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Rice Grain Quality Detection

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Abstract: ***The quality of grain is of great importance for human beings as it directly impacts human health. Hence there is a great need to measure the quality of grain and identifying non-quality elements. Analysing the grain samples manually is a more time-consuming and complicated process, and having more chances of errors with the subjectivity of human perception. To achieve uniform standard quality and precision, machine vision-based techniques are evolved. Rice quality is nothing but a combination of physical and chemical characteristics. So, to get the physical characteristics of the rice grains, image processing techniques are applied. Grain size and shape are some physical characteristics. The obtained all physical features grades the rice grains using canny edge detection.***

Keywords: Rice grains quality, Image processing, Canny edge detection.

I. INTRODUCTION

A new scientific era has emerged with great grain quality image processing instruments which can help in the categorization of grain samples and get an attractive price from consumers for the food industry, especially in Asia. Machine vision and image processing are widely used in biological and agricultural research with the improvement of computer technology and significant reduction of the cost of hardware and software of digital imaging. Many researchers applied machine vision to estimate rice appearance quality inspection. There are various food varieties like rice, wheat, potato, soya bean, and maze. The rice and wheat being commodity crops are important among all the grains. Grain shape is evaluated with length, width, and the ratio of length and width of rice grains. At present, the length and width of rice grains are usually measured by an inspector using a ruler or a micro-meter. For measuring the quality of the grain sample, the examiner needs to get few seeds from the sample and do the analysis. But for measuring the length and width of even a few seeds, by placing them in a one-grain tray and measure the length and width of each seed one by one, is a very tedious task and takes lots of time. Rice chalkiness is also estimated by the naked eyes of an inspector. Outcomes from different inspectors or inexperienced inspectors may vary at an unacceptable range. So, it is neither an objective nor efficient way of evaluating rice appearance quality relying upon manual method. These researches provided some new ideas and image processing methods for evaluating rice appearance quality. The effectiveness and accuracy of inspections have been improved through these methods.

II. LITERATURE SURVEY

The proposed system will contain single grain YBCO prepared by a top-seeded melt growth (TSMG) technique that has significant potential in applications such as contactless bearings or magnetic coupling systems. For large-scale applications sustainable quality of production is essential. In this work, we present a statistical evaluation of levitation force for YBCO samples produced over a long period (two years). The production was done using batch processing with batches of up to 32 pieces of bulk. This study shows results for several hundreds of large YBCO single grains with a total mass of more than 50 kg. Besides the levitation force, the trapped magnetic field was measured for selected samples of individual batches. The correlation between the quality control methods (levitation force and trapped field) was done. Potential risks for sustainable production were also identified and they are discussed in this work. The proposed system focuses on the Quality of grain which is of great importance for human beings as it directly impacts human health. Hence there is a great need to measure the quality of grain and identifying adulteration or non-quality elements and analysing the grain sample manually is a more time-consuming and complicated process, and having more chances of errors with the subjectivity of human perception. To achieve uniform standard quality and precision, machine vision-based techniques are evolved. Rice quality is nothing but a combination of physical and chemical characteristics. Grain size and shape, chalkiness, whiteness, milling degree, bulk density, and moisture content are some physical characteristics. This paper obtained all physical features and graded the rice grains using canny edge detection. We investigated the growth mode of YBa,Cn,O,(Y123) grains and its effect on the levitation forces and trapped magnetic field of top-seeded melt-processed YBCO samples. When a slablike Sm-seed was used, undesirable subsidiary Y123 grains were formed, while the formation of the subsidiary Y123 grains was suppressed and a nearly single Y123 grain grew when a thick 8 and a wide seed was used. The formation of the subsidiary Y123 grains decreased the levitation forces and trapped magnetic field, due to the presence of grain boundaries with weak link characteristics.

