Analysing rice seed Quality Using Machine Learning

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Abstract: This proposed system a solution of grading and evaluation of rice grains on the basis of rice grain size and shape by using image processing techniques. An edge detection algorithm is used to find out the region of boundaries of each grain quality. In the proposed work, we are measuring the length and breadth of rice by using image processing. This method requires less time, low cost and better result as compared with the manual result.

Keywords: Image Processing, Agriculture Business, Machine Learning, Rice Seed, Rice Seed Quality.

I. INTRODUCTION

Rice quality is a combination of chemical and physical characteristics. Physical characteristics of rice are grain size & shape, chalkiness, whiteness, milling degree, bulk density, moisture content etc. Chemical characteristics of rice are amylose content, gelatinization temperature, gel consistency.

Image processing technique is one of the most advanced & significant new technological area where farmers can identify rice seeds quality by their naked eyes. This technique also helps them to take experience about variety of rice seeds.

In agricultural industry quality analysis of product is very important. Quality of grain seeds is analysed visually by experienced technician. But the outcome of such measurement is relative, varying in results and time consuming. The quality also gets affected by the errors of technician; so to overcome the shortcomings occurred due to traditional methods new and advanced technique i.e. image processing technique is proposed.

In Traditional Method the dial micrometre, grain shape tester, and pictorial approach are all conventional methods for measuring grain size and shape, however they are all time intensive. We can measure the length and breadth of single grains using a dial micrometre and a grain shape tester. This analysis' outcome is likewise subjective, time-consuming, variable, and expensive. As a result, high levels of accuracy are required to satisfy consumer needs, and image processing techniques are presented as a novel and improved solution to overcome the constraints of human inspection.

The image processing technology is used to count the quantity of rice seeds and classify them by length, breadth, and the length-breadth ratio. The length-breadth ratio is computed as

L/B = [(Avg. length of rice) / (Avg. breadth of rice)]*100

Where length is the average length of rice grain and breadth is the average breadth of rice grain.

II. REVIEW OF LITERATURE

Bhagyashree Mahale, et. al.[1] in their research paper entitled “Rice Quality Analysis Using Image Processing Techniques”, observed that image processing algorithms are developed to segment and identify rice grains. They concluded that the 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.

VidyaPatil, et. al.[2] in their research paper entitled “Machine Vision based Quality Analysis of Rice Grains”, observed that quality of rice is based on the two characteristics physical and chemical for evaluation and grading of rice grains. The quality assessment is done by finding the region of the boundary and end points by its measures. The average value of features is considered and they are implemented in MATLAB.

Benjamaporn Lurstwut, et. al.[3] in their research paper entitled “Rice Seed Germination Analysis”, explained how agriculture industry is spread in all-over globe. Also, the main purpose of their paper is to make a computer software which can analyse rice seed quality by using image processing technique. The five main process modules for rice analyse are image acquisition, image pre-processing, feature extraction, quality control analysis and quality results.

Dr. T. Avudaiappan, et. al.[4] in their research paper entitled “Analysing Rice Seed Quality Using Machine Learning Algorithms”, focused on

analysing visual features of rice seed images such as colour, shape, and texture. It can be applied different classification models using these types of features. This research indicated that image processing techniques can combine with classification techniques such as MLP, SVM, and Decision tree and Bayesian network to identify rice seeds in mixed samples.

Anurag Sinha, in his research paper entitled "Dimension Analysis and Gradation of Rice Grain using Image Processing Technique", observed that the image processing technique method is convenient for preparing rice food in India. Customers also depends on the Rice quality through three consecutive faces as mentioned more parameter consideration will enhance the efficiency and reliability of the quality inspection system.

III. EXPERIMENTAL WORK

We used Python and its libraries in the proposed project. Python offers a large library of extensions and modules that can be utilised in Machine Learning. The greatest source for machine learning algorithms is a third-party library, which has practically all types of machine learning algorithms easily available for Python, allowing for fast and quick evaluation of ML methods

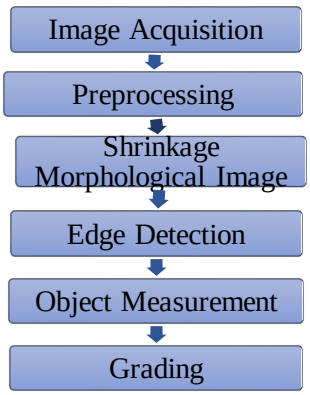

Fig: Work Flow diagram

a. Image Acquisition

A colour camera is used to capture the image. 640 x 380 pixels is the recommended image size. Using a USB cord, the image was transferred to the desktop. Image processing techniques are applied to the image after it has been saved on the desktop.

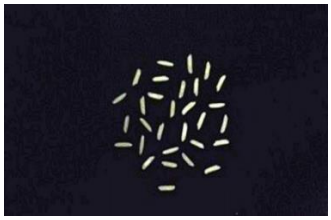

Fig 1 : Image captured from camera

b. Pre-Processing

We use a colour camera to capture images that are saved in the three-dimensional RGB (red, green, blue) colour space. To reduce noise that happens during the collection of the image a USB cable filter is applied to the obtained image on the desktop. The image is also sharpened by the filter. The rice grain is separated from the black backdrop using the threshold method. A colour image is turned to a grey image using a colour extractor.

