A Review on Vehicle Identification and Tracking System in Java and Open-CV and Kohonen's Neural Network

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ABSTRACT : In present scenario use of manual vehicle checking system requires so much man power as well as it is time consuming, to avoid that this system is being proposed. The basic idea behind this project is to create a vehicle's document checking system which will support for maintaining vehicle's document verification and different authentication procedures. The project also provides robust security system in case of a vehicle theft or any other such scenario which can help in different investigations. The system provides efficient use of technology by reducing man power and time consumption for vehicle document verification at a time. It also reduces paper work during verification.

KEYWORDS: Image preprocessing, Image enhancement, blob detection, Segmentation, template matching, KNN(Kohonen Nueral Network), Mathematical formule, JAVA based application**.**

I. INTRODUCTION

We have developed vehicle identification and tracking system. This system developed to identifying vehicles documentation. This system developed for reducing the manual and tedious work. The Vehicle Identification and Tracking System Using Number Plate Recognition is vehicle image database of almost every vehicle made in the last decade. This is designed to be used by law enforcement and security officers while on patrol.

It can be used to determine what a suspect vehicle looks like when responding to a call. It is also very useful when interviewing victims or witnesses to determine or rule out suspect vehicles. This is a system which identifies the customer as well as the vehicle details in few seconds without checking it manually. The things are done through Internet. Automatic vehicle identification is an essential stage in traffic systems. Vehicles play a very important role in transportation nowadays and also the vehicles use is increasing day by day because of population growth. Therefore, control of vehicles is big problem and much more difficult to solve. Automatic vehicle identification systems are used for the purpose of effective control. Number plate recognition is a form of automatic vehicle identification. It is an image processing technology used to identify vehicles by only their license plates. Real time plays a major role in automatic monitoring of traffic rules and maintaining law enforcement on public roads. Since every vehicle carries a unique license plate, no external cards, tags or transmitters need to be recognizable, only license plate.

II. LITERATURE REVIEW

Paper Title : Automatic Vehicle Identification by Plate Recognition
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Year : 2013

Automatic Vehicle Identification (AVI) has many applications in traffic systems (highway electronic toll collection, red
light violation enforcement, border and customs checkpoints, etc.). License Plate Recognition is an effective form of AVI systems. In this study, a smart and simple algorithm is presented for vehicle's license plate recognition system.

The proposed algorithm consists of three major parts: Extraction of plate region, segmentation of characters and recognition of plate characters. For extracting the plate region, edge detection algorithms and smearing algorithms are used. In segmentation part, smearing algorithms, filtering and some morphological algorithms are used. And finally statistical based template matching is used for recognition of plate characters. The performance of the proposed algorithm has been tested on real images. Based on the experimental results, we noted that our algorithm shows superior performance in car license plate recognition.

III. OVERVIEW

The main purpose of creating this paper for recognizing the vehicle number plate and identifying the vehicle documentation like insurance expiry, puc expiry and also it detects stolen vehicle and send message to respected authority and owner of vehicle. This system is designed for Indian number plate recognition. In this system we use blob detection method for identifying the number, here equal size of blocks are identify and the count of this block equal to format of Indian registration number of number plate. After that character segmentation is done then template matching is done. And finally we get number in text format, this text of number plate compare with data base and result will be produced.

IV. FUNCTIONAL REQUIREMENTS

1) Image Pre-processign.

Pre-processing is operations with images at the lowest level of abstraction of input and output are intensity images. The aim of pre-processing is an improvement of the image data that suppresses unwilling distortions or enhances some image features important for further processing, although geometric transformations of images (e.g. rotation, scaling, and translation) are classified among pre-processing methods here since similar techniques are used. But in this paper pre-processing is technique of doing image grayscale and noise removing from original image for improving specific elements from image like registration number from number plate.

2) Information Extraction.

