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Image Enhancement Using Genetic Algorithm

Ms.Shivangini Shrivastava
IES-IPS Academy Indore

Mr. Arvind Upadhyay
IES-IPS Academy Indore

Abstract-Image enhancement is one of the important and tough techniques in digital image processing. Principal objective of image enhancement is to process an image so that result is more suitable than original image for specific application. Image enhancement is used for improving the visual quality of an image. Contrast increment, elimination of noise and blurring and enlightenment of details are examples of enhancement operation. This paper presents an overview of genetic algorithm for gray scale image enhancement with N-point Crossover.

Index Terms
Gray scale image, Noise, Genetic algorithm, N-point crossover.

1.INTRODUCTION

Image enhancement is the task of applying certain alternations to an input image like as to obtain a more visually pleasing image. Image enhancement is to improve the image quality so that the resultant image is better than the original image. One of the parts of image enhancement is the improvement of digital image quality, without knowledge about the source of degration. It is the technique to improve the interpretability or perception of information in image for human viewers and modify attributes of an image to make it more suitable for a given task and specific spectator. It sharpens boundaries, edges, contrast for making display of image more helpful for analysis and display. Image enhancement doesn't increase the data's content. Whereas it helps in increasing dynamic range of features that are selected for enhancing so that they can be easily detected. There are number of techniques which constitutes Image Enhancement process that require to improve the visual appearance of an image or to transform the image to form a better one that can be easy for human or machine to analysis. Image enhancement is basically used when we want to remove noise from image, to enhance dark image and to highlights the object's edges in an image. For certain specific applications, the obtained result is more suitable than the original image. This paper proposed new concept in image enhancement which is Genetic algorithm for removing noise in gray scale image.

Genetic algorithms have been successfully applied to a wide range of optimization problems including design, scheduling, routing, and control, etc. Data mining is also one of the important application fields of genetic algorithms. In data mining, GA can be used to either optimize parameters for other kinds of data mining algorithms or discover knowledge by itself. In this latter task the rules that GA found are usually more general because of its global search nature. In contrast, most other data mining methods are based on the rule induction paradigm, where the algorithm usually performs a kind of local search.

This paper is organized as follows: Section 2 reviews related research on image enhancement techniques. Section 3gives details about our proposed method. Section 4 gives proposed algorithm. Section 5 tells about experimental and results. Section 6 present concluding remark.

2.LITERATURE SURVEY ON RELATED WORK

The Related work related to image enhancement technique is discussed here, K. Babu and Dr. K.N.N Sunitha proposed the new method for enhance the noisy image and improve the quality of image. This paper have discussed about the manipulation of the dynamic range of a given digital image to improve visualization of its contents which is based on Median Filter Technique [1]. R. Singh and A. Kaur proposed speckle noise removal method using wavelets. This paper compares and analyzes the behavior of these two techniques. Through experimental results both qualitative and quantitative it is shown that orthogonal undecimated wavelet transform gives much improved results than non linear PDE method and the traditional techniques. The non linear anisotropic diffusion based SRAD gives comparable results to decimated orthogonal wavelet transform. Un-decimated orthogonal wavelet transform gives the best overall results best visual perception, edge preservation and localization with comparable PSNR to other techniques. Both the methods SRAD and Wavelet based techniques give much improved results than traditional techniques like median and wiener [2]. G. Gupta proposed algorithm for improved median

filter. Fundamental of image processing, image degradation and restoration processes are illustrated. The pictures are corrupted with different noise density and reconstructed. The noise is Gaussian and impulse (salt-and pepper) noise. An algorithm is designed to calculate the PSNR and MSE. The result is discussed for Mean, Median and improved Median filter with different noise density [3].

