Effective Evaluation of Rice Grains by using Image Processing Technique

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***Abstract*— The purpose of this paper is grading of rice grains by image processing technique. Commercially the grading of rice is done according to the size of the grain kernel (full, half or broken). The food grain types and their quality are rapidly assessed through visual inspection by human inspectors. The decision making capabilities of human-inspectors are subjected to external influences such as fatigue, vengeance, bias etc. with the help of image processing we can overcome that. By image processing we can also identify any broken grains mixed. Here we discuss the various procedure used to obtain the percentage quality of rice grains.**

***Index Terms*— Grading, Rice Grain, Pixel Area.**

I. Introduction

The quality of the world's most important staple food crop can be determined based on the shape size and texture of the grain. In India the ever increasing population losses in handling and processing and the increased expectation of food products of high quality and safety standards there is need for the growth of accurate fast and objective quality determination of food grains. Now days we are using the chemical methods for the identification of rice grain seed varieties and quality. The chemical method used also destructs the sample used and is also very time consuming method. On the other hand the machine vision or the digital image processing is a non destructive method, it is also very fast and cheap process compared to the chemical method. In the early days of machine vision application to grain quality evaluation, Lai et al.(1986) suggested some pattern recognition techniques for identifying and classifying cereal grains. The same researchers (Zayas et al., 1986) also applied the digital image analysis technique to discriminate wheat classes and varieties.

II. Image Capture

Flat Bed Scanning (FBS) this process uses the desktop scanner. In this the rice grain is placed on the glass plate of the scanner and covered with a black sheet of paper.

Figure 1: Captured Image1

Figure 2: Captured Image2

Digital camera of high pixel resolution rate can also be used. To collect image data the camera should be placed at a location situated with a plane normal to the object's path. The black background was used. The environment was controlled to improve the data collection with simple plain background. The images acquired were 319 x 300 pixels in size. Images were captured and stored in JPG format automatically. Through data cable these images has transferred and then stored in disk.

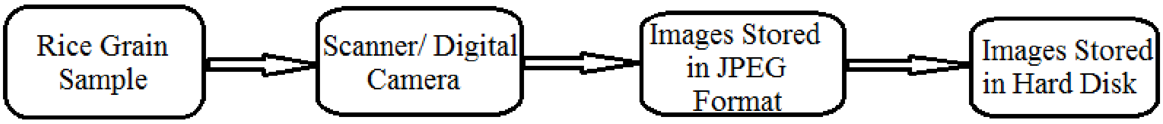

Figure 3: Building Block for Capturing Image.

III. Methodology

1. In this first of all we set the level for the background and then subtract the image(fig.2) from this background. By practicing this we get the more uniform background.

2. Then we adjust the stretch limit of the obtained image from the last step. By this we get more contrast between the grains and the background, as we set the ratio of 0 and 1 for both the background and grains kernels.

3. Here we convert this image into the binary image (Fig.4) for performing other morphological operations.

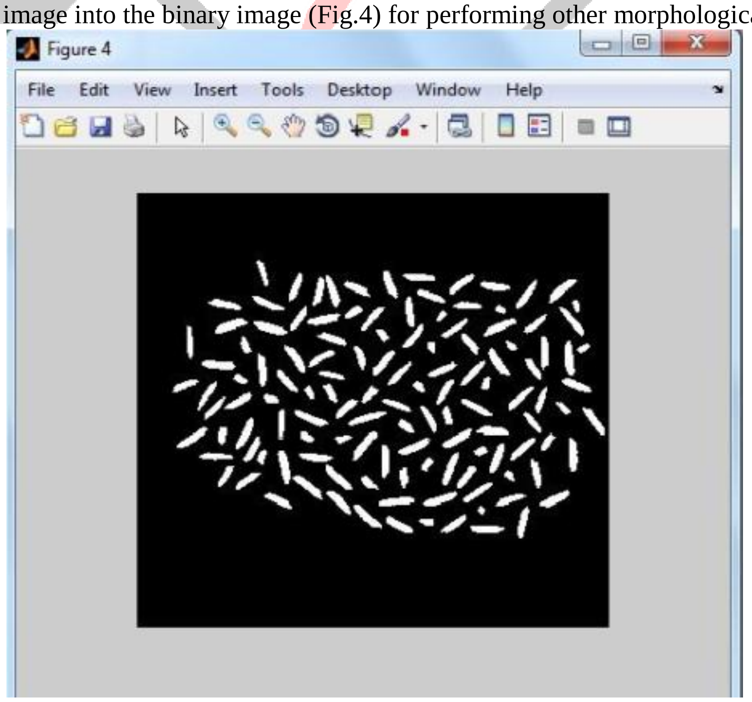

Figure 4: Binary Image

IV. Area of Grains

Here we find the connected components of our final binary image. By this we get the following information Connectivity, Image size, Number of objects, Pixel Id list about our final binary image. From this we also get the exact number of grain kernels present in our image. After this we find the pixel area of the each grain present in our binary image. Once we have the pixel area of each grain we can also map the pixel matrix of the whole image with the grain number for the grain area and zero for the rest of background. With the help of these pixel area values we can plot a stem graph which will show the pixel area of each grain kernel.

