Image Denoising using 2D FIR filter designed with BCSO

Salman Ali[1], Shubham Yadav[2]
Department of electronics and Telecommunication Engineering
[1, 2] Kalinga University, Raipur, Chhattisgarh

Abstract- *Digital images are often corrupted by additive noises during transmission. Thus, how to alleviate noise as much as possible has received concerns for decades. In this paper, we present a simple denoising method based on two dimensional (2-D) finite impulse response (FIR) filtering, where by Binary Cat Swarm optimization (BCSO) algorithm, Images are corrupted by random and unnecessary variations in intensity values called Noise. Image denoising still remains a fact of risk because noise removal can result loss of details and can causes blurring of the images. Image denoising is a process of correction and modification in image so that the resultant image is well suited for further analysis by human or machine. Wavelet parameter transformation is done for filtering. By using hybrid differential evolution algorithm 2D FIR filter is designed. Two dimensional impulse response are designed to filter different types of pixel On the bassis of optimization criteria denoised image will be obtained.*

Keywords *- 2-D FIR Filter, PSNR, SSIM, DE, Image Denoising, BCSO Algorithm, HDE*

I. INTRODUCTION

Images are corrupted by random and unnecessary variations in intensity values called noise due to non perfect camera acquisition or environmental conditions. Different factors may be responsible for introduction of noise in the image insufficient light levels and sensor temperature may introduces noise in the image ,the image may also corrupted due to interference in the transmission channel, the noise in the image can also be introduced if dust particles are present on the scanner screen. Filtering in an image processing is a basic function that is used to perform many task such as noise reduction. One conventional way to remove noise is to employ spatial filters, which can be further divided into two categories. The first one category is linear spatial filters, such as mean filter and Wiener filter . Mean filter is a sliding window spatial filter that replaces the center value in the window with the average of all the neighboring pixel values together with itself. The larger the size of mask, the more noise filtered, but the more blurred of the image. Wiener filter is a adaptive filter, which is based on assumption that the signal and noise are stationary linear stochastic processes with known spectral characteristics or known cross-correlation and autocorrelation. However, it may cause the unwanted smoothing of the image details since the nature images usually contain smooth areas, textures and edges. Similar to the mean filter, the non-linear spatial filter, such as median filter, replaces the center pixel of the window with the computed median]. In recent, the improved filter, such as weighted median filter, relaxed median filter are proposed. In this paper, we focus on the low pass filtering approach on image denoising but via a new perspective, Hybrid differential evolution algorithm where wavelet parameter transformation is done for filtering. By binary cat swarm optimization(BCSO) algorithm. Simulation results show that this method is superior to the conventional filtering method, as well as the modern bilateral filtering (BF) and stochastic denoising (SD) method. The remaining of this paper is organized as follows. The problem identification is in Section 2. Denoising filters designed by BCSO is presented in Section 3. Simulation results are given in Section 4 and Section 5 concludes the paper.

1.1 Image Noise

Image noise is the random variation of brightness or colot information in images produced by the sensor and circuitry of a scanner or digital camera. Mainly five types of noise or occurred, 1. Amplifier Noise, 2. Salt and pepper noise, 3.Shot noise, 4. Speckle noise, 5. Film grain. It is in herideted in and degrades the quality of the active radar image.

1.2 Image Denoising

Image denoising is an image processing task which holds its importance as a process as well as a component of other processes. There are many ways to denoise an image or a set of data. A good image denoising model removes noise from the image preserving its details and edges.

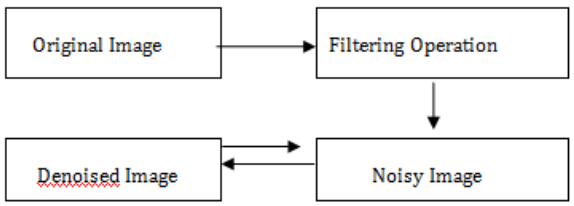

Figure1.1: Step involved in image denoising

II. PROBLEM IDENTIFICATION

As per study carried out on image denoising the following problems are noted down which are as follows:

1. It is necessary to have knowledge about the noise present in the image so as to select the appropriate denoising algorithm.

2. There are several methods and techniques and each method has its own advantages, disadvantages and assumptions.

3. Most of the existing image denoising work removes the assumes AWGN and removes the noise independently of the RGB image data

III. PROPOSED METHOD

Noise removal can be achieved, by using a number of existing linear filtering techniques. We will deal with the images corrupted by salt-and-pepper noise in which the noisy pixels can take only the maximum or minimum values (i.e. 0 or 255 for 8-bit grayscale images).

Figure 1.2 Original Image

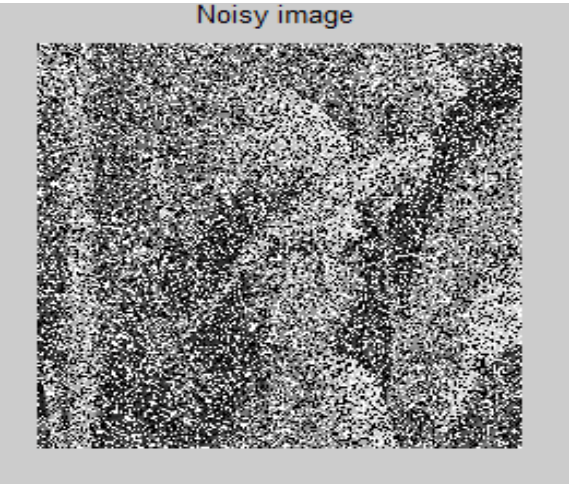

Figure 1.3 noisy Image

Figure 1.4 Denoised Image using Thresholding

Figure 1.5 Denoised Image

IV. RESULT AND DISCUSSION

This section concerned with the simulation result and elevated performance of the suggested technique. The suggested technique shows the elevation based on the PSNR Values of images which is used to denoised by BCSO and universal thresholding which are shown in below table1:

S.No.	Simulation Parameter	Values
1	Simulation Software	MATLAB 8.8
3	PSNR before Denoising	27
4	PSNR after Denoising	32
5	SSIM before Denoising	0.5643
6	SSIM after Denoising	0.9625

From the table above, it is clear that the proposed binary cat swarm optimization based 2D FIR filters perform best for image Denoising.

V. CONCLUSION

For removing the noise from noisy images, filter is designed by using the hybrid differential evolution algorithm. In the original image the Salt-and-pepper noise can be added for obtaining the noisy images. By applying the filter into the noisy images the noisy pixels can be detected and removed
.
Image denoising still remains a fact of risk because noise removal can result loss of details and can causes blurring of the images. Noise modeling in images is differs accordingly as change in capturing instruments, data transmitting media, image Quantization and discrete sources of radiation. Different algorithms are used depending on the type of noise model.

VI. SCOPE OF FUTURE WORK

As the future perspective can be seen, the mentioned methods can be implemented that to look how it can be used on different images. One area is in improving the de-noising along the edges as the method we used did not perform so well along the edges. Another area of improvement would be to develop a better optimality criterion as the MSE is not always the best optimality criterion.

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