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Image documentation for the Enhancement of text and noisy images

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Abstract: Digital-image processing, nowadays has been experiencing a vibrant growth and economically begin to use widely in almost every field. Nowadays, each application has different requirements from the others, but there aim is almost same , i.e. to do processing faster, cheaper and more accurate. Earlier, information has been stored on paper, to store it in better form and for faster processing, is now being transformed into an electronic form. The present paper gives the detail of different noise effects on the images and along with that it discusses the different methods to remove the noise by using various filter such as median filter, enhanced median filter, Gaussian filter to improve the image quality. The Experimental results in this has been performed on a standard test images having a wide range of noise corruption levels. The work is implemented on the MATLAB environment.

Keywords: RGB (red, green, blue), Image enhancement, noise, MATLAB, spatial domain etc.

1. INTRODUCTION

Image De-noising and Enhancement of the image are the key research areas in Image Processing as they are useful in many applications such as Feature Detection, which enhances the clarity of image and also the visual perception of human beings. It also modify images to improve the quality, extract the information from image and finally changes the structure of the image.

Following Image is an example of noisy image and other figure is displaying de-noised version of noisy image after applying different filters.[1]

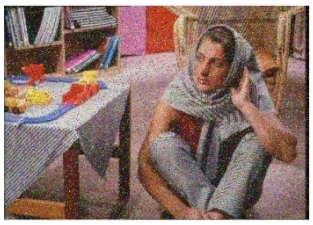

Figure 1: Image affected by noise

Figure 2: Recovered image

1.1 Different types of noises

[2] There are many types of noises which may degrade the quality of an image, its type are:

- Amplifier noise (Gaussian noise)
- Salt-and-pepper noise
- Poisson noise
- Quantization noise (uniform noise)

In our proposed work we have considered the effect of different noise and explains the different method to de-noise and the enhancement of the noisy image by using different filter. In the second section we have proposed a method for the enhancement of text image.

2. DOCUMENT IMAGE ANALYSIS

For recognizing the graphic & text components, image is analyzed. Two categories are known and these are :

2.1 Text Processing

It basically deals with textual components & determine:

- The skew, which is a kind of tilt, gets in a document during scanning.
- Different attributes such as size, font in Columns, paragraphs, textual lines, words, which are generally recognized by OCR

2.2 Graphical processing

Non-textual elements such as tables, lines, images, symbols.

3. RELATED WORK

Virtual rebuilding of notable works of painting and artifacts [3] mostly utilizes the systems of IE to reduce the stains. Color contrast enhancement, brightening effect , sharpening are the common techniques to make the images vivid. IE is a powerful tool for restorers who make informed decisions by viewing the results of restoring a image beforehand.

(Chandra, Vivek, Sagar Deokar, Siddhant Badhe, and Rajesh Yawle.) [4] proposed a median filtering algorithm as it had good noise reducing effect.

It is basically a combination of average filtering and median filtering algorithms. In this masking is done, which resize according to noise levels. Ultimately complexity of the algorithm was decreased, hence results in the effective noise reduction.

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4. PROPOSED FORMULATION

During the last five decades image-processing techniques have been adapted tremendously as analysis in image processing is based on set theory, topology, lattice algebra, function.

4.1 DOCUMENT PROCESSING

[6] Processing of document means to extract its content and any document goes through to the following three steps during processing :

1. The Pre-Processing Stage, that improves the nature of image.
2. The feature extraction stage that catches the particular attribute of record under processing.
3. The third stage is classification stage.

As image processing is mathematical in sense and DCT transforms the signal from a spatial representation to frequency representation.

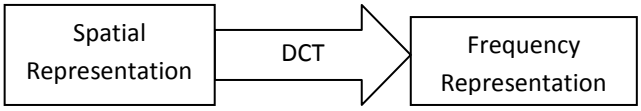

Figure 3: Representation of signal

4.2 Mathematical terminologies

Let Z be an arrangement of integers, and A be a set in Z^2, and imagine the pixel coordinates of elements as (x, y). If w = (x, y) is a component of A, then it can be written as $w \in A$, and if w is not an element of A, it is written as w $\notin$ A.

A set of B pixels satisfying a particular condition can be written as B = {w |condition}

4.3 Mathematical Morphology

The mathematical operators are particularly useful for analysis of binary images for edge detection, noise removal, image enhancement and segmentation.

The two most basic operations in mathematical morphology are erosion and Dilation, which take two pieces of data one as input, which takes an image to be Eroded or dilated, and a structuring element also known as a kernel. Out of two pieces of input data, each data is treated as representing sets of coordinates which are slightly different for binary and grayscale images.

Algorithm

The proposed work flow is described as below:

1. For i=1 to Max Itera
2. Select any random image.
3. Introduce noise
   a. img1_N= img1+0.1*random(size(img1));
   b. If{
   c. img1_N(img1_N<0)
   d. Then, img1_N = 0;
   e. Else
   f. {
   g. img1_N = 1;}
   h. }
5. Select Filter, from i=1 to m
   a. PSF=fspecial('gaussian',[5,5],3)
   b. Set bilateral filter parameters
   c. Median filter
   d. Relaxed filter
   e. Psmf
6. Display the processing time, for i=1 to m.
7. Repeat steps from 2 to 6.

