Comparative Study of Rice Using Image Processing

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Abstract: **This paper presents an automatic evaluation method for the determination of the qualityof rice granules.The quality of rice samples is to be determined with the help of color, and geometric features.A model of quality grade testing and identification is built which is based on appearance features such as area, major axis length, minor axis length, aspect ratio, the morphological and color with technology of computer image processing and neural network. The color and morphological features are presented to the neural network for training purposes. The trained network is then used to identify the unknown grain types and its quality.This proposed method gives good results in evaluation of rice quality.Chalky is whiteness part in the rice grain and it is one of the most important parameter that is used to evaluate the quality of rice grain. We proposed an image processing technique using extended maxima operator to detect the chalky area in the rice.We also calculated the dimensions and color to classify rice.**

KEYWORDS- Grain sample, Type, quality, image processing, neural network.

I. INTRODUCTION

The demand for quality of food products we consume is increasing day by day. As the literacy rate is increasing in India so is the need for quality of food products is increasing. India is the second largest producer of rice grains first being China. As the production of rice is increasing so is the demand for its quality. This demand for quality of food grains is increasing because some of the traders cheat the shopkeepers by selling poor quality food grains which contains the particles like stones, sand, leaf, broken and damaged seeds etc. This kind of low quality of rice is sold without being noticed even and moreover there is no special scheme to find such poor quality grains.Therefore it is been a problem for both consumers and sellers. Now a 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. These can beavoided by using a machine vision or the digital image processing system. These method is a non destructive, very fast and cheap compared to the chemical method and also an attempt to overcome the drawbacks of manual process.An image processing technique is applied to extract various features of rice grains and classifies the grains based on morphological features. The images have been properly enhanced to reduce noise and blurring in image. Finally image has segmented by applying proper segmentation methods so that edges may be detected effectively and thus rectification of the image has been done. The collected features are then used in Neural Network system for classifying the rice granuels.In this article, we are going to analyzed the quality of rice grain using image processing technique based on their physical properties includinglength, width, area, aspect ratio, color features and chalky in the rice grain.

II. RELATED WORK

Many researcher worked to find out the quality of rice grain.

1:*Leng Yan et al* (2004) [4], worked on the rice grain and found out the best quality to measuring the length, width as well as chalky of the grain. In their work, they used Vernier caliper to measure the length and width of rice with the precision of 0.02mm and calculated the weight of rice using LA114 type analytical balance (0.0001 g). Once the data of rice was calculated the data was analyzed using Excel software. This method is very complicated and time consuming method.

2:*Changming Sun et al* (2007) [5], used wheat grain for quality assessment. They used stereo vision technique to find out the size (length, width and thickness) of grain and detect the presence or absence of crease in the sample of the wheat grain. Crease is basically a line or black spot that are present in the grain. Stereo vision is basically extracting of 3D information from digital images.

3:*Jagdeep Sing &Banga* (2012) [6], have proposed a method in order to find the quality of rice grain. They graded rice based on their size. Images of rice grain were captured by using flatbed scanner (FBS) and high resolution camera was also used. The images were captured by using outside source then the RGB image was converted into binary to which the morphological operations were applied. Finally by finding the properties of the connected components in the image,the object features were extracted

4:*Neelamegam P et al* (2013) [7], analyzed the quality of Rice based on image processing technique. They proposed a method based on neural network in order to classify the Rice.

5:*Vinita Shah etal* (2103) [8],proposed a methodology based on image processing and multi-layer feed forward neural network technique which achieved high degree accuracy. The count large seed as well as small and also find out the features of the Rice grain by using this methodology.

6:*Nandini Sidnal etal* (2013) [9],proposed a model of quality grade testing and built an identification model which is based on appearance features such as the morphological and color using image processing and neural network. The morphological and color features are presented to the neural network for training purposes.The trained network is then used to identify the unknown grain types, impurities and its quality.

7:*L.A.I.Pabamalie,H.L.Premaratne [*2] focused on providing a better approach for identification of rice quality by using neural network and image processing concepts.

Today a great deal of effort is focused on the development of neural networks for applications such as pattern recognition and classification. Neural Networks, with their remarkable ability to derive meaning from complicated orimprecise data can be used to extract patterns and detect that are too complex to be noticed by either humans or other computer techniques. This research has been done to identify the relevant quality category for a given rice sample and it was based on texture and color feature extraction are used to measure the quality of a rice.

III. PROPOSED METHODOLOGY

MATLAB software will be used to write the programming code. The block diagram in fig. 1 explains the work flow.

