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Image Enhancement by Adaptive Filter with Ant Colony Optimization

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Abstract*— *The principal aim of the image enhancement technique is to modify the attributes in an image to make it more suitable for the given task and specific purpose. During the enhancement process the number of attributes to be modified varies from one to more. Digital image enhancement techniques provide the wide range of choices for improving the visual quality of image. The suitable choice of the technique to be applied is influenced by the imaging equipments, task in hand and viewing conditions. In this paper we use approach for image enhancement using weirner filter which optimize by met heuristics like ant colony optimization (ACO).Results is significance improve PSNR improve up to 28.56 and MSE reduce up to 2.54

Keywords— ***Image enhancement, weirner, ACO, PSNR, MSE.***

I. INTRODUCTION

Image enhancement processes are basically a set of techniques that seek to improve the interpretability or perception of images for the human viewers and providing better input for the automated image processing techniques. The principal aim of the image enhancement technique is to modify the attributes in an image to make it more suitable for the given task and specific purpose. During the enhancement process the number of attributes to be modified varies from one to more. Digital image enhancement techniques provide the wide range of choices for improving the visual quality of image. The suitable choice of the technique to be applied is influenced by the imaging equipments, task in hand and viewing conditions. This is important to note that the image enhancement is a subjective area of image processing. Image processing is a method in which certain operations are applied on digital image in order to extract some useful information. It involves number of phases in which image enhancement is one of them. It refers to sharpening the image features such as manipulating contrast for clear visibility, enhancing boundaries. Image Enhancement is done without the knowledge of image degradation. If the degradation is known, it is referred to as image restoration. Many different methods are used for improving the quality, generally elementary and the heuristics method.

Methods of enhancing image series with the use of motion information determined by a various motions investigation techniques. Firstly, multiple moving objects are identified and tracked with the use of a large spatial region and a large temporal region and without presuming any temporal motion constancy. The motion which are use to estimate the motion of the objects are 2-D parametric motions in the image plane alike affine and projective transformations. Once the object has been identified and segmented, it can be enhanced by filling-in occluded region and also by progressing the spatial resolution of their images.The principal objective of image enhancement is to process a given image so that the result is more suitable than the original image for a specific application. It accentuates or sharpens image features such as edges, boundaries, or contrast to make a graphic display more helpful for display and analysis. The enhancement doesn't increase the inherent information content of the data, but it increases the dynamic range of the chosen features so that they can be detected easily.

The goal of digital image enhancement is to produce a processed image that is suitable for a given application. For example, we might require an image that is easily inspected by a human observer or an image that can be analysed and interpreted by a computer. There are two distinct strategies to achieve this goal. First, the image can be displayed appropriately so that the conveyed information is maximized. Hopefully, this will help a human (or computer) extract the desired information. Second, the image can be processed so

that the informative part of the data is retained and the rest discarded. This requires a definition of the informative part, and it makes an enhancement technique application specific. Nevertheless, these techniques often utilize a similar framework.

Enhancements are used to make it easier for visual interpretation and understanding of imagery. The advantage of digital imagery is that it allows us to manipulate the digital pixel values in an image. Although radiometric corrections for illumination, atmospheric influences, and sensor characteristics may be done prior to distribution of data to the user, the image may still not be optimized for visual interpretation.

II. LITERATURE REVIEW

Mitra Basu [1]: The Gaussian filter has been used broadly in image processing and computer vision for many years. In this analysis paper, they discuss the several features of this operator that make it the filter of choice in the area of edge detection. Although these enticing features of the Gaussian filter, edge detection algorithms which use it suffer from many problems. We will review various linear and nonlinear Gaussian-based edge detection techniques.

Stanley Osher and L. I. Rudin [2]: Shock filters for image enhancement are developed. The filters use new nonlinear time reliant partial prong equations and their discretizations. The expansion of the initial image u0(x, y) as t -- oo into a constant state solution uOO(x, y) through u(x, y, t), t>0, is the draining process. The partial differential equations have solutions which delight a maximum principle. Furthermore the total deviation of the solution for any fixed t> 0 is the same as that of the initial data. The processed image is piecewise smooth, no oscillatory, and the jumps appear across zeros of an elliptic operator (edge detector). The algorithm is relatively fast and easy to program.

N. Senthilkumaran and R. Rajesh [3]: Soft Computing is an emerging field that subsists of complementary component of fuzzy logic, neural computing and evolutionary computation. Soft computing techniques have formed broad applications. One of the most significant applications is edge detection for image segmentation. The process of partitioning a digital image into multiple regions or sets of pixels is called image segmentation. Edge is a boundary between two homogeneous regions. Edge detection refers to the process of identifying and locating sharp discontinuities in an image. In this paper, the primary aim is to analysis the theory of edge detection for image segmentation using soft computing approach based Fuzzy logic, Genetic Algorithm and Neural Network. This paper mainly focuses on the study of soft computing approach to edge detection for image segmentation. The soft computing approaches namely, fuzzy based approach, Genetic algorithm based approach and Neural network based approach is tested on a real life example image of nature scene and the output show the effective of image segmentation.

