International Journal of Science Engineering and Advance Technology, IJSEAT,Vol.3,Issue 4 | ISSN 2321-6905 April 2015

International Journal of Science Engineering and Advance Technology

Real Time Automatic Number Plate Recognition Using Morphological Algorithm

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Abstract

The rising increase of up to date urban and national road networks over the last three decades become known the need of capable monitoring and management of road traffic. Expected techniques for traffic measurements, such as inductive loops, sensors or EM microwave detectors, endure from sober shortcomings, luxurious to install, they demand traffic distraction during installation or maintenance, they are massive and they are unable to notice slow or momentary stop vehicles. On the divergent, systems that are based on video are simple to install, use the existing infrastructure of traffic observation. Currently most reliable method is through the detection of number plates, i.e., automatic number plate recognition (ANPR), which is also branded as automatic license plate recognition (ALPR), or radio frequency transponders.

The first revalent step of information is finding of moving objects in video streams and background subtraction is a very accepted approach for foreground segmentation. Next step is License plate extraction which is an essential stage in license plate recognition for automatic transport system. We are planned for two ways for removal of license plates and comparing it with other existing methods. The Extracted license plates are segmented into particular characters by means of a region-based manner. The recognition scheme unites adaptive iterative thresholding with a template matching algorithm. The method is strong to illumination, character size and thickness, skew and small character breaks. The main reward of this system is its real-time capability and that it does not require any extra sensor input (e.g. from infrared sensors) except a video stream. This system is judged on a huge number of vehicle images and videos. The system is also computationally extremely efficient and it is appropriate for others related image recognition applications. This system has broad choice of applications such as access control, ringing, border patrol, traffic control, finding stolen cars, etc. Furthermore, this technology does not need any fitting on cars, such as transmitter or responder.

INTRODUCTION

Routine video analysis from traffic surveillance cameras is a fast-emerging territory based on computer vision method. It is a key technology to public security, intelligent transport system (ITS) and for well-organized management of traffic. In modern years, there has been an inflamed range for automatic analysis of traffic activity. We identify video analytics as computer-vision-based observation algorithms and systems to take out connected information from video. In traffic situations several monitoring objectives can be maintain by the application of computer vision and pattern recognition techniques, including the detection of traffic violations (e.g., illegal turns and one-way streets) and the detection of road users (e.g., vehicles, motorbikes, and pedestrians). Furthermore, they can be easily upgraded and they offer the flexibility to redesign the system and its functionality by simply altering the system algorithms. Those systems agree to measurement of vehicle's speed, including the number of vehicles, labeling of vehicles, and the naming of traffic incidents (such as accidents or heavy congestion). There is a wide choice of systems based on video and image processing employing diverse methodologies to detect vehicles and objects.

IMPRESSION OF THE PROPOSED MODEL

A classic surveillance system consists of a traffic camera network, which develops captured traffic video on-site and transmits the extorted parameters in real time. Here our focal point is on the study of algorithmic portion of such a system.

In this proposal, we present full-featured vehicle detection, tracking and license plate recognition system framework, mainly designed to work on video footage. This system chiefly having four modules:-

a. Video Acquisition

b. Vehicle detection and tracking

c. License plate extraction

d. Character recognition unit

This scheme is used to detect, recognize and track vehicle from inward video frames in dynamic scenes then take out the license plate from it as shown in Figure 1.1. It has found numerous applications as wide as probable such as: access control in security responsive areas, securities for the public and chief buildings, detection of military target region, traffic surveillance in metropolis and highways, detection of anomalies behavior, traffic control supervision for recognize vehicles that give traffic violation, such as occupying lanes kept for public transport, breaking speed limits, crossing red light, entering limited area without permission; and among lots of other applications.

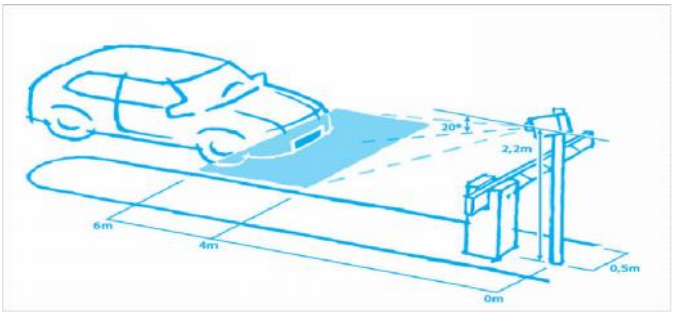
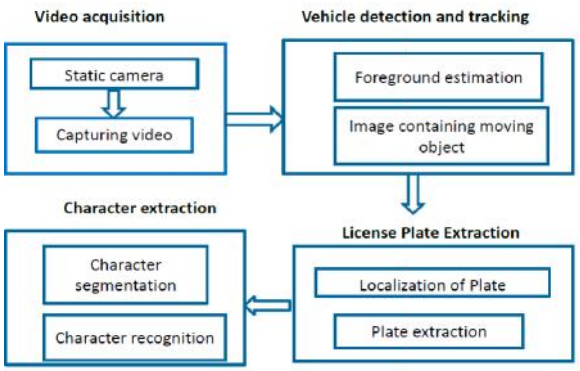


