Quality Analysis of Rice Grains Using Image Processing Techniques

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Abstract - **The Agricultural industry on the whole is ancient so far. Quality assessment of grains is a very big challenge since time immemorial. The paper presents a solution for quality evaluation and grading of rice grains using image processing techniques. Commercially the grading of rice is done according to the size of the grain (full, half or broken). The food grains 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 techniques we can overcome that and which are also a nondestructive and cost-effective techniques. Here we also discuss the procedure used to obtain the percentage quality of rice grains.**

Keywords - Grading, Rice grain, Quality, Image processing.

1. INTRODUCTION

Rice is grown in many regions across India. For about 65% of the people living in India, rice is a staple food for them. Rice is essential food to life in India and it is grown on a majority of the rural farms.Rice is first mentioned in the YajurVeda and then is frequently referred to in Sanskrit texts. In India, there is a saying that grains of rice should be like two brothers, close but not stuck together. Rice is often directly associated with prosperity and fertility. Therefore there is the custom of throwing rice at weddings. Since a large portion of maize crops are grown for purposes other than human consumption, rice is the most important grain with regard to human nutrition and calorie intake, providing more than one fifth of the calories consumed worldwide by the human species. In India, the ever increasing awareness in people results in increased expectation of food products of high quality and safety standards, because of this reason there is need for growth of accurate, fast and objective quality determination of food grains.

Being second largest producer of rice in the world, India is enforcing the use of rice grain standards to ensure that producers get paid maximum value for their grain according to the quality of the grain. The analysis of grain type, grading and their quality attributes is still performed manually by skilled personnel. This method is prone to many problems such as (i) It is highly subjective and is influenced by human factors and working conditions (ii) Human perception can easily be influenced by external factors that results in inconsistent results (iii) The rate of cleaning and recovery of salvages is limited. This may be overcome using computer vision based techniques to analyze images [1]. Digital image processing is the method of using computer algorithms to perform image processing on digital images, which are very fast, efficient and cost effective.

2. LITERATURE SURVEY

Gurpreet Kaur & Bhupinder Verma have proposed computer vision techniques for grading of rice kernels based on their sizes (full, medium, half) [1]. The images are acquired using a digital camera having high pixel resolution.

The poor illumination effects were removed from the background and the image is converted to binary image, by labeling the connected components the grains were counted, area of each connected components is found using region props, the maximum grain length is found and is used as a criteria for separating the grains, then finally grading formulae is applied which gives the percentage of full length grains in the given sample. The grading formula & standards were acquired from the analysis procedure followed in India for grading rice.

Jagdeep Singh Aulakh & V.K. Banga proposed image processing techniques for grading of rice samples based on their sizes [2]. The images were captured using a Flat Bed Scanner (FBS), image acquired is then converted to binary image to apply the morphological operations, and by finding the properties of the connected components in the image the objects features were extracted and based on the objects' features stem graphs were plotted and the grain kernels which have lesser values than threshold were discarded, finally they calculate the percentage of full length grains in the sample image to grade the quality.

Ajay G et al., proposed automatic evaluation method for the determination of the quality of milled rice [3]. Among the milled rice samples the quantities of broken kernels were determined with the help of shape descriptors, and geometric features. Grains were said to be broken kernels whose lengths were 75% of the grain size. Morphological processing on image were carried, minimum rectangular method was used to find physical parameter of individual grain sample.

Bhavesh B et al., proposed algorithm for quality analysis of Indian Basmati Rice using image processing techniques [4]. Here they say with the help of this algorithm, an automated software system can be made to avoid the human inspection and related drawbacks. They used a photographic enlarger to measure the dimensions to obtain the average length and width ratio of the basmati grains.

Chetna V. Maheshwari et al., proposed image processing techniques for identifying two varieties of rice based on their shape and size [5]. Image of a sample spread on the black or butter paper were captured using a digital camera, the edge detection operation were performed to calculate the Geometric parameters. Based on these parameters they classified rice seeds into three parts namely normal, long and small rice seeds and displayed the count of normal, long and small rice seeds on screen.

3. METHODOLOGY

3.1 System architecture for grading rice grains.

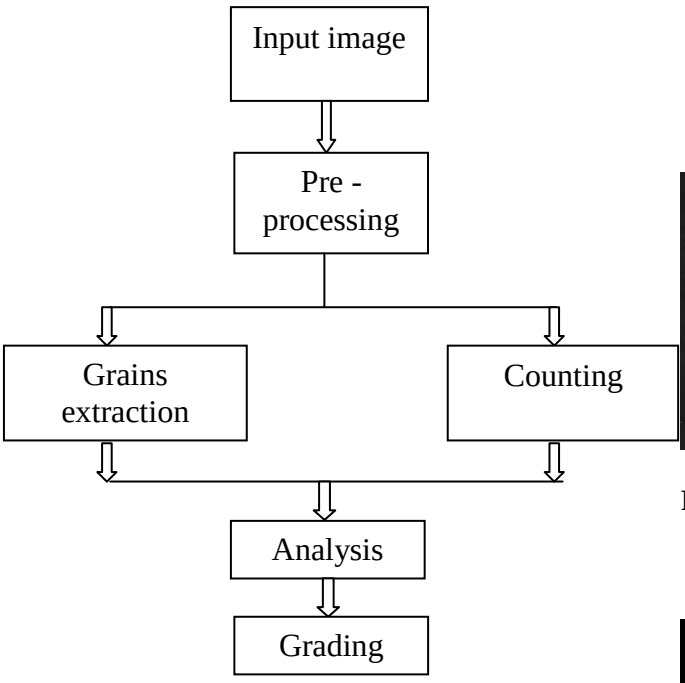
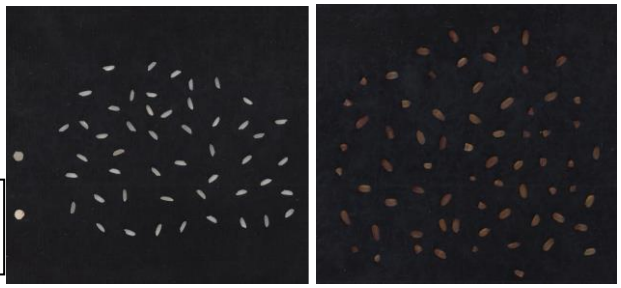


Figure 1: System Architecture for grading the rice grains.

