A Literature Review on Document Image Binarization

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ABSTRACT

Document Image Binarization is performed in the preprocessing stage for document analysis and it aims to segment the foreground text from the document background. A fast and accurate document image binarization technique is important for the ensuing document image processing tasks such as optical character recognition (OCR) and Document Image Retrieval (DIR). This research area has been studied for decades; many techniques have been reported and applied on different commercial document analysis applications. However, there are still some unsolved problems need to be addressed due to the high inter/intra-variation between the text stroke and the document background across different document images.

I. INTRODUCTION

Document Image Enhancement is a technique that improves the quality of a document image to enhance human perception and facilitate subsequent automated image processing. It is widely used in the pre-processing stage of different document analysis tasks. Document image enhancement problem is essentially an ill-posed problem, because a number of enhanced images can be generated from the same input image. Moreover, the quality of enhancement techniques is mainly judged by human perception, which makes the quantitative measures hard to be applied.

II. RELATED WORK

In [1] Sayali Shukla, Ashwini Sonawane et.al: This paper presents a new approach for enhancement of degraded documents. It consists of an adaptive image contrast based document image binarization technique that is tolerant to different type of document degradation such as uneven illumination document smear involving smudging of text, seeping of ink to the other side of page, degradation of paper ink due to aging etc. The images i.e. scanned copies of these degraded documents are provided as an input to the system. They are processed to get the finest improved document so that the contents are visible readable. Contrast image construction can be constructed using local image gradient and local image contrast. Further edge estimation algorithm is used to identify the text stroke edge pixels .The text within the document is further segmented by a thresholding technique which is based on the height and width of letter size present in degraded document image. It works for different format of degraded document images. The method has been tested on Document Image Binarization Contest (DIBCO) experiments on Bickley diary dataset, consists of several challenging degraded document images.

In [2], This paper has focused on the degraded document binarization technique. Document binarization is a key application of vision processing. The main objective of this paper is to evaluating the short comings of algorithms for degraded image binarization. It has been found that each technique has its own benefits and limitations; no technique is best for every case. The main limitation of existing work is found to be noisy and low intensity images.

In [3] Bolan Su, Shijian Lu, and Chew Lim Tan, Senior Member, IEEE et.al a novel method is proposed to binarize text from color images with textured background by analyzing character and non character edges. Sliding window based method is proposed to identify the character edges by suppressing the unwanted non character edges. Experimental results are showing encouraging performance of the proposed method with the compared binarization algorithms.

In [4] O. Imocha Singh, Tejmani Sinam et.al.This paper presents a new way of image binarization using a local threshold value which is determined using contrast pixel value within a local window size for local adaptation. We compare the result with other local techniques like Sauvola, Niblack, TR Singh et al, LAAB and Bernsen techniques.

In[5] Bolan Su, Shijian Lu et.al This paper presents a new document image binarization technique that segments the text from badly degraded historical document images. The proposed technique makes use of the image contrast that is defined by the local image maximum and minimum. Compared with the image gradient, the image contrast evaluated by the local maximum and minimum has a nice property that it is more tolerant to the uneven illumination and other types of document degradation such as smear. Given a historical document image, the proposed technique first constructs a contrast image and then detects the high contrast image pixels which usually lie around the text stroke boundary. The document text is then segmented by using local thresholds that are estimated from the detected high contrast pixels within a local neighborhood window. The proposed technique has been tested over the dataset that is used in the recent Document Image Binarization Contest (DIBCO) 2009. Experiments show its superior performance.

III. PROPOSED WORK

For a degraded image adaptive contrast map is constructed and then threshold is calculated from that which converts the document into binary.

A. The global contrast has three main regions:

- Mid-tones

- Highlights

- Shadows

IV. RESULTS AND CONCLUSION

Image binarisation technique requires the calculation of adaptive threshold value which can be tuned to image type and its contrast. No single method can work for all type of images. For that purpose we used self tuning optimization which will extract the threshold value depending upon imageIn our work we have used DIBCO 2010 data sets of images. This data set consists of a set of 10 degraded document images of various contrast level. The extraction of binary image from a document image with less contrast is very easy and gives high values of out parameters. By optimization gain value and block size for every image is set. Before processing the image pre processing of image is done by using wiener filter. The Wiener filter minimizes the mean square error between the estimated random process and the desired process. The goal of the Wiener filter is to compute a statistical estimate of an unknown signal using a related signal as an input and filtering that known signal to produce the estimate as an output. For example, the known signal might consist of an unknown signal of interest that has been corrupted by additive noise. The Wiener filter can be used to filter out the noise from the corrupted signal to provide an estimate of the underlying signal of interest. Thus wiener filter removes the noise in the image and make it more approachable to desired results. The output of wiener filter and test image is shown in figure 5.1 and 5.2 and notice the difference. Further bacterial foraging optimization is used and run for 140 iterations. In each iteration a new value of gain factor and window size is calculated and PSNR and F-measure output is observed at each iteration.
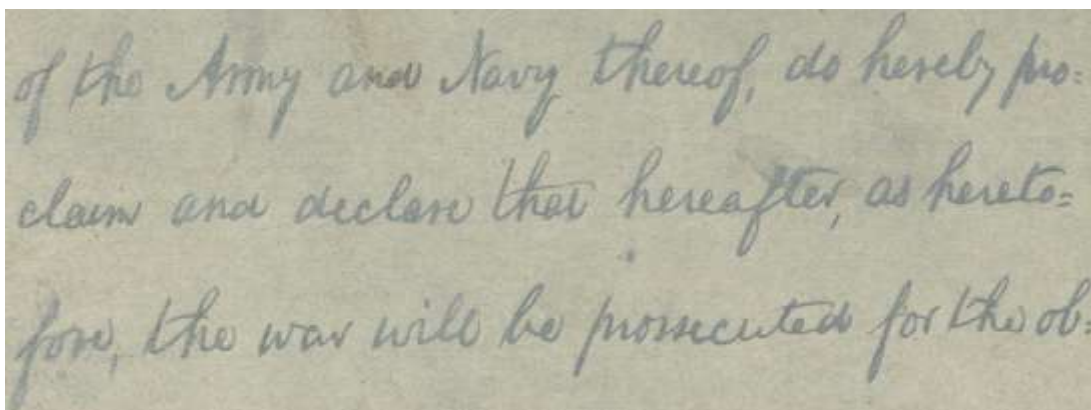
Input Image