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III. PROPOSED SYSTEM AND ARCHITECTURE

The aim of proposed system is to develop a system of improved facilities. The system provides higher accuracy and reduces the classification work. The existing system has several disadvantages and many more difficulties to work well. The proposed system tries to eliminate or reduce these difficulties up to some extent. To overcome limitations of manual inspection new and advanced method is proposed which is image processing technique. The image processing technique is used for counting the number of rice grains and classify them on the basis of length, breadth and length-breadth ratio.

The system is very simple in design and to implement. The system requires very low system resources and the system will work in almost all configurations. It has got following features:

A. It provides the strong quality assessment and low cost.
B. Based on the size, the grains are graded easily.
C. It gives better and accurate result and minimum time requirement.

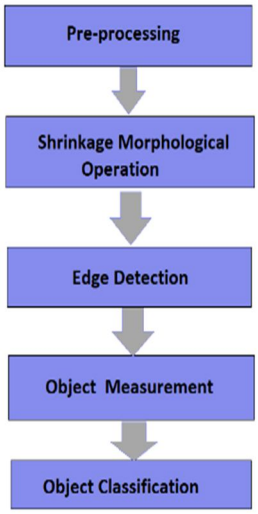

Fig. 1 System Architecture

A system architecture is very important to understand the flow of the project. It describes the step-by-step procedure of the complete project. Here, the user gives the image input of rice grains on the black background to the system. Then the system will apply the image processing techniques on the input image and classifies the image on the basis of the classification values which were already trained to the system. The output produced will be in pictorial representation of each and every step of the detection process. Along with that, it also gives the count of the rice grains of the input image, length-breadth ratio of each grain, aspect ratio and the category of the rice grains. By this, the user can get the accurate results and can easily analyse the grains which are good or bad in nature.

IV. IMPLEMENTATION

A. Module and its Description

1) Image pre-processing: The first step in this process is Image pre-processing. In this step, the Captured images were stored in JPEG/JPG/PNG format. The Images of rice grains were captured by using digitalized camera. Minimum 16MP resolution is maintained while taking the clicks. We maintain a uniform background which is black in colour. The grains are spread on a black sheet randomly. Filter is applied to remove noise which occurs during the acquisition of image. Filter also sharpens the image. Threshold algorithm is used to segment the rice grains from the black background.

2) Shrinkage Morphological Operation

This operation deals with two sub processes:

a) Erosion: It is applied to separate the touching features of rice grains without losing the integrity of single feature.

b) Dilation: This process follows erosion process. The goal of dilation is to grow the eroded features to their original shape without re-joining the separated features.

3) Edge-Detection

Edge detection helps to find out the region of boundaries of rice grains. We use canny algorithm to detect the edges.

a) Canny Edge Detection Algorithm: It is a multiple step algorithm that can detect edges with noise supressed at the same time. Smooth the image with a gaussian filter to reduce noise and unwanted details and textures. It is technique to extract useful structural information from different vision objects and dramatically reduce the amount of data to be processed. It has been widely applied in various computer vision systems. The general criteria for edge detection include:

- Detection of edge with low error rate, which means that the detection should accurately catch as many edges shown in the image as possible.
- The edge point detected from the operator should accurately localize on the centre of the edge.
- A given edge in the image should only be marked once and where possible image noise should not create false edges.

4) Object Measurement: Measurement indicates the count of rice grains. After getting the count of rice grains, edge detection algorithms applied on the image and outcome of the applied algorithm is we get end point values of each grain. We use calliper to join the end points and measure the value of length and breadth of each grain. After getting the value of length and breadth we can calculate length-breadth ratio by using the below formula.

L/B = (avg length of rice) / (avg breadth of rice) *100

5) Object Classification: Classification requires all standard, measured and calculated results. The classification of rice grains as per the standard database is shown in following table. Table1 indicates classification of rice grains on the basis of length and length-breadth ratio.

6) Object Classification: Classification requires all standard, measured and calculated results. The classification of rice grains as per the standard database is shown in following table. Table1 indicates classification of rice grains on the basis of length and length-breadth ratio.

