COMPARISON OF FILTARATION IN IMAGE RESTORATION

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ABSTRACT

One of the most exciting areas of application for digital image restoration is that in the field of image and video coding. Even though coding efficiency has improved and bit rates of coded images have reduced, there is another problem of blocking artifacts. These are as a result of the coarse quantization of transform coefficients used in typical image and video compression techniques. Already, much has been accomplished to model these types of artifacts, and develop ways of restoring coded images as a post-processing step to be performed after decompression.

INTRODUCTION

A major portion of information received by the human from the environment is visual. The process of receiving and analyzing visual information by the human species is referred to as perception or understanding. Similarly, the process of receiving and analyzing visual information by a digital computer is called Digital Image Processing. Computers are becoming more powerful and at the same time less expensive. Thus, the hardware needed for digital image processing is readily available. In this way, image processing is becoming a common tool to analyze multidimensional scientific data in all areas of natural science.

Multichannel signal processing is of paramount importance in application areas such as bio medicine, computer and machine vision, robotics, entertainment and multimedia application, industrial inspection, remote sensing and many others. In all these areas the users and system developers work with multidimensional data sets. An image may be described as two dimensional functions I.

$$I = f(x, y)$$

Where x and y are the spatial coordinates. Amplitude of f at any pair of coordinates x, y is called intensity I or gray value of the image. When spatial coordinates and amplitude values are all finite and discrete quantities, the image is called a digital image. Digital image processing may be classified into various sub branches based on methods whose:

- Input and output are images.
- Input may be images where as output are attributes extracted from those images.

Following is a list of different image processing functions based on above two classes:

- Image acquisition
- Image enhancement
- Image restoration
- Color image processing
- Multi-resolution processing
- Compression
- Morphological processing
- Segmentation
- Representation & description
- Object recognition

For the first seven functions the input and output are the images where as for the rest three the output are attribute from input images. With the exception of image acquisition & display, most image processing functions are implemented in software. Image processing is characterized by specific solutions; hence the technique that works well in one area can be inadequate in another. The actual solution of a specific problem still requires a significant research and development. Out of the ten sub branches in digital image processing, cited above, this dissertation deals with image restoration.

PROPOSED METHODOLOGY

All the discussed algorithms are based on direct RGB color space. It is well known that RGB space is not a perceptually uniform color space, and thus it is not suitable for numerical analysis of color difference between two color pixels. To overcome this drawback, the difference between two color pixels is commonly evaluated in the perceptually uniform color spaces such as CIELAB [24]. Using RGB to CIELAB transformation we change the image from RGB color space to CIELAB color space. The Fig. 1 and Fig. 2 illustrate the flow charts of filtering scheme used to filter the corrupted image.

The algorithm consists of following stages

- Apply RGB or true color test image of Tajmahal (256 x 256) as input i1.
- Artificially add the impulse noise of noise density 5% to 30% with step size of 5% and Gaussian noise with zero mean and variance of 2% to 10% into test image i1 and denote it by I.
- Find out the size (b) of noisy image corrupted with impulse or Gaussian noise and converts I to double precision.
- Choose the filtering scheme from VMF, VDF & DDF
- Do the corresponding process related to the filtering scheme.
- Filtered image NI is received
- Then Calculate the quality parameters according to flow chart

