ENHANCING ACCURACY OF AUTOMATIC VEHICLE NUMBER PLATE RECOGNITION SYSTEM USING TEMPLATE MATCHING ALGORITHM

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Abstract - *Automatic identification of vehicle card number become very important solicitation due to increase in vehicles and carriage systems. It is difficult to manage and monitor all these vehicles by human, for example traffic monitoring, tracking stolen cars, red-light abuse execution, border and customs checkpoints. Multiplicity of plate formats, different scales, rotations and non-uniform illumination conditions during image acquisition is a perplexing problem. Automatic number plate recognition is designed to compact with uncertain vehicle plates in lighting conditions and altered traffic situation. It applicable for morphological act, histogram operation and edge finding methods. A vast and highly inclusive datasets of license plates have been collected for estimation, judgment and to improve the accuracy obtained from previous works. The datasets include pictures of card plates of the vehicles taken from roads, highways, irrespective of weather conditions. Projected work enhancing the accurateness using k-means algorithm, MSER algorithm and template matching algorithm.*

***Key Words*: License plate segmentation, character recognition, K-means clustering, MSER (Maximum stable extreme region), Template matching**

1. INTRODUCTION

License plate recognition is a procedure of Automatic Vehicle Identification. It is an image treating technology used to categorize vehicles by individual their license plates. This Automatic scheme will gives a way to discover and identify license plates without constant human intervention. This will bring out cost and time saving benefit to the organization. A solution to the problem of monitoring the tremendous number of vehicles for law enforcement and security, this work motivations to design a license plate appreciation system to make the task more practical. Automatic number plate recognition system plays an essential role in many solicitations like electronic payment system (toll payment and parking fee payment), to discover stolen cars, traffic surveillance. For an example in parking, number plates are used to compute interval of the parking. When a vehicle arrives the gate, license plate is automatically recognized and kept in database. When a vehicle later leaves the parking area through the gate, license plate is recognized again and compared with the first-one kept in the database. The system must be able to deal with dissimilar styles of vehicle registration pates. Basically, the number plate recognition procedure is divided into three parts: plate detection, character segmentation, character recognition. Each of these parts plays an essential role in the finishing accuracy. Many difficulties such as size differences, viewing angle, vehicles high speed and time consuming have prohibited from introducing new skills to crack the problem. There have been, however, many algorithms projected for each part and improves accuracy.

2. RELATED WORK

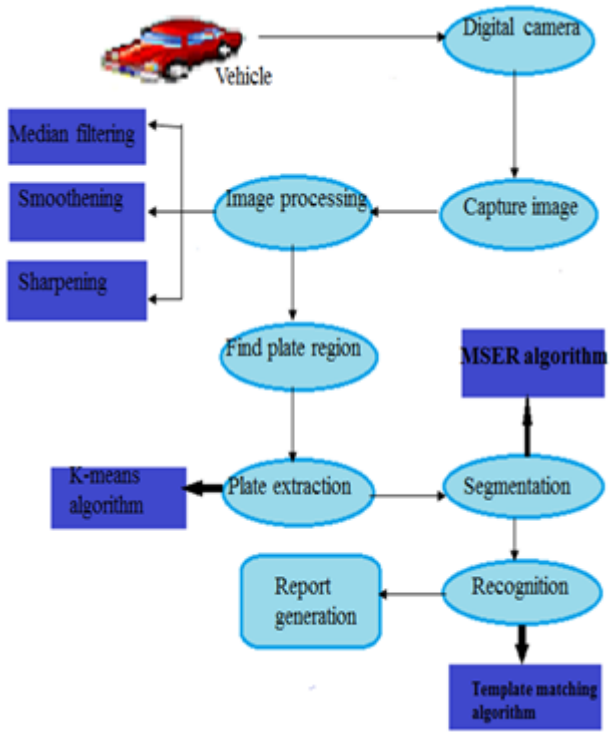
Rahim Panahi and Iman Gholampour [1] describes canny edge detector, Sobel operator is used by detecting image edges. For character recognition, many different classification tools and techniques have been utilized so far, such as Artificial Neural Networks (ANN), Support Vector Machines. It does not give exact solution and it provide more false detection. Jia-Le Zhao, Hai-Gen min, Xiao-Chi LI and Yong PAN [2] describes a license plate recognition algorithm under low illumination. In this paper, Random transformation used to extract the feature space of license plate area. The disadvantage is feature extraction processing time high and limited features were accepted. Wing Teng Ho, Hao Wooi Lim, and Yong Haur Tay [3] describes Two-stage license late detection using gentle Adaboost and sift-svm. In this paper, Adaboost classifiers were used and SIFT algorithm used for feature extraction, the main drawback is high false recognition system. Lixia Liu, Honggan Zhang, Aiping Feb, Jun Guo [4] describes simplified local binary pattern descriptor for character recognition of vehicle license plate. In this paper, local binary pattern based descriptor were used character recognition. It difficult to identify joined characters.

