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Restoration of Motion Blurred Images using Non Blind Technique-A Review

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Abstract: Image deblurring and restoration has been of great importance nowadays. Image recognition becomes difficult when it comes to blurred and poorly illuminated images and it is here image restoration come to picture. In this paper, we will examine various existing techniques are compared with the proposed PDE technique using horizontal and are shown that results are of better quality than these techniques. The comparison is done on the basis of the calculated PSNR for different techniques and for various noises.

I. INTRODUCTION

Images are produced in order to record or display useful information. Due to imperfections in the electronic or photographic medium, the recorded image often represents a degraded version of the original scene. The degradations may have many causes, but two types of degradations are often dominant: blurring and noise. The field of image deblurring is concerned with the reconstruction or restoration of the uncorrupted image from a distorted and noisy one.

II. IMAGE PROCESSING

The two types of methods used for Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques.
A blurred or degraded image can be approximately described by this equation

$$K = Hf + n$$

Where the k is the blurred image, the H is the distortion operator also called the point spread function (PSF), f is the original true image, n is the additive noise, introduced during image acquisition that corrupts the image.

A. Point Spread Function (PSF)

the PSF [5] describes the degree to which an optical system blurs (spreads) a point of light. The point spread function (PSF) describes the response of an imaging system to a point source or point object.

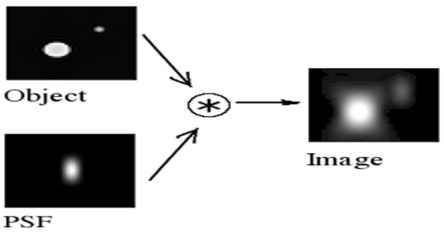

Fig2.1: Point Spread Function

There are different types of blurring like horizontal blurring, vertical blurring and combination of horizontal and vertical blurring.

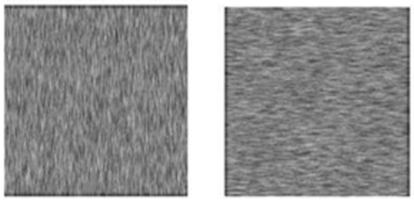

Fig2.2: Vertical & Horizontal Blurred

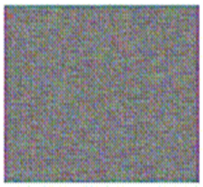

Fig2.3: Combination of Vertical & Horizontal Blurred Image

B. Noises types In Images

1) Shot Noise: Shot noise is a type of electronic noise that occurs when the finite number of particles that carry energy

2) White Noise: White noise is a random signal (or process) with a flat power spectral density.

3) Salt and Pepper Noise: Salt and pepper noise is a form of noise typically seen on images.

4) Gaussian Noise: Gaussian noise is properly defined as the noise with a Gaussian amplitude distribution.

III. DEBLURRING TECHNIQUES

Image restoration is an important issue in high-level image processing. The image restoration techniques are oriented towards constructing the original image from a degraded observation. First is a non-blind, in which the blurring operator is known. And second blind, in which the blurring operator is unknown. There are two methods of image deblurring

A. Blind deblurring *B. Non-Blind deblurring*

B. PDE based Image Deblurring Model

Let vector $\underline{X} \in R^n$, $f : R^n \rightarrow R$ and $\underline{x} = (x_1, x_2, \ldots\ldots\ldots, x_{n)}$ and f is a function of $\underline{X}$. For 1D the object $f(\underline{X}) = x$ and for 2D object i.e. images $f(\underline{X}) = (x, y)$. Let $\underline{V}$ represents the velocity vector of object and $\underline{V} = (v_1, v_2, \ldots\ldots v_n)$ .If object is moving in horizontal direction only then velocity reads as $\underline{V} = v_x$ and if object is under motion in XY-space in both horizontal and vertical directions then velocity vector reads as $\underline{V} = (v_x, v_y)$. If n-dimensional object $f(\underline{X})$ keeps a linear uniform motion at a rate $\underline{V}$ in n-Dim space under the surveillance of a camera. The total exposure $g(\underline{X}, t)$ at any point of the recording medium (e.g., film) is obtained by integrating the instantaneous exposure over the time interval 0<=t<=T during which camera shutter is open.

Observed object for duration T can be modeled as –

$$g(\underline{X}, t) = \int_0^T f(\underline{X} - \underline{Vt})dt$$

IV. REVIEW OF LITERATURE

In this paper "**Sirisha L. Kala**" et.al. [9] Image deblurring is one of the fundamental problems in the field of image processing and computer vision. Deblurring an image and sharpening the features within the image improves the detail and consequently the utility of an image. In the field of image processing one often needs to enhance an image that was blurred or smoothed by some known

operator. It is possible, in some cases, to invert the blurring operator, thereby deblurring or reconstructing the original image. In this paper "**Amir Beck**" et.al. [10] gives gradient-based schemes for image denoising and deblurring problems based on the discretized total variation (TV) minimization model with constraints. A fast algorithm for the constrained TV-based image deburring problem. In this paper **"Martin Welk"** et.al. [12] Deblurring with a spatially invariant kernel of arbitrary shape is a frequent problem in image processing. This problem is addressed by studying non convex variational functional that lead to diffusion-reaction equations of Perona Malik type. In this paper **"E. Nadernejad"** et.al. [13] have compared three recently developed techniques for image enhancement and denoising. These methods are based on the use of partial differential equations, including second order, fourth order, and the complex partial differential.

