Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X
IMPACT FACTOR: 6.017

IJCSMC, Vol. 6, Issue. 6, June 2017, pg.390 – 393

IMAGE RESTORATION AND THE VARIOUS RESTORATION TECHNIQUES USED IN THE FIELD OF DIGITAL IMAGE PROCESSING

Ishfaq Bashir[1], Adil Majeed[2], Owais Khursheed[3]

[1]Student, Computer Science Engineering, Kashmir University, Kashmir, India, heemjan@gmail.com

[2]Student, Computer Science Engineering, Kashmir University, Kashmir, India, aadelmajid@gmail.com

[3]Assistant Professor, Computer Science Engineering, Kashmir University, Kashmir, India, okhursheed@gmail.com

……..……..***……

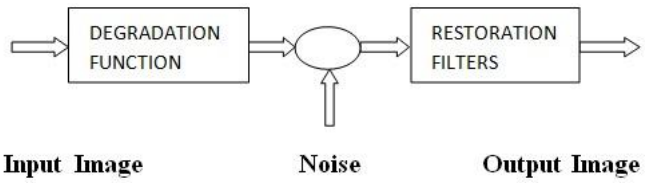
Abstract: The field of digital image processing deals not only with the extraction of features, analysis of images and restoration of images but also with the process of enhancement, filtering and restoration of images. Image restoration is one of the basic steps of processing that deals with making certain improvements in a digital image based on some predefined criteria .The prime objective of restoration is to build or reconstruct an image that has been degraded based on some prior knowledge regarding the phenomena of degradation of images .The process of restoration is objective in nature that is; it aims at a specific goal like removal of blur in an image by means of a deblurring function .The techniques that are used in the restoration of images can be formulated in spatial domain or in frequency domain. Image restoration is based on probabilistic models of image degradation. Thus image restoration tends to make the images look better in appearance.

Keywords: restoration, IBD, median, de-convolution, wiener

1. INTRODUCTION

Image processing is a technique in which we enhance the data (raw images) sensed from the sensors placed on different artifacts of the life for various specified applications. The result is of greater quality as the objects are clearly visible as compared to the original sensed image. There are various fundamental steps involved in the image processing that is representation of images, pre-processing of images, enhancement, restoration, analysis, reconstruction of images and image data compression.

Image Restoration: The concerns of the image restoration are the removal or reduction of degradations which are included during the acquisition of images e.g.; Noise, pixel value errors, out of focus blurring or camera motion blurring using prior knowledge of the degradation phenomenon. This means it deals with the modelling of the degradation and applying the process (inverse) to reconstruct the image. The image restoration has got a wide scope of usage.



The purpose of image restoration is to compensate for or undo effects[1].

The orientation of the image restoration techniques is towards modelling the degradations such as blur and noise which involves the applications of various filters to obtain the original scene approximation[3].

Input image is degraded by a degradation function say h(x,y) and channel transmission noise n(x,y), degraded image g(x,y) can be obtained. In mage restoration the target is to obtain the approximate target to the input. The blurred image can be described with the following equation [2].

$g(x,y) = h(x,y) * f(x,y) + n(x,y)$

2. RESTORATION TECHNIQUES

2.1 Median Filter

This is the statistical method as implied by the name .In this method pixel value is replaced by the median of the pixels in the neighbourhood found .The usage is to remove the salt and pepper noise .It is used widely and can reduce the noise in the images excellently. This filtering removes the noise but keeps the edges. This tends to overcome the image to become blur and that is its advantage over the smoothing model.

	10	5	20				
	14	80	11				
	8	3	22				

3, 5,8.10,11,14,20,22,80

Median (central value 18 is replaced by 11)

2.2 Adaptive Filter

In adaptive filter behaviour changes based on statistical characteristics of image inside the filter region. It is that type of linear filter which has a transfer function controlled by a variable parameter. For removal of impulse noise in images these filters use the colour and gray space in comparison to other filters .It has best noise suppression results, preserve edges in better way and hence yield better quality.

2.3 Linear Filters

In this, we replace each pixel by the linear combination of its neighbours. The operations that are implemented include sharpening, smoothing and edge enhancement. This type of filter has its implementation in salt and pepper noise and Gaussian noise[6].

2.4 IBD(Iterative Blind De-convolution) method

This technique was given by Ayers and Dainty (1988).It is a method of blind de-convolution. In this method Fourier transform is calculated which causes less computation.

In this method image recovery is done by (little or no) prior knowledge of PSF (Response of an imaging system to a point source or point object (point spread function)). It results in high resolution and Quality. The drawback of this method is that convergence is not guaranteed.

2.5 Non Negative and Support Constraints Recursive Inverse Filtering (NAS-RIF)

This filtering technique was put forward by D.kunde, The aim is to reconstruct a reliable estimated image from a blurred image. In this algorithm estimation of the target image is made. Error function is minimized to make the estimate which contains the domains of image. The advantage is that we only need to find support domain of target area and need to be cautious such that the estimation obtained will be positive.

2.6 Super-Resolution Restoration Algorithm based on Gradient Adaptive Interpolation

The basic idea is that the local gradient of pixel affects the interpolated pixel value, in the edgy areas of the image . The influence is inversely proportional to the local gradient of a pixel. In this method three subtasks are involved: registration, fusion and de-blurring. Low computation complexity is the advantage of this algorithm[5].