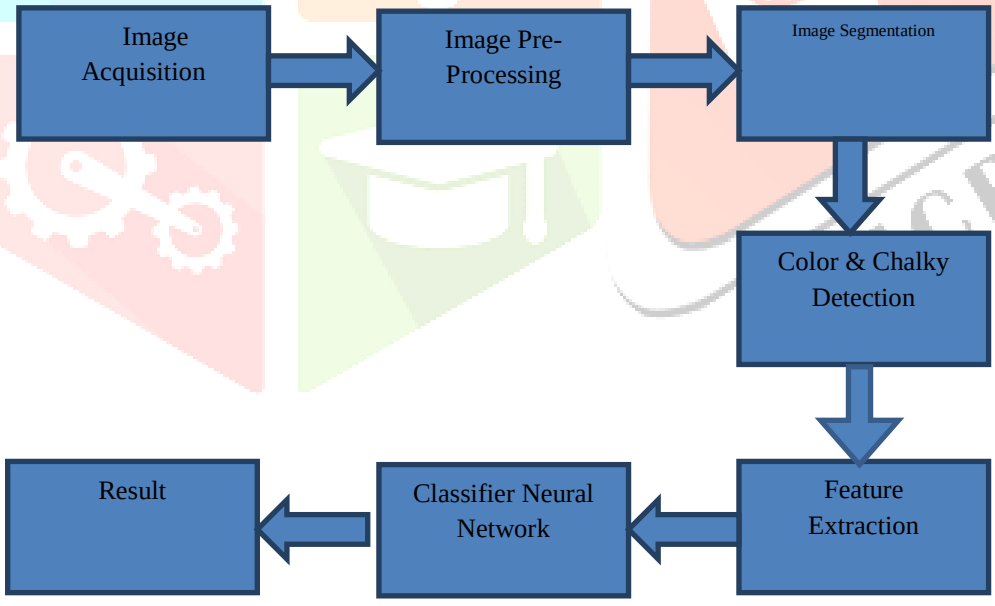


Fig.1.Work Flow Block diagram

A . Image Acquisition

Food grain images acquisition is considered as the most critical step of the grain recognitionsystem, as it determines the final grain image quality, which has drastic effects on overall system performance. The images are acquired with a color Digital Camera or a Mobile Phone is used to capture images of rice grain samples.To collect data a camera has been placed at a location situated with a plane normal to the object's path. The black & blue background is used.Fig 2 shows an input image of rice.

Fig.2. Input Image

B. Image Pre-processing

Captured image is then resized and enhanced. The images acquired with a color DigitalCamera is resized to a resolution of 640 by 480 saved as JPEG image. Further to remove noise the image is converted to black and white image. The patches with size less than 70 pixels are assumed to be noise and are ignored. The other patches are the region of interest. Image processing modifies pictures to improve them (enhancement, restoration), extract information by analysis, recognition and change their structure.Image enhancement improves the quality and clarity of images for human viewing. Removingblurring and noise, increasing contrast, and revealing details are examples of enhancement operations.

Fig 3. Binary Image

C . Image Segmentation

Segmentation is the process of partitioning a digital image into multiple segments (sets ofpixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries.After image enhancement, the image has been segmented. Image segmentation i.e. subdividing an image into different parts or objects is the first step in image analysis. The image is usually subdivided until the objects of interest are isolated from their background.Segmentation accuracy determines the eventual success or failure of computerized analysis procedures. Segmentation basically includes edge detection[1]. Thresholding is also one of the fundamental approaches of segmentation.Another approach is

for region oriented segmentation as Watershed segmentation Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

Fig 4. Segmented Image

D .Chalky Detection

Chalky is basically the whiteness part in the rice grain. Chalky does not effect on the taste of food but it does effect on the milling process in the nation and international market.

1) Detection of Chalky in the Rice Grain- Chalky is the most important parameter for identifyingthe best quality in the rice grain. For quality parameter, ricegrain with minimum chalky is considered the best quality. Inorder to detect the chalky in the rice grain, we used extendedmaxima operator along with other morphological operators.

2) Extended Maxima Operator-Extended maxima operator is used in our imageprocessing technique. By using this operator we can close allminimum values in the image and highlight the high values.We separated the chalky portion in the grain images byapplying this operator.

3) Algorithm for Chalky Calculation-The major steps that are involved in detection of thechalky in rice are described below:

a**) Step 1:**Apply Morphology Opening-Creates a square shaped structuring element with thespecified length and width. Then perform the morphologicalopening operation on the image. Morphological opening isbasically the dilation of erosion of set f by structuringelement b. The mathematical equation is given in equation 2.The opening process is shown in fig. 5(a).*f o b* = (*f* Q *b*)Å*b*.

b) Step 2: Apply Morphology Erosion and Reconstruction*:* Erosion is one of the fundamental operation inmorphological image processing. The mathematical form oferosion is given equation 3.*AQB* = {(*z* /(*B*)*z* Í *A*)}

c) Step 3: Apply Morphology Closing Operation:

