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Comparison Analysis of Different Binarization Techniques with Bernsen Method

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Abstract: ***Image binarization is the process of separation of pixel values into two groups, white as background and black as foreground. Thresholding plays a major in binarization of images. Thresholding can be categorized into global thresholding and local thresholding. In images with uniform contrast distribution of background and foreground like document images, global thresholding is more appropriate. In degraded document images, where considerable background noise or variation in contrast and illumination exists, there exist many pixels that cannot be easily classified as foreground or background. In such cases, binarization with local thresholding is more appropriate. In this thesis work, we have described a locally adaptive thresholding technique that removes background by using local mean and mean deviation. Normally the local mean computational time depends on the window size. The Global technique uses integral sum image as a prior processing to calculate local mean. It does not involve calculations of standard deviations as in other local adaptive techniques. This along with the fact that calculations of mean are independent of window size will speed up the process as compared to other local thresholding techniques.Optical character recognition (OCR) is used to enable keyword searches, document categorization, and other referencing tasks. These documents are challenging for OCR because they use non-standard fonts and suffer from printing noise, artifacts due to aging, varying kerning (space between letters), varying leading (space between lines), frequent linebreak hyphenation, and other image problems.Commercially, competitive OCR algorithms are designed to interpret bi-level (black and white) images. We consider the problem of denoising and binarizing scanned historical printed documents as a pre-processing step for OCR to enable keyword search. In this work, state-of-the-art commercial OCR is treated as a black box. Comprehensive experiments compare the effectiveness of a number of methods proposed in the literature and some newly developed methods to binarize images for keyword extraction for searching and indexing historical documents.***

Keywords: OCR, multilingual system, Bernsen Ago, Preprocesing, Binarization

I. INTRODUCTION

Image Binarizaion is the process of separating out the foreground from the background of an image and important preprocessing in image analysis. Its purpose is to acquire some useful information in the image for higher level image processing. Binarization or thresholding is such a widely-used method and generally, its process is to first determine a gray threshold according to some objective criteria and then assigns each pixel to one class (such as the foreground) if its gray level or gray value is greater than the determined threshold and otherwise to the other class (such as the background).

II. PROPOSED METHODOLOGY

The main steps are involved in achieving OCR are as follows:

1. Image Acquistion
2. Pre-Processing
3. Image binarization

This complete process has been shown in the following flow chart.

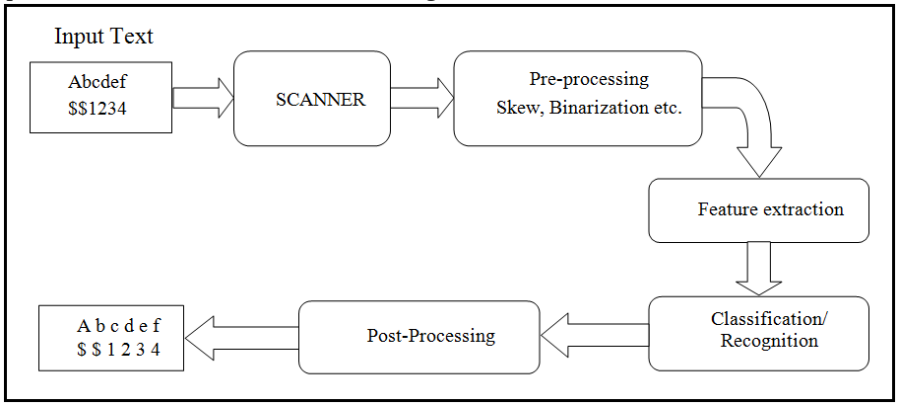

Fig 1 Complete Process of Image Binarization Through OCR

1.1 Pre-processing

We have used laplacian filter to improve the edges and sharpness of the image. The alpha parameter for lapalacian filter is kept 0.5.Noise removal is also essential for successful implementation of OCR and to enhance the quality of the image. Wernier filter [21] is used in most of the previous work and is proved worth in these types of requirements. It analyzes the local neighborhood pixels and estimates the statistics. The 3x3 wernier filter is used. Following images are shown result of before after preprocessing.