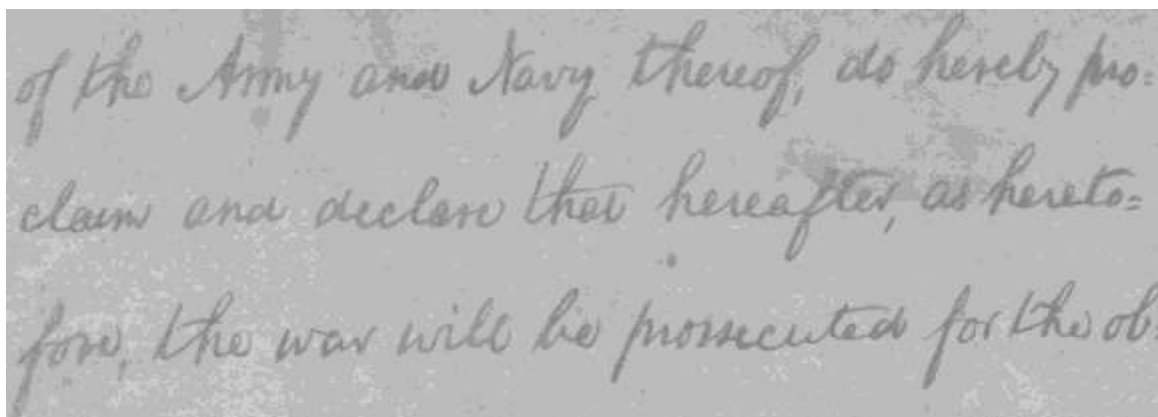**Figure 1.1: Input test image**

Wiener filtered Image

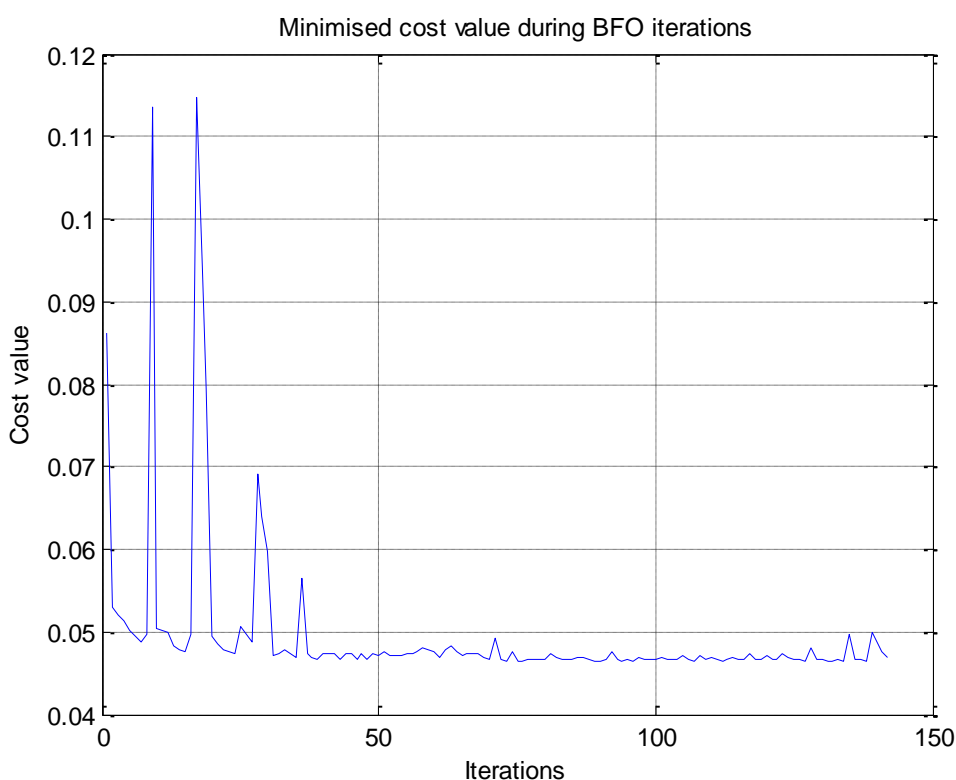**Figure 1.2: Wiener filter processed image**

Figure 1.3: cost function value after optimization of test image 1

CONCLUSION

We have proposed a novel document enhancement technique that has been tested on some public datasets and shown superior performance. We have considered the 10 test images of DIBCO 2010 data sets which are different in contrast and luminance. None of the image is similar to other. In such type of cases a single thresholding algorithm can't perform well for each image, it may give very good results for one or poor for other. So an adaptive thresholding algorithm is suggested in our work, which self tune to every image. Tuning parameters in our case are gain factor which have been taken from Niblak's method and block size of image, as we have considered the local thresholding scheme. It is shown, on the basis of a historical dataset with a defined ruling, that the layout information can be used as foreground estimation. The foreground is estimated to suppress background noise. Our results have been compared with some recent effective methods and performance is checked on the basis of peak signal to noise ration and F-measure which are the strong parameters and true evaluator for the image processing.

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