In image processing closing is, combine with opening the basic concept of morphological noise removal. Opening removes small objects, while closing removes small holes. In mathematical morphology, the closing of a set (binary image) f by a structuring element b is the erosion of the dilation of that set, and the closing process is shown in fig.5(c).

f ¥b = (*f* Å*b*)Qb (4)

d) Step 4: Apply Extended-Maxima-Transform:

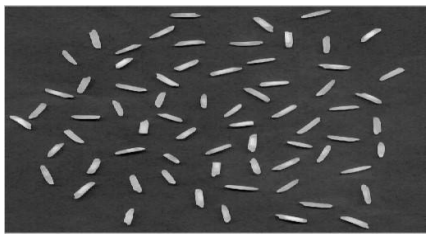
The extended-maxima-transform is applied to identify the chalky in rice grain. This transform is the regional maximum of the H-maxima transform where H is a nonnegative scalar. The H-maxima transform suppresses all maxima in the intensity image whose height is less than H,where H is a scalar.

e) Step 5: Superimposed Regional Maxima on the Original Image

Next we superimposed the chalky on the original image.

f) Step 6: Compute the Area of Chalky:

After performing step 4, we extracted the chalky portion in the rice grain and calculated the area of this chalky by the properties of region props .Finally we compared this value with the original area of rice. The extracted chalky from original image is shown is fig. 5(C).



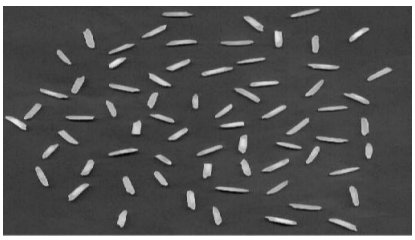


Fig 5(a) Apply Opening ProcessFig 5(b) Apply Reconstructing

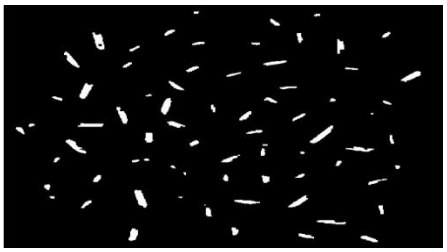


Fig 2(5) Separated chalky from original

E .Features Extraction

1.Morphological Feature Extractions

The following are morphological features which gives the basic information regarding the size andshape of the grains. The features were extracted from images of rice seeds

Area: This refers to the amount of pixels in the region.The algorithm calculated the number of pixels inside, and including the seed boundary (mm2/pixel).

Major axis length: It was the distance between the end points of the longest line that could be drawn through the seed. The major axis endpoints were found by computing the pixel distance between every combination of border pixels in the seed boundary.

Minor axis length: It was the distance between the end points of the longest line that could be drawn through the seed while maintaining perpendicularity with the major axis.

Aspect ratio: An Aspect Ratio feature is defined as the ratio between Major axis length to Minor axis length.Morphological and color features are extracted from the images and are stored in the knowledgebase.

2.Color Feature Extractions

From the red (R), green (G), and blue (B) color bands of an image, hue (H), saturation (S), and intensity (I) were calculated using the following equations[1]

The mean value of H, the mean value of S, the mean value of I and the minimum, maximum of theHue, saturation and Intensity were calculated in an image after segmentation.

F.Classifier Neural Network

There are various classifiers used for Rice granules classification and grading such asSVM(Suppor Vector Machine),Neural Network, KNN, PNN etc. The classification approach is mainly based on the guess that the digital image under consideration depicts one or more features, and these features correspond to one of the several dissimilar and exclusive classes. A probabilistic neural network (PNN) is predominantly a classifier that maps any input pattern to a number of classifications. The input layer contains N nodes ,one for each of the N input for each class that is recognized by the PNN as follows features of a feature vector. The hidden layer contains a node for each training vector. The hidden nodes are collected into groups one group for each of the K classes.The output layer has a node.

$$g_i(X) = \frac{1}{n_i} \sum_{k=1}^{n_i} e^{-\frac{\|X - X_{ik}\|^2}{\sigma^2}}$$

where X= unknown (input)

$X_{k=\text{" kth" sample }}\sigma$

where σ = smoothing parameter

IV. CONCLUSION

From the survey of various papers it is observed that quality and grading can be done better on the basis of their grain length ,width, area and area of chalky.

However it is not essential that all features can be present in the rice grain. An efficient method of Neural Network will be used for classification of food grain.

ACKNOWLEDGEMENT

I would like to thank my guide, Mrs.V.S.Kulkarni for his great guidance and support.I am thankful to H.O.D Mr. A.N.Paithane sir,Principal Dr.R.K.Jain and post graduate faculty members of Rajarshi Shahu College of Engg, Tathawade, Pune.

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