3.PROPOSED MODEL

My proposed work introduces a new concept in image enhancement. Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further analysis. For example, you can remove noise or brighten an image, making it easier to identify key features**.** In proposed methodology we have a more efficient and novel approach to perform de-noising and image enhancement in more effective manner. In this methodology we are using genetic algorithm for de-noising image and image analysis. In this method, first we take any gray image (.png), and then add noise by changing their contrast value and set threshold level. At threshold level Genetic algorithm convert each pixel in bit pattern and perform N-point Crossover & bit wise mutation and will get more enhanced image. Noise in an image are small, unwanted random pixels in areas where the surrounding majority of pixels are a different value, i.e. a white pixel in a black field or a black pixel in a white field. Noise removal is an eminent problem in image processing applications. Due to noise in the images, their segmentation, classification, and detection become difficult. Noise removal is an essential element of image processing. One reason for this is that many images are acquired under less than ideal conditions and consequently are contaminated by significant amounts of noise. Due to noise in the images, their segmentation, classification and detection become difficult. It is important for noise suppression algorithms to reduce the noise while preserving the important features in the images. Depending on the noise types, the noisy image can be generally modeled as one of the two models: additive model and multiplicative model. The main aim behind this work is the de noise and enhances the quality of image so from our base work it is seen that the quality of image can be enhanced through pixels level analysis and that analysis and de-noising could also be possible through our proposed genetic algorithm. We can enhance or de-noise any gray image (.png) through our proposed algorithm**.** A Genetic Algorithm should be able to reduce noise in gray scale image. There are numerous algorithms available for image de-noising and image enhancement. Proposed approach deal with N-pint crossover and pixels bit pattern for noise reduction. We explain that, Denote a two-dimensional digital image of gray-level intensities by I. The image I is ordinarily represented in software accessible form as an M × N matrix containing indexed elements I (i, j), where 0 ≤i ≤M - 1, 0 ≤j ≤N - 1. The elements I (i, j) represent samples of the image intensities, usually called pixels (*pict*ure *element*).Typically, the pixels represent optical intensity. This matrix is converting in to bit pattern for creating chromosomes in this algorithm.

4. PROPOSED ALGORITHM

The proposed algorithm is given below, this algorithm first take input gray image (.png) and then apply genetic algorithm to provide more enhanced image.

1. Take Input gray .png image.
2. Create Random Initial State: Add noise in image by change their contrast & bit map value.
3. Evaluation fitness: in this step fitness is evaluated through the noisy section of image.

Fitness Function:

alpha = en2/sqrt(en1^2+en2^2)
en1 = 0.5*sum(sum(g.*(T-I).^2))
en2 = 0.5*sum(sum(Tx.^2+Ty.^2))

Note:

I=input image

T=threshold surface

g=(Ix.^2+Iy.^2).^ (pow/2)

(T-I)=Pixels creation

Tx=pixels on X-axis

Ty=pixels on Y-axis

4. Reproduce: Using N-Point Crossover and Bitwise mutation, 96.8% of noisy section is removed to get final next generation output image.

5. The next generation or output image is accurate image through above four steps

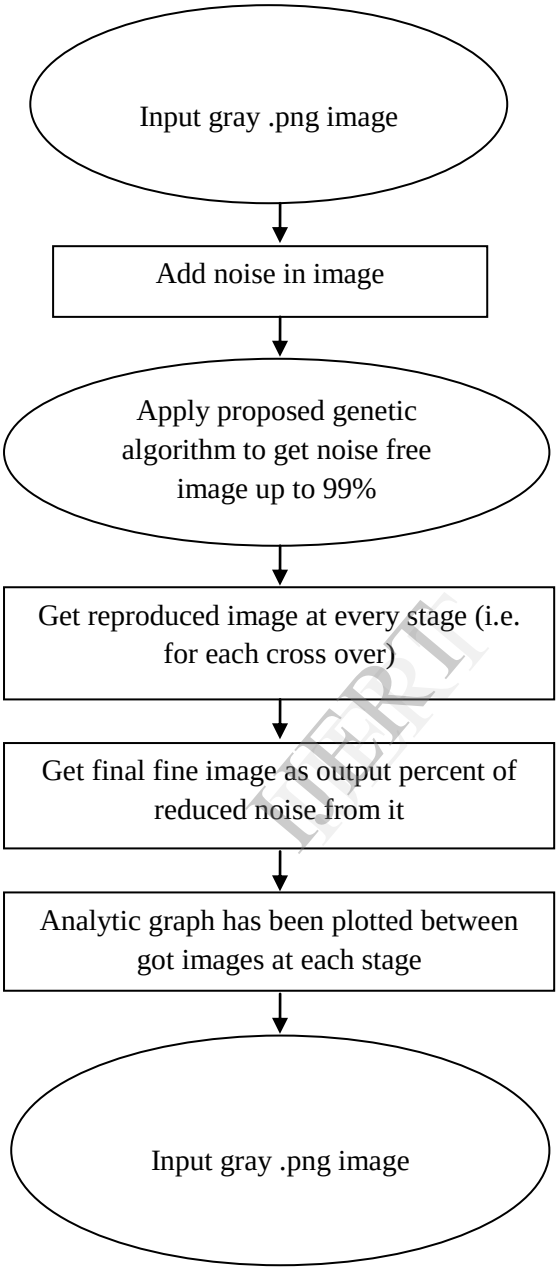

Fig 4.1. DFD & Flow of Execution of Program

5.EXPERIMENTAL RESULT

The proposed algorithm is applied on gray image in which noise is added by changing their contrast and bit level pixel value in "Lena" images. Then Genetic algorithm is applied after a specific threshold level i.e. for each noise & image starting threshold evaluated then genetic algorithm is applied. The way to set starting threshold will work as input image to genetic algorithm then result & process can be evaluated in the following way.