Figure 1 ANPR system implementation in practical scenario

The system is designed for real time videos where a camera is used for nonstop recording of videos. The view of camera or the area enclosed by camera is fixed between entry zones and exit zone. Each frame is endlessly processed to check the occurrence of a vehicle. A defined connected component area is full as threshold.

BLOCK DIAGRAM OF PROPOSED MODEL



This Proposed System having mainly four modules:

Video Acquisition

In this module videos are taken by the static camera located at traffic scenario. A camera network that has the skill to transmit images in real time to a central equipped centre. The processing of the images can be carried out on-site saving precious network bandwidth as it transmits simply the outcome of the answers. The whole process can also be executed either in real time video streaming from an operational centre or in previously stored video material.

Vehicle Detection and Tracking

In vehicle detection we have replicated various background subtraction techniques exiting in the literature. The background subtraction technique should defeat the problems of unstable illumination state, background clutter, camouflage and shadow. Motion segmentation of center object has been done in real time. It's hard to get this total problem solved in one backdrop subtraction technique. So the idea was to replicate and evaluate their act on various video data taken in different conditions.

License Plate Extraction

License plates are initially located in current frame then they are remove various available techniques in the literature based on Hough Transform method, Template matching technique, Region growing algorithm, Histogram method and Edge Detection method.

Character Extraction

Images of the obtained plates are the input to this unit. Here first license plate image is cutter in lines, and then characters are segmented and known.

Proposed Method I for license plate extraction

This Technique is based on watching that "The License plate is the noisiest division of the Car Image". It means that if the edges of the image are taken, then we get the majority most edges in the License Plate Area. Here I used Sobel edge detection Technique to notice the edges of the image. After noticing the edges we get a binary image. Now a window is run above the image and no of white pixels are calculated. And when white pixels are 10% – 30% of the whole pixels, I take that region may contain a License plate. From the open plates we check for the number of linked objects in that region. If this count is in between 8-15, I believe that as a license plate.

Sobel edge detection

Known the binarized image I perform vertical edge detection with *mask A* and horizontal edge detection with *mask B*. Since I am not interested in the way of the edge, I take the absolute value of the output of the cover to obtain edges present in all four ways. Wherever an edge is there we mark the pixel as a 1, if not, we mark it 0.

If the binarization threshold is suitable, performing edge detection on the black and white image should effect in a great deal of edges in the area of the license plate owed to the characters. This is a assets I can use to wish possible license plates. The 3x3 mask used to notice edges that are relatively slim comparing to the lines of the characters on a license plate. Then, the edge detector will detect much slimmer edges in adding to the edges of the characters of the license plate. Construct masks that specifically detect lines that are around the thickness of the characters on a license plate to minimize fake alarms.

Car Image-1 **Car Image_2**

Car Image 1 Car Image 2

a

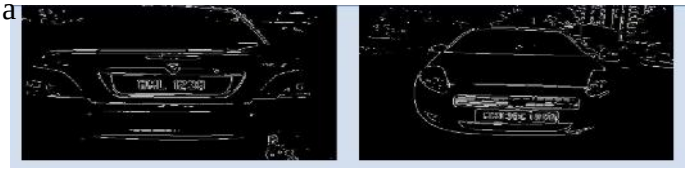
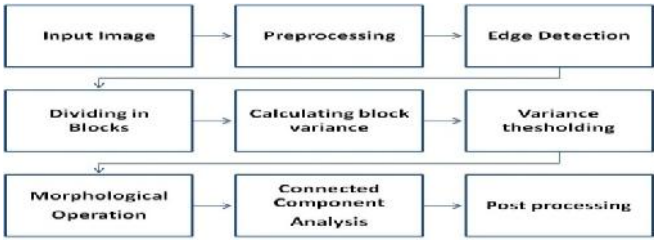


Fig. **Sobel edge detected Images**

Proposed Method- II for license plate extraction

Now I am proposing Block Variance Technique for license plate removal. The license plate having alphanumeric characters with heavy variance as compared to respite part of the image, so I am using this trait of license plate for extracting it from the image.



