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An Innovative Accession To Mobile License Plate Reader System (MLPR)

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Abstract: *This paper presents an algorithm for the Mobile License Plate Reader System using various approaches. Mobile license plate reader (MLPR) technique consists of two modules, a license plate locating module and a license number identification module. In this paper, an experimental extraction of image is performed with PCA (Principle Component Analysis), Segmentation is performed with OCR (Optical Character Recognition) and Recognition is performed with SVM (Support Vector Machine) which are based on original binary images of the characters. The training via support vector machine has yielded the accurate outputs for the recognition of various input images taken in the algorithm. The purpose of this paper is to develop a real time application which recognizes license plates from cars at a gate, for example at the entrance of a parking area or a border crossing. Recognition of about 98% vehicles shows that the system is quite efficient*

Keywords: *License plate recognition (LPR), Support Vector machine (SVM), Optical Character Recognition (OCR), Principal Component Analysis(PCA).*

1. Introduction

Number plate recognition is a form of automatic vehicle identification. A number plate is the unique identification of every vehicle. Automatic number plate recognition is an image processing technology used to identify vehicles by their own number plates. Real time number plate recognition plays an important role in maintaining law enforcement and maintaining traffic rules [1]-[5]. It has wide applications areas such as toll plaza, parking area, highly security areas, boarder's areas etc.[2]-[3]-[6] Automatic Number Plate Recognition system is designed to identify the number plate and then recognize the vehicle number plate from a vehicle automatically.
Mobile license plate reader has three major parts: Firstly extract the features of input image using principal component analysis and detected number plate is pre-processed to remove the noise and then the result is passed to the segmentation part to segment the individual characters from the extracted number plate[]. The segmented characters are normalized and passed to an OCR algorithm.[4] At last the optical character information will be converted into encoded text. The characters are recognized using Template matching. The final output must be in the form of string of characters.

2. Objective

The image of car plate and recognition of the characters segmented from the car plate image using support vector machine. The main goal is to develop a new plate recognition system with intelligent issues surpass the systems introduced in previous and to reduce many of the restrictions in the working environment. Our system will provide a way to detect and identify license plates without constant human intervention. The aim of this project is three-fold; first, we will look at Optical Character Recognition techniques and investigate the process of license plate recognition from acquiring an image using PCA; second, we will develop a database that contains the user information; and finally, we will train the information to the SVM and then recognized.

3. Problem Formulation

The process of vehicle number plate recognition requires a very high degree of accuracy when we are working on a very busy road or parking which may not be possible manually as a human being tends to get fatigued due to monotonous nature of the job and they cannot keep track of the vehicles when there are multiple vehicles are passing in a very short time and extraction of number plate is difficult task, essentially due to: Number plates generally occupy a small portion of whole image; difference in number plate formats, and influence of environmental factors. This step affects the accuracy of character segmentation and recognition work.

4. Methodology

Mobile license plate reader has three major parts: First extract features of input image using principal component analysis and detected number plate is pre-processed to remove the noise and then the result is passed to the segmentation part to segment the individually characters from the extracted number plate. The segmented characters are normalized and passed to an OCR algorithm. At last the optical character information will be converted into encoded text. The characters are recognized using Template matching. The final output must be in the form of string of characters.

5. Preprocessing Of License Plate

License plate preprocessing is a necessary step in LPR, which includes plate detection, correction, and segmentation.[1] The goal of detection is to locate regions of interest that are similar to the license plate. Due to the angle of orientation, the image may have a slant and distortion [3]; thus, transformation or

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correction of image is an important step before the character segmentation.

