



Image Enhancement with Statistical Estimation for Multimodal images

Ramandeep Kaur¹, Khushdeep Kaur²

^{1,2}Department of Computer Science & Engineering, Bhai Maha Singh College of Engineering,
Sri Muksar Sahib, Punjab, India

Abstract: Image restoration is an important issue in high level image processing which deals with recovering of an original and sharp image using a degradation and restoration model. During image acquisition process degradation occurs. Image restoration is used to estimate the original image from the degraded data. Aim of this research paper is to provide a concise overview of most useful restoration models. Using the proposed approach the features of the neighboring pixels are calculated and on basis of these features image is restored. In the end performance evaluation of proposed method is performed based on various parameters like MSE, PSNR, contrast, and coefficient of correlation.

Keywords: Image restoration, Contrast enhancement, GLCM, PSNR, MSE

I. Introduction

Image restoration is a main part of digital image processing, including research on restoration algorithms, and programming of some specific image processing problems. In the processes of image generation, transmission and recording, some distortion and various-degree degradation occur inevitably. The purpose of image restoration is to remove degradation factors of degraded images, and recover it as far as possible. The quality of reconstructed images is judged not only by human subjective feeling, but also by some objective measures, such as squared error between reconstructed image and original image etc. There are many degradation sources in the image system. Some degradation factors affect only some individual gray scale of the image, while some degradation factors blur a spatial area of the image. The former is called point degradation, and the latter is called spatial degradation. There are also degradations caused by digital, display, time, color, and chemical. This paper focuses on image restoration blurred by uniform linear motion. Photos of running cars and flying airplanes are blurred, which is caused by motion of photographed objects. Similarly, if capturing a static object from the running car, the photo is also blurred, which is caused by motion of the camera. In some, the image is blurred if there is enough relative motion between camera and photographed object during photographing. The phenomenon is called motion blur. It is a common problem of image processing, so research on motion-blurred image restoration is a main subject of image restoration. Total variation has proven to be a valuable concept in connection with the recovery of images featuring piecewise smooth components. So far, however, it has been used exclusively as an objective to be minimized under constraints [1]. The filling-in of missing information is a very important technique in image processing. It aims to reconstruct the lost data using correlation between the lost block and its neighbors [2]. In this paper we are comparing various image restoration techniques like Richardson-Lucy algorithm, Wiener filter, Neural Network approach, on the basis of PSNR [4]. A coarse version of the input image is in painted using CDD in painting technique and also by TV in painting technique [10]. Two filling-in techniques are used to restore the damaged image. In the hybrid technique first Probabilistic Recovery Filling-in technique is implemented to find out the distortion in the pixels. In this technique corrupted and missing pixels are founded according to low density of pixels and restored by using information from the surrounding pixels [9.] The hybrid filter is such a tool that makes it successful to remove these noise form images and provide clarity to picture while preserving its details [6]. Probability recovery which will find the corrupted and missing pixels and the probability of recovery on particular pixel is proposed. For corrupted pixels, if probability of recovery of pixel is $< 60\%$ then matching of the pixel from surrounding will be done. If recovery probability of corrupted pixel is $> 60\%$, then matching of the pixel will be done with the remaining part of that particular pixel. For completely missing pixels, finding the missing block process will be carried and matching with surrounding is good option in this case [8]. The paper studies image restoration methods based on Median filter, Lee filter and spatial difference technique, simulates the two methods, and analyses simulation results. It depends on how much we know about original image, information contains in the original image how much the image is degraded, reasons behind the degradations and how accurate our degradation models are and with what accuracy it can be implemented.

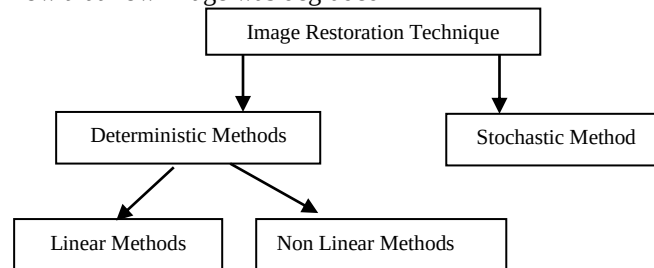
- Image restoration differs from image enhancement in that the latter is concerned more with accentuation or extraction of image features rather than restoration of degradations.

