Automatic Car License Plate Recognition System using Multiclass SVM and OCR

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Abstract— over the years information technology has been used to develop applications that aim to simplify the human task, to execute various human tasks efficiently, faster and with quality. Many such applications have indeed revolutionized the way we execute many of our daily activities. Still there are many areas which need quality applications that can help in improvising the quality of services in those areas. One such application is the license plate detection system. License plate detection can be used for toll processing, at parking areas and for traffic monitoring purpose. The biggest challenge in making such applications is that such application need to process the input image of the license plate in quick time and be accurate. Many researchers have been carried out earlier to detect and recognize the characters of the license plate. Most of these methods have their own set of advantages and disadvantages.

On considering the license plate detection system literature the methods can be classified as template based methods and the feature extraction methods. Feature extraction methods are more generic and hence I make use of this method in this paper. I choose support vector machines for feature extraction of the car licenses plates for a given dataset. The main challenge in using SVM is that it is a binary classifier. Thus, I propose the usage of a multiclass SVM for the feature extraction of the license plate. Integrated with the optical character recognition I propose and implement the system of car license plate detection and recognition system using SVM and OCR.

Keywords — *Multi class SVM, OCR, License plate*

I. INTRODUCTION

Toll processing or parking system need to make an entry of the vehicle license plate number, the type of vehicle whether it is private commercial or government owned and size and accordingly bill the vehicle. Usually a manual entry takes time and the processing of the vehicle billing thus takes more time. To avoid such delays many toll systems have started to adopt an automatic application. But most of these applications make use of a camera to capture the image of the license plate and store it in the data base. There after a manual entry is made in the application for the vehicle number, plate recognition and billing. Thus, still the system is not fully automatic. The main challenge lies in detecting the license plate and recognizing the characters of the license plate accurately[2].

Over the years many such systems have been proposed most making using of optical character recognition. These methods failed to address the accuracy issue due to the fact that the character recognized varied due to difference in fonts[4]. More over many methods failed to accurately detect the license plate, classify the images, etc. generally the license plate recognition system is classified as template base methods and feature extraction methods. In template based methods a standard template for the car license plate is chosen and the system is trained for that template image. Once the system is trained it is tested for the input images. Such methods have challenges in terms of efficiency and accuracy[3].

Thus, feature extraction methods have shown to be more promising than the existing methods. In feature extraction methods, certain unique features of the licenses plate are identified and a feature dataset is created. This dataset is used for identification of the license plate. The method of feature selection is more advantages in terms of accuracy than the template matching method but the main challenge lies in the proper choice of the feature selection.

For feature selection there have been many methods. I make use of a variant of support vector machine. I choose a binary classifier Support vector machine and make it a multi class support vector machine to select features and identify the car license plate. Integrated further with the OCR the method is used for detecting and recognizing of the car license plate system.

II. BACKGROUND

Generally Support vector machines are binary classifier which is used to classify the given dataset by computing the hyper plane that is the decision function for the classifier. for images the support vector machines first identify some unique set of features for the image, these unique features are used to train the support vector machine and then it is tested for rest of the images. Thus the data is divided into a training set and a testing set. Generally a split ratio of 70:30 is used for testing and training [8,9].