Table 1 : Image taken for experimental result

Sr.No.	NAME	FORMAT	Processing time(in sec)
1.	Image1	PNG	32.71321
2	Image2	JPEG	22.4210
3	Image3	JPEG	45.5600

5. SIMULATION RESULTS

Figure 7: Image effected by noise

Figure 8 : Filtered Image

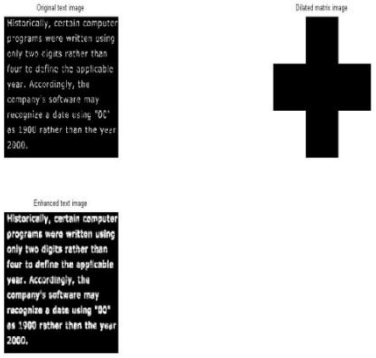

Figure 9 : Enhancement of Text image using Dilated matrix method

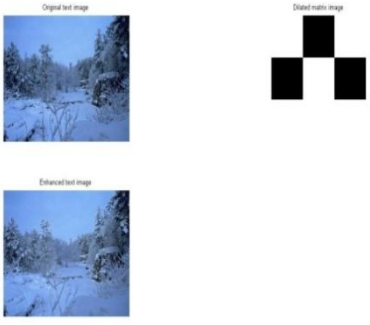

Figure 10 : Enhancement of Image using dilated matrix method

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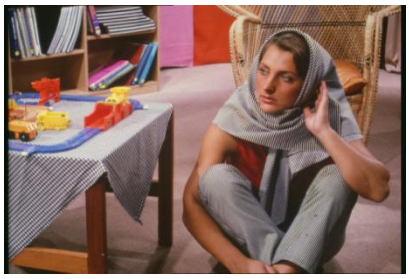


Figure 11 : Original image

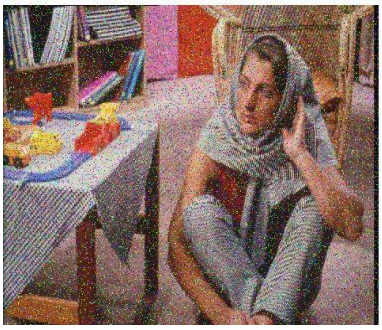


Figure 12 : Noisy Image

Figure 13 : Dull Image Quality because of noise

Figure 14 : Enhanced Image using Bilateral filtering method

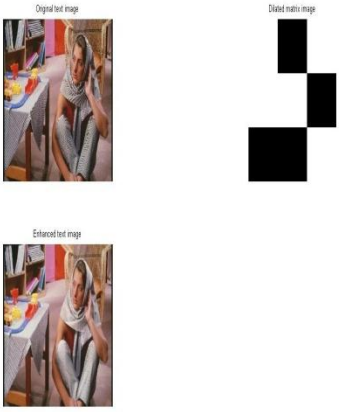


Figure 15 : Enhancement of Image using dilated filtering matrix method

Table 2 : MSE Evaluation for Different Filters At Noise Density 0.3

MSE EVALUTION FOR DIFFERENT FILTERS AT NOISE DENSITY 0.3			
IMAGE	NOISY IMAGE	MEDIAN FILTER	RELAXED MEDIAN FILTER
Image1	6763	517	279
Image2	6801	548	303
Image3	6337	321	100
Image4	7132	369	110

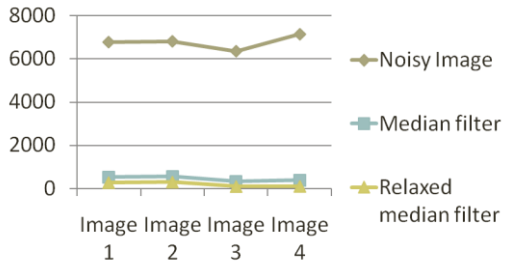


Table 3: PSNR Evaluation for Different Filters at Noise Density 0.3

PSNR EVALUTION FOR DIFFERENT FILTERS AT NOISE DENSITY 0.3			
Image	Noisy image	Median filter	Relaxed median filter
Image1	9.8294	20.9959	23.6748
Image2	9.8051	20.743	23.3164
Image3	10.1120	23.0658	28.1308
Image4	9.5987	22.4605	27.7169

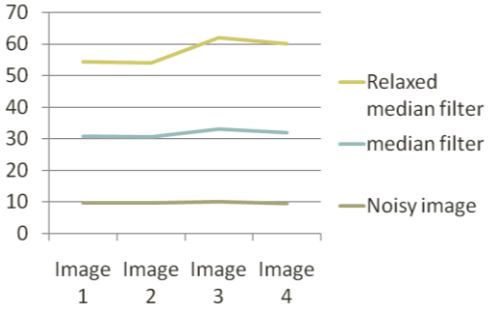
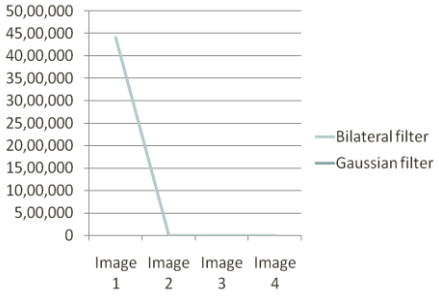


Table 4 : Improved Time Evaluation for Different filters

TIME EVALUTION(in sec) FOR Enhancement of Images using DIFFERENT FILTERS		
IMAGE	Gaussian filter	Bilateral filter
Image1	4.404470	3.429937
Image2	4.697325	2.898726
Image3	5.346803	3.077748
Image4	11.019039	4.470673



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6. CONCLUSION AND FUTURE SCOPE

Image Filtering is the procedure of diminishing noise from a noisy image with an aim to deliver a filtered image similar to original one.

In this article we give brief summary of essential blocks which contain document explaining image processing framework which adjusts the image to enhance the quality and change their structure.

In today's reality Information technology has demonstrated that there is a need to store and find large amount of electronic information productively and precisely. So document image processing is extremely difficult field of research.

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