Detecting and Recognizing the License Plate Number for Fast Moving Vehicle Using Smearing Algorithm

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ABSTRACT
Capturing of speed vehicles need some important technique to avoid motion blur which can decrease the identification accuracy dramatically. To ensure the right image quality short shutter time need to be used with the combination of high-power illumination. The snapshot of over-speed vehicle captured by surveillance camera is frequently blurred due to fast motion. To identify the license plate number in that image and also gets the details of that vehicle. The Existing work is the license plate deblurring algorithm can be used to reduce the parameter estimation problem. The length estimation is completed by exploring the well-used power-spectrum character of natural image. But, under some very weak assumptions the sparse representation coefficients with kernel parameter (angle) is uncovered and exploited. The proposed work is divided into two sections: The first section identifies the blur kernel on sparse representation coefficients of the captured image. The second section of this work is applies optical character recognition for the individual character detection with the help of database stored for each and every alphanumeric character and the affine transformation can be used to improve the OCR recognition from different size and angles. The proposed model can handle very large blur kernel and the methods are more robust. With this model the computer can accurately identify the large motion blur even when the license plate is unrecognizable by human. And it also shows the details of that vehicle automatically by using the stored entries in Database. The output of this proposed system is deblurred image of vehicle number. These images are expected to produce highly effective, fast and more accurate recognition results for providing key clue to uncover overspeed vehicles or ones involved in hit-and-run accidents.

KEYWORDS: Kernel, Optical character recognition, Principle Word Discovery, Smearing algorithm.

INTRODUCTION

License plate recognition (LPR) is a form of identification of vehicle automatically. It is one of the image processing technologies to verify the plate of vehicle. The LPR system consists of three steps: license plate location, character segmentation, and character recognition [1]. The person using vehicle day to day gets increased. The growth has a positive intimation to provide a professional and best parking system. Thus, recognition system is required to support parking management [2].

Every vehicle has their own unique license plate number and they have no cards, tags, transmitter that fit externally to be recognized. In this manner execution of License Plate Recognition can be exceptionally helpful to build up a vehicle stopping administration framework. Thus, the point of this venture is to build up a framework to identify and perceive the tag from a picture of a vehicle. This picture preparing based framework
is separated into vehicle identification, pre-handling, tag discovery, character disconnection and character acknowledgment.

Related Works:
From the point of view of Bayesian induction, there are two principle choices for BID: most extreme a posteriori (MAP) strategies and minimization techniques. Then again, for particular portion, the recuperation can be diminished to a parameter estimation issue. In this area, we will survey a few agent BID conspires in the over three classifications.

A. Outline:

The MAP strategies endeavor to acquire the inert picture by tackling the accompanying enhancement issue: 
\[ p(B|k, I) \] is the probability thing which is normally displayed with a Gaussian dissemination; \( p(k) \) and \( p(I) \) mean the earlier learning of part and inactive picture, individually. As Levin et al. [11] brought up, the arrangement of gullible MAP system with inclination sparsity earlier as a rule does not really relate to the piece and sharp picture, yet prompts the outcome supporting the no obscure arrangement \( (I^* = B) \). To abstain from getting a no obscure arrangement, a few preprocessing strategies have been proposed for the MAP structure. Shan et al. [7] presented another model of spatially irregular circulation of picture commotion and another smooth requirement of dormant picture. In [6] and [10], the creators proposed to include one expectation (or determination) venture to upgrade the huge scale edges to enhance the execution. In view of a similar thought, Xu et al. [8] presented an unnatural 0 sparsity earlier, and the sparsity work utilized as a part of their calculation has the comparative impact with edge forecast. In this procedure, the edge expectation is basic for the deblurring execution.

Another option is to present more convoluted earlier, for example, framelet [16], [17] and straightforwardness data [18], [19]. Inspired by the colossal accomplishment of inadequate portrayal in the held of picture preparing and PC vision [13], [14], the sparsity on an educated over-total word reference is utilized as the earlier of sharp picture in Huõs work [13]. For the unique obscured archive, Chen et al. [14] and Cho et al. [9] presented a very much planned earlier which is figured by content identification calculation [14], [15]. Be that as it may, both of these two strategies require that the picture is sufficiently enormous and the foundation is not extremely perplexing. Goldstein and Fattal [16] proposed to assess the power range of the obscure piece with an unearthly brightening equation. Liu et al. [17] acquainted a curved portion regularize with the pervasive nonblind deconvolution techniques, which demonstrated noteworthy execution in their paper.

