

“ RICE GRAIN GRADE CLASSIFICATION USING IMAGE PROCESSING ”

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Abstract : Rice is the most favorable and most consuming food for human being in all over the world and researchers are working to improve the quality of rice. Quality of grains is an important requirements. Seed purity is a crucial seed quality parameter in the Indian rice seed standard. The use of high quality cultivated rice seed, free of any foreign seeds, is the prerequisite to sustaining high yield in rice production. The presence of foreign seeds such as weedy rice in the cultivated rice seeds used by the farmers can adversely affect growth and yield as it competes for space and nutrients with the cultivated rice varieties in the field. The current cleaning processes that rely mostly on the difference in physical traits do not guarantee effective separation of weedy rice seeds from the lots. Seed bags found to contain more than 10 weed seeds upon inspection by the enforcing agency will not be approved for distribution to farmers. There are different type of techniques that use for testing the quality of rice grains , like using machine vision and image processing. Image processing nowadays plays a vital role in automation in several domains like medical science, remote sensing, agriculture, environmental science, special science etc.

Keywords - Quality, Image Processing, Rice Grains.

I. INTRODUCTION

The demand for quality of food products we consume is increasing day by day. India is second largest producer of rice grains first being China. Grain quality has probably been used as a criterion to select rice since humans first cultivated it. For the International Rice Research Institute, grain quality has had a key role in research from the institute's beginning. In the future, grain quality will be even more important once the very poor many of whom depend largely on rice for their staple food become better off and begin to demand higher quality rice. It is primarily due to his dedicated work in this important research area that IRRI scientists can routinely measure grain quality in prebreeding efforts serving national agricultural research systems. *Grain quality evaluation of world rice* is a much needed data base of selected grain quality characteristics of milled rice from all countries producing more than 0.1% of the world's rice. Quality characteristics and preferences are discussed by country based on information obtained from national programs.

Our present life situation in the world is very hurried as well as there is no time to take care of our health. In the recent survey most disease caused only because of the food habit. The Indian most famous proverb is food is the solution of the disease but now tablets and syrups are becomes food. This is only happens because of we don't know how to choose the food materials. Even though we care about our food but we don't know how to analyze it such that whether it contains the good quality as they promised. The one solution is that, each state government they have food quality analyze council, they randomly checking the food materials which are available in market but the checking also not frequent. So there are lot of chances for the duplicate products and low quality things. On the other side the only solution the branded name, because of the branded name we blindly go for the product. Because they have some quality certificates like ISO, ISI etc.

Rice is the most favorable and most consuming food for human being in all over the world and researchers are working to improve the quality of rice. The quality measurement of rice is also important because it is consumed as food as well as it is used for milling process in the national and international market. Many researchers have already worked on the quality of grain and proposed different techniques to characterize the quality of rice. 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.

There are different methods are available for testing the quality of rice grains.

I. LITERATURE REVIEW

Here different papers are studied based on the approaches used by different researchers and modification are made to provide more reliability in the proposed system.

N. Minni et al [1] presented a survey of grading the agricultural products using image processing. A model for the automatic grading of food products is suggested by analyzing their quality. Quality is checked and analyzed using the classification and clustering algorithms. Neural network and image processing algorithms are becoming prominent in the field of agriculture. So they proposed a model to detect the type of deficiencies in the food products with the help of image processing algorithms. The essential features such as shape, size, color, texture and mass are used to grade the quality of the products. There paper proposes an effective model for grading the quality of food products. It uses image processing applications which have been proved effective for various agricultural domains. The analysis of the parameters have proved to be accurate and less time consuming when compared to traditional methods. There are still some more features to be considered in each food product so that the grading can be done more effectively. There model can be improved by considering more combinations of features for better classification rather than identifying from one category of features. The proposed system consists of preprocessing, feature extraction, segmentation , training and classification and finally grading. There paper proposes a valuable approach

which supports the accurate detection of deficiencies and lack of quality in food products and hence this model achieves efficient grading of food.