3. PROPOSED SYSTEM

To overcome the disadvantages in existing system, we have proposed this enhancing accuracy of automatic vehicle number plate recognition. The camera captures the vehicles number plates in different scenario. Then it does the following process of data acquisition, preprocessing, extraction, segmentation and recognition. In the preprocessing step, acquired images may be of different dimensions. In data acquisition capture the unclear image and perform smoothening, sharpening and filtering operation. Extraction is done by using the k means algorithm. Segmentation is done by using the maximally

stable extreme region algorithm. Recognition is done by using the template matching algorithm. All these algorithms are used to enhancing accuracy of recognition and report generating process.

4. ARCHITECTURE DIAGRAM



5. MODULE DESCRIPTIONS

5.1 Data acquisition and image preprocessing:

In this preprocessing approach, the image is at first captured using camera in ideal lighting conditions with adequate resolution. In preprocessing, Image resizing algorithm is applied on the images, which in turn convert them in square image. Also image sharpening algorithm is applied for performing declaring operation to blurred image. Images can be affected by several noises; the noises can be categorized under two sections, periodic noise and random noise. To remove these noises, images are passed through the median filters.

5.1.1 Filtering

Median Filter

The median filter is a non-linear filtering method used to eradicate noise from image. While it helps in eradicating the impulse noise it conserves the edges. Median filter performs median filtering of the image in two dimensions. Each output pixel covers the median value in a 3-by-3 neighborhood around the equivalent pixel in the input image. Median filter pads the image with 0s on the edges, so the median values for points within one-half the width of the neighborhood ([m n]/2) of the edges might appear distorted.

5.1.2 Smoothening

The course of adjusting intensity values can be finished automatically using *histogram equalization*. Histogram equalization involves transforming the intensity values so that the histogram of the output image around matches a specified histogram.

5.1.3 Sharpening

Sharpen image using un sharp masking procedure. It returns an enhanced version of the gray scale or true color (RGB) input image , where the image features, such as edges, have been sharpened using the un sharp masking method.

5.2 Extraction and segmentation of license plate

Extraction is used to extract the parts and describes each part individually using K-Means Clustering Algorithm. The number plate recognition can be identified by using the extraction. In image segmentation, the image can be grouped based on extraction of number plates. Segmentation uses MSER algorithm.

K-Means Clustering Algorithm

The k-means algorithm is an algorithm to cluster *n* objects based on features into *k* partitions, where $k < n$. An algorithm for partitioning (or clustering) N data points into K disjoint subsets S_j holding data points so as to minimize the sum-of-squares criterion. The grouping is done by minimizing the sum of squares of distances between data and the equivalent cluster centroid.Let X={xi}, i=1,2,…,n is the set of n d-dimensional points which are to be clustered into set of K clusters, C = {ck, k = 1,2,..,K}. The purpose of K-means is to minimize the sum of squared error over K clusters, the squared error between points of cluster ck and μk is given in equation

$$J(C) = \sum_{k=1}^{K} \sum_{x_i \in c_k} \|x_i - \mu_k\|^2$$

Where: xi be the set of points, K be the number of clusters and μk be the mean of cluster ck.

Maximally stable extreme region algorithm

MSER is constructed through a process of trying multiple thresholds. The regions that are going to be viewed in threshold must be maintaining unchangeable shapes. MSER produces a binary image that made up of zeros and one's in which 0 refers to the white region and 1 refers to the black

region. White region contains the characters in the license plate and black region contains the blank spaces in the plate. Generally, to find Vehicle license plates on an image, it is not easy in a Variety of environmental changes such as rotation, affine transform, scaling, and light changes. So, a robust feature is needed to detect the vehicle license plates on images.