2.7 Deconvolution Using a Sparse Prior

Deconvolution problem is formulated in this algorithm as given by the observation which determines the maximum a-posterior estimate of the original image. Furthermore, a prior enforcing spatial-domain of the image derivatives is exploited in the algorithm. It has been successfully applied to raw images.

2.8 Block Matching

In Block matching high correlation containing blocks are used because its accuracy is significantly affected by the presence of noise. A block-similarity measure is utilized which performs a coarse initial de-noising in local 2D transform domain. or blur is removed from each block in this method by dividing the image into blocks.

2.9 Wiener Filter

Wiener filter includes both the degradation function and statistical characteristics of noise into the restoration process. The main objective of the method is to find an estimated value of the uncorrupted image value such that the mean square value between them is minimized. The drawback of inverse and pseudo inverse filtering is that they are noise sensitive. But wiener filtering is not noise sensitive .so this is the advantage of the wiener filtering. Its response is better in presence of noise. [4]

2.10 Deconvolution using Regularized Filter (DRF)

It is another category of Non-Blind Deconvolution technique. When smoothness like constraints are applied on the image recovered and limited information of noise is known, then this techniques can be used effectively. Using a regularized filter, by constrained least square restoration, the degraded image is actually restored.

2.11 Lucy- Richardson Algorithm Techniques

The image restoration is divided into blind and non blind de convolution. In non blind PSF is known. The Richardson–Lucy is the most popular technique in the field of astronomy and medical imaging .The reason of popularity is its ability to produce reconstructed images of good quality in the presence of high noise level. Lucy and Richardson found this in the early 1970's from byes theorem. Lucy Richardson is nonlinear iterative method. This method is gaining more acceptance than linear methods as better results are obtained here. The inverse Fourier transform of Optical Transfer Function (OTF) in the frequency domain is the PSF, where OTF gives linear, position-invariant system the response to an impulse. The Fourier transfer of the point (PSF) is OTF[7].

3. APPLICATIONS OF RESTORATION

1. In the area of astronomical applications characterized by poisson noise, Gaussian noise; image restoration has played a very important role in the area of imaging.

2. SR technique is also useful in medical imaging such as computerised tomography(CT) and magnetic resonance imaging (MRI) Since resolution while the resolution quality is limited the acquisition of multiple images is possible. This can help the surgeon to operate more successfully over the exact part of the body with care.

3. Over the multispectral bands of satellite imagery , multispectral image restoration can be carried out in order to improve the resolution of the captured satellite images.

4. To enhance the HR of the mobile camera.

5. In order to improve the video resolution, the motion blur estimation can be performed in the real time video image processing applications.

4. CONCLUSION

Restoration of images is a difficult problem to resolve. The main objective of this work is to carry out a comparative study. Though every technique has got its own way of dealing with the problem and have their own pros and cons. It is concluded from the above explanations that usage of the techniques is governed by the understanding, requirement and the standard of the output needed. Before the application of the any filtering technique; it is supposed to have the better understanding that is it requires proper analysis, though some of the researches have categorically claimed that wiener and Lucy-Richardson are expected to give the better results.

REFERENCES

[1] Er.Neha Gulati, Er.AjayKaushik, "Remote Sensing Image Restoration Using Various Techniques", International Journal of Scientific & Engineering Research, Volume 3, Issue 1, January-2012 1 ISSN 2229-5518.

[2] Er. Priya Tiwari, Dr. Naveen Dhillon and Er. Kuldeep Sharma.Vol.3, no. 4, 1.July 2013.Analysis of Image Restoration Techniques for Developing Better Restoration Method.

[3] Charu Khare ,Kapil Kumar Nagwanshi. Vol. 39, February, 2012. Image Restoration Technique with Non Linear Filter

[4] M.B kathale ,A.S Deshpande "Restoration using statistical modelling" IJRET eISSN:2319-163|pISSN:2321-7308

[5] Giacomo Boracchi and Alessandro Foi. Vol. 21, no. 8, August 2012. Modelingthe Performance of Image Restoration from Motion Blur. IEEE Transaction on image processing.

[6] Mathri thakur, Shilpa Chadury.Volume 14 Number 4 – Aug 2014.Image Restoration Based On Deconvolution by Richardson Lucy Algorithm. International Journal of Engineering Trends and Technology (IJETT).

[7] R.Pushpavalli1 and G.Sivarajde2.Vol.4, No.2, April 2013.A hybrid filtering technique for eliminating uniform noise and impulse noise in digital image Signal & Image Processing. An International Journal (SIPIJ) .

BIOGRAPHIES

Ishfaq Bashir is pursuing B.E Degree from SSM **Col**lege of Engineering & Technology in Computer Science Engineering from University of Kashmir, J&K, India. The field of interest is Digital image processing.

Adil Majeed Bhat is pursuing B.E Degree from SSM College of Engineering & Technology in Computer Science Engineering from University of Kashmir, J&K, India. The field of interest is Digital image processing.

Mr. Owais Khursheed is the Assistant Professor at SSM College of Engineering and Technology in the department of Computer Science Engineering, University of Kashmir, J&K, India. The fields of interest are Computer Graphics, Programming and Networking.

