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Evaluation of Sobel Edge Detection Technique for Counting of Clustered Soyabean Seeds

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Abstract- Counting of different types of objects is an important and challenging activity in the daily routine of many areas of industry. This is particularly true in agriculture, in which objects like cells, microorganisms, seeds and other structures have to be quantified as a source of relevant information. One of the most used methods to test the quality of grain seeds is to determine their weight per thousand kernels. Normally, those seeds are counted either manually or using expensive commercial photoelectronic counters.We use Sobel edge detection method for counting soyabean seeds.We use Matlab 7.0 software.Here the delimitation of area of interest for counting is overcome.Other parameters like Entropy,energy,histogram,correlation ,contrast,local range and standard deviation also calculated.

Keywords- Soyabean seeds, Sobel edge detection,CLAHE, Dialation,Co-occurrence Matrix.

I. INTRODUCTION

One of the most used methods to test the quality of grain seeds is to determine their weight per thousand kernels.Normally, those seeds are counted either manually or using expensive commercial photoelectronic counters. A method [1] that depends only on a low-end digital camera and a computer may be very useful. Automatic counting of objects in digital images is a subject that has received significant attention in the last 20 years, dealing with objects as varied as cells [1], bacteria [2], trees [3], fruit [4], pollen [5], insects [6], people [7], etc. The authors proposed a vibrating mechanism to separate the seeds, and used a high contrast background to favor the estimates. They reported accuracy close to 100%. Without external intervention, the seeds are more likely to be found clustered than spread, in which case the method proposed by Zhao and Li is not effective. Also, it is usually more time effective to have a higher seed density per image. The technique proposed here tackles this clustered seed problem, and it was designed to work even under far-fromideal conditions, including variation in illumination and low contrast between seeds and background. The proposal is mainly based on morphologic operations largely used in digital image processing, in order to make its implementation simple and to keep the computational burden low.

Figure 1. Soybeans concentrated in part of the image (source:www.21food.com).

II. METHOD

The Sobel operator is used in image processing, particularly within edge detection algorithms. Technically, it is a discrete differentiation operator, computing an approximation of the gradient of the image intensity function. At each point in the image, the result of the Sobel operator is either the corresponding gradient vector or the norm of this vector. The Sobel operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations. If we define Gx and Gy are two images which at each point contain the horizontal and vertical derivative approximations, the computations are as follows.

$G = \sqrt{(Gx)^2 + (Gy)^2}$

Typically, an approximate magnitude is computed using. which is much faster to compute.

$G = |Gx| + |Gy|$

Method for getting result is following by the different steps which are as follows:

Step1- Take digital soyabean seeds image and converted it into grey image .After that apply adaptive thresholding to image. CLAHE(Contrast Limited Adaptive Histogram Equilization) is applied to Image for adaptive thresholding.
Step2- Then convert CLAHE image to binary image.Reverse the binary image and apply filter to enhance image and remove noise from image.
Step3- Dialation is applied to image and then enhance the same dialated image.Then a thresholding level is applied to image. And again apply filter to remove noise.
Step4- Then refining the shape of soyabean beans.Sobel Edge detection is applied to image.Then enhancing and smoothing the bean shape.
Step5- Finally beans are extracted with respect to bean shapes.
Step6- We also calculate various parameters like energy, entropy, contrast, correlation, local range, Standard deviation and histogram.

III. RESULT

Final result will come by following these steps.