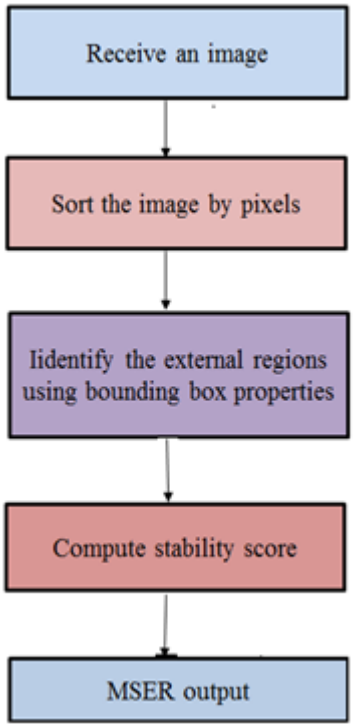


Figure: MSER algorithm

The MSER feature is invariant rotation, affine, and view point changes. The mean of external regions is connected components of image binaries at a range of certain threshold.

$$q(i) = \frac{|Q_{i+\Delta} / Q_{i-\Delta}|}{|Q_i|}$$

The region Q. is chosen as an external region if i = t 1 and q(i) gets the minimum. The q(i) can be achieved through . In is a parameter of the method and its value is 5 in this algorithm.

5.3 Character recognition from vehicle number plate image

Character recognition is the mechanical or electronic conversion of images of handwritten or typewritten text into machine-editable text. Template matching is an effective algorithm for recognition of characters. The character image is compared with the ones in the database and the best similarity is measured.

Create the template file from the stored template images. Resize image obtained from segmentation to the size of template. Compare each character with the templates.

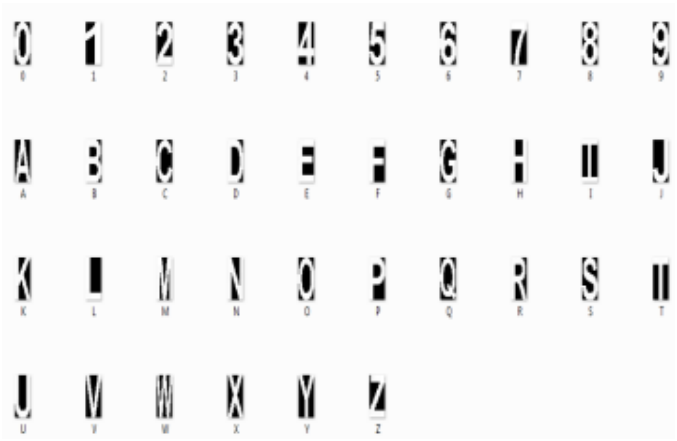


Figure: Template matching process

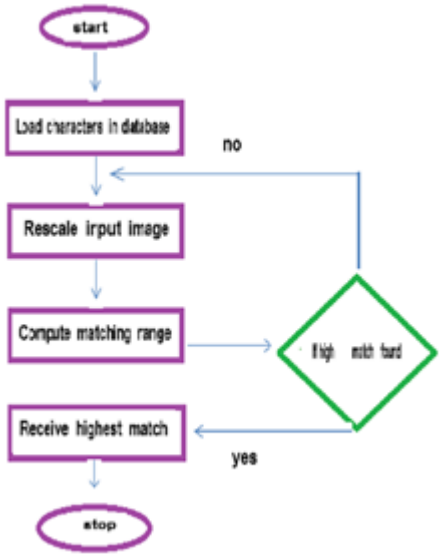


Figure: flow chart

In order to analyze the matching of the characters from the image, using template matching algorithm. In order to examine the matching of the characters from the image, The

flow chart in explains the steps that were followed in the algorithm: In the above flow chart, the matching is done on the basis of correlation between the characters segmented from input image and the template images stored in the database.

5.4 Performance evaluation

The crossroad and highly data sets of this paper involve of indian plates. Each plate includes digits. Total character set includes, 9 digits and 18 alphabetical letters. The overall accuracy is calculated based on:

Overall Accuracy=number of the images wrongly classified/total number of images

6. CONCLUSION

In the image processing, by using the above algorithms the number plate recognized to improve the up to 94% accuracy and also if any crime accrued in the signal the report generated and automatically it send to the police. And also it is used to count the number of vehicles. Compare with previous techniques it is very secure and optimization method and provide accurate result.

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BIOGRAPHIES

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