- **Input image**
  Images are acquired using 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. The images acquired were of resolution 1200 dpi (dots per inch). Images were captured and stored in JPG format automatically. Through data cable these images has been transferred and then stored in disk.
- **Image preprocessing**
  Images acquired from the first step are pre-processed for background subtraction and then converted to binary image.
- **Grains extraction**
  Pre-processed images are acquired, based on the following criteria the grains are extracted and mapped on to different images.
  - If Area of grain ≥ 3/4th biggest grain map it to image 1.
  - If Area of grain 2/4th biggest grain ≥ Area < 3/4th biggest grain map it to image 2.
  - If Area of grain < 2/4th biggest grain map it to image 3.
- **Counting of Grains**
  The total grains in each image are counted after labeling the connected components in the image.
- **Analysis**
  Counting grains based on area acquired by each grain (full, medium, broken).
- **Grading**
  Determine percentage of whole sound grains = (N * 100) / W Where, N = Number of whole sound grains in a given sample image; W= Total number of grains in given sample image. If percentage of whole sound grains is ≥ 75% then it is graded as 'A', between 50-75% means grade 'B', below 50% means grade 'C'.

. RESULTS

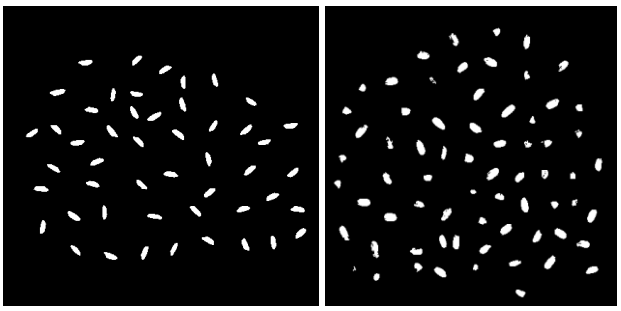
- **Some sample images used for grading**



(a) (b)

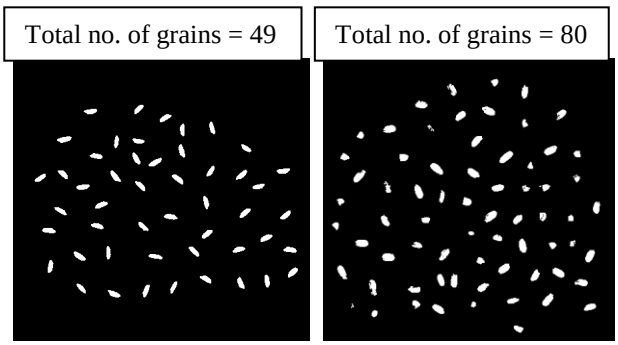
Figure 1: (a) Image 1.jpg, (b) Image 2.jpg

- **Results after binary conversion**



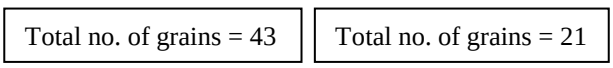
(a) (b)

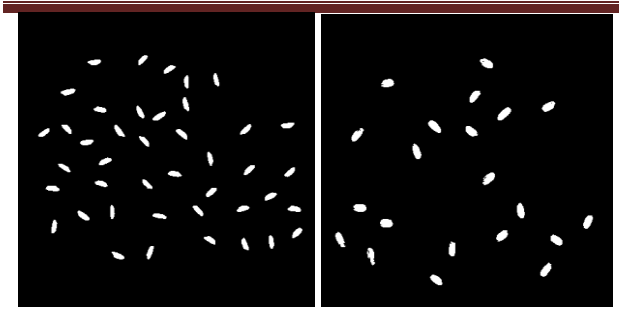
- **Results of labeling & counting**



(a) (b)

- **Results after extracting full length grains**





(a) **(b)**

- **Comparison between manual & simulated results**

Table 1: Accuracy of simulated results

Compare factor	Input image	Results of manual analysis	Results of simulated analysis	Accuracy
Total no. of grains	Image 1.jpg	49	49	100%
	Image 2.jpg	80	80	100%

- **Grading of rice samples**

Table 2: Quality of rice grains

Parameters	Image 1.jpg	Image 2.jpg
Total no. of grains	49	80
no. of full length grains	43	21
% Quality	87.75	26.25
Grade	A	C

5. CONCLUSION

This paper indicates that digital image analysis can be a viable approach to the quality analysis of rice grains. The methodologies presented can be used to demonstrate that the separation of short, medium and long grains is achievable using a descriptor area of a grain. These techniques may work well with commonly available low-cost imaging hardware. It is observed from table 1 & 2 above that accuracy of counting total number of grains in the images is 100% and is suitable to grade large number of grains efficiently, which otherwise will consume lot of time in manual analysis this feature will be able to save lot of time & human effort.

6. 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. Chalkiness is also one of the key factors in determining quality and price; there is a need to find effective method to calculate the chalkiness of rice.

7. REFERENCES

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