Flow chart of Block Variance Technique

Pre-processing

In pre-processing phase some transformations are done. They are

- Change of RGB Image into a Gray-scale image.
- Resizing all input images in a pre-defined range
- Alter the 8 bit image to 4 bit image

Mask B

Morphological Operation

CAR Image-2

Morphological procedures are a collection of non-linear operations connected to the form or morphology of features in an image. Morphological procedures rely only on the relative arranging of pixel values, and are specially suited to the giving out of binary images. Morphological methods analyse an image with a small form or template called a structuring element. The structuring element is located at all possible places in the image and it is compared with the district pixels. A few operations test whether the element fits in the neighborhood, while others test whether it intersects (hits) the neighborhood.

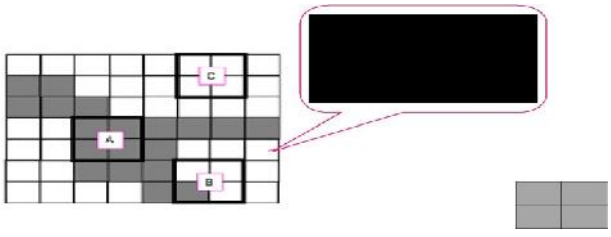


Fig. Probing of an image with a structuring element

Fundamental Morphological operations

Erosion and dilation

The attrition of a binary image f by a structuring element s (denoted f $\ominus$ s) makes a new binary image g = f $\ominus$ s with

ones in all locations (x, y) of a structuring element's source at which that structuring element s fits the input image f, i.e. g(x, y) = 1 is s fits f and 0 if not, repeating for all pixel coordinates (x, y).

The dilation of an image f by a structuring element s (indicated f ⊕ s) produces a fresh binary image g = f ⊕ s with ones in all sites (x, y) of a structuring element's source at which that structuring element s beats the input image f, i.e. g(x, y) = 1 if beats s f and 0 if not, repeating for all pixel coordinates (x, y). Dilation has the reverse effect to erosion. It adds a layer of pixels to equally the inner and outer limits of regions.

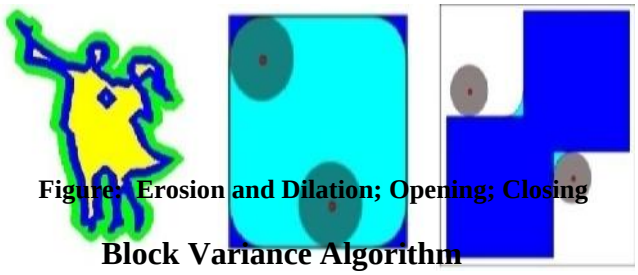


Figure: Erosion and Dilation; Opening; Closing

Block Variance Algorithm

step 1: *First an image is in use, then pre-processing is done to eliminate unwanted noise and to boost the image contrast.*

step 2: *Resizing of all input image in 300 x 400 pixels since we ha to divide the whole image into the blocks so all the images should be of equal pixel resolution.*

step 3: *Exchanging RGB image into Gray scale image because w only interested in Focus values.*

step 4: *The license plate of the car contains of several characters, so the plate area Consists rich edge information. We used Sobel edge detection Technique to indicate the edges of the image.*

step 5: *Separating image in (5 x 5) blocks i.e. total 25 blocks of 6(80 pixels then finding clash of each block.*