5.1 Iteration Table with Fitness

In genetic algorithm Fitness gives main pressure for convergence of evolution process. It is calculated by the evaluation function. In proposed work fitness function calculate the value of each pixels of gray image using evolution fitness function. In encoding process each pixel convert in to bit pattern. Iteration is the process of repeating evolution on each chromosome until the termination condition is found.

Iteration	Fitness
96	0.466
97	0.475
98	0.477
99	0.488
100	0.489

Table 5.1 Iteration Table of Image

5.2 Noise Reduction

Noise reduction is the method of removing noise in image. First we set threshold level of each image. At maximum threshold level each image is enhanced using genetic algorithm. When we add noise, the noise reduction is 98% of given image.

Reduction Function = (Iteration – Fitness)

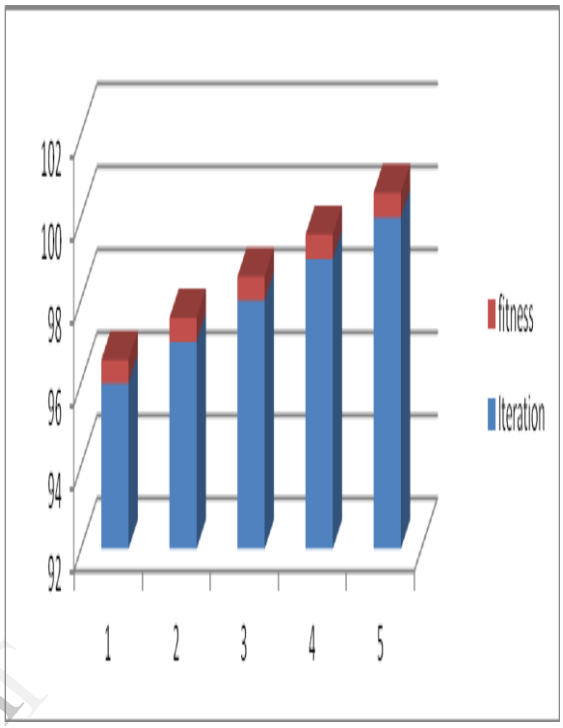

Fig 5.2 GA Analyzing Graph

5.3Pixels Analysis

Pixels analysis of image is the process of evaluating each pixels value using plotting each image in x-axis or y-axis uses mapping evolution.

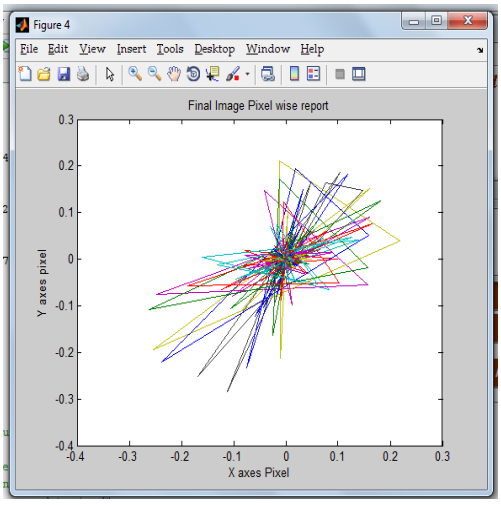

Fig 5.3 Pixels Analysis of Image

5.4 Experimental Result with output.

The performance of the method that has been proposed is implemented with noise (different contrast value). De-noising is carried out with mean of each noise reduction. Which is defined as-

μ(mean) = Threshold level / Noise Reduction(%)

Fig 5.4 Output Enhanced Image

6.CONCLUSION

Image enhancement algorithm provides a wide variety of approaches for enhancing or modifying images to provide a better view. It is not possible to say which technique is good because the image enhanced by using such technique if it is looks good to user then it is good. The choice of such technique is depend on the requirements. In this paper, we have developed a method that is very effectively work on image enhancement. It takes gray image as an input image then using genetic algorithm to provide more enhanced image. It is a new concept in image enhancement tool. This proposed method gives better result than all the other individual method. The above implementation was really an effort to understand how to de-noise image using genetic algorithm. In this work it is observed that genetic algorithm can play their role efficiently to analyze image, in this implementation it is applied at gray image because it is easy to analyze. A Genetic Algorithm should be able to reduce noise in gray scale image. There are numerous algorithms available for image de-noising and image enhancement. Proposed approach deal with N-pint crossover and pixels bit pattern for noise reduction. Proposed algorithm reduce noise reduction of different contrast value images is 98%, with mean=2.60

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