IMPLEMENTATION ON IMAGE DENOISING BASED ON GENETIC ALGORITHM IN SOFT COMPUTING

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ABSTRACT
This work presents image denoising algorithm based on genetic techniques. Image denoising's aim is to restore images to a better quality without losing any relevant information. The genetic algorithm is based on the concept of soft computing. The genetic algorithm have three phases i.e. fitness, crossover, mutation. There are various techniques for image denoising like wavelet, curve let transform. Intelligent approach based on cellular neural network . How genetic algorithm is better than existing techniques also given. The experiments will be performed on a noisy image firstly image is taken then introduces noise into it then applies image denoising methods using genetic algorithm to remove maximum noise.
KEYWORDS: Image denoisig, genetic algorithm, Fitness function, crossover function, mutation function.

1 INTRODUCTION

Digital image play an important role in daily routine. When capture a image through a particular instrument .An image define as a two dimensional function f(x,y) where x and y are spatial coordinate. The coordinates x and y have finite values is called the intensity or gray level of the image at that point. The digital image processing refers to processing digital image by a digital computer. Digital image composed of finite number of elements. These elements are refers to as picture elements and pixels. Pixels are the term to numbers of dots that make a picture with specific values and different color combinations. Digital image is used in handwriting recognitions, television image and in area of research medical images, scanning techniques, printing etc.

The noise can be introduced due to transmission error when image is transmitted. So when data set is called by image sensor through that time data is contaminated by noise. Noise can be introduced due to instrument problems or natural phenomena causes. Most of noise types are salt and pepper noise and Gaussian noise. For removing these noises the dynamic algorithm that is genetic algorithm is used. The genetic algorithm is a method for solving both constrained and unconstrained optimization problems that is based on natural selection. This process is biological evolution. It gives optimal solution. The basic principal of selection and evolution to produce several solutions to a given problem. The solution has three distinct stages .

- Selection rules select the individuals, called parents that contribute to the population at the next generation.
- Crossover rules combine two parents to form children for the next generation.
- Mutation rules apply random changes to individual parents to form children.

This paper represents the removal of salt and pepper noise using genetic algorithm for image denoising.

2. Purposed Genetic Algorithm

1. Porcedure GenAlgo (Image Imm);
2. Add← create noise(Imm);
3. for i←1to size of block value do
4. for j←1 to size of block value do

5. Find out noise value and apply fitness function
6. Imm1,Imm2←nonzerovalue();
7 Imm3←crossover( );
8. Value←Mutation( );
9. end of loop
10 end of loop
11 End

The GA is implemented using two dimensional images. The genetic algorithm (GA) presented in this paper evolves images that are restorations of noisy images. The noisy image is received as input and is represented as a matrix of pixels, whose entries are integer values ranging in the interval [0::255]. The objective of the proposed method is to find the uncorrupted image from the noisy one. In this paper the related energy function used as fitness function.

Two crossovers are applied over the pixel matrix of the parents. For each one of these crossovers has equal chance to be selected:

1. **one-point column:** randomly defines a column of the pixel matrix of the individual. All pixels to the left of that column come from one parent and all the other pixels come from the other parent.
2. **one-point row:** is similar to the one-point column, but a row is now randomly chosen.

Three mutations are proposed to be applied over the new individual. Again, each one of them has the same chance to be randomly selected.

Three mutations are proposed to be applied over the new individual. Again, each one of them has the same chance to be randomly selected:

1. Blur: applies the effect of blur to the image of the individual. Each pixel is assigned the value of a weighted average between it and its neighbors, making the image smoother.

2. Random: a small random perturbation can be applied with 5% of chance to each entry of the pixel matrix.

3. Intensity: multiplies all the individual pixels of the image by a same random factor, which lightens or darkens the image as a whole.

3 OBJECTIVE QUALITY MEASURES

The objective quality measures are primirily based on that quality of differences in original and processed image.so that objective quality measures may be categorized into:-

1.SNR(Singnal to Noise Ratio)

The signal to noise ratio is the ratio of signal energy to noise energy expressed in :-

$$\mathbf{SNR=10\ log10}\frac{\sum_n s^2(n)}{\sum_n[s(n)-\hat{s}(n)]^2}$$

2. MSE (Mean Squared Error)

The mean squared error Between the original and the recovered images. It is defined in Equation, where *M* and *N* are the dimensions of the image.

$$\mathbf{MSE}=\frac{1}{MN}\sum_{i=0}^{M-1}\sum_{j=0}^{N-1}[O(i,j)-K(i,j)]^2$$

Where M and N are the image dimensions, O is the original image, LO is the maximum possible pixel value of the image and K is the restored image. T

3**. PSNR (Peak Signal-to-Noise Ratio**)

one of the most common metrics, measured in decibels(dB) and defined in Equation for 8-bit gray-scale images:

$$\mathbf{PSNR=}_{10}\mathbf{log}_{10}\left(\frac{255^2}{MSE}\right)$$

4.RMSE (Root Mean Squared Error) This is used for measure of the difference of Pridect values and observerd values.

$$\mathbf{RMSE}\left(\hat{\theta}\right)=\sqrt{MSE\left(\hat{\theta}\right)}\quad=\sqrt{E\left(\hat{\theta}-\theta\right)^2}$$

The RMSE of an estimator $\hat{\theta}$ with respect to an estimated parameter θ is defined as the square root of the mean square error.

