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Non-Local Image Restoration using Orientation Optimization by Means of Genetic Algorithm

Ramandeep Kaur, Tejinder Thind

***Abstract*— As we know image de noising is a main part of almost every image processing devices so it's better to have good algorithm to get good quality of image even after de noising that using some algorithm. Many researchers are doing work in this field to recover pixel lost in given RGB image. We are going to present a noble approach for restoration of pixels in image using optimizing its pixel orientation by means of GA (genetic algorithm). We implement orientation analysis for whole image using genetic algorithm and make unmatched orientation to its best optimized orientation to enhance image PSNR and MSE. This paper presents GA as an efficient algorithm comparable to the original non local means algorithm used for denoising.**

***Index Terms*—GA, MSE, PSNR, SAIST**

I. INTRODUCTION

The graphical representation or capturing of any living or non-living thing into 2D for which is a part of this real world is called an image. Capturing of an image lead to fluctuations in its quality. There are various reasons of degradation of an image that may be due to faulty hardware, backlight environment or strong illumination etc. So there is a need to restore the originality of these degraded images. But image restoration depends upon the complexity of degradation. Accordingly different techniques are practiced depending on the problem of degradation. Major factors of degradation are noisy artifacts introduced during capturing of an image or during transmission.

A. Algorithm

GAs are adaptive heuristic search algorithms which follows the process of natural evolution. It provides solutions for optimization problems using methods of natural evolution like inheritance, mutation, selection, crossover etc. Our goal is to enhance the quality of an image by removing noise artifacts and recovering incomplete data.

GA is the technique which performs well in case of scare information and is efficient solution if the sample size increases. [8]

B. Figures

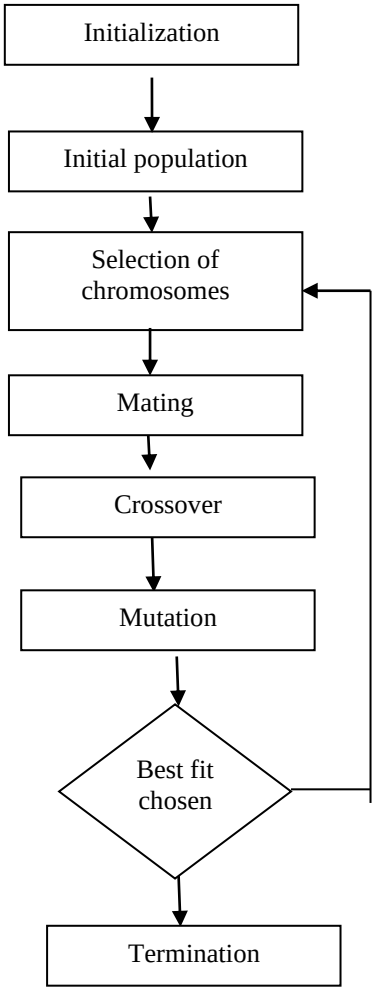

Fig1. Process of Genetic Algorithm

II. REVIEW OF TECHNIQUES AND RELATED WORK

David Corrigan, Anil Kokaram and Naomi Harte 2011 IEEE emphasized on tearing of frames. [2]In films, some frames face the problem of tear.

Tearing of frames lead to relative shift between the regions on either side of tear boundary of frame and it also affects image data along the tear boundary. This paper describes a method to sketch out or trace the tear boundary and provide procedures to correct the displacement occurred between the regions of the frame. Displacement is corrected by graph cut segmentation framework and damaged image data is recovered by using a missing-data treatment solution i.e. using any dirt and sparkle removal algorithms.

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***Correspondence Author(s)**
Ramandeep Kaur, Computer Science & Engineering, Lovely Professional University, Jalandhar, India.
Prof. Tejinder Thind, Computer Science & Engineering, Lovely Professional Universit,y, Jalandhar, India.

Jianjun Zhang 2011 IEEE [3] presented an idea about restoring binary images. Very little attention is provided for restoring binary images. Binary images include text images, line art, handwritten signatures, bar codes, vehicle license plates etc. Binary restoration is essential they are needed frequently in automatic recognition and for identification purposes. This paper emphasizes on two main causes of degradation i.e. blurring and noise. Blurring is caused by optical deviations, motions between the object and the camera whereas noise is caused by faulty camera sensors, hardware problems or due to noisy channels. This paper describes the problem of restoring binary images because of its combinatorial nature. The proposed algorithm in this paper is a fast alternating minimization algorithm for resolving this difficulty by using a new variable which enforces the image to be binary.