Shape of Grain	Measurements
Long Slender(LS)	Length 6mm and above, L/B ratio 3 and above
Short Slender(SS)	Length less than 6mm, L/B ratio 3 and above
Medium Slender(MS)	Length less than 6mm, L/B ratio 2.5 to 3.0
Long Bold(LB)	Length 6mm and above, L/B ratio less than 3
Short Bold(SB)	Length less than 6mm, L/B ratio less than 2.5

Table1 Classification Table

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V. RESULTS AND ANALYSIS

The project is based on structure analysis so the output is in the form of structure parameters. As soon as the code runs, output gives the parameters of the rice grains along with the classified property name. Along with text output an image output also gets generated as original image, binary image, filtered image, Eroded image, Dilated image, edge detection image.

A. Input1

1) The input image should follow some conditions in order to avoid ambiguity.
2) The grains should be arranged properly.
3) The background should be black in colour un order to detect the edges and parameters of the grains.

Fig 2: Input image which contains the perfect background

B. Output1

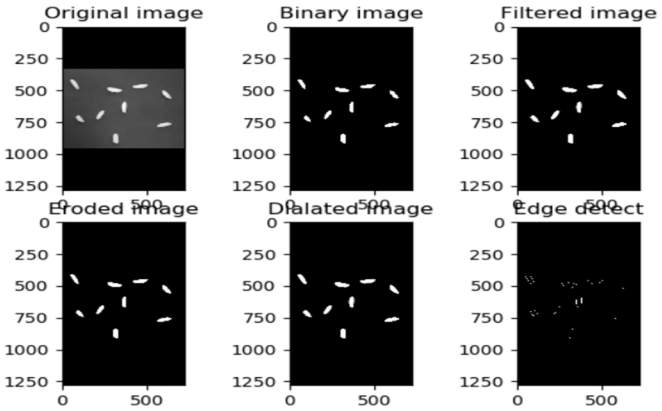

Fig:3 Output1

The image describes the conversions which are done while the image goes on while running the code. The image goes on state to state, those are displayed on the image.

1) Text Output: The text output describes the parameters of rice grains like length-breadth ratio for each grain and also average aspect ratio which is the average of all length breadth ratios obtained.

The text output is as follows:
No. of rice grains= 9
2.44 (Medium)
2.24 (Medium)
1.15 (Bold)
1.49 (Bold)
2.93 (Medium)
1.26 (Bold)
2.15 (Medium)
2.43 (Medium)
1.65 (Bold)
Average Aspect Ratio= 1.97 (Bold)

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2) Input2

Fig 3: Input image which contains no rice grains

3) Output2

Fig 4: Output

As there are no grains in the input image, there occurs ZeroDivisionError and shows the count of grains as 0.

VI. CONCLUSION

The image analysis algorithms are applied on image in which rice grains are randomly placed and spread in one layer. If the error occurs like touching kernels shrinkage operation works efficiently for separating the connecting part from point touching kernels. Edge detection is performed to find out the region of boundaries and endpoints of each grain; and then after that using calliper length and breadth can be measured. After getting the values for length and breadth, length-breadth ratio is to be calculated.

In this study, the image processing algorithms are developed to segment and identify rice grains. Use of image processing algorithm is an efficient method to analyse grains quality by its size. The main benefit of proposed method is it requires minimum time; cost is less and gives better results compared with manual results or traditional methods. We have successfully executed all the steps proposed. Last two steps include calculating the size of the grains and then classifying them according to the Table provided.

VII. FUTURE ENHANCEMENTS

Future enhancement and scope related to the rice grain quality detection are listed below

1) *Can be used for any Grain Detection:* Different types of grains and its varieties may be added for which detail analysis related to accuracy and efficacy may be carried out.
2) *Scanner Enhanced Detection:* Scanner is used for experiment purpose which can be replaced with conveyor belt with vibration mechanism using proper hardware.
3) *Grain Colour Advancements:* Instead of identifying seed colour as whole, percentage distributions of a colour or colour group can be considered which is similar to the determination of chalkiness using white colour.
4) *Cameras Enhanced Detection:* For capturing image CCD cameras or even IP cameras can be used with minor turning of configuration parameters.