There are likewise different scientists depending on more data about the idle sharp picture. Zhang et al. [18], Yuan et al. [19] and Zhu et al. proposed to utilize a couple of pictures to assess a more precise obscure portion, which can lessen the deblurring antiquities. Tai et al. endeavored to tackle the deblurring issue by building an exceptional camera equipment which can record a helper bring down determination yet higher casing rate video [1]. In any case, the necessity of multi-perception strategy or equipment is infeasible in numerous genuine applications [11], [12].

The cutoff points of MAP structure are self-evident. Firstly, MAP with basic angle earlier can't ensure that the genuine arrangement is accessible in most zone of pictures. Also, when the piece size is extensive, generally inadequate edges can be changed out in the obscured picture, which fundamentally influences the outcome.

B. Minimization Methods:

The minimization techniques depend on the perception that boosting \( p(k | B) \) generally prompts a more heartly and exact bit even under a frail earlier of sharp picture [11], [13], [14], [17]. These techniques wrestle appraise the portion by desire augmentation (EM) calculation, and after that apply NBID just once. Wang et al. [14] consolidated the underestimation strategy and vast scale step edge forecast method to enhance the power of deblurring calculation.

Be that as it may, it can be demonstrated hypothetically that the maximum underestimation technique can just deal with little portion circumstances (i.e., the span of piece is considerably littler than the measure of watched picture). Indeed, in our situation, the portion measure even achieves 33% the extent of the obscured picture. Another downside of the underestimation strategy is that the computational multifaceted nature develops quickly by presenting the EM calculation.

C. Parametric Kernel Estimation Methods:

The vast majority of the calculations specified above endeavor to gauge a general part with the main requirement that each component of piece is nonnegative. Be that as it may, in true, a few normal obscure bits are parametric, for example, obscure brought about by moving at a consistent speed and out-of-center obscure [12]. The obscure estimation issue can be lessened to a parameter estimation issue which is considerably more tractable. Parametric estimated property that straight uniform obscure parts range is sinc-like capacity which is
particular from characteristic picture [12], [14]. Oliveira et al. expected nature picture to be around isotropic, which is substantial for common picture with extensive size. In any case, for little picture, the range is intensely reliant on the substance of the picture, for example, substantial scale edge. For non-uniform deblurring, the piece estimation is a thornier issue on the grounds that a strict non-uniform part has excessively numerous degrees of opportunity. To rearrange the estimation of piece, the non-uniform obscuring is regularly thought to be brought about by projection change [15] & [7]. Whyte et al. [15] acknowledged that the darknes from camera shake is generally because of the 3D pivot of camera, which could be approximated by move, yaw and pitch. Essentially, Gupta et al. [16] decreased the movement of camera into 3D subspace: roll and x, y-interpretations. In a current work, Zheng et al. [17] assessed the typical plane. For over-speed license plate deblurring, the size of blur kernel is very large, even reaching one-third of the size of blurred image, which poses great challenges to both the MAPand marginalization methods. To tackle this problem, we adopt the blur kernel parameter estimation method (angle and length). For angle estimation, our scheme makes use of the relationship between the kernel angle and sparse representation coefficients. For length estimation, we exploit the fact that the behavior of power spectrum is significantly affected by the length of kernel in Fourier domain. The major advantage of our method is that the proposed scheme can handle large motion blur even when the license plate is unrecognizable by human, which makes our approach promising in real applications.

**Methodology:**

The number plate recognition is the extraction of the number plate in an image. A yellow search algorithm is utilized to extricate the probability return for capital invested in a picture. The picture got after the inquiry calculation is in high contrast position. Picture is then sifted for evaluating of all white fixes and expels the little locales. OCR calculation uses to perceive the vehicle number. The OCR really utilizes connection strategy to match singular character lastly the number is recognized and put away in string position in a variable. The string is then contrasted and the put away database for the vehicle approval.

