GRAIN COUNTING METHOD BASED ON MACHINE VISION

Swati[1], Richa Chanana[2]

[1,2] Deptt. Of Electronics and Communication, Greater Noida institute of Technology, UPTU, (India)

ABSTRACT

Determining grain type and quality is of paramount importance at several stages during grain handling operations. Grain handling operations is usually performed by trained inspectors which is rather expensive and is determined by operators' inconsistency and subjectivity. In this respect, a machine vision system that is capable of applying the evaluation criteria consistently, objectively, and without fatigue would be invaluable tool for grain handling and quality monitoring. Machine vision technology offers objective solutions for all these problems and it is considered to be a promise for replacing the traditional human inspection methods. This work represents a new efficient method for separate and counts multiple touching scenarios where kernels are defected and results indicate accuracy of the results up to 95%.

Keywords- Counting, Dilation, Erosion, Grains, Images, Separation.

I.INTRODUCTION

Determining grain type and quality is of paramount importance at several stages during grain handling operations. Despite technological advances in the transportation and handling of grain, the analysis of quality attributes and grading of grain is still performed manually by skilled personnel. Manual analysis of grains is prone to many problems: (i) it is highly subjective and is influenced by human factors and working conditions; (ii) the rate of cleaning and recovery of salvages is limited; and (iii) human perception can easily be influenced by external factors resulting in grading inconsistencies. In this respect, a machine vision system that is capable of applying the evaluation criteria consistently, objectively, and without fatigue would be invaluable tool for grain handling and quality monitoring. This would also mean that automated grain separation and grain cleaning could be performed with ease. Machine vision systems are widely used for the inspection of fruits vegetables and grains. Classification of grains based on measurements of morphological, optical and textural features of various grain types such as wheat, rice, corn, and lentils has been reported. A number of studies have been conducted to classify grains based on their physical attributes. Most of the previous feature extraction algorithms have been applied to grain kernel images that were presented to the imaging systems manually in a non-touching fashion. This is to avoid clusters of touching kernels that make the feature extraction procedure difficult. Despite the use of vibrating beds to present grain kernels in a monolayer, the presence of touching scenarios cannot be avoided. Morphological methods used to separate fused object in binary images are generally based on watershed transform (Beucher, 1990) on the complimentary of the distance function (TalbotandAppleton, 2002).However when fused particle have elliptical shape and when they are fused beyond a certain point. Watershed algorithm may be insufficient to produce an appropriate segmentation algorithms required all kernels to be non-touching. The majority of touching kernels appeared in groups of 2, with less than 4% of all kernels appeared in groups of 3 or 4. Therefore, it is necessary to develop an algorithm to separate touching grain kernel images to solve this problem. Also, such an algorithm should focus on separating two or three touching kernels, because multiple kernels touching instances can be eliminated by using mechanical systems (Crowe *et al*. 1997). Although domestic and overseas scholars made some beneficial research [5],[6],[7] on the overlaps and conglutinations among grains, but the universal simple and high-precision methods were not proposed to resolve them. Image recognition and processing technology is use to finish the grain counting. In addition to providing a high effective, shortcut and new technique of grain counting for breeding works, this study also provides essential theory and practice foundation for further studies on cereal grains, such as recognition, classification, selection etc

II.METHODOLOGY

This work represents separation of touching kernels and count those separated kernels also, where kernels are broken also. This work applied the morphological operation "erosion followed by dilation" that is called "opening" also. The opening of *A* by *B* is obtained by the erosion of *A* by *B*, followed by dilation of the resulting image by *B.* But in "opening" process same structuring element is used for both erosion and dilation. But here different structuring element was used for both erosion and dilation. Image erosion is an operation of mathematical morphology, whose action is eliminating boundary point, and makes it shrink toward center. So, the conglutination among grains may be separated by it. Image dilation is also a operation of mathematical morphology, whose action is add boundary point or add pixel to the boundary of the object. The image types that can be processed are the grayscale, binary, or packed binary image. If the image A is eroded by B, then B is called a structuring element. The shapes and sizes of structuring element are selected according to the need of specific problems, and the shapes usually used are line, diamond, disk, rectangle, etc. In this diamond structuring element was used.

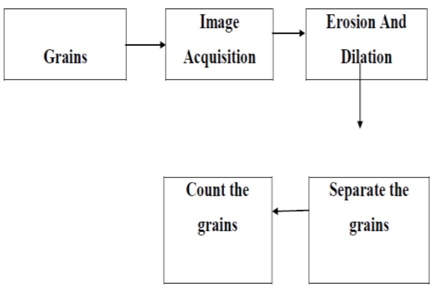

Fig.1

III. EXPERIMENTAL SETUP

Following steps were done to acquire the images and analysis further;

- Image acquisition

- RGB to GRAY conversion.
- Filter that grayscale image using median filtering process
- Take a threshold value and perform binary image processing
- Binary process means whole image has two colors white and black
- Then create a structuring element with the help of that structuring element
- Image erosion and dilation is performed.
- Then grains are separated.
- Then label those separated kernels to count them.