Plate region extraction is the first stage in this algorithm. Image captured from the camera is first converted to the binary image consisting of only 1's and 0's (only black and white). by thresholding the pixel values of 0 (black) for all pixels in the input image with luminance less than threshold value and 1 (white) for all other pixels. The binarized image is then processed using some methods. To find the plate region, firstly smearing algorithm is sed. Smearing is a method for the extraction of text areas on a mixed image. With the smearing algorithm, the image is processed along vertical and horizontal runs (scan-lines). If the number of white pixels is less than a desired threshold or greater than any other desired threshold, white pixels are converted to black. In this system, threshold values are selected as 10 and 100 for both horizontal and vertical smearing. If number of 'white' pixels < 10 ; pixels become 'black' Else ; no change If number of 'white' pixels > 100 ; pixels become 'black' Else ; no change After smearing, a morphol- ogical operation, dilation, is applied to the image for specifying the plate location. However, there may be more than one candidate region for plate location. To find the exact region and eliminate the other regions, some criteria tests are applied to the image by smearing and filtering operation.

3) Number and char Recognition.

Before Information algorithm the normalization is done, normalization is process of refinement of the characters into a block containing no extra whitespaces around the character border. Fitting of character in the block is necessary for matching the template. For template matching database image and extracted images must be same for that purpose information is 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. To measure the similarity and find the best match, a statistical method correlation is used. Correlation is an effective technique for image recognition which was

developed by Horowitz. This method measures the correlation coefficient between a number of known images with the same size unknown images or parts of an image with the highest correlation coefficient between the images producing the best match. There are two forms of correlations: auto-correlation and cross-correlation. Auto-correlation function (ACF) involves only one signal and provides information about the structure of the signal or its behavior in the time domain. Cross-correlation function (CCF) is a measure of the similarities or shared properties between two signals. Since there are two signals as unknown input image and known database image in this system, cross-correlation is used.

4)   Send SMS to Vehicle Owner and Police.

When template matching is over then we got text format of number plate that text data compare with the database and using comparison using expiry date of insurance or puc present in the database or stolen vehicle is true or false declared or updated by the authorized person (Police). If the documents are expired or vehicle stolen is true the sms will send to police and customer.

V.   ALGORITHM USES/ INTERESTED ALGORITHAM

A. Kohonen Neural Network Algoritham

Kohonen's networks are one of basic types of self-organizing neural networks. The ability to self-organize provides new possibilities - adaptation to formerly unknown input data. It seems to be the most natural way of learning, which is used in our brains, where no patterns are defined. Those patterns take shape during the learning process, which is combined with normal work. Kohonen's networks are a synonym of whole group of nets which make use of self-organizing, competitive type learning method. We set up signals on net's inputs and then choose winning neuron, the one which corresponds with input vector in the best way. Precise scheme of rivalry and later modifications of synapthic wages may have various forms. There are many sub-types based on rivalry, which differ themselves by precise self-organizing algorithm.

Functioning of self-organizing neural network is divided into three stages:
1. Construction
2. Learning
3. Identification

System, which is supposed to realize functioning of self-organizing network, should consist of few basic elements. First of them is a matrix of neurons which are stimulated by input signals. Those signals should describe some attributes of effects which occure in the surrounding. Thanks to that description the net is able to group those effects. Information about events is translated into impulses which stimulate neurons. Group of signals transfered to every neuron doesn't have to be identical, even its number may be various. However they have to realize one condition: unambiguously define those events. Another part of the net is a mechanism which defines the stage of similarity of every neuron's wage and input signal. Moreover it assigns the unit with the best match - the winner. At the beginning the wages are small random numbers. It's important that no symetry may occure. While learning, those wages are being modified in the best way to show an internal structure of input data. However there is a risk that neurons could link with some values before groups are correctly recognized. Then the learning process should be repeated with diffrent wages.At last, absolutely necessary for self-organizing process is that the net is able to adapt wages values of winning neuron and his neighbours, according to response strenght. Net topology can be defined in a very simple way by determining the neighbours of every neuron. Let's call the unit whose response on stimulation is maximal the image of this stimulation. Then we can presume that the net is in order, if topologic relations between input signals and their images are identical.

KNN Algorithm:

The name of the whole class of networks came from the designation of algorithm called self-organizing Kohonen's maps. They had been described in the publication "Self Organizing Map". Kohonen proposed two kinds of proximity: rectangular and gauss.

$$G(i,x) = \begin{cases} 1 & dla \quad d(i,w) \leq \lambda \\ 0 & dla \quad d(i,w) > \lambda \end{cases}$$

$$G(i,x) = \exp\left(-\frac{d^2(i,w)}{2\lambda^2}\right)$$

Fig: 1 Formula

"lambda" is the radius of proximity, it decreases in time.