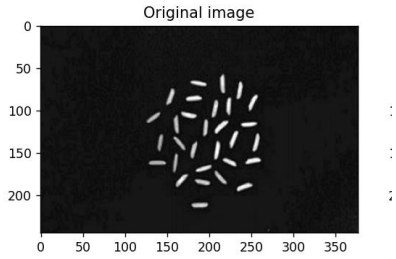

Fig 2 : Original image

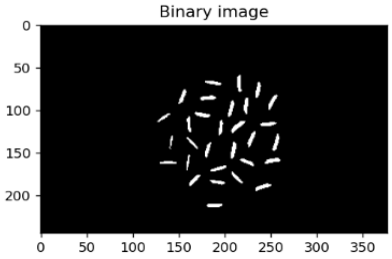

Fig 3 : Grey image

c. Shrinkage Morphological Image

Dilation and erosion are used together in morphological operations. Erosion is used to separate the touching aspects of rice grains without compromising their integrity. The erosion process is followed by the dilation process. The purpose of dilatation is to restore the original shape of degraded features without re-joining the divided elements.

Different types of morphological operations are accessible in the vision and motion toolbox, including**:**

i. AutoM: Auto median,
ii. Close: Dilation followed by an erosion,
iii. Dilate: Dilation (opposite of erosion),
iv. Erode: Erosion that eliminates isolated background pixels,
v. Open: Erosion followed by dilation,

d. Edge Detection

Edge detection aids in determining the region of rice grain boundaries. In vision, there are six different methods for detecting edges. Differentiation, gradient, and Perwitt are examples of motion toolboxes. Sobel, Roberts, and Sigma methods are used. The type of data is specified by the method, to be employed is an edge detection filter. For this, we employed the Sobel approach. The suggested methodology includes edge detection.

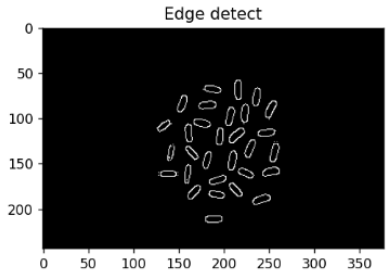

Fig 4 : Edge detection algorithm on rice grain

e. Object Measurement

The count of rice grains is indicated through measurement. This image depicts the counting of each grain, with the number indicated in the red margin. After determining the number of rice grains, edge detection techniques are applied to the image, and the result is endpoint values for each grain. We link the terminals with a calliper and measure the length and breadth of each grain. We can calculate the length-breadth ratio after we have the length and breadth values.

f. Grading

All standard, measured, and calculated results are required for classification. The laboratory manual on rice grain quality refers to the standard database for rice size and shape measurement.

The following tables provide the classification of rice grains according to the standard database. Table 1 shows how rice grains are classified based on length and length-to-breadth ratio. Table 2 shows how grains are classified based on their length, which determines the size of the grain. Table 3 classifies grains according to their length-to-breadth ratio, with slender, medium, bold, and round grains determining the shape of the grain. The tables below are used to categorise rice grains into distinct categories.

Table 1 : Classification of rice grain

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

Table 2 : Classification on the Basis of Length

Grain Size	Length(mm)
Extra-Long	>7.5
Long	6.61-7.7
Medium	5.51-6.6
Short	5.5 or less

Table 3: Classification on the Basis of L/B Ratio

Grain Size	L/B ratio
Slender	Over 3
Medium	2.1-3
Bold	1.1-2
Round	1 or less

IV. RESULT AND DISCUSSION

The image analysis methods are applied on a single layer of rice grains that are randomly arranged and spread. If an error such as touching kernels happens. The shrinking operation is effective in separating the materials. From the place where the kernels touch, a connecting portion is created. To determine the region of boundaries, edge detection is used and each grain's ends; and finally, utilising the length and width of callipers can be measured.

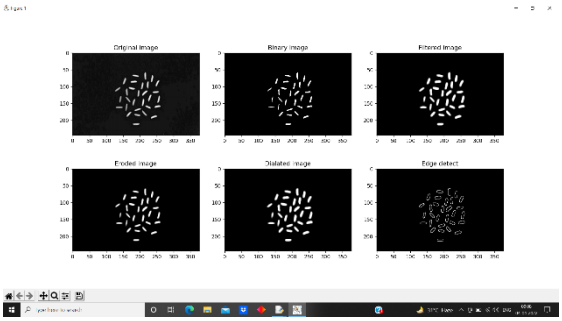

Fig 1: Screenshot of rice grain

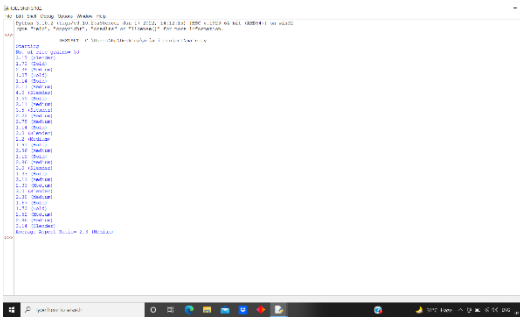

fig 2: Screenshot of L/B ratio

V. CONCLUSION

Rice grain samples were captured using a camera. The input image processed using Edge detection algorithm to extract the grain's physical characteristics. The proposed system process rice grains image analyse rice quality in a short period of time than manual inspection with good accuracy result. Furthermore, rice seed analyse method provides a solution to measure 2D area of rice grains to identify rice quality and broken grains.

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