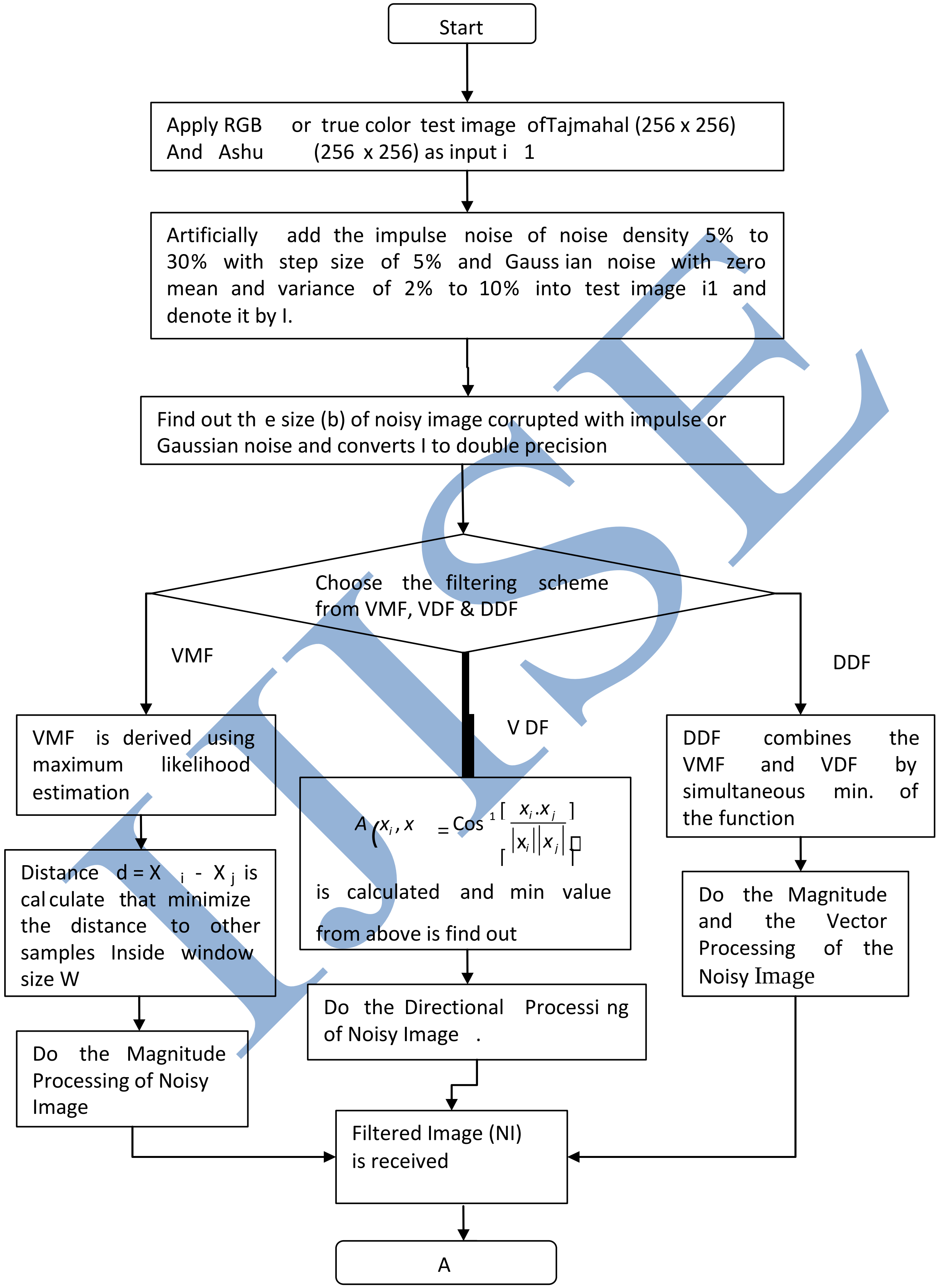

Fig. 1 Flowchart of the Filtering Schemes

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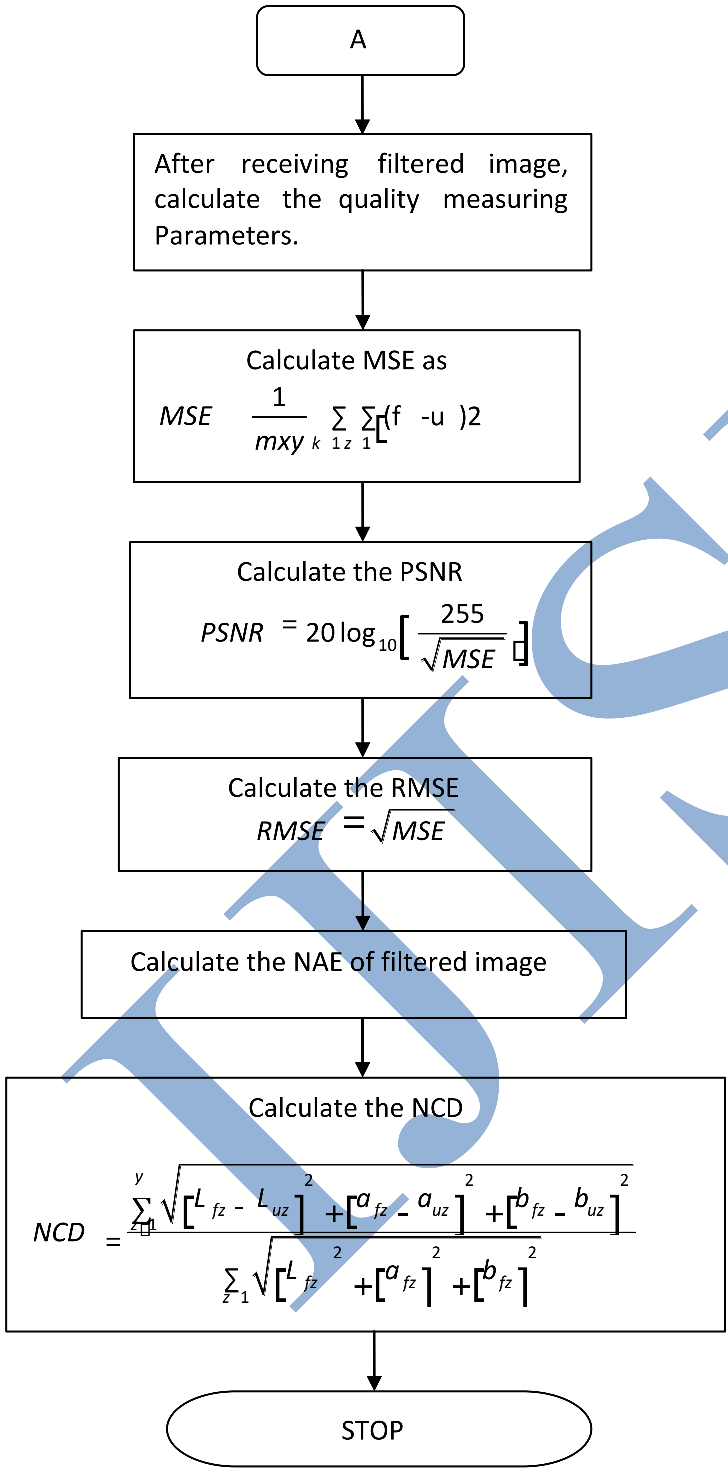


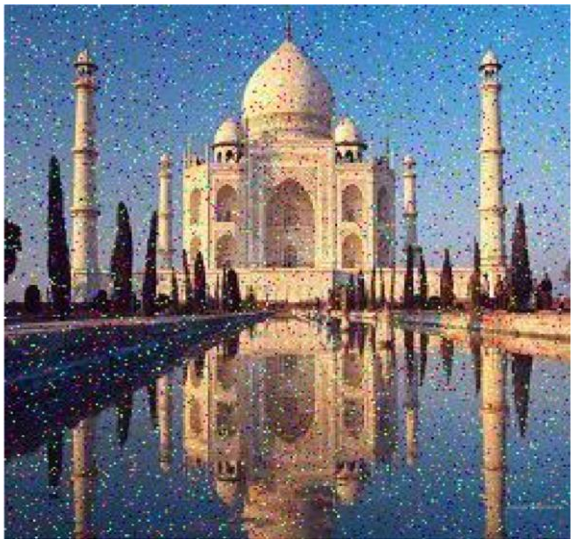
Fig. 2 Flowchart to calculate the parameters for comparison of Test Images

RESULT ANALYSIS

This section presents the simulation results illustrating the performance of the different filtering technique. The test image employed here is the true color image "Tajmahal" as shown in Fig. 3 respectively with 256×256 pixels.

