RESEARCH ARTICLE

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Image Restoration and De-Blurring Using Various Algorithms

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ABSTRACT

Most offline handwriting recognition approaches proceed by segmenting characters into smaller pieces which are recognized separately. The recognition result of a word is then the composition of the individually recognized parts. Inspired by results in cognitive psychology, researchers have begun to focus on holistic word recognition approaches. Here we present a holistic word recognition approach for degraded documents, which is motivated by the fact that for severely degraded documents a segmentation of words into characters will produce very poor results. The quality of the original documents does not allow us to recognize them with high accuracy - our goal here is to produce transcriptions that will allow successful retrieval of images, which has been shown to be feasible even in such noisy environments. We believe that this is the first systematic approach to recognizing words in historical manuscripts with extensive experiments. Our experiment is to clear the degraded documents using filter approach. We will use wiener filter for removing noise partials from different images using wiener filter algorithm. We will also implement this design using GUI (Graphical User Interface) for selecting different images from our created data-base.

Keywords:- GUI, MSE

I. IMAGE PROCESSING

Image processing is a technique for converting an image into digital form and performing operations, in order to get some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. Image processing basically include three steps, first is to Importing the image, second to analyzing and manipulating the image including compression, enhancement and spot patterns and last is to analyze the image to get required output.

II. DEGRADED IMAGES

Degradations in document images result from poor quality of paper, the printing process, ink blot and fading, document aging, extraneous marks, noise from scanning, etc. The goal of document restoration is to remove some of these artifacts and recover an image that is close to what one would obtain under ideal printing and imaging conditions. The ability to restore a degraded document image to its ideal condition would be highly useful in a variety of fields such as document recognition, search and retrieval, historic document analysis, law enforcement, etc.

(a)



(b) Figure 1(a,b) DEGRADED DOCUMENT IMAGES

III. IMAGE RESTORATION

Pre-processing methods that aim to suppress degradation using knowledge about its nature are called image restoration. Most image restoration methods are based on convolution applied globally to the whole image. Degradation of images can have many causes: defects of optical lenses, non-linearity of the electro-optical sensor, graininess of the film material, relative motion between an object and camera, wrong focus, atmospheric turbulence in remote sensing or astronomy, scanning of photographs, etc.. The objective of image restoration is to reconstruct the original image from its degraded version.

Wiener Filter

The Wiener filter is a linear filter for filtering images degraded by additive noise and blurring. Calculation of the Wiener filter requires the assumption that the signal and noise processes are second-order stationary. Wiener filters are often applied in the frequency domain. An image is often corrupted by noise in its acquisition and transmission. Image de-noising is used to remove the additive noise while retaining as possible as possible the important signal features.

Ni-Black Algorithm

Most common problems in poor quality document images are:

- (1) Variable background intensity due to non-uniform illumination and unfit storage.
- (2) Very low local contrast due to smear or smudge and shadows in the capturing process of the document image.
- (3) Poor writing or printing quality.
- (4) Serious signal-dependent noise.

(5) Gray-scale changes in highlight and color areas. It is essential to find thresholding methods which can correctly keep all useful information and remove noise and background. The sole purpose of thresholding is to convert a gray scale image into a binary image.

The simplest property that pixels in a region share is intensity. So, a natural way to segment such regions is through thresholding, the separation of light and dark regions. Thresholding creates binary image from grey-level image by turning all pixels below some threshold value to zero and pixels above the threshold value to one, thus converting image into black and white regions.

If g(x, y) is a threshold version of f(x, y) at some global threshold T, then

 $g(x,y) = \{1 \text{ if } f(x,y) \ge T$

0 otherwise

IV. STATEMENT OF THE PROBLEM

Image enhancement technique is used to enhance the quality of degraded document images. In the degraded images we generally found the problems like Broken line structures in which the gaps of all sizes in lines were roughly counted and large gaps were considered worse than small. Broken symbols, text, etc in which Symbols and text characters with gaps were roughly counted and the degree of fragmentation was also assessed. Blurring of lines, symbols and text in which both the number of blurred print objects and the degree of blurring were assessed. Loss of complete objects in which the number of print objects which were completely lost was roughly counted. Noise in homogeneous areas in which the number and the size of noisy spots and false objects in both background and print were estimated. IBT using limited number set of rules with 2x2 mask which is not able to predict various types of noises, we will try to remove the blurry effect from degraded images using wiener filter algorithm. Wiener filter is used for restoration purpose. Image restoration is an old problem in image processing, but it continues to attract the attention of researchers and practitioners alike. A number of real-world problems from astronomy to consumer imaging find applications for image restoration algorithms. Plus, image restoration is an easily visualized example of a larger class of inverse problems that arise in all kinds of scientific, medical, industrial and theoretical problems. Besides that, it's just necessary to apply an algorithm to a blurry image and then restore the image. In this proposed work I will try to implement Wiener Filter & Ni-Black algorithms to restore the images. I will also try to calculate PSNR and try to reduce the error ratio.

Objectives

- To reduce the noise in homogenous areas.
- To implement Ni-Black's algorithm.
- To implement Wiener Filter algorithm.
- Calculate PSNR, MSE & Elapse Time.

V. RESULT AND DISCUSSION NI-BLACK ALGORITHM

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Figure 1: Input Image





Figure 3: Output of Ni- Black Algorithm



Figure 4: Plot for MSE





Figure 6: Plot for TIME

WIENER FILTER ALGORITHM

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Figure 7: Input Image



Figure 8: Restore Image

Figure 9: Degrade Image



Figure 10: Plot for MSE

Figure 11: Plot for PSNR



Figure 11: Plot for TIME-TAKEN

TABLES

Table1- Ni-Black Algorithm

Image Name	Size Of Input	Size Of Output	MSE	PSNR	Execution
	Image (pixel)	Image (pixel)			Time (sec.)
Doc_1	1402500	38734	0.7091	36.5115	7.100500
Doc_2	1402500	50650	0.6968	36.6204	2.806731
Doc_3	1398725	48742	0.6949	36.6375	4.786733
Doc_4	1402500	27118	0.7213	36.4063	2.690524
Doc_5	1402493	46812	0.7008	36.5853	2.592645

Table 2 - Wiener Filter Algorithm

Image Name	Size Of Input	Size Of Output	MSE	PSNR	Execution
	Image (pixel)	Image(pixel)			Time (sec.)
Doc_1	128903	133392	0.3964	56.1686	2.775168
Doc_2	332463	345870	0.5259	53.7127	1.175190
Doc_3	778671	812285	0.5976	52.6032	2.484617
Doc_4	712505	743262	0.5993	52.5778	2.871289
Doc_5	716838	737639	0.2783	59.2400	1.815139

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VI. CONCLUSION

This research work is based on removing noise from degraded images (handwritten documents). The implemented algorithm is Wiener Filter Algorithm. Coding is done on MATLAB tool, the code is written and tested on a number of images from different DIBCO datasets. This method includes de-blurring or de noising of degraded documents. This research work develops a system which is used to clear the degraded documents. Parameters like Peak Signal to Noise Ratio, Image size, Mean Square Error etc. are calculated to show the improvement for our work.

Another algorithm for removing blurred background has also been developed; the algorithm is Ni-Blacks algorithm. Both the algorithms are used for different type of images. The results are compared are shown in the chapter above.

VII. FUTURE SCOPE

For developing an image technique that will become efficient for clearing degraded images, blur images and other noisy images. In future the better design for GUI can also be implemented.

Also the design can be improved for reduced the time taken for execution our code and improved PSNR and MSE. More parameters can also be calculated. Some other filters can also be implemented.

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