A NOVEL METHOD TO REMOVE OF IMPULSE NOISE FROM IMAGES

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Abstract: The process of getting original form of image from its degraded image is known as restoration process. Image restoration mainly used to remove the degradation in an image to get a better image. The unwanted signal is called noise. The noise is due to clicking instrument, recording systems and transmission medium etc. It is the noise which degrades the quality of an original image to the poor quality. There are various types of noises such as salt and pepper noise (impulse noise), Gaussian noise etc. During image acquisition process degradation occurs. The degradation process first determine the type of noise, and then apply the inverse process to recover the corrupted image.

Keywords: DIP, Salt-and-pepper noise ,image restoration , Median filter

I. INTRODUCTION

Digital image processing orginate with refines of digital images through a digital computer. It is a subfield of signals and systems but concentration particularly on images. The input of DIP system is a digital image and well organized algorithm is use to process that image, and gives an image as an output. The most common example is Adobe Photoshop.

How it works.

Image restoration process

Due to defect in the imaging and capturing process, however, the recorded image always represents a degraded version of the original scene. There exists a huge range of different degradations, which should be taken into account, for example noise, geometrical degradations, illumination and color imperfections and blur. Reconstruction or estimation of the uncorrupted image is concerned with the image restoration. Image Restoration refers to a group of methods or techniques that aim to remove or reduce the deterioration that have occurred while the digital image was being obtained.

II. LITERATURE SURVEY

This section covers the literature survey of the work of the paper:

Zayed M.Ramadan [1] introduces a method for elimination of salt-and-pepper noise from images. The method consists of two step: detection and filtering. In the detection step, to be considered the pixel noisy two conditions must be satisfied. The first condition is based on complication of the corrupted image with four difficult kernels and the second depends on the pixel under consideration in the sliding window and its neighborhood. In the filtering step, the common median filtering is used except that only pixels that are considered noise-free in the sliding window of the
In our proposed work we take an input two dimensional image. Which have 30% of salt and pepper noise then we try to reduce the salt and pepper noise from images. For this we have to find the value of pixel of an image. Then we observe that if the pixel value is 0 or 255 then the pixel is noisy (salt and pepper) and when the value of pixel is greater than 0 and less than 255 then we use masking operation to reduce noise. If the masking value is non zero then we find length of matrix.

Let suppose we take array of size 3*3. Array size can vary according to requirement. Elements of these array is g[1],g[2],g[3],g[4],g[5],g[6],g[7],g[8],g[9]. Now we take first 4 elements of these array on which we apply interpolation. So we collect the non noisy in array and calculate its length. If the length of the array is greater than equal to 4 then we assume that we have at least 4 non noisy pixel available to use in the interpolation. Therefore we can use the order 3 equation(i.e. eq. 1) i.e in this equation the value of i ranges from 0 to 3 so then we multiply the element(g[1],g[2],g[3],g[4]) with 4 part .If the condition is not so then 3 other possible case be there. Array could have 3 non noisy pixel, 2 non noisy pixel ,1 non noisy pixel and may non. Then we will choose the order of eq. accordingly i.e when n would be 2 then we multiply the element (g[1],g[2],g[3]) with 3 part in eq.(2) and when n would be 1 then we multiply the element (g[1],g[2]) with 2 part in eq.(1).

CASE 1: If length is greater then equal to 4 to then we apply interpolation of 4 degree.
\[
\sum_{i=0}^{n} C^2_0 t^i(1-t)^{(n-i)}
\]
Here n=3
\[
Y(i,j) = g[1] \times C^0_0 t^0(1-t)^3 + g[2] \times C^1_0 t^1(1-t)^2 + g[3] \times C^2_0 t^2(1-t)^1 + g[4] \times C^3_0 t^3(1-t)^0
\]
............eq. (1).

CASE 2: If length is less than 4.

