



License plate Recognition using SVM

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Abstract. The recognition of vehicle license plate numbers is an essential step to implementing traffic laws and reducing the number of daily traffic accidents. This paper aims to apply a recognition system for Arabic license plates by using one method. Support vector machine (SVM) was used in association with data obtained from Iraq. Support vector machines (SVMs) are a set of related supervised learning methods used for classification and recognition. In simple words, given a set of training examples, each marked as belonging to one of two categories, an SVM training HOG builds a model that predicts whether a new example falls into one category or the other. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall on. Here we are using the concept of SVM in LPR systems. Then a License plate recognition HOG is proposed for character segmentation and recognition. This algorithm employs an SVM to recognize numbers. The algorithm starts from a collection of samples of numbers from License plates. Each number is recognized by an SVM, which is trained by some known samples in advance. The recognition results are achieved by finding the maximum value between the outputs of SVMs. The experimental results show that our new method is of higher recognition accuracy and higher processing speed than using traditional SVM based multi-class classifier. This new approach provides a good direction for automatic license plate recognition. Here we can conclude SVM is better than any other supervised learning.

Keywords: support vector machine , recognition, license plate, Iraq, vehicle, segmentation, detection.

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1. Introduction

A number plate is the unique identification of a vehicle. Automatic Number Plate Recognition (ANPR) is designed to locate and recognize the number plate of a moving vehicle automatically [1]. The Fundamental issues in number plate recognition are high accuracy and high recognition speed. ANPR algorithms are generally divided in four steps: [2] Vehicle image capture [3] Number plate detection [4] Character segmentation and [5] Character recognition. As it is shown in Fig.1, the first step i.e. to capture image of vehicle looks very easy but it is quite exigent task as it is very difficult to capture image of moving vehicle in real time in such a manner that none of the component of vehicle especially the vehicle number plate should be missed. Presently number plate detection and recognition processing time is less than 50 ms [5] in many systems. The success of fourth step depends on how second and third step are able to locate vehicle number plate and separate each character. Most of the ANPR systems are based on common approaches like Support vector machine (SVM) [6]. SVM have considerable potential for classification. Although SVM based number plate recognition [7] has achieved higher recognition accuracy, it does not work well still under some situations. For example, some number plates cannot be recognized due to very poor illumination, motion blurred effect, fade characters and so forth. We propose a new SAM-based multi class classifier to recognize number plates. The number plates are recognition without going through character detection because i have ready images that were previously detected.

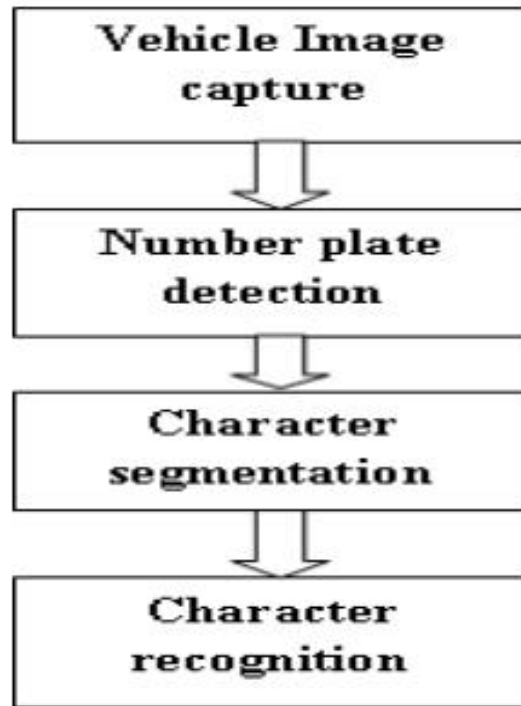


Fig. 1. Conventional ANPR system [6]

2. Related Work

In this section, previous studies on segmentation, and recognition of license plates in various countries are discussed.