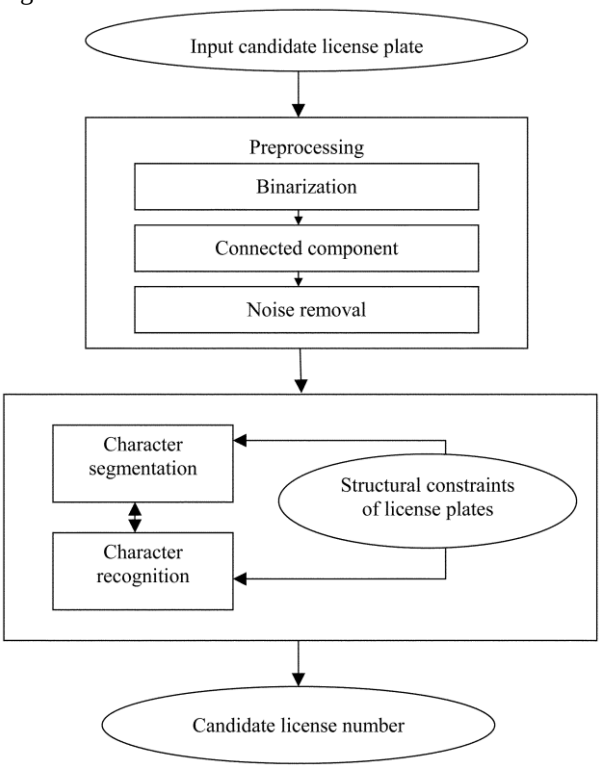


Fig.1 Block Diagram of complete flow of number plate recognition system

6. Feature Extraction Using PCA

Principal component analysis is a very important statistical method that explains the covariance structure of data by means of a small number of components. These components are linear combinations of the original variables, and often allow for an interpretation and a better understanding of the different sources of variation. PCA is widely used because it is concerned with data reduction and PCA is used for the analysis of high-dimensional data which are frequently encountered in chemo metrics, computer vision, engineering, genetics, and other domains [5].

ALGORITHM:-

Step1:- mean-adjusted values
d$x_adj = d$x - mean(d$x)
d$y_adj = d$y - mean(d$y)
step2:-calculate covariance matrix and eigenvectors/values
(cm = cov(d[,1:2]))
Step3:- (e = eigen(cm))
Step4:- principal component vector slopes
s1 = e$vectors[1,1] / e$vectors[2,1] # PC1
s2 = e$vectors[1,2] / e$vectors[2,2] # PC2
step5:- PCA data = rowFeatureVector (transposed eigenvectors) * RowDataAdjust (mean adjusted, also transposed)
feat_vec = t(e$vectors)
row_data_adj = t(d[,3:4])
final_data = data.frame(t(feat_vec %*% row_data_adj))
names(final_data) = c('x','y')
step6:- final_data[[1]] = -final_data[[1]] # for some reason the x-axis data is negative