V. PERFORMANCES PARAMETERS

In this section we discuss the two performance measuring parameters on which the above discussed techniques are compared.

A. MMSE(Minimum Mean Square Error)

In statistics and signal processing first error metrics, a minimum mean square error (MMSE) estimator is an estimation method which minimizes the mean square error (MSE) [27] of the fitted values of a dependent variable, which is a common measure of estimator quality.

B. PSNR(Peak Signal to Noise Ratio)

Second of the error metrics used to compare the various image deblurring technique is the (Mean Square Error and PSNR) Peak Signal to Noise Ratio (PSNR) [28].

$$PSNR = 20 * \log 10(255 / sqrt(MSE))$$

VI. CONCLUSION

Restore motion blurred image using the different methods and compare the results of these methods and as per PSNR value of different methods. Remove noise from blurred images. Restoration motion blurred images using non blind techniques.

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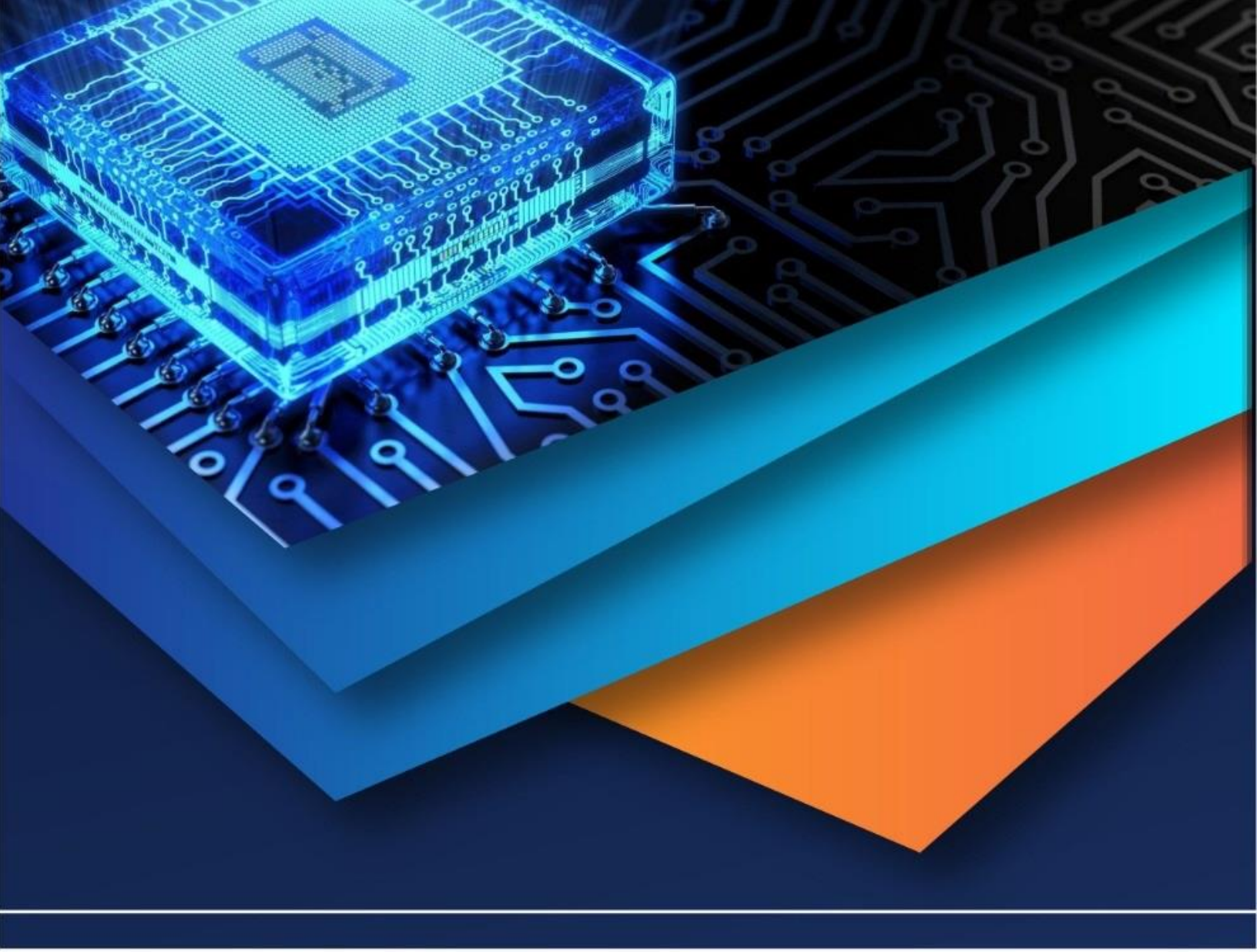

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