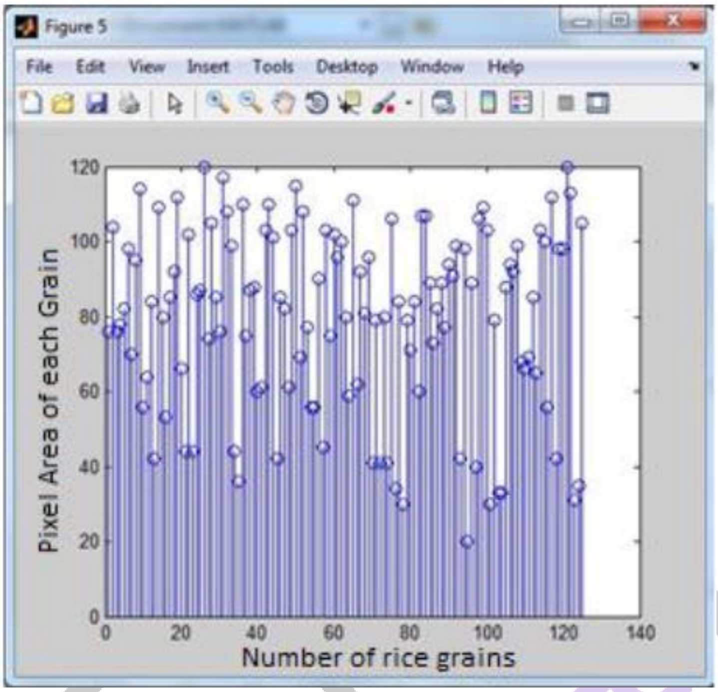

Figure 5: Stem Graph of Pixel Area of each Grain

In the above stem graph we have number of grains on the x-axis and their corresponding pixel area on the y axis.

V. Percentage Purity of Given Sample Rejecting the Broken Grains

We know from the data we have, that the broken or the half grain kernels occupies the lesser pixel area as compare to the healthy grains. So we set a threshold value of the pixel area for the average healthy grain kernel and the values lower than that of threshold will be discarded. Here we obtain a new binary image without the broken or the half grain kernel

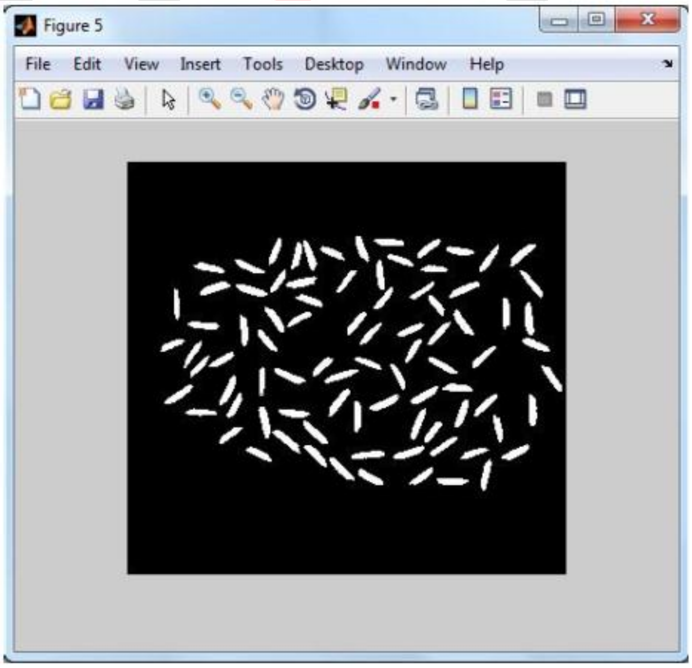

Figure 6

By using this new binary image(fig.6) we can again find the connected components and get the information about Connectivity, Imagesize, Numobjects, PixelIdxlist. and with the help of the region props we can find the pixel area of each grain of this new binary image now we can also plot a stem graph of these values.

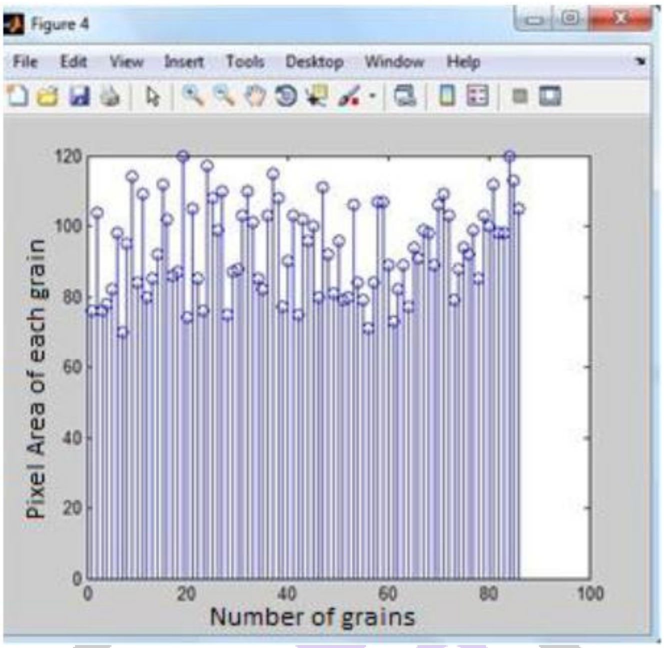

Figure 7

Here also we have the number of rice grain kernels on the x-axis and the pixel area on the y-axis.

VI. Percentage Purity of Given Sample

On studying the both stem graphs we can clearly see that the second graph has all healthy grains and also the number of grains are lesser because half or broken grains are discarded. Now if we divide the number of grains in the second graph by the number of grains in first graph and multiply it by 100. We can achieve the percentage purity of the given sample.

VII. Conclusion

Here we conclude that grading of rice can effectively be done by using the image processing techniques. With our coding we can calculate that how pure is our sample. The setup used is also very common and easily available. This is also more accurate than the human visual inspection. All this leads to better quality in food processing by image processing.

VIII. Future Work

For future work we have to find some alternative method where we not only compare the pixel area but also compare the length of each rice grain for more accurate results.

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