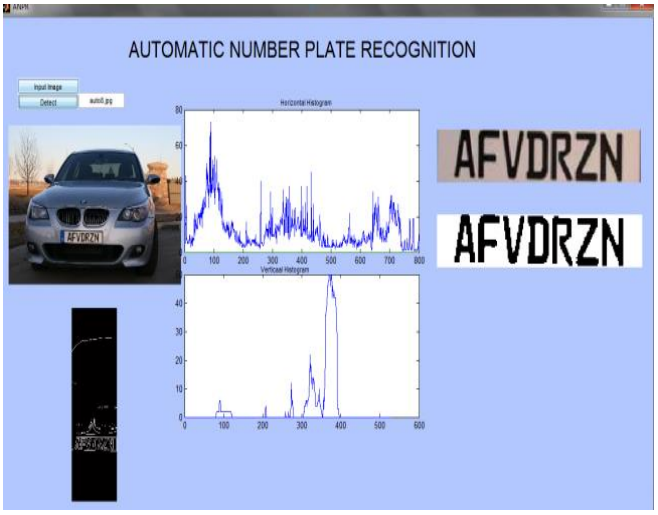
7. Segmentation

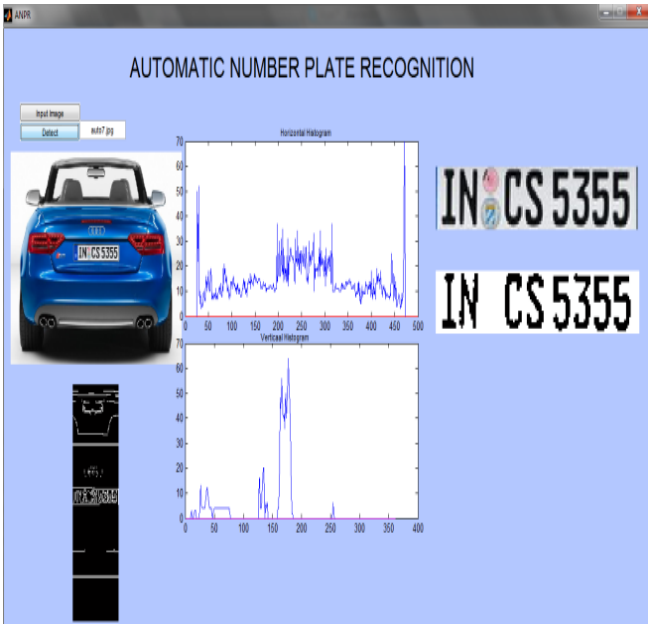
Segmentation is one of the most important processes in the automatic number plate recognition, because all further steps rely on it [1]-[2]-[3]-[5]-[6]. If the segmentation fails, a character can be improperly divided into two pieces, or two characters can be improperly merged together. We can use a horizontal projection of a number plate for the segmentation [6], or one of the more sophisticated methods, such as segmentation using the neural networks. First we have performed vertical segmentation on the number plate then the characters are vertically segmented. After performing vertical segmentation we have to perform horizontal segmentation by doing this we get character from the plate.

8. Training Via Support Vector Machine

The recognition stage has two steps. The first step is to train the support vector machine based on the training feature vector samples of the characters to get the optimal weights [6]. The second step is test the system using a new input character.

9. Results





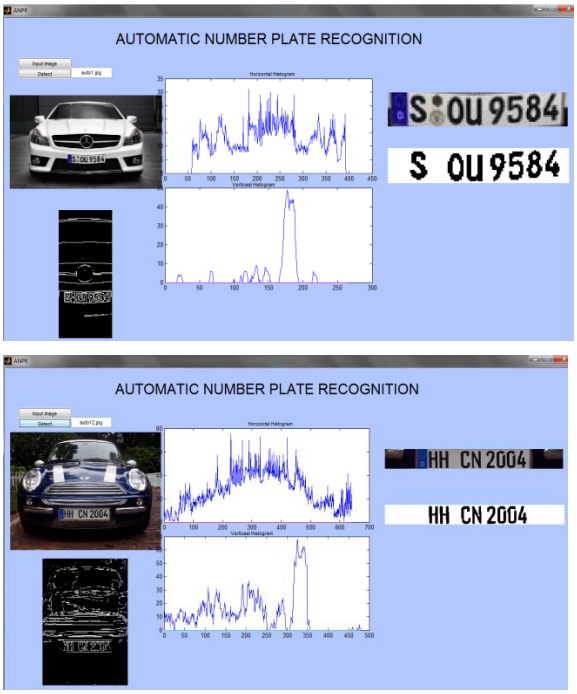


FIG. 2 Output for the Specified Input Number Plates

In comparison to the previously described algorithms for the LPR, the algorithms used in this paper is less restrictive and can be of great application for the application in automatic number plate recognition systems. The algorithm has three main stages i.e. locating the number plate, segmenting the characters in the plate and finally identifying the license characters in the number plate. The algorithm is tested over a number of images and was found to be correct for every image. This algorithm can even be improved with the style of number plates in different countries.

10. References

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Author Profile

Dolly Sharma received the B.Tech and Pursuing M.Tech. degrees in Computer Science Engineering from S.R.M.S.W.C.E.T, Bareilly in 2014 and Sachdeva Institute of Technology in 2016, respectively.