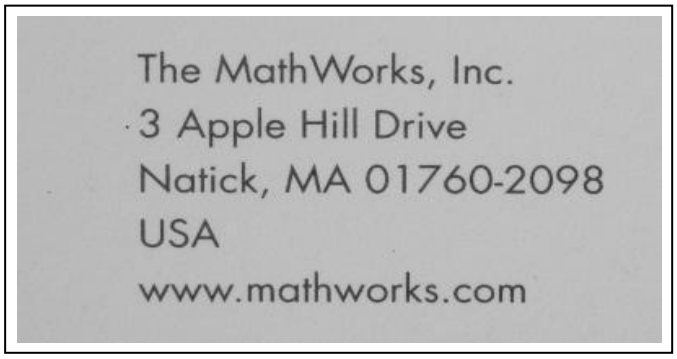

Fig. 1 Original Image

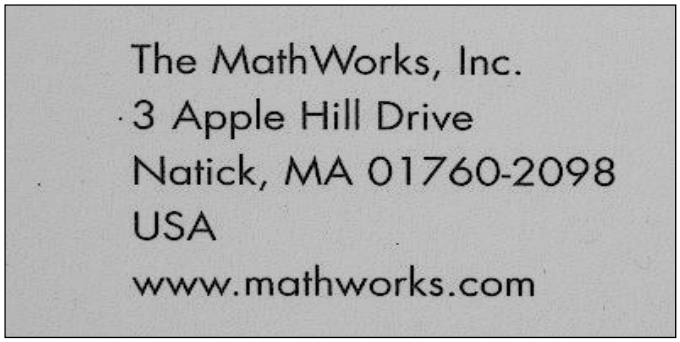

Fig. 2 Laplacian Filtering Image

Fig. 3 Weiner Filtering Image

1.2 Binarization

Image segmentation is a critical and essential component of image analysis and/or pattern recognition system. It is one of the most difficult tasks in digital image processing, and its accuracy determines the success and failure of given system [17]. Two types of characters colours, black and white are considered. While acquisition the license plate image may suffer from brightness distribution due to effect of environment (such as rain, fog, presence of shadows etc) or condition of plate (such as age of plate, dust). Therefore global thresholding can fail when the background illumination is uneven. In these scenarios, locally adaptive binarization methods are used for segmentation [18]. The Bernsen algorithm [19] is such method to the solve problem of uneven illumination.

1.3 Bernsen Algorithm

Bernsen algorithm [19] is such method to the solve problem of uneven illumination. Suppose that *f* is the input image and *f(x, y)* denotes a gray value of point *(x, y)*. The mean gray level *M(x, y)* of centre point(*x*, *y*) within window size of (2*w+1)* × *(2w+1)* is calculated as:

$$M(x,y) = \frac{\max_{-w \le k,l \le w} f(x+l,y+k) + \min_{-w \le k,l \le w} f(x+l,y+k)}{2} \quad (3.1)$$

where*l* is x-axis direction size of *w* and *k* is the y-axis direction size of *w*. A window size of 15givesthe satisfactory results and fixed for all experiments. The contrast difference with in window is given as:

$$C(x,y) = \max_{-w \le k,l \le w} f(x+l,y+k) - \min_{-w \le k,l \le w} f(x+l,y+k) \quad (3.2)$$

If the contrast *C(x, y)* is below a certain threshold 15 (experimentally calculated), then threshold value is set to fixed threshold value (100). The threshold *T*(*x*, *y*) of centre point(*x*, *y*) is given as:

$$T(x,y) = \begin{cases} M(x,y), & if(C(x,y) \geq \\ 100, & else. \end{cases} \quad (3.3)$$

Therefore it can be concluded that control over the threshold value is not biased. Then, the binary image *b(x, y)* is obtained as:

$$b(x,y) = \begin{cases} 0, & if(f(x,y) < T(x,y)) \\ 1, & else. \end{cases} \quad (3.4)$$

Where 0 (black) represents foreground colour and 1 (white) represents background.