The images taken and processed ones are listed below in figure;

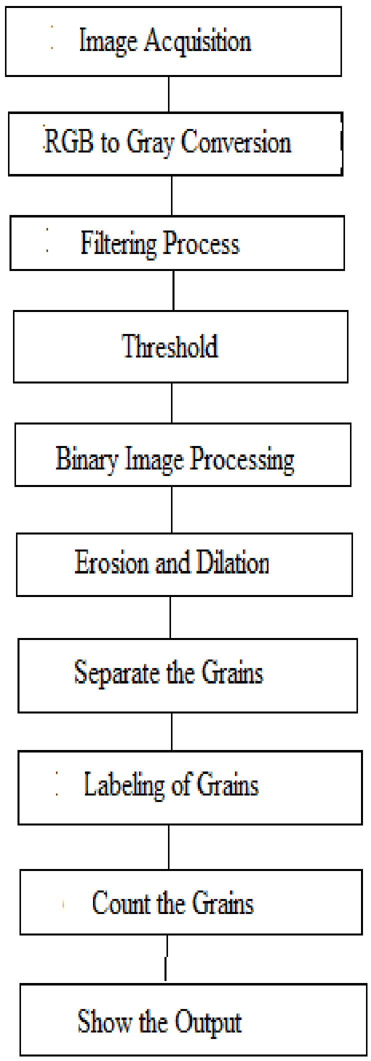

Fig. 2

Firstly took some kernels and then take the image of these kernels in RGB camera and then read that image into MATLAB by image acquisitions. First stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today and although the image acquired by the video cameras is RGB, using this model for products classification complicates the classification algorithms since simultaneous analysis of the three spaces (red, green, blue) is required. Processing of RGB images is quite expensive in terms of time and memory space. It represents an image as a matrix where every element has a value corresponding to how bright/dark the pixel corresponding position should be colored. There are two ways to represent the number that represent the number that represents the brightness of the pixel .The value 0 corresponds to black and the value 1 corresponds to white. These results based on MATLAB software to separate the touching kernels and count those separated kernels. Convert the RGB image to Grayscale image because the RGB values can be varied but the saturation or intensity value for the individual pixels is static is the important value. If our pixel color is in 4-byte form, then three bytes will give the amount of each color (varying from 0 to 255 or 0 to ff hex), while the fourth byte describe the saturation. If we change a pixel's saturation byte to 0 without changing the RGB values then the image will get a grayscale representation. Then filter that grayscale image using median filtering process because image has some noise and image needs a process that will remove the noise and increase the quality of the image so we use median filter. After that take a threshold value and perform binary processing .Binary process means whole image has two colors white and black (white means pixel related to object and black means pixel related to background) Then create a structuring element with the help of that structuring element image erosion and dilation is performed. Then grains are separated. Then label those separated kernels to count them.

IV. RESULT

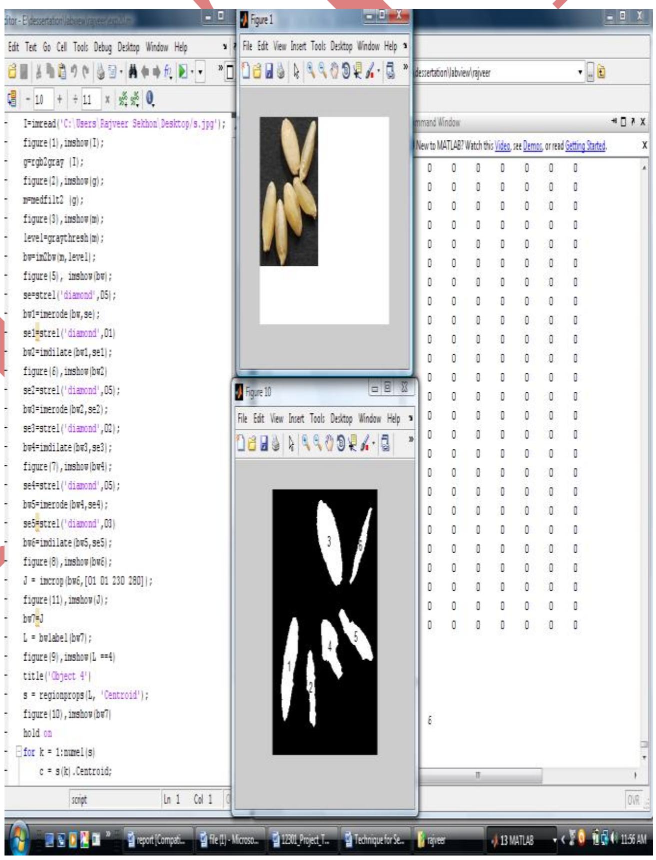

Fig. 3

V. CONCLUSION

In order to overcome the classification errors and inconsistencies involved in grain counting, type and quality done through human inspectors, an automated computerized inspection system has been discussed in this paper. Use of machine vision using morphological operations has been illustrated to demonstrate the separating and counting the grains. Accuracy to the level of 95% has been achieved in experimental results. 5% Error present may be due to system calibrations vis-à-vis human grading and/or variation of Hue parameter with respect to light variations which should not be there ideally. This inaccuracy leaves a scope for further investigation.

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