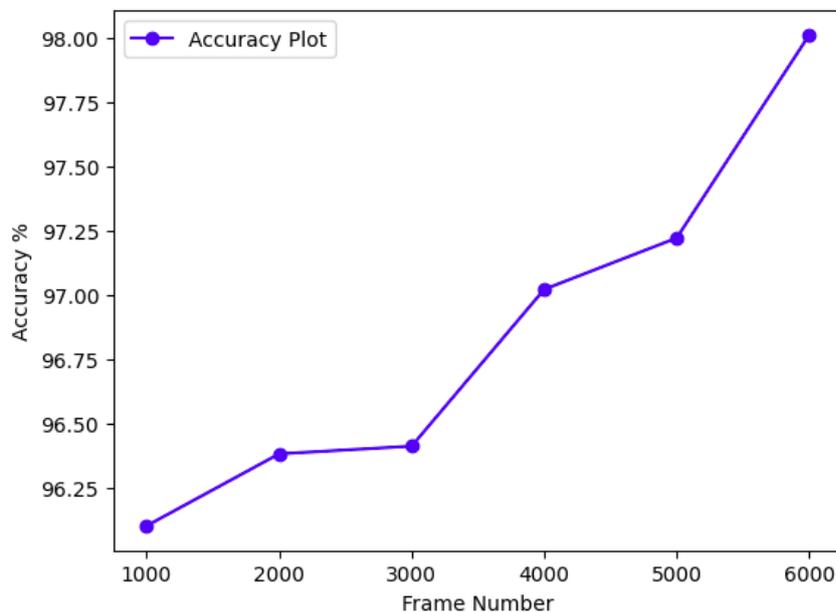


Figure 5. Accuracy of the OCR Method

The output observed using Python Matplotlib shows that applying OCR for detecting the characters in the number plates enables to have a better accuracy. The frame number denotes the numbers that were used for saving the extracted images from the real time videos. Further the detected numbers are stored in .csv format and stored in database for future use. In future the method aims in continuing the work with manually collected dataset of the university. The deep learning and the IOT methods are planned for further development of the work to check and confirm if the vehicle is registered and belong to the premises, otherwise the details of the vehicle are gathered and forwarded to the respective authority for necessary actions.

5. Conclusion

In order to create an automatic number plate recognition system that extracts the car number plate from gathered Images, optical character recognition (OCR), which can convert pixels from imagery into alphanumeric letters, was used. The method utilizes the HD cameras, followed by the pre-processing and segmentation stages to improve the accuracy of the OCR in detecting the number plates, the model was devised using python. In future the research aims in developing an automatic gate open and close system, which uses automatic number plate recognition, to ease the burden on security in managing the vehicles that were entering the premises and leaving the premises Based on the above method an automatic operation of the gates could be developed for universities in future. The cameras fixed in the entry and the exit are always kept on to detect the incoming as well as the outgoing vehicles. The gates will be designed to open if the university database contains the car number and the image is examined applying the OCR method. If the vehicle's number plate number is incorrectly identified or not registered, a message will be forwarded to the guard to take necessary action.

References

- [1] Bhavin V Kakan ,Divyang Gandhi, Sagar Jan, "Improved Ocr Based Automatic Vehicle Number Plate Recognition Using Features Trained Neural Network(8th ICCNT 2017 July 3-5, 2017, IIT Delhi Delhi, India)
- [2] P.Sai Krishna, "Automatic Number Plate Recognition by Using Matlab", International Journal of Innovative Research in Electronics and Communications (IJIREC) Volume 2, Issue 4, June 2015.
- [3] Sushruth Shastry, Gunasheela G, Thejus Dutt, Vinay D S and Sudhir Rao Rupanagudi, i - A novel algorithm for Optical Character Recognition (OCR), IEEE 2013.
- [4] W. Badawy, "Automatic License Plate Recognition (ALPR): A State of the Art Review", 2012
- [5] Sukhpreet Singh Optical Character Recognition Techniques: A Survey, Journal of Emerging Trends in Computing and Information Sciences, Vol. 4, No. 6 June 2013.
- [6] T. Naito, T. Tsukada, K. Yamada, K. Kozuka, and S. Yamamoto, Robust licenseplate recognition method for passing vehicles under outside environment, Trans. Veh. Technol., vol. 49, no. 6, pp. 23092319, Nov. 2000.

- [7] K. Seo, W. Kim, C. Oh, J.-J. Lee, "Face detection and facial feature extraction using color snake," in Proceedings of the 2002 IEEE International Symposium on Industrial Electronics, L'Aquila, Italy, 2002, pp. 457-462.
- [8] S. Vijayarani and M. Vinupriya, "Performance analysis of canny and sobel edge detection algorithms in image mining," *Int. J. Innov. Res. Comput. Commun. Eng.*, vol. 1, no. 8, pp. 1760–1767, 2013
- [9] S. Saunshi, V. Sahani, J. Patil, A. Yadav, and S. Rathi, "License Plate Recognition Using Convolutional Neural Network," *IOSR J. Comput. Eng.*, pp. 28-33, 2017.