III. SIMULATION RESULTS AND EVALUTION

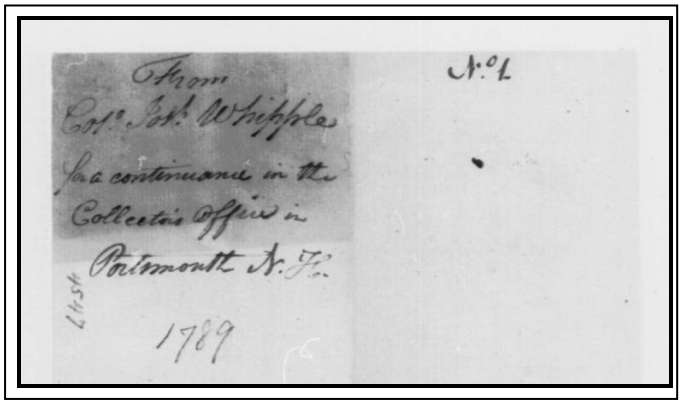

Fig. 4 Original Image

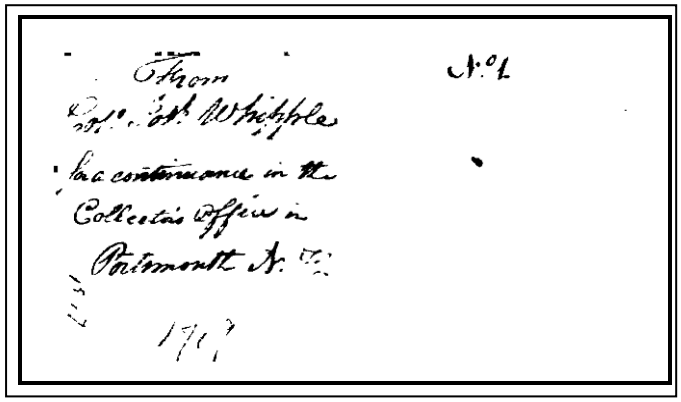

Fig. 5 Bernsen Image

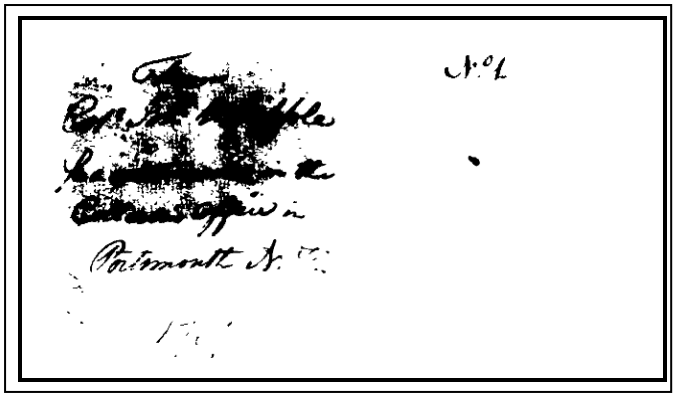

Fig. 6 Im2bw Image

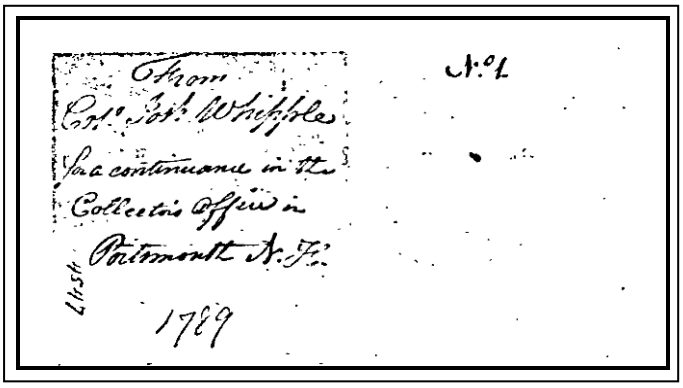

Fig. 7 Nilblack's Image

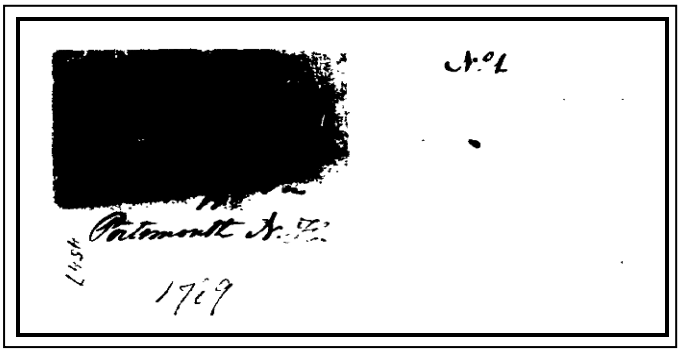

Fig. 8 Ostu's Image

(showing the result after applying different binarization techniques)

Table 1.1(showing the comparison of binarization with different techniques)

S.no.	Method	F-measure(%)	PSNR
1	Bernsen	81.484869	18.81909
2	im2bw	50.447931	11.95516
3	Niblack	80.012947	17.91927
4	Ostu	28.074058	7.26691

IV. CONCLUSION

This method describes simple efficient OCR system for printed text document in English. It takes complex image and convert it into binarized form. In binarization ,it has used bernsen algorithm which gives the more than 90% accurate results as compare to other algorithms and methods. we tackled the general problem of binarizing degraded documents images. A lot of methods were proposed in the literature for binarizing documents images, but no one between them demarcate to the others, especially for the old documents images having different degradation characteristics

REFERENCES

[1] An Adaptive Binarization Technique for Low Quality Historical Documents Basilios Gatos, IoannisPratikakis, and Stavros J. Perantonis

[2] Niblack, W.: An Introduction to Digital Image Processing. Englewood Cliffs, N. J., Prentice Hall (1986) 115-116

[3] Optical Character Recognition (OCR) for Printed Devnagari Script Using Artificial Neural Network Raghuraj Singh1, C. S. Yadav2, Prabhat Verma3, Vibhash Yadav4