step 6: *Calculating threshold variance by (3.3).*

$$_{H} = V_{MAX}+V_{MIN} / 2$$

Where V_{MIN} *maximum variance and minimum* V_{M} *variance Inthat order.*

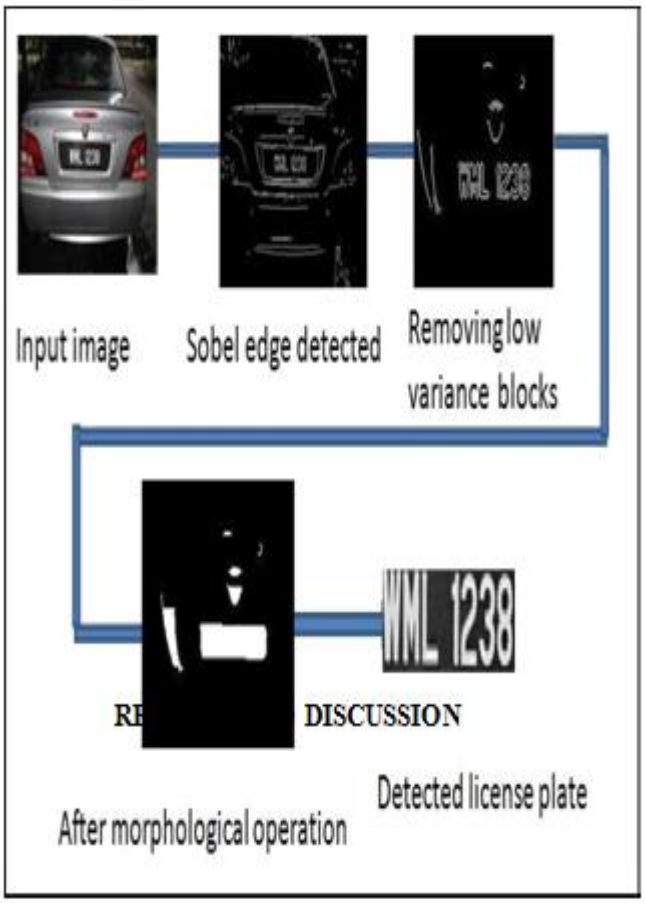
step 7: *Segmenting every blocks , blocks having low variance as by* V_{th} *evaluate to threshold variance are detached.*

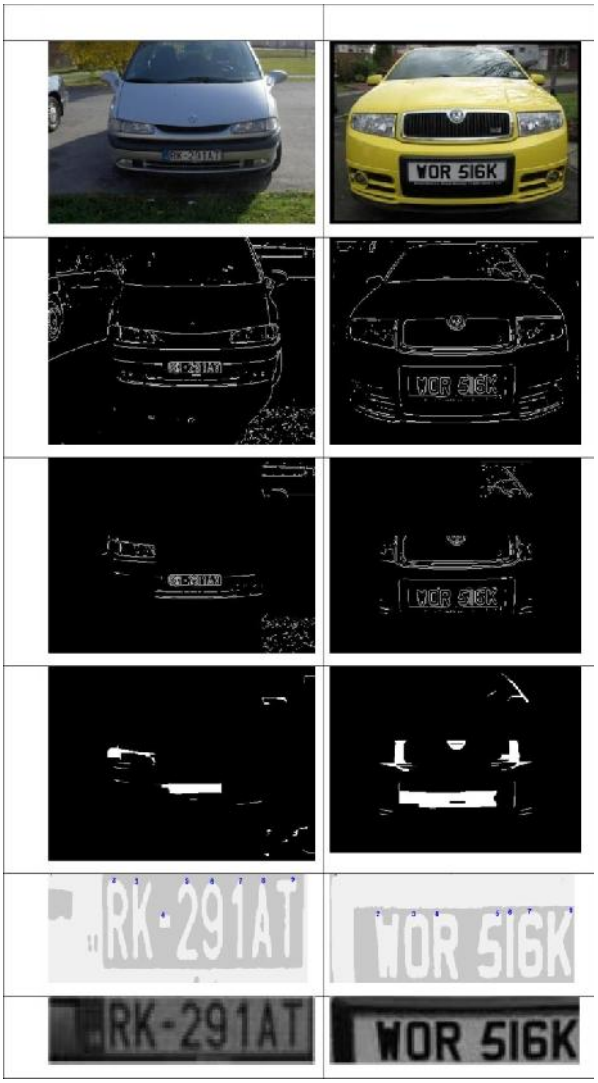
step 8: *After that we are taken away the long lines.*

step 9: *Performing morphological finishing operation with rectangular structuring element of size [2, 20].*

step 10: *Then using allied component analysis for labeling the each component and Haul out the license plate using region properties.*

step 11: *After extracting the number it will exchanged to binary image, enhancing image resolution and then sending this image to character segmentation module for* further process.