Dr. Prashant Kumbharkar et al [2] Introduced a solution of grading and evaluation of rice grains on the basis of grain size and shape using image processing techniques. Especially edge detection algorithm is used to find out the region of boundaries of each grain. The existing system of rice portal consists of some features: 1. Market report 2. Finance3.USDA information 4.Features.In there paper there are little more advancement like: 1. Farmers will capture the image of the harvested rice and that image will be uploaded on our web portal. 2. With the help of this image, consumer can easily classify and judge the quality of rice. 3. This application will help the entire stake holders who are responsible of making almost 60% of the food grains business in India. They conclude that the use of image processing algorithm is an efficient method to analyze 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.

Manabu SUZUKI et al [4] presented that the quality of food plants has been performed by many inspection methods. To date, the evaluation of the grain of crops by photoacoustic spectroscopy in the infrared region has only been performed for corn. They had developed a method of applying a photoacoustic microscope (PAM) to pollen analysis. In therestudy, a PAM was used to evaluate the quality of crop grains, rice in there case, for the first time. Due to differences in the absorption of the laser beam, the homogeneity of rice grains was measured and shown as thermal images. The resolution was sufficiently good to evaluate a single grain of rice. There method had an advantage in that it can be used to measure the existence of both the surface and back surface colored regions. In addition to conventional video image evaluation or the macroscopic optical absorption method, PA imaging can enable the evaluation of the quality and condition of rice grains.

S.Durai et al[5]used image processing technique for grading of rice quality by chalky area analysis. By considering the chalky area of rice we can say all rice in the baggage is same variety or some mixed is there. In future we apply this technique to classify the rice as well as grading them. This proposed methodology is a simple and time efficient and we got 90 percentages of accuracy results when compared to the manual analysis of grain quality. For the taken samples they got the expected results when compared to other classical analysis methods.

Rahul Birla and Ajay Pal Singh Chauhan[6] presented a solution for quality assessment and grading of Indian basmati *Oryza sativa* L variety rice using machine vision and image processing. Basic problem of rice industry for quality assessment is addressed which is traditionally done manually by human inspectors. Machine vision provides an alternative with automated, non-destructive, cost-effective, and fast approach method. Quality analysis is done using computer vision, image analysis and processing as compared to human vision inspection. They presented an efficient method for calculating the size of *Oryza sativa* L rice using machine vision along with detection of chalky and broken rice with improved accuracy compared with human inspectors. They proposed a new non destructive method for quality analysis of Basmati rice seeds via image analysis. Since error in detecting average percentage of normal seed and average percentage of chalky seed are 10.59 % and 2.27 % respectively. So it can be emphasized that the proposed system is 10.59 % and 2.27 % more accurate than human inspector for normal seed and chalkiness estimation respectively. So the proposed system is giving promising results in comparison to human inspector. For further expansion of quality analysis, more parameters can be added to make accuracy even higher. Soft computing classification and neural network approach can be used for unknown samples and to further expand the work

SnehaS.Kausal et al[7]presented that the quality of grains is an important requirement to protect consumers from sub-standard products. Sensory pleasure, healthy eating, value and convenience the consumer trends are driving the food industry today. Rice delivers on all of these. Rice is the primary dietary staple for more than half the world's population. It is the most popular grain globally, supplying energy, carbohydrates, protein, fibre, essential vitamins and minerals and beneficial antioxidants. In the last 30 years, rice consumption all over the world has more than doubled. There proposed system helps to identify the type of rice grain being provided. Quality of a grain is an important requirement for today's market, to protect consumers from substandard products. There are so many inferior quality grains arriving to the market day by day. Today in rice trade; rice of low quality is sold without being noticed. However, there is no convenient method to identify these inferior quality grains in the market. Therefore, this has become a serious issue for both the consumer and the governments. There project will help in identification and classification of varieties of rice using Image processing.

Leng Yan et al (2004) [8], 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.

Changming Sun et al (2007) [9], 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.