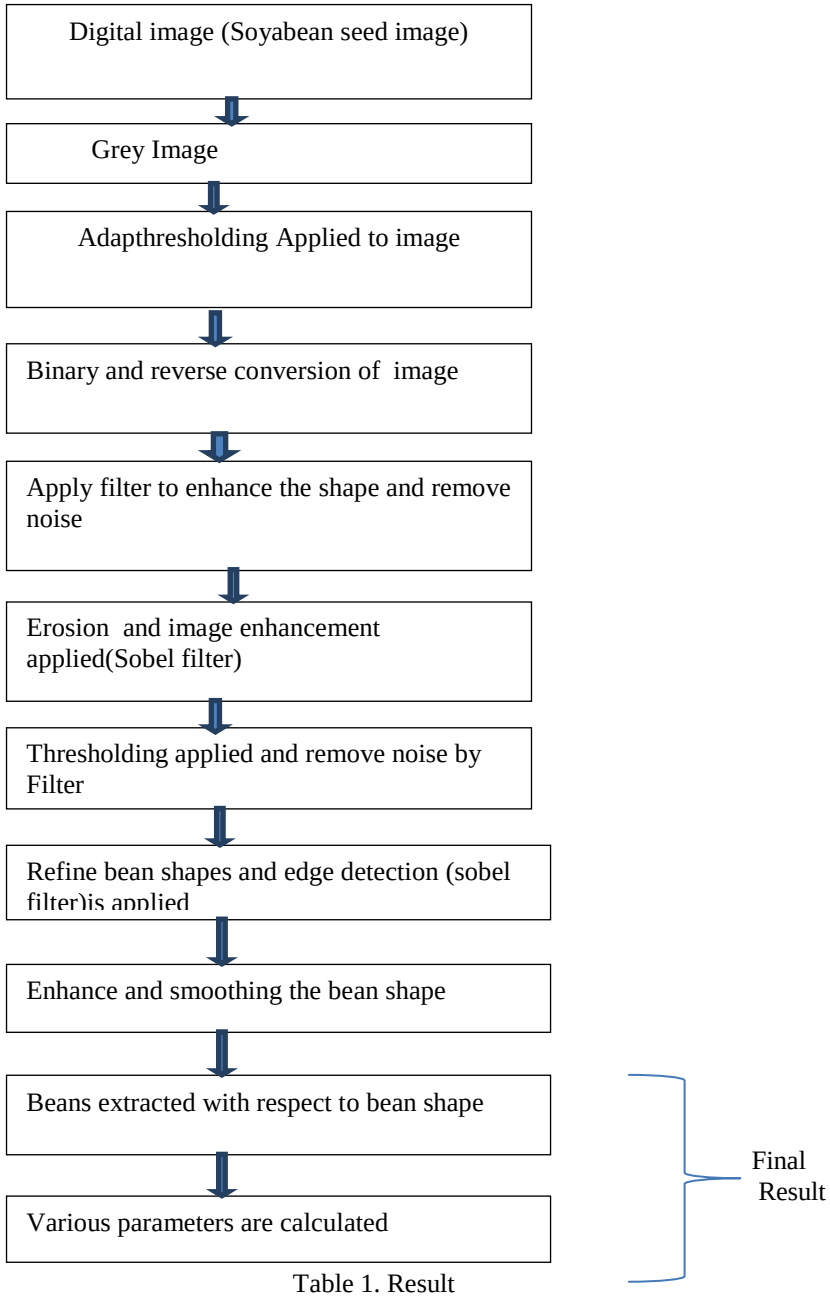

Table 1. Result

Firstly take a digital image of soyabean seeds and convert this image into grey image.Apply CLAHE(Contrast Limited Adaptive Histogram equilization) to image. Adaptive histogram equalization Adaptive histogram equalization (AHE) is a computer image processing technique used to improve contrast in images. It differs from ordinary histogram equalization in the respect that the adaptive method computes several histograms, each corresponding to a distinct section of the image, and uses them to redistribute the lightness values of the image. A variant of adaptive histogram equalization called contrast limited adaptive histogram equalization (CLAHE) prevents this by limiting the amplification. Due to the nature of histogram equalization, the result value of a pixel under AHE is proportional to its rank among the pixels in its neighbourhood.

The contrast amplification in the vicinity of a given pixel value is given by the slope of the transformation function. This is proportional to the slope of the neighbourhood cumulative distribution function (CDF) and therefore to the value of the histogram at that pixel value. CLAHE limits the amplification by clipping the histogram at a predefined value before computing the CDF. This limits the slope of the CDF and therefore of the transformation function. The value at which the histogram is clipped, the so-called clip limit, depends on the normalization of the histogram and thereby on the size of the neighbourhood region. Common values limit the resulting amplification to between 3 and 4 times the histogram mean value.It is advantageous not to discard the part of the histogram that exceeds the clip limit but to redistribute it equally among all histogram bins.