- Image restoration problems can be quantified precisely, whereas enhancement criteria are difficult to represent mathematically.

II. Classification of Image Restoration

Image restoration techniques are methods which attempt the inversion of some degrading process. Image restoration technique can be broadly classified into two types depending upon the knowledge of degradation. If the prior knowledge about degradation is known then the deterministic method of image restoration can be applied. If it is not known then the stochastic method of image restoration has to be employed. Restoration often exhibits arte-facts near the edges, as linear methods are unable to recover missing frequency components which lead to Gibbs effect.

1. **Blind Image Restoration:** This Technique allows the reconstruction of original images from degraded images even when we have very little or no knowledge about PSF. Blind Image Deconvolution (BID) is an algorithm of this type.
2. **Non-Blind Restoration:** This Technique helps in the reconstruction of original images from degraded images when we know that how image was degraded

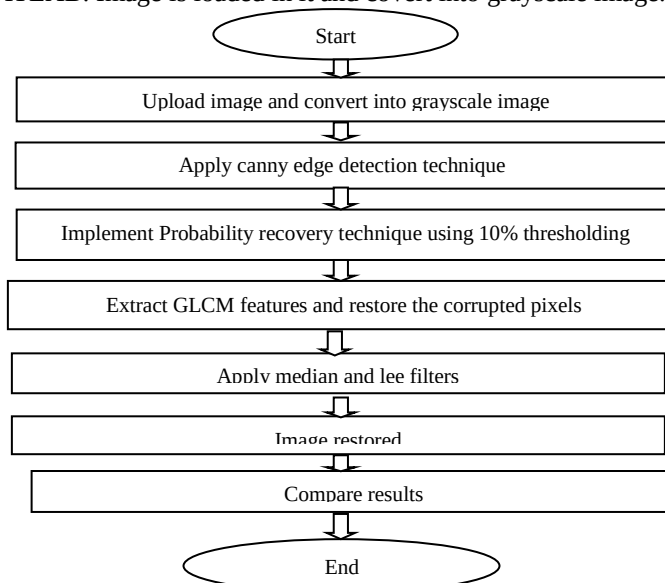


III. Proposed Work

In this paper filling-in technique is used to restore the corrupted or damaged images. In the technique first Probabilistic Recovery Filling-in technique is implemented to find out the distortion in the pixels. Firstly canny edge detection technique is applied to preserve edges in image. Recovery Probability of each pixel is founded. For corrupted pixels, if probability of recovery pixel is $>10\%$ then matching of pixel from surrounding is done. For corrupted pixels, if probability of recovery pixel is $<10\%$, then matching is done from the remaining part of the pixel. If the pixel is missing, finding the missing block process is carried and matching with surrounding is done. After this proposed filling-in technique is implemented in which GLCM (Gray level co-occurrence matrix) is used to scan the properties of image. First window size is set according to GLCM. Each pixel is traced in window block. Features of pixels are scanned and best matching pixels is founded through scanning. Values of corrupted pixel are replaced by best matching pixel. The research will provide better quality of image after recovery. Probabilistic Recovery Filling-in technique removed distortion to large extent by implementing proposed filling-in technique.

IV. Methodology

In the hybrid technique density based approach is implemented to find out the distortion in the pixels. After this approach the proposed technique is implemented to restore the noisy and distorted image. First of all GUI window is created in MATLAB. Image is loaded in it and covert into grayscale image.



Flow Chart

Then noise and blur is added into it. After adding distortion canny edge detection technique is implemented to detect the edges. After filtration, proposed image restoration technique is applied. Recovery Probability of each pixel is founded. For corrupted pixels, if probability of recovery pixel is $>10\%$ then matching pixel from surrounding is done. For corrupted pixels, if probability of recovery pixel is $<10\%$ then matching is done from the remaining part of the pixel. For completely missing pixels, finding the missing block process is carried and matching with surrounding is done. Pixel matching is judged good observations. After this proposed filling-in technique is implemented in which GLCM (Gray level co-occurrence matrix) is used to scan the properties of image. First window size is set to 3×3 . Each pixel is traced in window block. Features of pixels are scanned and best matching pixels is founded through scanning. Values of corrupted pixel are replaced by best matching pixel. After all the operations defined above two filters namely median filter and lee filter is applied. Median filter is better able to remove these outliers without reducing the sharpness of the image. Output of median filter is given to Lee Filter. Lee filter further filters the image.

