Image Denoising with 2D FIR Filter by using Binary Cat Swarm Optimization

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Abstract— A very vast portion of digital image processing is concerned with image de-noising. This includes research in algorithm and routine goal oriented image Processing. Image restoration is the removal or reduction of degraded images that are Incurred while the image is being obtained. Degradation comes from blurring as Well as noise due to various sources. Blurring is a form of bandwidth reduction in the image caused by the imperfect image formation process like relative motion between the camera & the object or by an optical system which is out of the focus. When aerial photographs are taken for remote sensing purposes, atmospheric turbulence introduces blurs, optical system aberration and relative motion between camera and the ground. With these blurring effects, the recorded image can also be corrupted by noises. A noise can be introduced in the transmission medium due to a noisy channel, errors during the measurement process and during quantization of the data for digital storage. Each element in the imaging chain such as film, lenses, digitizer, etc. contribute to the degradation. In this paper, two dimensional FIR filters are designed for image Denoising, using binary cat swarm optimization. the results obtained are shown that it performs better than the existing systems.

Key words: 2D FIR filter; digital images; image processing; Denoising

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[1].

Image demising 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[2], data transmitting media, image Quantization and discrete sources of radiation. Different algorithms are used depending on the type of noise model.

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. The principal objective of image denoising is the modification of the image attributes so that it becomes suitable for the observer. In this process image attributes are modified for improvisation in image quality.

The studies which are intended for digital filter design are quite important because the digital filter design is one of the most common applications of digital signal processing. In literature, a digital filter is commonly described as a system that can be used in specified procedure such as modifying, reshaping, or manipulating the frequency spectrum of a signal according to some desired specifications. Depending on the latest developments in computer technology, two dimensional (2D) digital signal processing has be-come more important. DIP is a special name of the 2D digital signal processing and the one of the most studied topics in the digital image processing is 2D filtering.

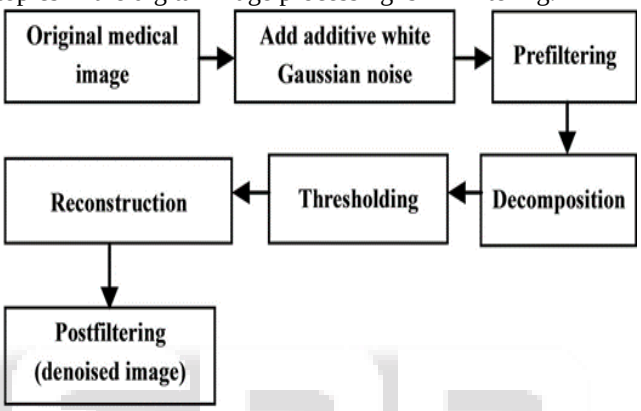

Fig. 1: overview of simple Image Denoising

II. RELATED WORK

A 2D FIR filter acts on an image by smoothing it; that is, it reduces the intensity variation between adjacent pixels. The mean filter is nothing but a simple sliding window spatial filter that replaces the center value in the window with the average of all the neighboring pixel values including itself. By doing this, it replaces pixels, that are unrepresentative of their surroundings. It is implemented with a convolution mask, which provides a result that is a weighted sum of the values of a pixel and its neighbors. It is also called a linear filter. The mask or kernel is a square. Often a 3×3 square kernel is used. If the coefficients of the mask sum up to one, then the average brightness of the image is not changed. If the coefficients sum to zero, the average brightness is lost, and it returns a dark image[3].

III. PROPOSED METHOD: BINARY CAT SWARM

In the proposed methodology to detect the sinkhole attack in the wireless sensor networks the detection process is divided into three phase which are as follows:

Fig. 2: Noisy Image

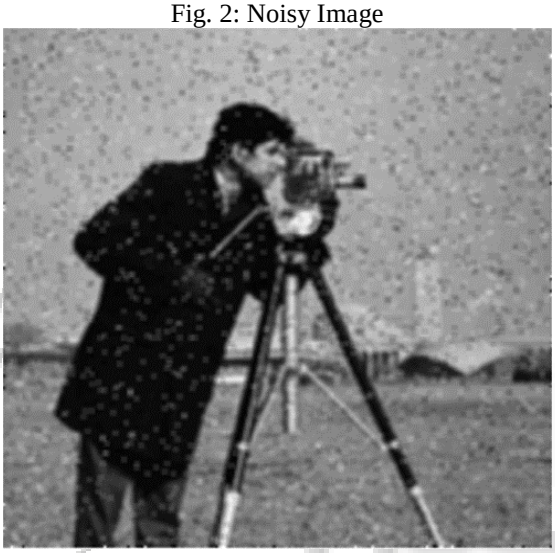

Fig. 3: Image after Noise removal

Noise removal can be achieved, by using a number of existing linear filtering techniques[4].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) [5-9].

IV. Results and Analysis

This section concerned with the simulation result and elevated performance of the suggested technique. The suggested technique shows the elevation based on the detection rate of sinkhole attack in a wireless sensor network. Here, first of all we will talk about the simulation parameter which are shown in below table1:

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

Table 1: Results obtained after denoising

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

In this paper, we have focused on the denoising of images using 2D FIR filtering techniques using adaptive filters while the nonlinear filtering is performed using a median filter. These filters are good for removing noise that is impulsive in nature. The 2D FIR filters find applications where a small region in the image is concentrated. Besides, implementation of such filters is easy, fast, and cost effective. It can be observed from the output Images

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