VIII. ACKNOWLEDGEMENT

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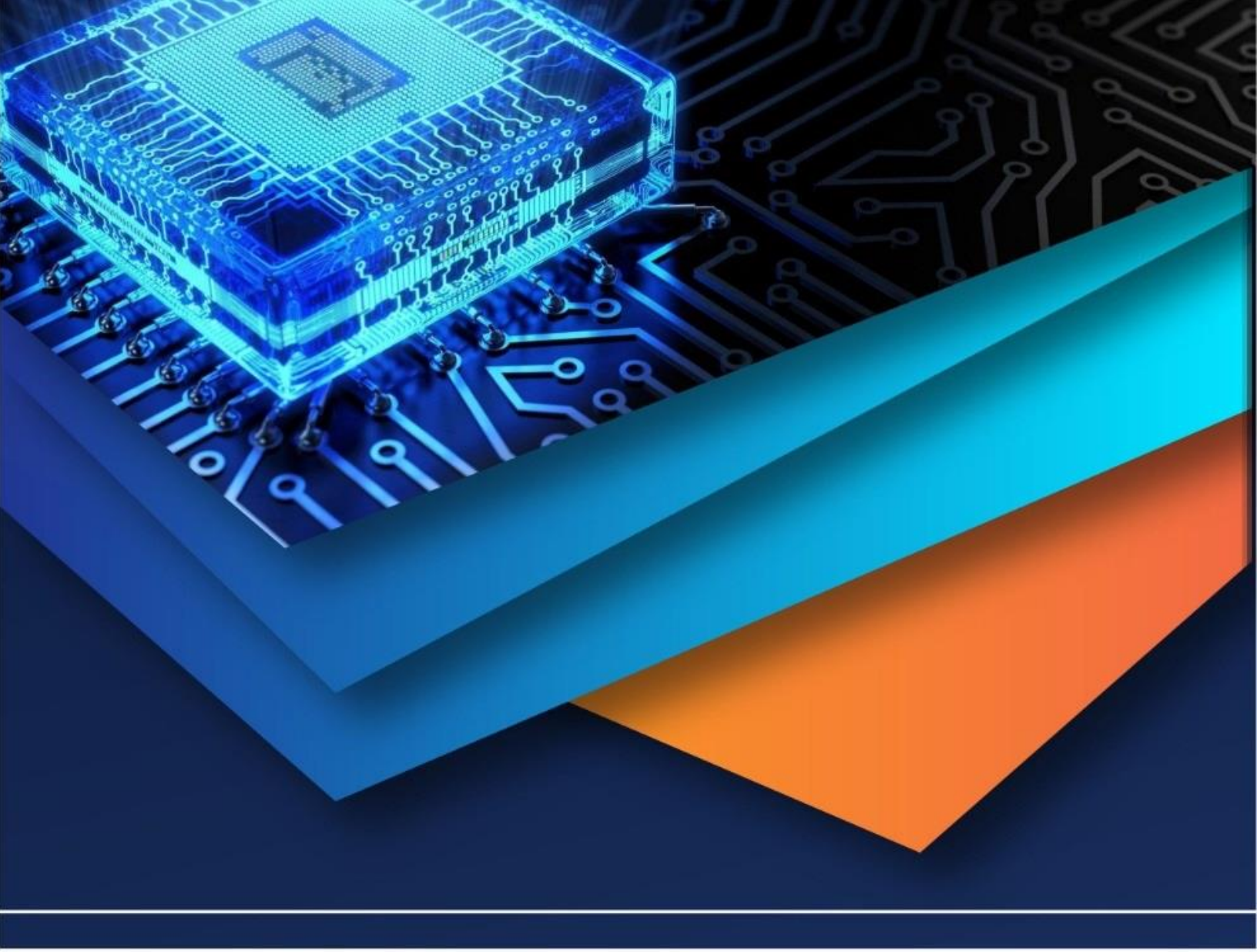

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