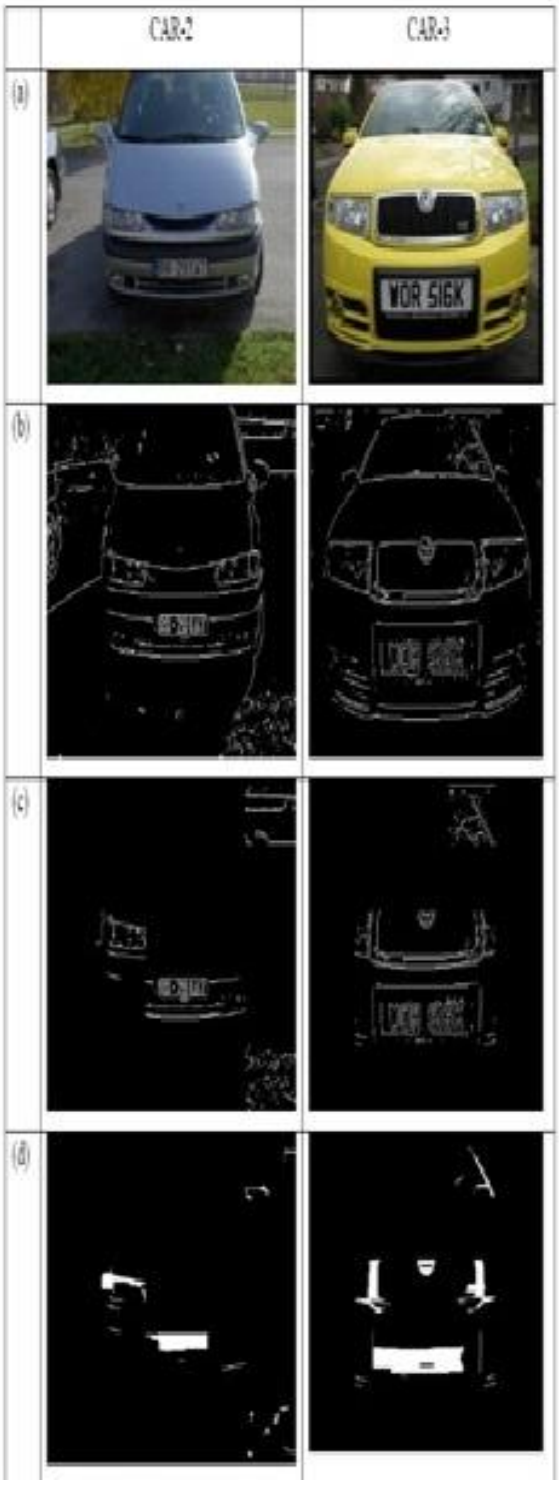




RESULTS AND DISCUSSION

Figure Results of Proposed Block Variance Algorithm

Now (a) shows the input image CAR-1 and CAR-2 (b) image after submit sobel operator (edge detected image) (c) removing low conflict blocks (d) after morphological action (e) showing allied component (f) detected license plate



CONCLUSION

Here in this theory, the methods for traffic observation have been obtained and the work on motion discovery, license plate extraction and character recognition is passed out. In motion

detection, a study on dissimilar background subtraction available in the literature has been calculated and their presentation tests on the different video test sequence are given. The fitness coefficient and error coefficient is also calculated for all the ways. It should be noted that robust motion detection is a serious task and its performance is affected by the attendance of varying illumination, background motion, mask, shadow, and etc.

In license plate removal the strength and flaw of the different extraction algorithm have talk about which are available in the literature and judgments of all the methods have been done. Future two methods for extraction of license plate i.e edge detection process and the block variance technique are obtainable. The block variance algorithm has been tested on 90 images and giving 87.4% exactness measure. In character extraction template matching (OCR) algorithm is used for extraction and dissimilar algorithms that are presented in literature survey are also calculated. For improving the performance of template corresponding algorithm the format of license plate is calculated.

This included system locates tracks and extracts traffic issues in real time. Furthermore, the system can utilize any existing traffic surveillance communications without further changes or tuning (except for the camera calibration that work outs image metrics). Overall, the system was found to work adequately and the background reconstruction algorithm added vigor to the process. In normal traffic circumstances the system responded fine and the outcome results concerning vehicle license plate and course were accurate enough. The experiments carried out explain that the proposed algorithm is capable of real time operational working due to its low difficulty. The background reconstruction algorithm permits the clear operation of the system without human intrusion. The system works fine either in real time mode or in previously stored video.

FUTURE SCOPE

In future work, I am aim to focus on night surveillance and to look up the existing algorithms account in literature. However, the other sections of our suggested system should be better, spotlight on the occlusion handling, vehicle matching procedure and also spotlight on improving the accuracy measure for character detection by using the concept of neural network for make out all font type of a character by using back propagation algorithm. In this, first the network is skilled out and to train the network, the input and target are required. After the network had been fruitfully trained, the segmented character in license plate can now inputted the neural network to simulation. Ideally, the input characters will compare with the data that trained in neural network, and then outputted the ASCII code for analogous input character.

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