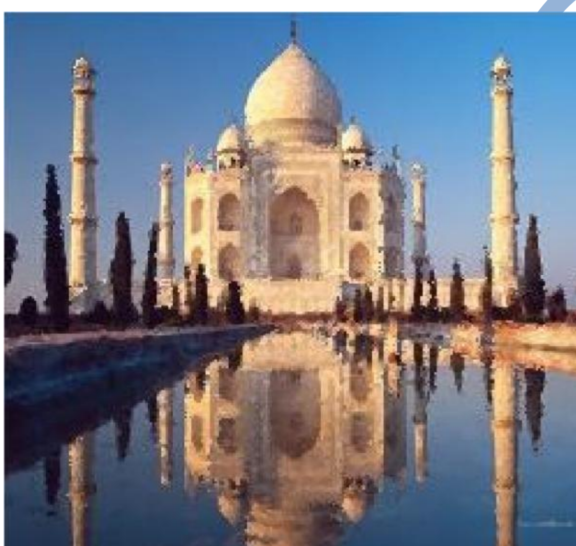
Fig. 3 Tajmahal images

The *salt and pepper noise* also known as *impulse noise* and *Gaussian noise* is added into the test image. Impulse noise is added with noise density 0.05, 0.10, 0.15, 0.20, 0.25 and 0.30 and filtered with DDF, VDF and VMF as shown in Fig. 4 to Fig. 9 respectively and then filtered by using DDF, VDF and VMF as shown in Fig. 10 to Fig 14 respectively. The performance of filters is evaluated by computing the MSE, PSNR (dB), RMSE, NAE, and NCD. The comparative analysis of the parameters is calculated and results will be discussed.

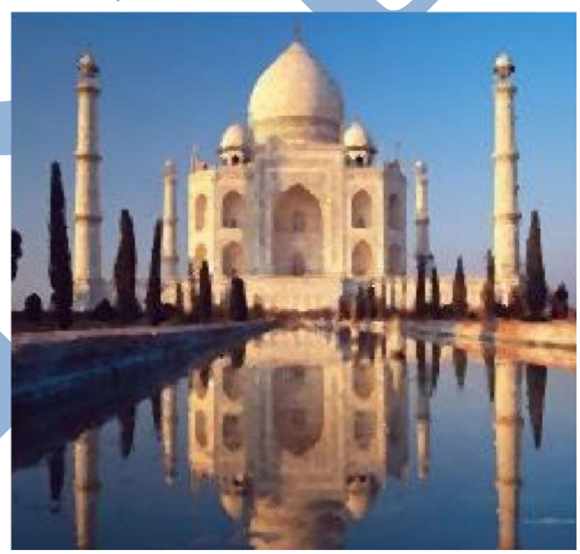


(a) Image with 5% impulse noise

(b) Filtered output of DDF



(c) Filtered output of VDF



(d) Filtered output of VMF

Fig. 4 Results of different filters in restoring Test image Tajmahal (256 X 256) corrupted with impulse noise of noise density 5% and filtered by DDF, VDF and VMF

Impulse noise with noise density 0.05 is added to the original test image Fig. 4.1-(a) and then the noisy image shown in Fig. 4.2-(a) is filtered with different filtering schemes DDF, VDF and VMF as shown in Fig. 4.2. DDF and VMF filtering scheme gives the good result among above images as compared to VDF.

Table 1: Comparison of MSE on Tajmahal corrupted with impulse noise

Noise Density	Mean Square Error (MSE)		
	MSE(ddf)	MSE(vdf)	MSE(vmf)
0.05	29.4335	21.7381	23.9704
0.10	30.6896	24.4817	26.1927
0.15	31.3056	26.2301	27.4936
0.20	31.7745	27.2698	28.6923
0.25	33.1169	28.9510	31.5407
0.30	33.0492	29.8984	34.0567

Low value of MSE indicates that the image is of good quality and vice-versa. From Table 4.1 and Fig. 4.8 it can be calculated density that at lower noise density **$MSE_{(ddf)} > MSE_{(vmf)} > MSE_{(vdf)}$ and** at high noise density **$MSE_{(vdf)} < MSE_{(ddf)} < MSE_{(vmf)}$.** VDF gives good result at lower noise density whereas at higher noise density the VDF and DDF filtering scheme gives good result.

