

NOISE REMOVAL IN COMPOUND IMAGE USING MEDIAN FILTER

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ABSTRACT - Compound image is a combination of text, picture and graphs. Noise reduction in compound image is necessary to maintain the quality of images. Noise is added into an image at the time of image acquisition (or) image capturing. After capturing, image preprocessing is necessarily done to correct and adjust the image for further classification and segmentation. From the literature study different filtering techniques are available to reduce the noise from compound images. Normally the filters are used to improve the image quality, suppress the noise. This paper proposes median filtering technique for removing salt & pepper noise from various types of compound images. Several examples were conducted to evaluate the performance of the median filter on noise.

Keywords: *Compound Image, Salt & Pepper Noise, and Median Filter.*

I INTRODUCTION

With recent advances in data processing systems and in electronic imaging and scanning devices, documents are now present in a wide spectrum of printing systems. From offset printers to home desktop computers, documents in digital form became a common place [1]. Besides natural images, there are up to millions of artificial visual contents generated by computers every day, such as Web pages, PDF files, captured screens, online games, slides, and so on. These are very complicated and consist of text, graphics, and natural pictures. So these mixed types of images are called as compound images [2] [3]. When they are displayed in remote clients, wireless projectors or thin clients, how to efficiently compress them has become a prevalent and critical problem in many applications [4]. Image noise [5] is generally regarded as an undesirable by-product of image captures. At the time of image capturing there are various types of noises are included in that image. Image filtering [6] is not only used to improve image quality but also is used as a preprocessing stage in many applications including image encoding, pattern recognition, image compression, and target tracking, to name a few [7]. One of the most popular noises in an image is the salt & pepper noise [8] [9]. Noise in an image will decrease information of that image. Noise reduction is used to recover the perfect image from a

degraded copy of an image. This paper attempts to remove Salt & Pepper noise removal in various types of compound images.

The section II has an overview of various types in compound image. In section III & section IV the discussion is made about the basics of salt & pepper noise and median filter. In section V the results are experimented. Finally section VI has the conclusion of this work.

II COMPOUND IMAGES

Electronic document images often contain mixed content types like, text, background, graphics in both gray scale and in color form because of this mixed content, and they are termed as Compound Images.

The compound images are classified into various types. Two of most popular types are

1. Scanned compound images
2. Compound document images

When scanning a paper document or capturing documents using cameras, the resulting image may contain noise from dirtiness on the page during the acquisition process. This noise may hinder the translation of the image into ASCII characteristics while performing optical character recognition. It may also degrade an image such that key characteristics are damaged. So these types of images need noise reduction for further classification and segmentation.

III SALT & PEPPER NOISE IN IMAGES

There are various types of document noise that can corrupt images. Some of these are

1. Salient noise
2. White line dropout noise
3. Shadowing noise
4. Salt & pepper noise

In paper discuss about the salt and pepper noise in two types of compound images. The Salt & Pepper noise is randomly occurred in white and black pixels of an image. The main challenge in removing salt/pepper noise from binary image is due to the fact that image data as well as the noise share the same small set of values (either 0 or 1), which complicates the process of detecting and removing the noise.

IV MEDIAN FILTER

Normally filters are used to remove noise from images. Filters are classified into two types,

1. Linear Filters
2. Non-linear Filters

Linear filters too tend to blur sharp edges, destroy lines and other fine image details, and perform poorly in the presence of signal-dependent noise. With non-linear filters, the noise is removed without any attempts to explicitly identify it. The median filter was one of the most popular nonlinear filter for removing Salt & Pepper noise. The noise is removed by replacing the window center value by the median value of center neighborhood.

The scanned compound images and compound document images are experimented using median filter which is explained in the following section V.

V EXPERIMENTAL RESULTS

To assess the performance of the proposed filter for removal of Salt & pepper noise standard performance indices are defined as follows:

Peak Signal to Noise Ratio (PSNR): It is measured in decibel (dB) and for gray scale image it is defined as:

$$PSNR = 10 \log_{10} \frac{255^2}{mse} \text{ dB} \quad (1)$$

In the equation “(1)”, Where mse is the mean square error between the original and the denoised image. The higher the PSNR in the restored image, the better is its quality. In this paper four images are experimented. The quantitative results have been given in Table-I for the four images.