[4] Design of an Optical Character Recognition System for Camera-based Handheld Devices AyatullahFarukMollah, NabamitaMajumder, SubhadipBasuand MitaNasipuri

[5] Fast Document Image Binarization Based on an Improved Adaptive Otsu's Method and Destination Word Accumulation Yudong ZHANG , Lenan WU† (Journal of Computational Information Systems 7: 6 (2011) 1886-1892)

[6] A Complete Optical Character Recognition Methodology for Historical Documents G.Vamvakas, B.Gatos, N. Stamatopoulos, and S.J.Perantonis(The Eighth IAPR Workshop on Document Analysis Systems)

[7] A Methodology of Separating Images from Text Using an OCR Approach *Nikoluos*G. *Bourbakis*

[8] An Improved Adaptive Document Image Binarization Method Shuang-fei ZHOU Chun-ping LIU Zhi-ming CUI Sheng-rong GONG

[9] Extraction of Text on TV Screen using Optical Character Recognition Ivan Kastelan, Sandra Kukolj, Vukota-Pekovic, Vladimir Marinkovic, ZoranMarceta (2012 IEEE 10th Jubilee International Symposium on Intelligent Systems and Informatics • September 20-22, 2012, Subotica, Serbia)

[10] Fast and Efficient Document Image Clean Up and Binarization Based on Retinex Theory Marian Wagdy12 Ibrahima Faye 13 DayangRohaya 12 (2013 IEEE 9th International Colloquium on Signal Processing and its Applications, 8 - 10 Mac. 2013, Kuala Lumpur, Malaysia)

[11] Exploiting Stroke Orientation for CRF based Binarization of Historical Documents XujunPeng, Huaigu Cao, Krishna Subramanian, Rohit Prasad, and PremNatarajan (2013 12th International Conference on Document Analysis and Recognition)

[12] Binarizing Document Image Using Coplanar PrefilterLiyingFan,Lixin Fan and Chew Lim Tan(Proceedings of the Sixth International Conference on Document Analysis and Recognition (ICDAR'01))

[13] http://www.csie.ntu.edu.tw/~cjlin/libsvm, accessed Aug. 2013.

[14] http://www.csie.ntu.edu.tw/~cjlin/papers/guide/guide.pdf, accessed Aug. 2013.

[15] Cheng, H.D., Jiang, X.H., Sun, Y., Wang, J.: 'Color image segmentation: advances and prospects'. Pattern Recognition, 2001, 34, (12), pp. 2259-2281.

[16] Wen, Y., Lu, Y., Yan, J., Zhou, Z., Deneen, V., K. M., Shi, P.: 'An Algorithm for License Plate Recognition Applied to Intelligent Transportation System'. IEEE Transactions on Intelligent Transportation Systems, 2011, 12, (3), pp. 830 – 845.

[17] Bernsen, J.: 'Dynamic thresholding of gray-level images', In Proc. 8th Int. Conf. Pattern Recognition, 1986, pp. 1251–1255.

[18] Rosenfeld, A., and Pfaltz, J. L.: 'Sequential operations in digital picture processing'. Journal of the ACM, 1996, 13, (4), pp. 471–494.

[19] Jain, A.: Fundamentals of Digital Image Processing. Prantice Hall, Englewood Cliffs, NJ (1989)

[20] The United States Postal Service: An American History 1775--2002, Government Relations, United States Postal Service, 2003.

[21] H. Genchi, K. Mori, S. Watanabe, S. Katsuragi, Recognition of handwrittennumeral characters for automatic letter sorting, Proc. IEEE 56 (1968)1292--1301.

[22] http://www.industry.siemens.com/postal-automation/usa/_.

[23] Wen, Y., Lu, Y., Yan, J., Zhou, Z., Deneen, V., K. M., Shi, P.: 'An Algorithm for License Plate Recognition Applied to Intelligent Transportation System'. IEEE Transactions on Intelligent Transportation Systems, 2011, 12, (3), pp. 830 – 845.

[24] Bernsen, J.: 'Dynamic thresholding of gray-level images', In Proc. 8th Int. Conf. Pattern Recognition, 1986, pp. 1251–1255.

[25] Rosenfeld, A., and Pfaltz, J. L.: 'Sequential operations in digital picture processing'. Journal of the ACM, 1996, 13, (4), pp. 471–494.

[26] Jain, A.: Fundamentals of Digital Image Processing. Prantice Hall, Englewood Cliffs, NJ(1989)

[27] Zheng, L., and He, X.: 'Number plate recognition based on support vector machines'. In Proceedings of the IEEE International Conference on Video and Signal Based Surveillance (AVSS'06), 2006.

[28] Armon, S.: 'Handwriting recognition and fast retrieval for Hebrew historical manuscripts', PhD thesis, 2011.