A. License plate segmentation

Text-region segmentation has been largely studied over the last years, [8], [9], [10], [11], [12], however, even today it remains an open field of work, interesting for many different applications in which complex images are to be processed. Reasonable advances have been actually achieved in the task of extracting text from some kind of restricted images, as in the case of scanned documents, artificially edited video, electronic boards, synthetic images, etc. in [13], A robust text segmentation technique has been presented. This technique seems to be able to cope

with highly variable acquisition conditions (background, illumination, perspective, camera-to-car distance, etc.) in a License Plate Recognition's task.

B. License plate recognition

The complexity of automatic vehicle license plate recognition varies throughout the world. In some countries, vehicle license plate design is highly standardized. Standard plate design makes it easier to detect and read vehicle license plates in images [14]. In [15] a Self Organized Neural Network based on Kohonen's Self Organized Feature Maps (SOFMs) was implemented to tolerate noisy, deformed, broken or incomplete characters acquired from license plates, remarkable 95.6%. Probabilistic Neural Networks (PNN) for license plate recognition was introduced in [16]. In [17] was reported an impressive recognition rate that reached 99.5%.

3. Our Methodology

In this section, describes the methods adopted in this research and includes the explanation the recognition of LP numbers. The Iraqi license plate was used for the proposed system. Data was collected in Iraq . A total of 327 photos were obtained in Iraq using IPHONE 8 cameras . where these images were previously revealed, but in our research, we worked directly in the segmentation of these images.

A. License Plates of Iraq

The recognition of license plates is very important in many applications such as Parking, Borders control, Detect and monitor traffic, Travel and Airport parking [18]. In many countries the license plates that written in English language as samples, the English letters is separated and the LP have a similar design for all cities in the country, so that will facilitate the recognition process of the characters. Because the LP is different and specific for each country, so the algorithms used for LPR system is different and specific too.

In Iraq, there are 3 styles for Iraqi car license plates written in Arabic language [19] [20], The first style is for the three Northern provinces (Erbil, Sulymania and Duhok) as shown in Fig.2a the second style is the old style (before 2003) as shown in Fig.2b, and the third style is the new style which is shown in Fig.2c. The second and third styles are used for the other fifteen provinces and each has a different size and design.



Fig. 2. Iraqi car license plate types

B. Proposed Method

This research proposes a Support vector Machine framework for automatic segmentation and recognition of license plate numbers. The LP segmentation is the process of extracting the numbers from a given LP image, assuming this LP image is extracted from the vehicle image during the first processing stage, the LP detection. This is an embedded process with recognition. the LP numbers segmentation was performed via the MATLAB Image Labeler tool and then used for recognition performance evaluation. In segmentation, the entry point here is the LP image, where the program should be able to extract uni-character images. The result obtained in this stage is considered as inputs for the recognition stage and has excellent accuracy in the identification of the plates. In addition, the segmentation is the most important stage for automatic recognition of license plates. In case partition fails, the result of the recognition of plates will be incorrect, and in order for the division to be correct, preliminary treatment of the plates must be done. The result that was previously processed was saved in the train-skewed file, which is loaded by MATLAB Image labeler tool. After labeling is created for all images, the segmentation process begins to obtain a train result file, as in the case of the test results.

A Histogram of oriented gradients (HOG) is one of the most powerful features used to classify shapes with SVM . This feature, also called a shape-based feature that depends on the severity of the orientation graph, was used through the segmented image.

4. Experiments and Rustles

In this section, the results of Iraqi plate segmentation are presented. Segmentation is the process of extracting a single letter or number from the license plate image. In this step, the data are processed and segmented through the MATLAB Image Labeler Tool/App. Moreover, the Iraqi LP data were segmented using the Image labeler for manually labeling letters and numbers where 30 classes were used (i.e., Iraq, Baghdad, two, zero, six, eight, four, seven, Arbil, five, three, nine, R, Basra, private, one, A, F, fare, DhiQar, Maysan, Governmental, M, Sulaymaniyah, carry, W, B, Dhok, E, N).

Support vector machines in our experiments are trained using HOG . The training samples of these number plates are located and segmented from images of a real-time traffic flow. These cases are all failed recognized . Figure 3 show that some of the plates could not be truly recognized due to the poor quality of photos and also due to the distance between image and camera. As such, the final recognition result was unsatisfactory.

