

A Recognition of License Plate Images from Fast Moving Vehicles Using Blur Kernel Estimation

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ABSTRACT: license plate image play a important role in recovering of overspeed vehicles involved in hit and run accidents. However, the vehicles captured by camera which is fixed in roadside is blurred due to fast motion which is not recognizable by human eye. Those obtained image usually have low resolution and have loss in edge information which is a great challenge now a days. Due to fast motion, the blur kernel is viewed as linear uniform convolution and it is modeled with parameters such as angle and length. In this paper, the method is based on sparse representation to identify the blur kernel. Based on that sparse representation coefficients of recovered image, the angle and length is estimated. Here we estimate the angle of the kernel using the hough transform and length is estimated using random transform in fourier domain. And we get final deconvoluted image using NBID techniques. This method can well handle large motion blur even the license plate is not recognizable by human.

KEYWORDS: license plate deblurring, sparse representation, NBID, linear uniform deconvolution, fourier domain.

I. INTRODUCTION

License plate is separate ID given for each and every vehicles which plays a significant role in identifying crime maker vehicles. There are many methods are identified to auto detect the over speed vehicles and capturing system is more improved for traffic violation on the main roads of highways. During the exposure time, the blurred image is obtained due to fast motion of the vehicle. While taking a video, the exposure time is based on the illumination situations. In outdoor, due to sunshine, the exposure time is about 0.003seconds.during the exposure time, the vehicles moving at 60miles per hour for displacement of number plate of about 9cm and length is of 45 pixels and angle between the camera imaging and horizontal plane is about 60degree when the license image size is about 140*140 pixels. In this case the license plate cannot be neglected. If exposure time is reduced to 0.0001seconds, blur can be minor and there will be loss of semantic information. The image captured from fast motion vehicles has more blur and plates are not easy to be detectable and it is not recognizable by human.

II. EXISTING METHODS

A. BLIND IMAGE DEBLURING

In image processing community, the blind image deblurring plays a significant role in many applications. For BID, there is unknown kernel and sharp image. Based on whether the kernel is invariant, the BID is classified as uniform BID and non uniform BID. It has improved a lot to perform in real time cases but it still have challenges. Prior knowledge introduced in the BID due to its ill-imposed nature to get a correct solution. BID estimation is based on four parameters that is kernel size, sampling size, and trade off parameters λ and α .

B. MAP METHODS

Map method solve the optimisation problem to obtain a latent image. To get no blur solution, there are many preprocessing stages are handled in this method. It is used to overcome the problems faced in BID techniques. Due to slope inclination, it is not gurantee to provide the proper solution in most of images. If the kernel size exceeds the minimum, the edges are filtered out during the filtering process and that effects the final results.

C. MARGINALISATION METHODS

In this method, even under the weak prior of sharp image, the kernel is obtained with more accuracy. Herue the kernel is estimated using the expectation maximisation algorithm and the NBID is applied at once. this methods can only handle if the size of the kernel smaller than the size of the observed image. It has more computational complexity.

III. PROPOSED METHOD

In this paper, we propose a method to estimate the blur kernel from blurred license plate images from the fast moving vehicles. Here the input is given as video and the blurred license plate image is segmented from that video through shape detector. And then from the obtained image, the parameters such as angle and length of the kernel are estimated through hough transform and randon transform respectively in fourier domain. And final deconvoluted image is obtained by applying NBID algorithms.

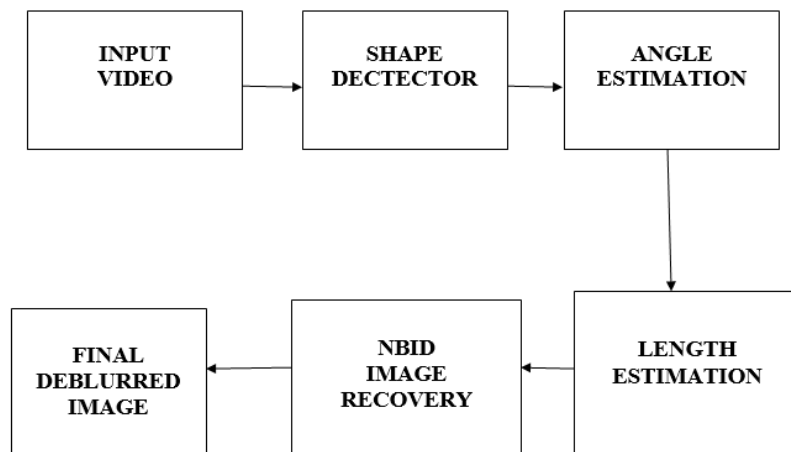


Fig 1: Flow chart of proposed system

A. SHAPE DETECTOR

By computing the compactness of the object, we recognizes the shape of the object. The compactness is given by $c = p^2/A$. Using the perimeter and area of the object we obtain the compactness of that object. In this method the compactness range for circle is about 1 to 14 and for square the range of compactness is about 15 to19 and for triangle is about 20 to 40. The compactness computing is applicable to all geometric shapes.