The stream will begin when the vehicle ventures over the cameras. It will actuate a sign to the vehicle tag arrangement of the nearness of the vehicle. The light will be actuated and pictures of the front photo of the vehicle will be taken. The framework will read the data pixels of the vehicle and run the acknowledgement procedure and framework will apply spreading calculation to dissect the vehicle picture. Other than examining, the pictures will be upgraded, finding the vehicle plate position and concentrate the characters from the vehicle plate. The characters will be perceived by utilizing OCR. At that point framework will attempt to coordinate the perceived vehicle plate number with the auto plate database. On the off chance that entrance in all actuality, the gantry will open and permitted the vehicle.

The essential issues continuously tag acknowledgment are the exactness and the acknowledgment speed. License plates are initially situated in current edge then they are extricated utilizing different strategies as a part of the writing in view of upgrade procedure.

At the point when the tag in the picture is in great determination, say, more than 25 pixels in character stature, our approach works truly well in confinement. Notwithstanding, when the determination of tag in picture is too low, it will be troublesome for our way to deal with find the tag. It is seen from our examinations that when the tallness of characters in a tag is littler than 15 pixels our approach may miss the plate. In spite of the fact that edge-outline methodologies can make it once in a while, the low determination issue is still a test to the three gauge calculations.

In Image processing they used some sensor to detect the occupancy of the parking. Input image is captured using a fixed camera at the entry level of the vehicle park. Background subtraction will be used to detect the existence of the vehicle at the entrance. Once the vehicle is detected, the image will be subtracted out from the background image so that the contour of the vehicle can be obtained. The distance between the vehicle and the acquisition camera should be fixed at certain distance. This is to ensure that the threshold value set in the program can be applied to all images. Figure 1 shows the input sample image which is fast moving blurred snapshot image.

![Sample input image](image_url)
License plate has different number for each particular vehicle that plays a vital role in identifying the issues making vehicle. These days, there are heaps of auto over-speed identification and catch frameworks for petty criminal offense on the primary streets of urban communities and highways. Nonetheless, the movement of vehicle amid the introduction time would bring about the obscure of preview picture. Thus, the introduction time (shade speed) has huge effect on the measure of obscure.

For video shooting, the expo-beyond any doubt time is to a great extent reliant on the enlightenment circumstances. In usual outdoor scene with sunshine, the typical exposure time is about 1/300 second. For a vehicle running at 60 miles per hour, during the exposure time, the replacement of license plate is about 9 centimeters which is compared to the size of the license plate (14*44 centimeters in India), i.e., the length of kernel is about 45 pixels when the license plate image is with size of 140 × 440 pixels and the angle between camera imaging plane ignored. In an ideal scenario with sound and

![Image](image.png)

**Fig. 2:** Middle blur example.

image size is 224 × 140, and our estimated kernel parameters are (θ= 66.67¡, l= 29.87). Top-left is the observed license plate image. Top-middle is our recovered result. He other four images are the results acquired by modifying illumination, the blur from shorter exposure time, say, 1/1000 second, can be minor and may not harm the semantic data. In any case, under poor light circumstances, the camera needs to draw out the presentation time to get a completely uncovered picture, which effectively acquires the movement obscure. In addition, for high-determination advanced horizontal plane is about 60 degree. In such cases, the blur image of license plate is cameras, fast videography is likewise vulnerable to movement obscure. When the vehicle is over-speeded, such blurring effect from fast motion becomes much more severe, resulting in plates far from detectable, recognizable and difficult for retrieval [2]&[5]. In this scenario, the basic task of deblurring is to recover the helpful semantic hint for distinguishing proof. The fundamental task of license plate deblurring is to recover the useful semantic clue for identification.