Qinchun Qian [4]: Computational photography is presently a speedily developing and cutting-edge topic in applied optics, image sensors and image processing fields to go beyond the limitations of classical photography. The modernization of computational photography allows the photographer not only merely to take an image, but also, more necessarily, to perform computations on the captured image data. Good examples of this modernization include high dynamic range imaging, focus stacking, super-resolution, motion deblurring and so on. Although extensive work has been done to explore image enhancement method in each subfield of computational photography, attention has seldom been given to study of the image enhancement method of together extending depth of field and changing range of a scene. The research present an algorithm which combines focus stacking and high dynamic range (HDR) imaging in order to produce an image with both extended depth of field (DOF) and dynamic range than any of the input images. In this dissertation, also investigate super-resolution image restoration from multiple images, which are possibly degraded by large motion blur. The offered algorithm potent the super-resolution problem and blind image deblurring problem in a unified framework. The blur kernel for each input image is severally estimated.

Y. J. Zhang [5]: This paper studies distinctive techniques offered so far for segmentation interpretation. Most techniques can be categorized into three groups: the analytical, the empirical goodness and the empirical discrepancy groups. Each group has its own characteristics. After a brief explanation of each technique in every group, some comparative discussions about different techniques groups are first carried out. An experimental comparison for some empirical (goodness and discrepancy) techniques generally used is then performed to provide a rank of their evaluation abilities. In addition, some special techniques are also discussed. This study is helpful for an appropriate use of existing assessment technique and for improving their performance as well as for consistently designing new evaluation techniques.

III. RESULTS AND DISCUSSION

Table 3.1 : Weirner +ACO Filter

Images	PSNR	MSE	Quality
Lena	25.23	8.23	56
House	23.45	5.67	53

Barbara	25.67	8.12	54
Boat	23.56	7.34	56.45
Cameraman	20.56	6.34	58.67
hill	26.78	4.56	54
Montage	28.56	2.54	54.34

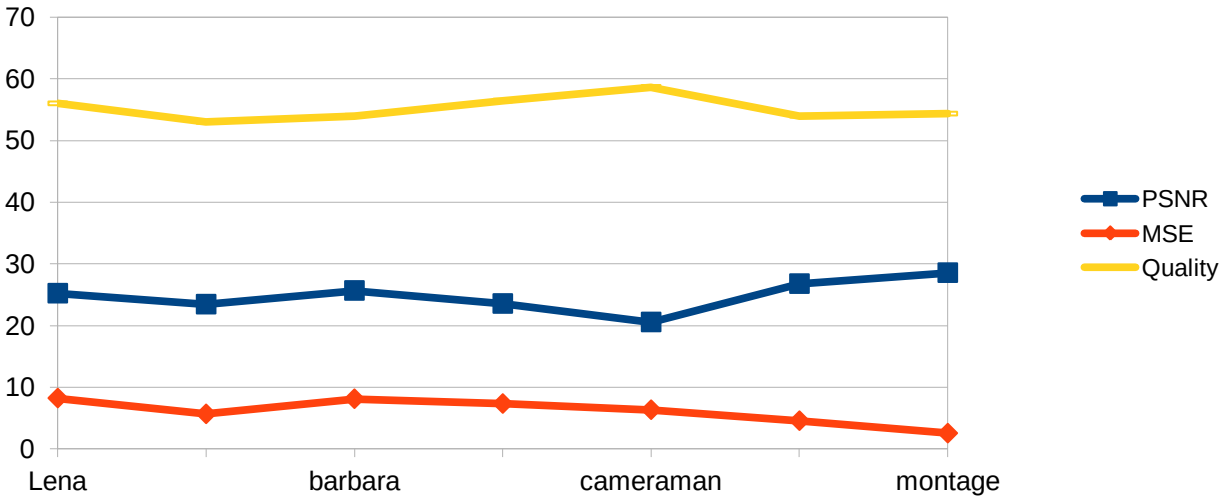

Fig. 3.1: Response of weirner+ACO Graph

Table 3.2 : Weirner Filter

Images	PSNR	MSE	Quality
Lena	12.45	28.23	53
House	14.56	15.67	45
Barbara	12.34	18.12	56
Boat	15.67	27.34	34
Cameraman	12.56	16.34	32
Hill	16.76	14.56	35
Montage	18.96	12.54	36