Ground Truth:							
iraq	Baghdad	two	zero	zero	seven	three	three
Predicted:							
basra	Baghdad	two	zero	zero	seven	three	three

Fig. 3. Wrong result

The result for Iraqi license plates reached 87.38% for recognition train rate and 78.69% for recognition test rate, as shown in Table 1.

Table 1 . Iraqi recognition result (SVM)

SVM	Train skewed	Test skewed	Train wrong	Test wrong	Train results	Test results
					Recognition rate	Recognition rate
Fold 4	327	74	38	13	87.38	78.69

5. Conclusion

The method proposed in this paper is suitable for poor quality images in real time applications. It gives a total different view in number plate recognition. It can achieve faster recognition in complex conditions especially in dark and poor weather conditions. It works well for broken or dirty images of number plates. In these special cases, we do not need to go through image pre-processing such as image denoising, image enhancement, image segmentation and so forth. Hence, the overall processing/recognition speed has been improved a lot while higher accuracy is obtained. Although it has the drawback that every number plate needs a corresponding classifier to be recognized. the performance of SVM method degraded when data exceeded feature count. The main disadvantage of the SVM algorithm was in the classification result, which had many key parameters that needed to work correctly for any given problem.

As a future work, suggestion more data on Iraq and also the use of the python program to increase the accuracy. also, a new partition method can be used and compared with the SVM.

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التعرف على لوحات الترخيص باستخدام SVM

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المخلص. يعد التعرف على أرقام لوحات ترخيص المركبات خطوة أساسية لتطبيق قوانين المرور وتقليل عدد حوادث المرور اليومية. تهدف هذه الورقة إلى تطبيق نظام التعرف على لوحات الترخيص العربية باستخدام طريقة واحدة. تم استخدام آلة ناقلات الدعم SVM باستخدام البيانات التي تم الحصول عليها من العراق. آلات المتجهات الداعمة (SVMs) هي مجموعة من طرق التعلم الخاضعة للإشراف ذات الصلة المستخدمة في التصنيف والتعرف. بكلمات بسيطة ، بالنظر إلى مجموعة من الأمثلة التدريبية ، تم وضع علامة على كل منها على أنها تنتمي إلى واحدة من فئتين ، فإن تدريب SVM يبني HOG نموذجًا يتنبأ بما إذا كان المثال الجديد يندرج في فئة واحدة أو أكثر. بكلمات بسيطة ، بالنظر إلى مجموعة من الأمثلة التدريبية ، تم وضع علامة على كل منها على أنها تنتمي إلى واحدة من فئتين ، فإن تدريب SVM يبني HOG نموذجًا يتنبأ بما إذا كان المثال الجديد يندرج في فئة واحدة أو أخرى ، ثم يتم تعيين الأمثلة الجديدة في نفس المساحة والتنبؤ بالانتماء إلى فئة بناءً على أي جانب من الفجوة يقعون عليه. نحن هنا نستخدم مفهوم SVM في أنظمة LPR. ثم يُقترح التعرف على لوحة الترخيص HOG لتجزئة اللوحة والتعرف عليها. تستخدم هذه الخوارزمية SVM للتعرف على الأرقام. تبدأ الخوارزمية بجمع عينات من الأرقام من لوحات الترخيص. يتم التعرف على كل شخصية بواسطة SVM ، والتي يتم تدريبها بواسطة بعض العينات التي تم تجميعها سابقًا. يتم تحقيق نتائج التعرف من خلال إيجاد أعلى قيمة بين مخرجات أجهزة SVM. تُظهر النتائج التجريبية أن طريقتنا الجديدة تتميز بدقة تمييز أعلى وسرعة معالجة أعلى من استخدام المصنف متعدد الفئات التقليدي القائم على SVM. يوفر هذا النهج الجديد اتجاهًا جيدًا للتعرف التلقائي على لوحة الترخيص. هنا يمكننا أن نستنتج أن SVM أفضل من أي تعلم آخر خاضع للإشراف.