For example, take a image of the over speed vehicle that will be blurred, the most to address some genuine cases. Numerically, the model of picture obscuring can be planned as

\[
B(x , y)=(k * I)(x , y)+ G(x , y) \tag{1}
\]

deblur image.

\[
a) \quad \text{blurred image.} \\
b) \quad (\theta = 66.67¡, l= 29.87). \\
c) \quad (\theta= 66.67¡, l = 24.87). \\
d) \quad (\theta = 66.67¡, l= 34.87). \\
e) \quad (\theta = 61.67¡, l = 29.87). \\
f) \quad (\theta = 71.67¡, l= 29.87)
\]

where B, I, and k denote the blurred image, the sharp image we intend to recover, and the blur kernel, respectively; G is the additive noise (usually regarded as white Gaussian noise); and denotes convolution operator. For BID, the kernel k and sharp image I are both unknown. According to whether the kernel k is spatially-invariant or not, the BID problem can be divided into two categories: uniform BID and non-uniform BID. For uniform BID, the kernel k is often called point spread function.
Evaluation Of The Proposed Algorithm:

For the unclear images we captured in real scenario, the better truth is unavailable. In order to test the validity of our proposed algorithm, Fig 2 clarified that our assessed results are correct or close to the best parameters on three cases under various obscure levels. The plate pictures get to be distinctly unmistakable after deblurring under our estimated parameter settings.

We compare our proposed scheme with four state-of-the-art blind image deblurring methods: 1) NSBD [12]; 2) TPISD [10]/USR [8]; 3) FSR [17]; 4) HQMD [7]. We use the major codes of those comparison methods are extracted from the authors websites. The edge detection is not necessary for these NSBD [16] and FSR These two are based on edge detection USR [8] and HQMD [7]. Xus method [8] requires the size of image be larger than 200×200 in pixel. When the height of our observed image is smaller than 200, an extra super-resolution is applied before applying XuOs BID method. After obtaining the recovered sharp image, we acquire the anal

![Fig. 3: Smearing algorithm applied.](image)

Optical Character Recognition:

OCR is utilized for the character identification. In the recent past those matching process, those enter picture must have a chance to be resized so as should be equal-sized for the format. Then afterward that, those separated character make distinguished toward thinking about for those ones in the format and the best similitude may be measured. To measure those comparability what’s more figure the best match, an 2-dimension correspondence strategy may be utilized Two superbly matched characters will have an association which will be equals will 1. Finally, those permit plate amount It will make distinguished what's more spared on database. most cases, the proposed method achieves the best performance improvement and successfully improves the plate image from deblurring performance of our scheme and with algorithms under different situations. In unrecognizable to recognizable. The second size.Fig. 3 restored image by down sampling to the raw shows the comparison between and third images of Fig. 4, the first and second images of Fig.5 show the same great improvement on semantic recognition. It can be maintained that in real scene and huge obscure condition, deblurring is unavoidable no clear pictures and that can be cleared to the spreading calculation irritating the edges and could be lessen the calculation time.

![Fig. 4: Optical Character Recognition](image)

Template Matching:

The developed program used template matching to identify the segmented character to the base of OCR. Template matching method must have character images as template stored in memory [6]. The separated character will be identified by calculating the correlation coefficient. The idea behind the implementation of a correlation based identification scheme is when two template pools, the pool consisting of all possible letter values and digits are constructed. Generally, once the license plate has been segmented into the several characters, in each image has single letter that has to be evaluated. The correlation coefficient between the image of the character and the appropriate template pool is computed. The template that yields the highest
coefficient will indicate what character is depicted in the input images. Fig. 4 displays matching characters with the template, input images must be equal sized with the template’s characters. In this program, the characters are fixed to the size of 24 x 42. The obtained characters are extracted from plate and the characters on database are now equal sized. After that, the character image is compared with each component in the database and the best similarity is measured.

Fig. 5: The Database Characters

Figure 5 shows the template which consists of 24 alphabets and 10 numerals with the size of 24 x 42. The template formed is based on the real font of the license plate. To measure the similarities and locate the best match, a 2-dimensional relationship coefficient is utilized. This strategy measures the relationship coefficient between various known pictures with similar size obscure pictures or parts of a picture with the most elevated coefficient between the pictures delivering the best match. The equation for calculate the coefficient is as shown in Equation (1).

Disclosure and Neighbourhood highlight coordinating. Watching that characters in various tags are copies of each other, we acquire utilizing the Back of-words (BoW) demonstrate famously connected in halfway copy picture look. Not at all like the great BoW show, for every plate character, have we naturally found the PVW described with geometric setting. Given another picture, the tags are separated by coordinating nearby elements with PVW.