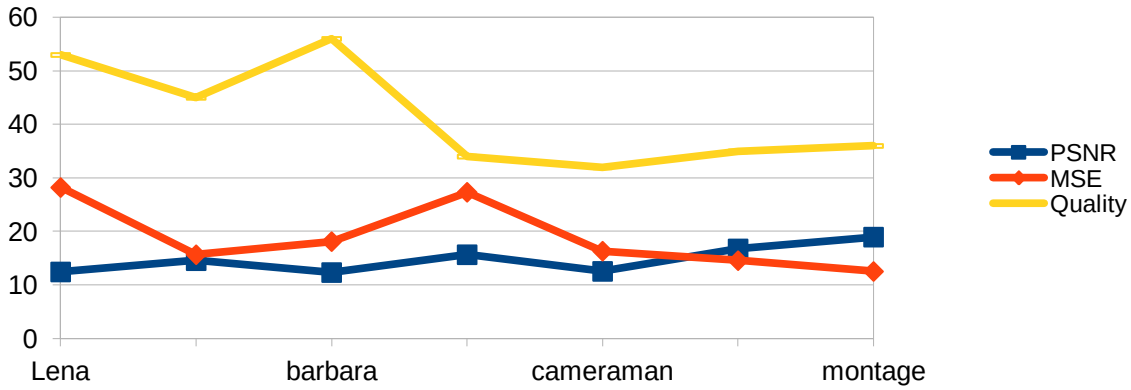

Fig. 3.2: Response of weirner Graph

Table 3.3 : Guassian Filter

Images	PSNR	MSE	Quality
Lena	9	38.23	34
House	10.34	25.67	35
Barbara	12.2	28.12	32
Boat	10.45	37.34	45
cameraman	8.98	36.34	23.45
hill	5.6	44.56	32
Montage	15.67	22.54	23

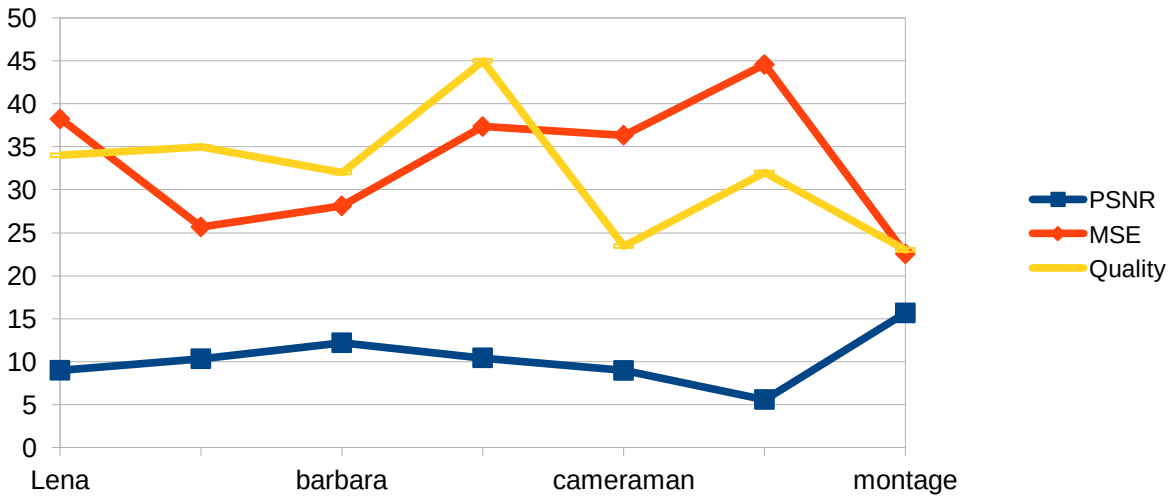

Fig. 3.3: Response of Guassian Graph

Table 3.4 : weirner +ACO and weirner filter in Gaussian noise with PSNR

Images	PSNR(wA)	PSNR(w)	PSNR(G)
Lena	25.23	12.45	9
House	23.45	14.56	10.34
barbara	25.67	12.34	12.2
boat	23.56	15.67	10.45
cameraman	20.56	12.56	8.98
hill	26.78	16.76	5.6
montage	28.56	18.96	15.67