TABLE-I PSNR VALUE FOR TWO TYPES OF COMPOUND IMAGES

Image type	Scanned Image		Document Image	
	Scan image1	Scan image2	Doc image1	Doc image2
PSNR Value	17.71	12.34	21.85	19.15

In the above table PSNR value of four images are tested. According to the table the median filter is best suited for compound document images compared with scanned compound images.

The following images are tested.

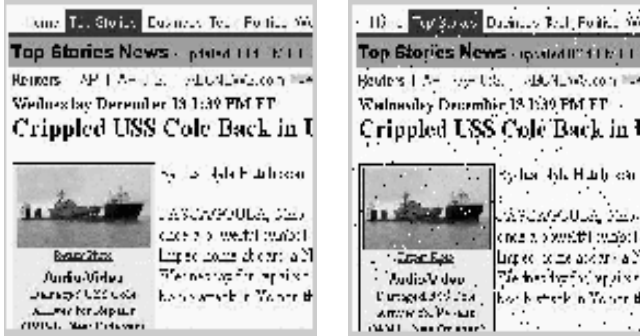


Original

Corrupted



Filtered
(a)Scan Image1



Original

Corrupted



Original

Corrupted



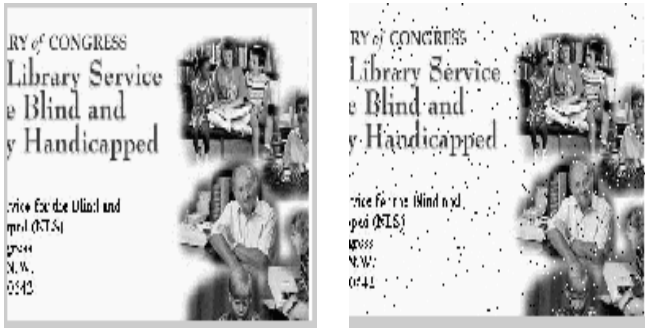
Filtered
 (b) Scan Image2

Fig 1 Scanned compound image noise removal Using median filter



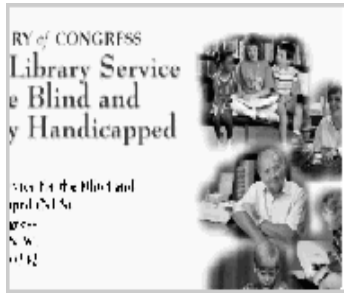
Filtered
 (b) Doc image2

Fig 2 Compound document image noise removal Using median filter



Original

Corrupted



Filtered
 (a) Doc Image1

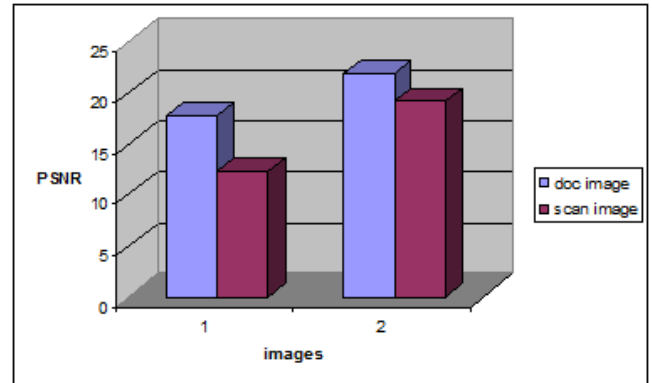


Fig3 PSNR value comparison for two types of compound images

Figure 3 shows the performance results of two types of compound images.

VI CONCLUSION

This paper attempts to remove Salt & pepper noise from two types of compound images using median filter. The performance of the median filter with these two types of images are compared and analyzed according to PSNR value. From the performance analyses the median filter gives better results for compound document images compared with scanned compound images.

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