RESULTS AND DISCUSSIONS

It will be interesting to quantitatively study the tolerability of our PVW approach under various observation views. Since our PVW is derived from SIFT, the essence of the issue is SIFT’s tolerability of affine distortion from observation views, which has been well studied by Serkan Ozbay et al. [14].

Table 1: Comparative table of Existing License Plate Recognition:

<table>
<thead>
<tr>
<th>SNO</th>
<th>METHOD</th>
<th>OBSERVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Blind Deconvolution</td>
<td>85% Accuracy</td>
</tr>
<tr>
<td>2.</td>
<td>Motion Deblurring</td>
<td>87% of Accuracy</td>
</tr>
<tr>
<td>3.</td>
<td>Principal Visual Word Discovery</td>
<td>90% of Accuracy</td>
</tr>
<tr>
<td>4.</td>
<td>Proposed Smearing Algorithm</td>
<td>94% of Accuracy Expected</td>
</tr>
</tbody>
</table>

Since our technique does not rely on upon the preparation information, we can gauge the obscure kernel from any content area in the given picture (Fig. 6) to estimate the Root Mean Square Error and Angle for the
camera fixed. To delineate this legitimacy, we chose and trimmed two unique districts from the information obscured picture and assessed.

Blur kernel estimation can be regarded as searching the best solution in a large blur kernel space. By constraining the blur kernel, the search range can be greatly reduced, which can significantly improve the robustness of blur kernel estimation. The experimental results demonstrate that such constraints on blur kernels are very effective since our technique does not rely on

![Analysis Chart](image)

**Fig. 6: Analysis Chart of Existing Methods**

The preparation information, we can gauge the obscure kernel from any content area in the given picture (Fig. 6) to estimate the Root Mean Square Error and Angle for the camera fixed. To delineate this legitimacy, we chose and trimmed two unique districts from the information obscured picture and assessed the obscure piece separately. The evaluated parts of two districts are practically same, and the deconvolution comes about show clear messages paying little respect to the content and foundation.

Fig. 6 shows the failure process of the two -rows license plate where error occurs due to inappropriate selection of threshold value for the horizontal smearing. When vertical smearing took place, it will cause all the white pixels (pixel with value 1) to be wiped off. Thus the program cannot be finished as all the characters had been cleared.

Even the license plate provided with frame and location of the license plate can be easily located using Sobel or Canny edge operator, but somehow the characters of the license plate cannot be accurately extracted. The method used such as ‘labelling connected component’ will label each character started from left to the right. It cannot differentiate upper and lower part of the license plate. Thus, the extracted character may carry some errors.

**Limitation Of Smearing Algorithm:**

Smearing algorithm depends on the pixel size that present between the character that are horizontal and vertically. Range of gap to be detected by smearing algorithm is manually set in the program as the threshold value. Hence, the pixel value is present in the image must be restricted to a certain value. Another error that might occur is due to the connected object which will be calculated from and lower part of the license plate.

The advantages of this algorithm are it is independent to the rotation and the bounds found are quite precise. Its disadvantage is that it requires a good image quality and good conversion from the original image to binary image, to avoid making two characters appear as one connected region

**Conclusion:**

There are many methods that can be used to detect and recognize the license plate. In this paper, the flow of procedure is vehicle’s detection, pre-processing, vehicle’s license plate localization, character isolation and template matching. The pre-processing step plays a vital role in preparing the mixed image to be segmented. Smearing algorithm is used in extracting the license plate. Then the characters on the license plate are separated
by isolating every connected component obtained from the vehicle plate. For recognition of characters we used template matching.

From the results and discussion, it can be concluded that smearing algorithm is used to recognize the license plate but it is not hundred percent precise. This may be caused by more factors such as brightness effect, image quality, camera position, distance between the camera and the vehicle and distance between the characters and the insignificant parts of the vehicle’s plate. Besides that, the labeling of connected component method causes a limitation for the two-row license plate. In the real world application, there are also many distortions and noises exist due to the environment. Hence, enhancements need to be added to ensure that the system may run smoothly to overcome the limitations. Further improvements are still needed to be done in order to increase the accuracy and reliability of the system.

REFERENCES