Yuquan Xu, Xiyuan Hu, Lu Wang, Silong Peng 2012 IEEE[5] This paper deals with the problem of motion blur. It is difficult to restore blur images if blur kernel and sharp image are unknown. This paper presents an algorithm for removing motion blur by first decomposing the image and then applying the image deblurring process. Image deblurring process uses the alternative iterative mechanisms which estimate the kernel and restore the original sharp image. Image is decomposed into cartoon and texture components. If the whole image is restored using deblurring process, it would be difficult to estimate kernel accurately in the beginning of the iteration as there would be many ringing and noise artifacts in the restored image

Chanwoo Chun and Jung-Young Son [6] gave an idea about 2D-barcode images. The 2D-barcode image is used in various applications and it faces the blurring problem so it is very essential to restore these binary images. This paper deals with the blurring problem which takes place in binary images. Blurring is caused by diffraction and deviations of the imaging optics and problems of detector array. This paper presents an algorithm which uses pilot pattern to estimate PSF. It applies MMSESIC technique to decide the binary pixel value of the image.

Ui Seong KIM, Jeong Ho LEE, Ki Tae PARK, and Young Shik MOON, Member, IEEE [4] This paper emphasizes on the degradation of quality of an image due to strong illumination or back-light environments. It deals with restoring original colors and textures of an image. Firstly, this paper describes an image enhancement method named 'Histogram Equalization' which is used to adjust contrast by using image's histogram. But this method does not produce desirable effects. So this paper describes the second image enhancement method named 'Retinex' which is used to enhance low contrast images. But this method leads to color shifting problem, i.e. color tone changes. So to reduce this color shifting problem, this paper proposed a novel color restoration method using color projection technique. This method involves two steps.

In the first step, low contrast images are enhanced by a multi-scale retinex method and in the final step, mapping is done between the pixels of the enhanced image with the corresponding pixels of the input image and then color restoration is performed.

Chao Wang, Lifeng Sun, Peng Cui, Jianwei Zhang, and Shiqiang Yang [1] This paper focuses on removing various kinds of image blurs in order to get a sharper image. Generally blur is the result of many properties of a camera and a scene like focal variation, depth, Camera translation, camera roll, object movements etc. This paper presents three methods to restore blur images. The first method is 'The deterministic Sharpening filter'. Due to its limitations, the second method 'Bayesian estimation' is used. But this method did not produce desirable results, so the third method called 'CODA' which uses the both previous methods in a conjunctive manner

Weisheng Dong and Guangming Shi and Xin Li [7]

This paper focuses on the restoration of non local images affected by noise factors. It emphasizes on using low rank approaches like SVD based approach or mechanisms of non local image denoising. Three denoising algorithms are presented in paper and fourth denoising algorithm is proposed in the paper which provides better performance compared to the previous three algorithms.

BM3D, LSSC, CSR are the three denoising algorithms. Their PSNR value determines the

performance, and checking their PSNR value proves that LSSC and CSR gives better denoising performance compared to BM3D. The proposed algorithm presented in this paper is SAIST which gives highest PSNR value and thus gives more significant results as the noise level increases.

SAIST uses the low rank approach, i.e. SVD based so as to model on similarity in images. In this process, the left multiplying and the right multiplying matrices of SVD provides local variation in the row space and non local variations in the column space respectively.

III. PROBLEM FORMULATION

Various denoising algorithms have been used to remove noise to a greater extent. To be specific, the state of the art image restoration techniques used in non local images produce good results but not the optimal ones. There is still plenty of room for further improvement, i.e. how to choose patch size and neighborhood size? And how to develop an efficient solution if sample size increases? [7]

IV. PROPOSED WORK

The method proposed to resolve the given noise problem efficiently is by orientation optimization using GA. The main goal of this paper is to enhance the quality of an image by diminishing noisy artifacts from the image. To achieve this goal, the paper demonstrates the GA technique to enhance PSNR and MSE to the maximum than current leading techniques.

There was a need of the proposed algorithm due to following reasons:-

a) For achieving good quality measure than leading methods.
b) Need of computationally more efficient solution to large sample, i.e. provide scalability if the noise level increases to great extent and there is a large amount of missing data.
c) Need of less computational complexity
d) Need to eliminate or minimize error rate to greater extent.

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V. CONCLUSION

Different non local image restoration techniques have been employed till now but they still do not produce optimal results. Every technique has its own pros and cons. SAIST technique performs well for restoring these images but still there is a need of higher PSNR value to have clearer image. So these techniques of evolutionary computation produce better results. In future, we will work on its design and implement this method.

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AUTHOR PROFILE

Ramandeep Kaur, student of Lovely Professional University, Jalandhar Pursuing M.tech (CSE). She has received B.Tech Degree from HPU, Shimla 2011

Tejinder Thind is Asst. Prof. of Lovely professional University, Jalandhar. He has received his MCA MCAFrom degree from GNDU, Amritsar in 2001and M.Tech From Punjabi University, Patiala in 2004. In his research area he has published two international and one national paper

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