5. NC(Normalized Cofficent) Find out the diffeerence between orignal image and denoise image

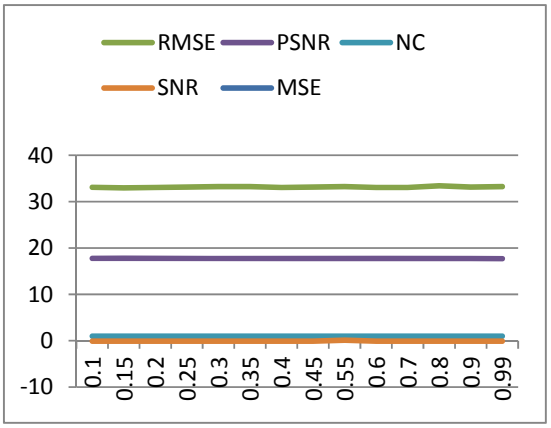
4. RESULTS OF DIFFERENT PARAMETERS

S. No	Noise value	MSE	RMSE	PSNR	NC	SNR
1	0.1	1.09E+03	33.0739	17.7411	0.9835	-0.0865
2	0.15	1.086+03	32.9549	17.7724	0.9839	-0.0877
3	0.2	1.09E+03	33.0498	'24	0.9836	-0.0871
4	0.25	1.10E+03	33.1511	17.7208	0.9835	-0.0881
5	0.3	1.1049	33.2288	17.7474	0.9834	-0.0873

		3+03				
6	0.35	1.05E+03	33.2396	17.6977	0.9831	-0.08846
7	0.4	1.09E+03	33.0498	17.7474	0.9836	-0.08871
8	0.45	1.10E+03	33.1511	17.7208	0.9835	-0.0881
9	0.55	1.10E+03	33.2288	17.7005	0.9834	0.0873
10	0.6	1.09E+03	33.0498	17.774	0.9836	-0.0871
11	0.9	1.10E+03	33.1511	17.7208	0.9835	-0.0881
12	0.99	1.10E+03	33.2288	17.7005	0.9834	-0.0873

All Parameters values basis on Different Noises

In results, the values of five parameters are shown. The values of parameters change when noise level increases. The most important factor is that when image visibility is only 1% that time it gives best result with change of parameters values. The clarity of image depends on peak signal noise ratio (PSNR) parameter. When PSNR value goes high then salt and black pepper noise goes decrease. It shows graphically all parameters values on different noise level.



Show Graphically All Parameters Values Basis on Different Noise

5. LITERATURE SURVEY

Sandeep Kaur et al [1] purposed this method, the wavlet based imge denoising is removed using different techniques like BayesShrink, SureShrink, VisuShrink. The output from BayesShrink method is much nearby to the high quality image and there is no blurring in the image unlike the other two methods. Bayes Invariant thresholding technique has best performance, SureShrink is better where as a VisuShrink is comparatively poor in performance.

Yan-Hua Ma et al [2] is purposed this method Using adaptive filtering algorithm based on data mining is mainly remove the a salt and paper noise. It is based on spatial distribution structure by data mining it is mainly overcome blurring edge and averaging noise. The image restore 90% from the noisy image using this algorithm in compare the mean and median filter methods. But the adaptive algorithm is not remove Gaussian noise.

Nikita Jain et al [3] is purposed this method using data mining based on Neural Network and Genetic Algorithm is researched in detail and the key technology and ways to achieve the data mining on Neural Network and Genetic Algorithm are also surveyed. This paper also conducts a formal review of the area of rule extraction from ANN and GA.ANN itself is a very suitable for solving the problems of data mining because its characteristics of good robustness, self-organizing adaptive, parallel processing, distributed storage and high degree of fault tolerance.

Jonatas L. De Pavia et al [4] purposed this method, hybrid genetic algorithm is use for image denoising. There are used three different techniques. These techniques are crossover, mutation and population reinitialization.HGA produced batter results in comparison on GA. But it is time consuming. In future that will be execute parallelize execution of image. Because this method divide image into segment wise and work on it.

Claudio F. M. Toledo et al [5] is purposed method process remove of relevant image features, such as edges and corners. This papers describes a novel image denoising method based on a genetic algorithm. A population of noisy images is evolved for several epochs applying tailor-made crossover and mutation operators. The population is reinitialized every time a convergence occurs, when only the best individual (image) is kept for the next epoch. Experimental results demonstrate that the

proposed method is competitive in comparison with state-of-the-art approaches. As future work, an approach where the images are divided into several small frames is planned to be developed, such that one population is created and evolved

6. CONCLUSION AND FUTURE WORKS

In this paper, Genetic algorithm based image denosing algorithm has been proposed .This algorithm remove the salt and pepper noise from the image and restores the image to a batter quality. In this paper first of all noise is introduced into the image using different proposed operators. Then image denoising has been implemented using different types of filters. Thus this is an image representation to restore the noisy image to a improved quality. The images quality has been measured using various parameters like PSNR, RMSE, MSE, SNR, NC.This proposed method removes noise and give batter quality images.

Future work In the future work, this approach can be used to remove other types of noises .This algorithm can also use different types of operations to remove the noise and enhance the image quality.

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