Binary classifier simply classifies the dataset into two groups based on the decision function. Figure 1 shows the result of a binary classifier[6, 7].
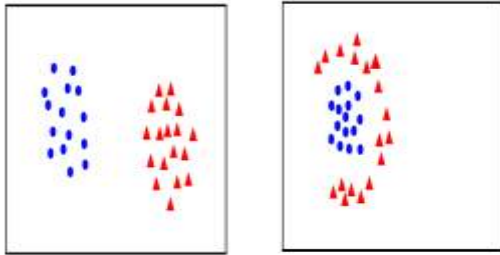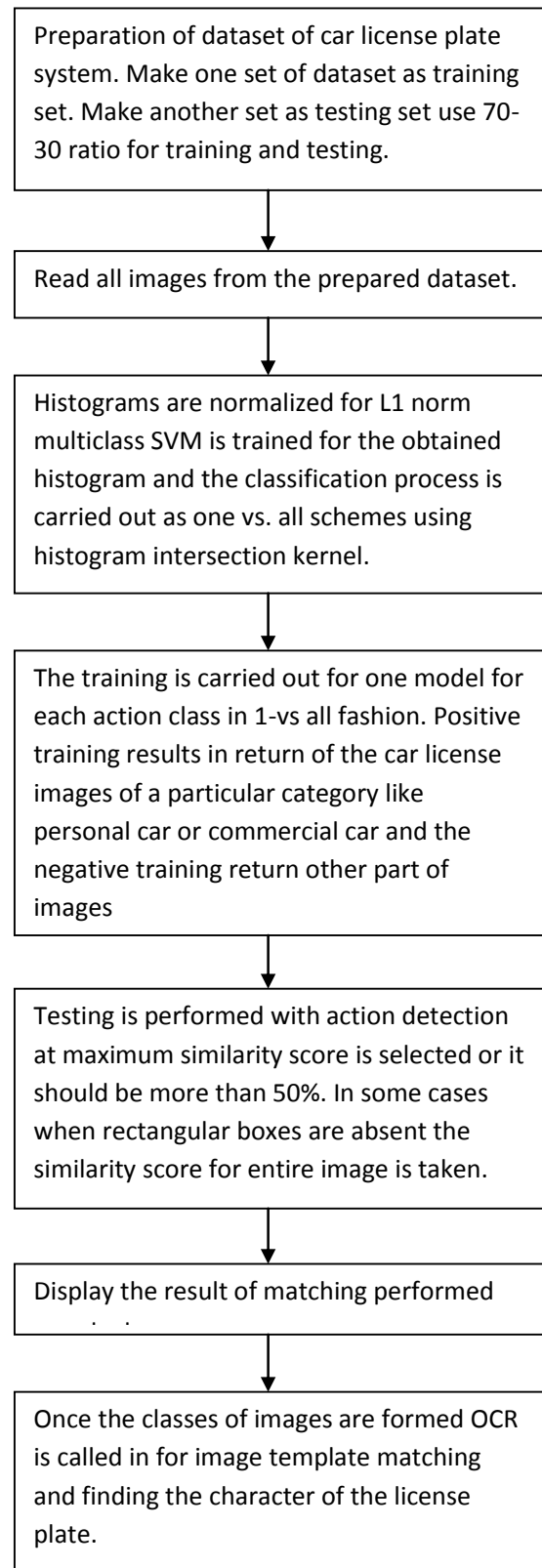

Fig. 1 Binary Classifier Result

Support vector machine takes the set of training features and group them into one group or other based on the decision function or the hyper plane. In the testing phase the input data features are extracted and mapped to either of the two groups to give a result of the mapping as the output[5].
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III. METHODOLOGY

The given method of car license plate detection and recognition system makes use of a variant of multi class SVM and makes use of the algorithm 2 [1] for multi class SVM. The generic algorithm for the whole system is given below [1].

Algorithm 1: proposed methodology of ACL

Preparation of dataset of car license plate system. Make one set of dataset as training set. Make another set as testing set use 70-30 ratio for training and testing.

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Read all images from the prepared dataset.

↓

Histograms are normalized for L1 norm multiclass SVM is trained for the obtained histogram and the classification process is carried out as one vs. all schemes using histogram intersection kernel.

↓

The training is carried out for one model for each action class in 1-vs all fashion. Positive training results in return of the car license images of a particular category like personal car or commercial car and the negative training return other part of images

↓

Testing is performed with action detection at maximum similarity score is selected or it should be more than 50%. In some cases when rectangular boxes are absent the similarity score for entire image is taken.

↓

Display the result of matching performed

↓

Once the classes of images are formed OCR is called in for image template matching and finding the character of the license plate.

IV. . EXPERIMENTAL RESULT

The proposed methodology for the given system is implemented using MATLAB r 2013b. The system is built using the above algorithm and the system is validated for a set of images of the car license plate. Following results have been obtained.

Fig. 2 Detected plate highlighted by green colour

Fig. 3 Final output of the system.

It can be seen that the system was capable of detecting the license plate and correctly recognize the license plate number along with the category of the license plate as a private vehicle.

V. CONCLUSIONS AND FUTURE WORK

The paper proposed an idea of the car license plate detection and recognition system using integrated approach of SVM and OCR. The proposed algorithm was implemented in MATLAB and the system was successfully able to recognize the car license plate number. The SVM is able to perform detection of the images with accuracy. The only challenge is the OCR part of the algorithm. As a future work I am to use fully SVM instead of OCR for character segmentation and character recognition.

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