B. ESTIMATION OF BLUR KERNEL

In general, the blur kernel is obtained by determining the relative motion between the moving vehicle and surveillance camera during the shutter speed. If the shutter speed is short for fast moving vehicles then the

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motion is considered as the constant value. Here the license plate image is modelled as a linear uniform kernel with two parameters such as angle and length.

C. ANGLE ESTIMATION

Sparse representation pay a little attention on parameter inference. As prior of sharp image, the sparsity on learned over complete dictionary is considered. Parameter estimation is nothing but solving the optimisation problem.

$$(\vartheta, I) = \underset{\theta, I}{\operatorname{argmin}} \left\{ -\log p(I) + \frac{\lambda}{2} \|k_{\theta} * I - B\|_F^2 \right\}$$

In this proposed method, we are using the hough transform to estimate a angle Θ . Hough transform is used to determine the blur direction by detecting the orientation of the line in spectrum. Here the spectrum is treated as an image. To determine the gobal patterns such as circles , lines and ellipses in a spectrum obtained by applying hough transform. In general lines can be easily detected as points in hough transform by using polar representation of line which is given by $\rho = x \cos \theta + y \sin \theta$. the transformation of line parameters from image domain to polar domain is given by the figure1.using this angle Θ is estimated.

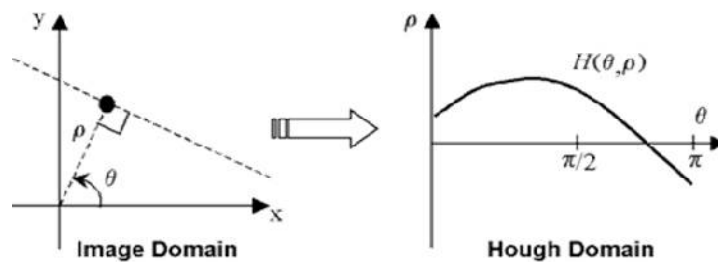


Fig 2: Hough transform

D. LENGTH ESTIMATION

In general, by fixing the direction of motion, we rotate the blurred image to make that to horizontal direction. Then we get a blur kernel is in the form as,

$$k(x, y) = \begin{cases} \frac{1}{L} & x = 0, 1, \dots, L - 1; y = 0 \\ 0 & \text{otherwise} \end{cases}$$

Then the magnitude of the kernel obtained in frequency response is given by the equation

$$|F_k(v)| \propto \frac{\sin\left(\frac{L\pi v}{N}\right)}{L \sin\left(\frac{\pi v}{N}\right)} \quad v = 0, 1, \dots, N - 1$$

The length is determined by estimating the distance between two adjacent zero points of frequency response of kernel. The two successive zero points are obtained by,

$$L = \frac{N}{|v_1 - v_2|}$$

In this method, the randon transform is used to detect length of the blur kernel. In specified directions, it computes the projection of an image. With the estimated angle, using randon transform the log spectrum of blurred image is projected to x-axis. The separated dark lines with identical distance are obtained which is correspond to local minima. And by detecting average distance between them, we deect the final blur length.

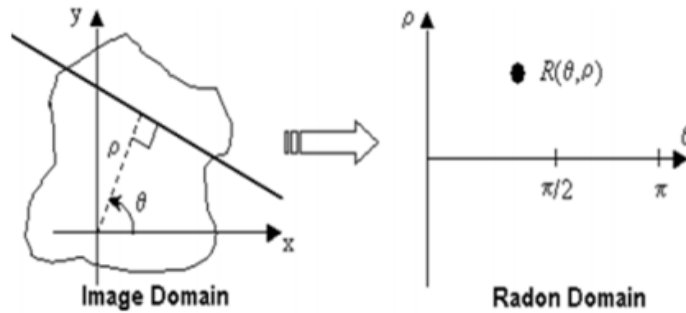


Fig 2: Radon transform

E. NON BLIND IMAGE DECONVOLUTION

NBID is applied whenever the blur kernel of image is known and from the blurry version, the latent image has to be estimated. At the end of any deconvolution process the NBID is applied to uncover the blurred image. There are many techniques to perform deconvolution process. Here we are using wiener filtering to get a final deconvoluted image. In this filtering method, the unwanted noises are removed from the blurred image. It is well operates on fourier domain. By filtering out unwanted noise from the obtained latent image, we get a final deconvoluted image.

IV. SIMULATION RESULTS



Fig 3: Input image



Fig 4: Blurred image



Fig 5: Final deconvoluted image

Table 1

Simulation outcomes	
Computational time	34.8seconds
PSNR(dB)	49.8
MSE	0.6

V. CONCLUSION

In this paper, we proposed an algorithm of novel kernel parameter estimation for license plate from fast moving vehicles. Under some weak assumptions, the license plate deblurring problem can be reduced to a parameter estimation problem. An interesting quasi convex property of sparse representation coefficients with kernel parameter (angle) is uncovered. In our scheme we use very simple and naïve NBID algorithm. By exploring the well used power spectrum character of natural image the length estimation is completed. The main advantage of our algorithm is that it can handle very large blur kernel and it is more robust. For the number plate which cannot be recognized by human the deblurred results made them readable.

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