Then CLAHE image is converted into binary image and reverse this binary image.Apply filter to enhance the shape and remove noise.Erosion and image enhancement is applied to image. Erosion is one of two fundamental operations (the other being dilation) in morphological image processing from which all other morphological operations are based. It was originally defined for binary images, later being extended to grayscale images, and subsequently to complete lattices.Thresholding is applied to image by setting the value of pixel to 255.Remove noise by using filter.Now refining the bean shapes by setting the diameter of disk.Apply sobel edge detection to image. The Sobel operator is used in image processing, particularly within edge detection algorithms. Technically, it is a discrete differentiation operator, computing an approximation of the gradient of the image intensity function. At each point in the image, the result of the Sobel operator is either the corresponding gradient vector or the norm of this vector. The Sobel operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations. On the other hand, the gradient approximation that it produces is relatively crude, in particular for high frequency variations in the image.Now enhance and smoothing of bean shape is done.Finally we get beans extracted with respect to its bean shape.

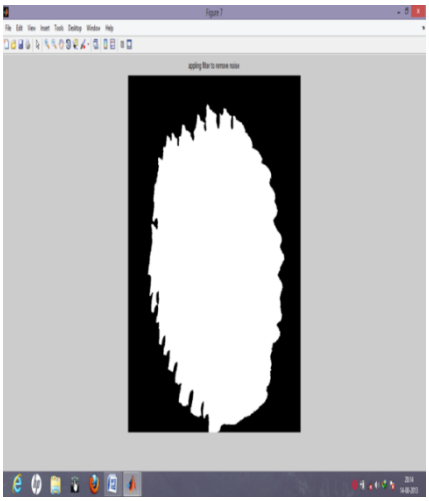

Fig. 2 Apply filter to remove noise

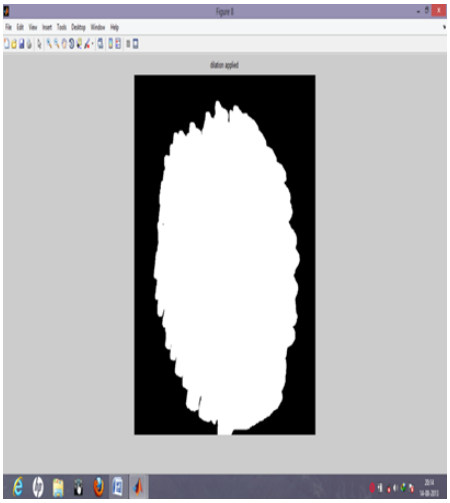

Fig. 3 Dialation applied to image

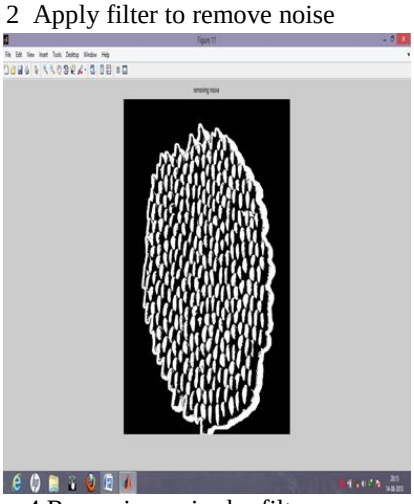

Fig. 4 Removing noise by filter

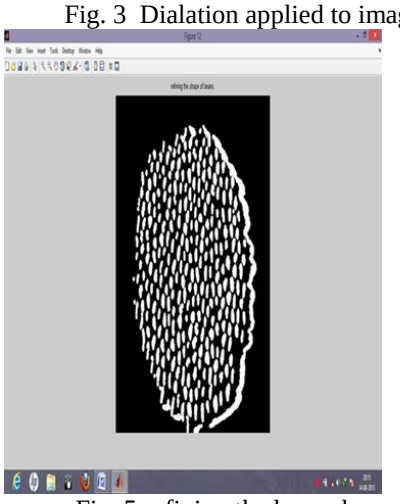

Fig. 5 refining the bean shapes

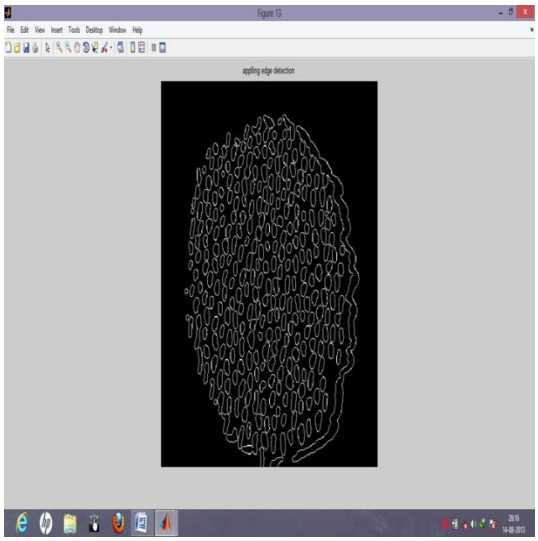

Fig.6 Sobel edge detection applied

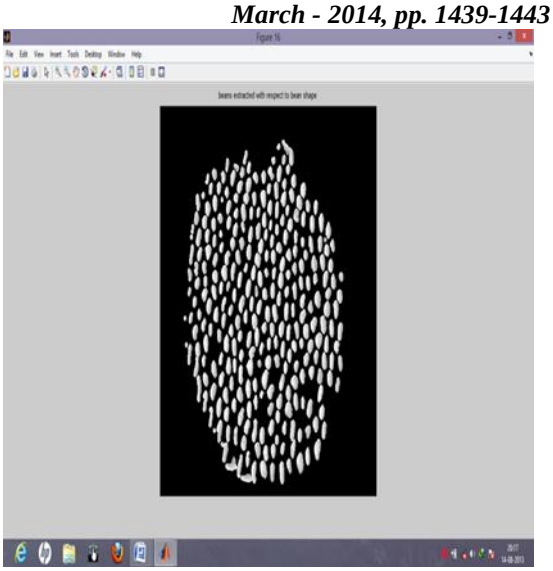

Fig. 7 Beans extracted with respect to its Bean shape

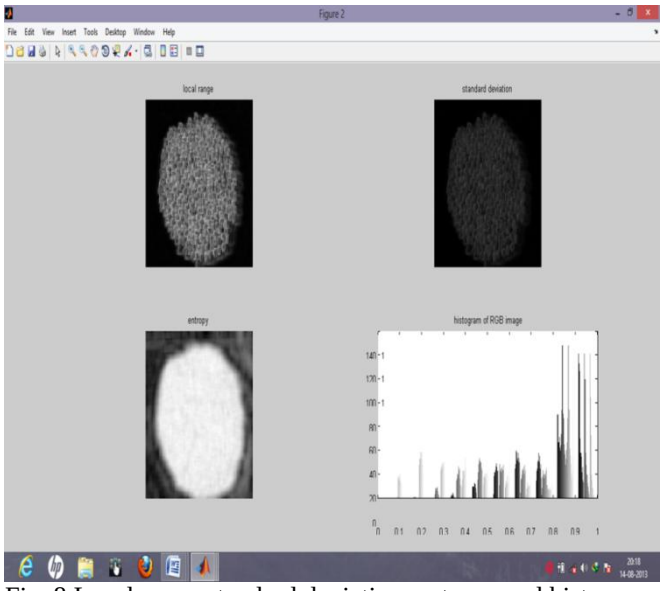

Fig. 8 Local range,standard deviation ,entropy and histogram

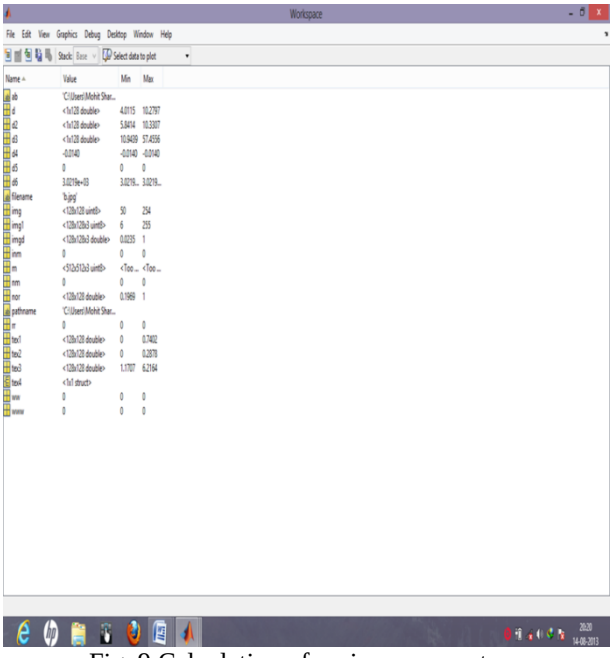

Fig. 9 Calculation of various parameters

	Min	Max
Local Range	0	0.7402
Standard Deviation	0	0.2878
Entropy	1.1707	6.2164
Correlation	-0.0143	-0.0143
Energy	6.4846.....	6.4846.....
Contrast	3.0219.....	3.0219.....