Use of Kohonen's method gives us better results than "Winner Takes All" method. Organization of the net is better (neurons organization represents the distribution of input data in a better way) and the convergence of the algorithm is higher. Because of that the time of single iteration is a few times longer - wages of many neurons , not only winners', have to be modified.

VI.   WORK FLOW OF PROPOSED SYSTEM

Work flow of the system is shown by following Fig 2, here first input is taken form camera using OpenCV. Then image captured by camera is stored and give for image processing. In image processing noise removal, thresholding etc process are done. After that we got filtered image, on that image bob detection is done. Blob detection is process of finding equal size of shapes present in image that blobs are detect and processed using segmentation. Segmentation crops the bobls which ratio match with condition. After that template matching process is start, here segmented blobs are match with the database and convert it into text format from image format. After template matching condition checking is done on documents which expired or not shown in Fig: 2. If documents are expired or vehicle is stolen then sms is sending to police and customer
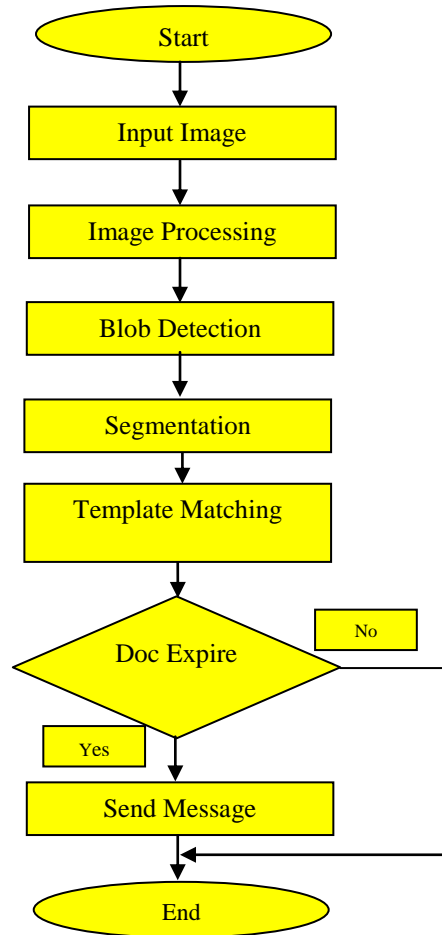
Fig.: 2 Work flow Diagram

VII. FURTHER ISSU

Normally the Number Plate recognition using blob detection is done on standard single row characters on Number Plate. This system takes only single line number plate in present scenario. It also take input in standard (Fixed) format, if input format is change then it cannot give the correct output. It also takes fixed resolution image and then gives correct output, low resolution or high resolution image gives wrong result This system uses Internet continuously that's why this system may fail because of internet connectivity problem.

VIII. GOLAS AND OBJECTIVE

- To minimize the manual work of vehicle document verification.
- Creating and updating vehicle details.
- Updating documents detail.
- Capturing vehicle Number Plate.
- Verifying documents in database.
- Tracking vehicle.
- Generating reports.
- Sending SMS

IX.   ACKNOWLEDGMENT

X.CONCLUSION

In this project, we presented application software designed for the recognition of Vehicle number plate. Firstly we extracted the plate location, then we separated the plate characters individually by segmentation and finally applied template matching with the use of correlation for recognition of plate characters.

REFERENCES

[1] Riazul Islam, Kazi Fatima Shariff and Satyen Biswas "Automatic Vehicle Number Plate Recognition Using Structured Elements" 2015 IEEE Conference on Systems, Process and Control.

[2]Serkan Ozbay, and Ergun Ercelebi "Automatic Vechicle Identification by Plate Recognition" World Academy of Science, Engineering and technology 9 2011.

[3]Yuc Huang, Ruiwen Wu, Ye Sun, Wci Wang, and Xinghao Ding, Member, I" Vechicle Logo Recognition system based no convolutional Neural Networks with a pretraining strategy" IEEE transactions on Intelligent transportation system vol 16 no 4 august 2015.

[4]Ali Farhat*, Ali Al-Zawqaru, Abdulhadi Al-Qahtani, Omar Hommos, Faycal Bensaali and Abbes Amira, Xiaojun Zhai " Ocr based Feature Extraction and Template Matching Algorithm for Qatari Number Plate" in 2016 IEEE.