V. Results and Discussion

In this section the results of the proposed approach is defined so that we can compare it with existing system and validate it.

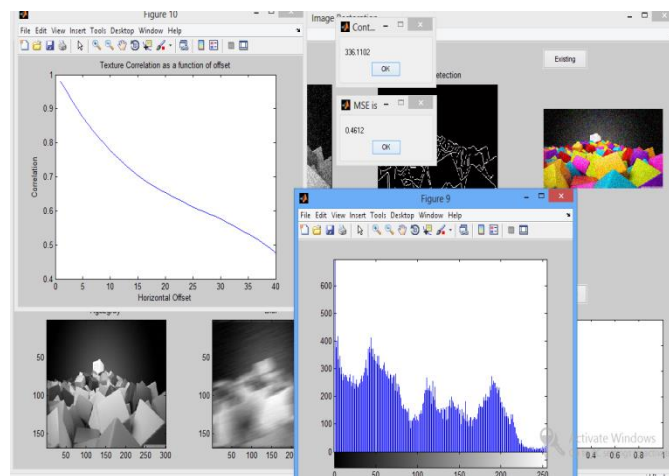


Fig. 2: Existing System

Figure 2 is the presentation of the existing system which restore the image and values generated using this approach are defined as MSE is: 0.46 and that of contrast is: 333. 28

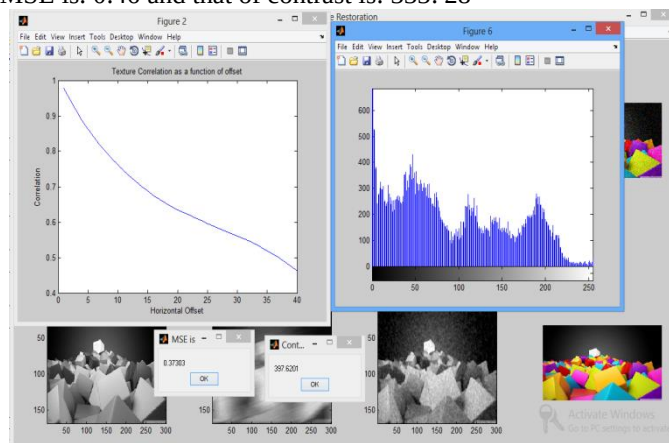


Fig. 3: Proposed System

Figure 3 is the presentation of the proposed system which restore the image and values generated using this approach are defined as MSE is: 0.37 and that of contrast is: 398.16. A comparison table for both the approaches is defined as follows:

Technique	Existing	Proposed
Parameters		
MSE	0.46	0.37
Contrast	333.28	398.16

Table 1: Comparative Study

In the table 1 a comparative study on the basis of MSE and Contrast is defined. From the above defined table it can be validated that the proposed approach is better than that of existing one.

VI. Conclusion & Future Scope

Image Restoration is the process of removal or reduction of degradation in an image through linear or non-linear filtering. Degradations are usually incurred during the acquisition of the image itself. The aim of image restoration is to bring the image what it would have been if it had recorded without degradation. In the current research the drawback of the existing restoration methods are reduced. In the proposed research the a method is developed for restoration in which the image can resist to the noise and any other distortion, so that it can contains the property that it possessed in the original stage. In the proposed research if any distorted image is uploaded then it restores the image to near to its original stage using the proposed thresholding concept. Using the defined approach the results are much better than that of existing approach as defined and validated in the results and discussion section.

Because the above technique is mainly concerned with the additive type of noise and the ringing effect, therefore in future scope, using this technique in the multiplicative noise can enhanced the image features in any type of distortion.

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