Graph 1. Mathematical value of various parameters

IV. CONCLUSION

Objective of using this counting method is less time used, highly accurate in to work even under far-from ideal conditions, including variation in illumination and low contrast between seeds and background. Delimitation of area of interest is also overcome in this dissertation. Many other parameters also help in counting like energy ,entropy, contrast, histogram and correlation etc. Scopes are in this can be seen in further improvement in time, accuracy in non-ideal conditions. There is further a scope to compute many other parameters.

REFERENCES

[1] J. M. Bewes, N. Suchowerska, and D. R. McKenzie, "*Automated cell colony counting and analysis using the circular hough image transform algorithm (ChiTA),*" Physics in Medicine and Biology, vol. 53, pp. 5991–6008, 2008.

[2] J. Marotz, C. Lubbert, and W. Eisenbei, "*Effective object recognition for automated counting of colonies in Petri dishes (automated colony counting),"* Computer Methods and Programs in Biomedicine, vol. 66, pp. 183–198, 2001.

[3] J. I. Miranda, J. C. Neto, V. H. Oliveira, and E. D. Assad, "*GeoCaju – a software for unsupervised counting of cashew trees,*" in Proc. Braz. Symp. Remote Sensing, 2009, pp. 6967– 6973.

[4] P. Wijethunga, S. Samarasinghe, D. Kulasiri, and I. Woodhead, "*Digital image analysis based automated kiwi fruit counting technique,*" in Proc. Int. Conf. Image and Vision Computing, 2008.

[5] C. M. Costa and S. Yang, "*Counting pollen grains using readily available, free image processing and analysis software*," Annals of Botany, vol. 104, pp. 1005–1010, 2009.

[6] W. Z. Shen, C. L. Zhang, and Z. L. Chen, "*Research on automatic counting soybean leaf aphids system based on computer vision technology,"* in Proc. Int. Conf. Machine Learning and Cybernetics, 2007, pp. 1635–1638.

[7] Y. L. Hou and G. K. H. Pang, "*People counting and human detection in a challenging situation,*" IEEE Trans. on Systems,

[8] Jinshan Tang, Eli Peli, and Scott Acton," *Image Enhancement Using a Contrast Measure in the Compressed Domain* " Senior Member, IEEE IEEE SIGNAL PROCESSING LETTERS, VOL. 10, NO. 10, OCTOBER 2003 289

[9] A. Polesel, G. Ramponi, and V. J. Mathews, "*Image enhancement via adaptive unsharp masking,*" IEEE Trans. Image Processing, vol. 9, pp. 505–510, Mar. 2000.

[10] H. D. Cheng and H. Xu, "*A novel fuzzy logic approach to contrast enhancement*," Pattern Recognition., vol. 33, pp. 809–819, 2000.

[11] K. Zuiderveld, Contrast Limited Adaptive Histogram Equalization. Academic Press, 1994, pp. 474–485.

[12] J.G.A. Barbedo, "*Counting clustered soybean seeds,*" in Proc. International Conference on Computational Science and Its Applications, 2012, pp. 142– 145.

[13] Amol P Bhagat and Mohammad Atique "*Design and Development of Systems for Image Segmentation and Content Based Image Retrieval*" IEEE 2012.

[14] J. G. A. Barbedo, "*Method for counting microorganisms and colonies in microscopic images,*" in Proc. International Conference on Computational Science and Its Applications, 2012, pp. 83–87.

[15] W. Z. Shen, C. L. Zhang, and Z. L. Chen, "*Research on automatic counting soybean leaf aphids system based on computer vision technology*," in Proc. Int. Conf. Machine Learning and Cybernetics, 2007, pp. 1635–1638.

[16] P. Zhao and Y. Li, "*Grain counting method based on image processing,"* in Proc. Int. Conf. Information Engineering and Computer Science, 2009.

[17] Xiuwen Liu and DeLiang Wang *"Texture Classification Using Spectral Histograms"* in IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 12, NO. 6, JUNE 2003.

[18] WANG Chong-jun, YANG Yu-bin, LI Wu-jun, CHEN Shi-fu " *Image Texture Representation and Retrieval Based on Power Spectral Histograms*" 16th IEEE International Conference on Tools with Artificial Intelligence (ICTAI 2004).

[19] www.google.com

[20] www.wikipedia.com