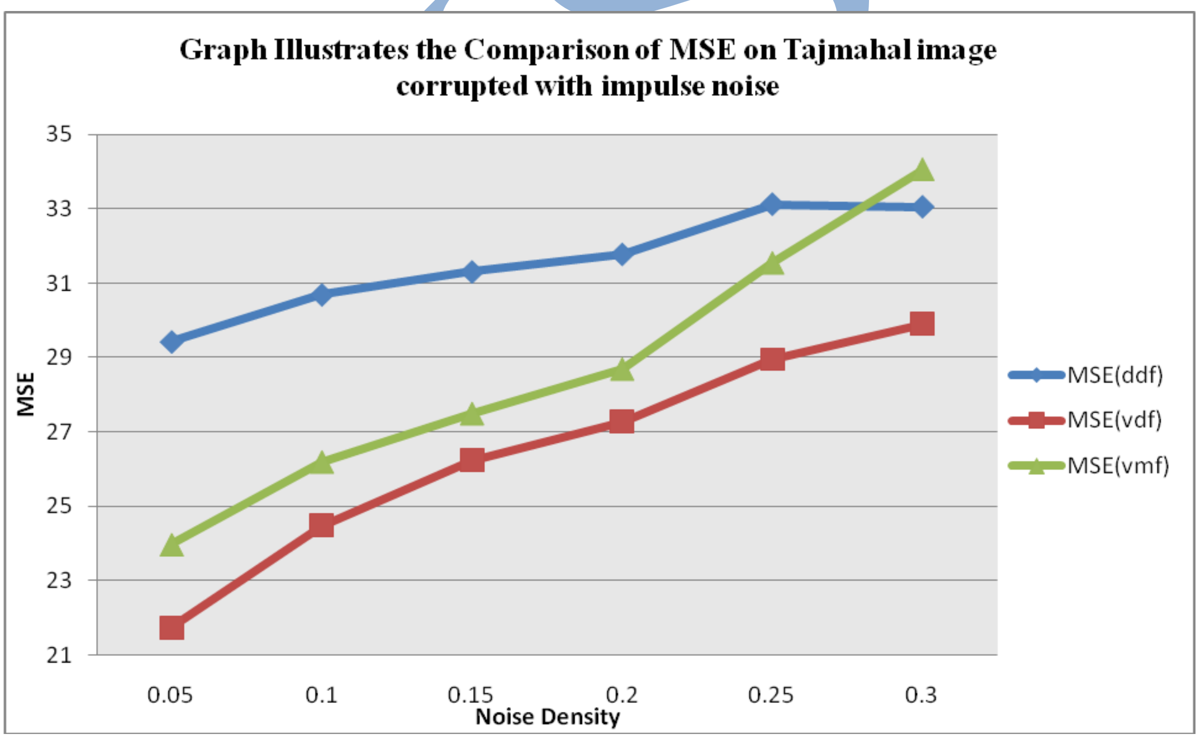


Fig. 10 Graph Illustrates the Comparison of MSE on Tajmahal image corrupted with impulse noise

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REFERENCES

[1]. A. Koschan and M. Abidi, "A comparison of median filter techniques for noise removal in color images", *Proc. 7th German Workshop on Color Image Processing*, Vol. 34, No. 15, pp. 69-79, October 2001.

[2]. B. Chanda and D. Majumder, "*Digital Image Processing and Analysis",* Prentice-Hall of India, 1st edition, 2002.

[3]. D. Karakos and P. Trahanias, "Combining Vector Median and Vector Directional Filters: The Directional Distance Filters", *Proceedings of ICIP-95*, Vol. 1, pp. 171-174, Oct. 1995.

[4]. D. Karakos and P. Trahanias, "Generalized Multichannel Image-Filtering structures**",** IEEE Transactions on image processing, vol. 6, no. 7, pp 1038-1045, July 1997.

[5]. J.Astola, P. Haavisto and Y. Neuvo, "Vector Median Filter", *Proceeding of the IEEE*, vol. 78, No. 4, April.1990.

[6]. J. Zheng, K. Valavanis and J. Gauch, "Noise Removal from Color Images", *J. Intell. Robot. Syst.*, vol. 7, No. 3, pp. 257-285, June, 1993.

[7]. K. Tang, J. Astola, and Y. Neuvo, "Nonlinear multivariate image filtering techniques," *IEEE Trans. Image Processing*, vol. 4, pp. 788–798, June 1995.

[8]. P. Trahanias and A. Ventsanopoulos, "Vector Directional Filters- A New Class of Multichannel Image Processing Filters", *IEEE Transactions on Image processing*, Vol. 2, No. 4, pp. 528-534, Oct. 1993

[9]. P. Trahanias, D. Karakos and A. Venetsanopoulos, "Directional Processing of Color Images: Theory and Experiments results", *IEEE Transactions on Image processing*, Vol. 5, No. 6, June 1996

[10]. Q. Xu, R. Zhang, M. Sbert, "A New Approach to impulse Noise Removal for Color Images", *ICME*, 2007.