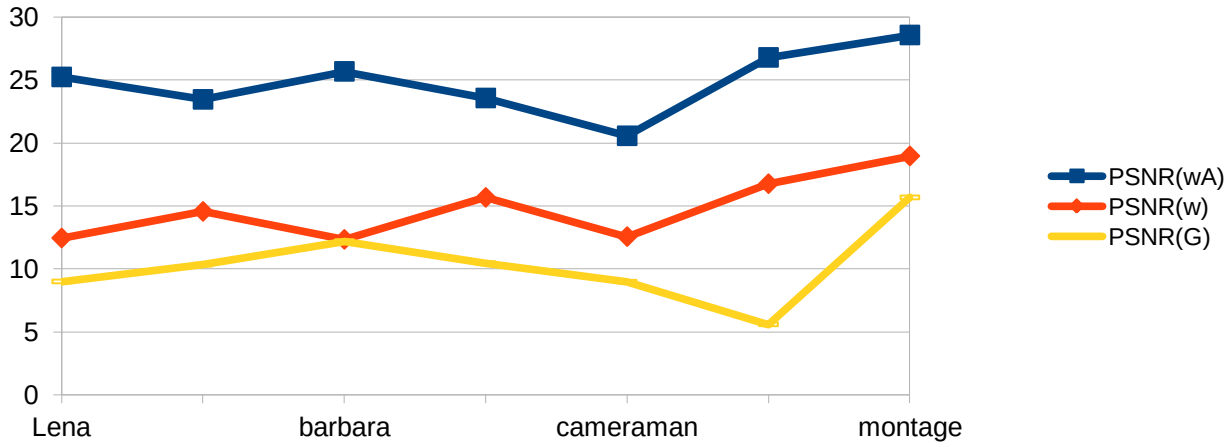

Fig. 3.4: Response of weirner +ACO and weirner filter, Gaussian Filter on the basis of PSNR.

Table 3.4 : Weirner +ACO and weirner filter in Gaussian noise with MSE

Images	MSE(wA)	MSE(w)	MSE(G)
Lena	8.23	28.23	38.23
House	5.67	15.67	25.67
Barbara	8.12	18.12	28.12
Boat	7.34	27.34	37.34
cameraman	6.34	16.34	36.34
Hill	4.56	14.56	44.56
Montage	2.54	12.54	22.54

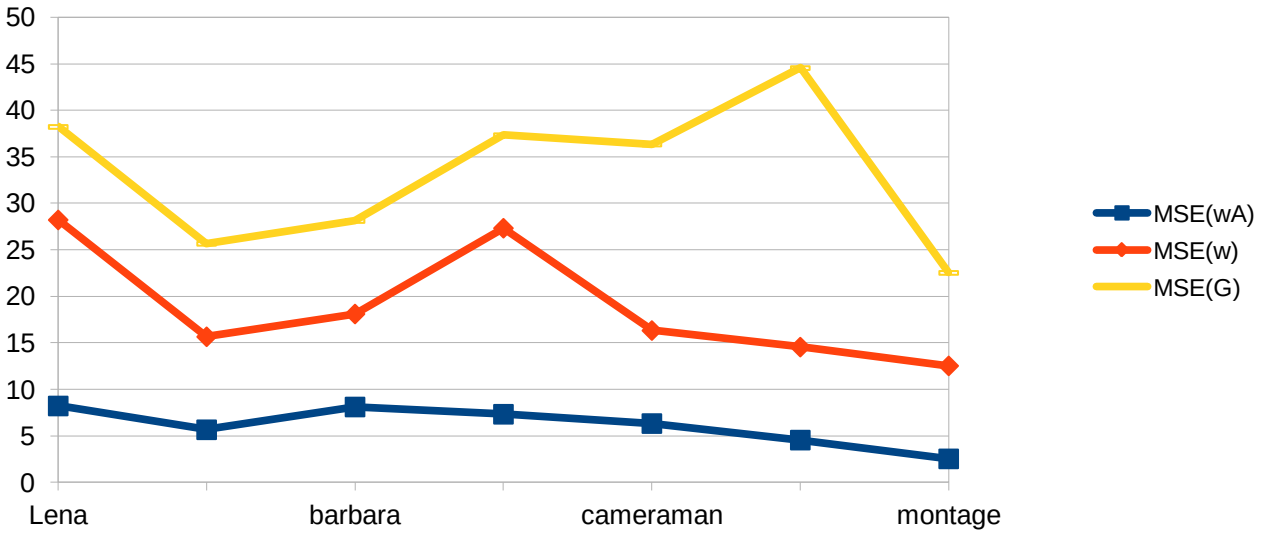

Fig. 3.5: Response of weirner +ACO and weirner filter, Gaussian Filter on the basis of MSE.

III CONCLUSIONS

Enhancements are used to make it easier for visual interpretation and understanding of imagery. The advantage of digital imagery is that it allows us to manipulate the digital pixel value in an image. Although radio metric correction for illumination, Atmospheric influences, and sensor characteristics may be done prior to instruction of data to the user, The image may still not be optimized for visual interpretation.

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