2.1 If length is equal to 3 then we apply interpolation of 3 degree.
\[
\sum_{i=0}^{n} C^2_0 t^i(1-t)^{(n-i)}
\]
Here n=2
\[
Y(i,j) = g[1] \times C^0_0 t^0(1-t)^2 + g[2] \times C^1_0 t^1(1-t)^1 + g[3] \times C^2_0 t^2(1-t)^0 .
\]
............eq.(2)

2.2 If length is equal to 2 then we apply interpolation of 2 degree.
\[
\sum_{i=0}^{n} C^2_0 t^i(1-t)^{(n-i)}
\]
Here n=1
\[
Y(i,j) = g[1] \times C^0_0 t^0(1-t)^1 + g[2] \times C^1_0 t^1(1-t)^0
\]
............eq.(3)

2.3 If length is equal to 1 then we will replace only non noisy value in array.
2.4 If length is equal to 0 then we will keep the current value

**ALGORITHM TO REDUCE IMPULSE NOISE FROM IMAGES**

Input: Let X be the image with impulse noise

\[ X(i,j) \leftarrow \text{Input image of size } M \times N \]

For all \( (X(i,j)) \)

\[ S(x,y) \leftarrow \text{Kernel of size } m \times n \]

\[ a[] \leftarrow S(x,y) \] // all the pixel in window of size \( m \times n \)

if \( a(x,y) \leq 255 \) || \( a(x,y) \geq 0 \)

2.3.1 \[ g[] \leftarrow a(x,y) \] // \( g \) be the vector

2.4 \[ l \leftarrow |g| \] // \( |g| \) be the length of array

2.5 if \( (l \geq 4) \)

2.5.1 \[ Y(i,j) \leftarrow g[1] \times C_0 t^0 (1-t)^3 + g[2] \times C_1 t^1 (1-t)^2 + g[3] \times C_2 t^2 (1-t) + g[4] \times C_3 t^3 (1-t)^0 \]

2.6 if \( (l < 4) \)

2.6.1 if \( (l = 3) \)

2.6.1.1 \[ Y(i,j) \leftarrow g[1] \times C_0 t^0 (1-t)^2 + g[2] \times C_1 t^1 (1-t) + g[3] \times C_2 t^2 (1-t)^0 \]

2.6.2 if \( (l = 2) \)

2.6.2.1 \[ Y(i,j) \leftarrow g[1] \times C_0 t^0 (1-t) + g[2] \times C_1 t^1 (1-t)^0 \]

2.6.3 if \( (l = 1) \) then we will replace only non noisy value in array

2.6.4 if \( (l = 0) \) then we will keep the current value

3. \[ Y(i,j) \leftarrow \text{output image or restored image have better quality} \]

**IV. RESULTS**

When Noise added in original image is 30% the window size is 3 then restored the noisy image.

Fig: (a) Lenna original image (b) Noisy image(30% noise added) (c) Restored image(PSNR=33.0972 db)

When Noise added in original image is 50% and the window size is 3 then restored the noisy image.

Fig: (a) Lenna original image (b) Noisy image(50% noise added) (c) Restored image(PSNR=29.0388 db)

When Noise added in original image is 70% and the window size is 3 then restored the noisy image.

Fig: (a) Lenna original image (b) Noisy image(70% noise added) (c) Restored image(PSNR=18.5819 db)

When Noise added in original image is 30% and the window size is 5 then restored the noisy image.

Fig: (a) Lenna original image (b) Noisy image(30% noise added) (c) Restored image(PSNR=33.0972 db)
When Noise added in original image is 50% and the window size is 5 then restored the noisy image.

When Noise added in original image is 70% and the window size is 5 then restored the noisy image.

When Noise added in original image is 30% and the window size is 7 then restored the noisy image.

When Noise added in original image is 50% and the window size is 7 then restored the noisy image.

When Noise added in original image is 70% and the window size is 7 then restored the noisy image.
V. CONCLUSION
In this thesis, we proposed an algorithm for reducing impulse noise of images by using interpolation methods. The proposed algorithm not only reduce noise from images but also maintain the high quality of images with same information present in the objects of image. And we apply this algorithm on different images and compare all the results with each other. From the different results produce on different images we can infer that our algorithm works efficiently and effectively in a good manner. Image restoration and filtering is one of the prime areas of image processing and its objective to recover the images from degraded observations. The restored image which is produce have low value of noise and also improve the PSNR value. Techniques can be developed to estimate the peak signal to noise more accurately.

REFERENCES