Jagdeep Sing & Banga (2012) [10], 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.

II. PROPOSED WORK

The proposed block diagram is shown below.

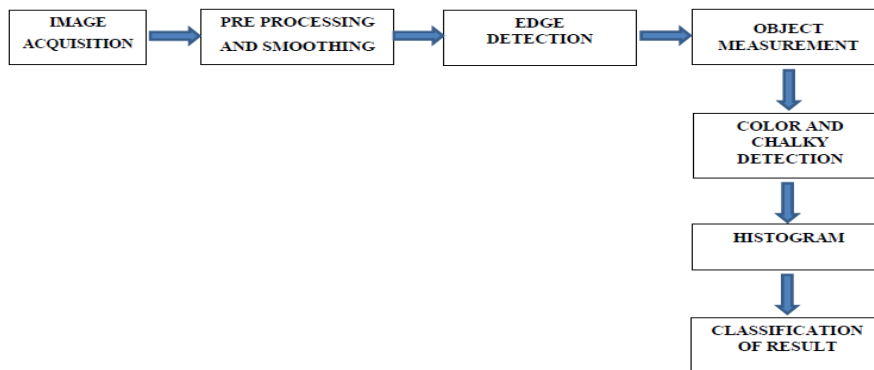


Fig.2. An Architecture of system

The work process of system

- A. Image acquisition/Capturing the image of grains
- B. Image preprocessing and smoothing
- C. Edge detection
- D. Object measurement
- E. Color and chalky detection
- F. Histogram
- G. Classification of result

A. Image Acquisition

Image acquisition is the creation of digitally encoded representation of the visual characteristics of an object, such as physical scene or the interior structure of an object. The term is also include the processing, compression, storage, printing and display of such image. Food grain images acquisition is considered as the most critical step of the grain recognition system, as it determines the final grain image quality, which has drastic effects on overall system performance. The images will acquired with a color Digital Camera will be used to capture images of rice grain samples. The images will be save in Jpeg format and then it will be use for image processing.

B. Image Preprocessing And Smoothing

The aim of image processing is an improvement of the image data that suppresses unwanted distortions or enhance some image features important for further processing. Smoothing is often used to reduce noise within an image. Preprocessing and smoothing means image is filtered from external factors (such as noise, dust etc.) Capture image will be resize and enhance . In this we will go to use Gaussian filter for removing noise.

C.Edge detection

Edge detection includes a the variety of mathematical methods that aim at identifying points in a digital image at which the image brightness changes sharply or more formally, has discontinuities. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of world. We will used canny edge detector. The canny edge detector will be applied on gray scale images. It is a good approach for detecting the edges and has the ability to minimize the localization error. It can detect the weak edges as well. However, in this research work sobel edge detector is also used to find out area and other features of an object .

D.Object measurement

Object measurement are made on a per-object basis, with one set of measurements for each object detected in a field. These measurement are typically of morphological characteristics of the objects detected, and can include size, shape, position, intensity, color, count etc.

Following features were extracted from rice sample images:

Area: The total number of pixel covered by grain.

Major axis Length (L): The longest line that can be drawn through an object is called major axis length.

Minor axis Length (I): The longest line that can be drawn through an object, perpendicular to the major axis.

Length (l): Rice grain is enclosed in rectangular bounding and the length of this rectangle bounding box gives the length.

Width (w): Width of rectangle bounding box is known as width

E. Color and 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.

Percentage of Chalky: Percentage of chalky is calculated using following formula.

$$\text{percentage of chalky} = \frac{\text{Actual area of grain} - \text{area of chalky portion}}{\text{Actual area of grain}}$$

1) Detection of Chalky in the Rice Grain

Chalky is the most important parameter for identifying the best quality in the rice grain. For quality parameter, rice grain with minimum chalky is considered the best quality. In order to detect the chalky in the rice grain, we will be used extended maxima operator along with other morphological operators.

2) Extended Maxima Operator

Extended maxima operator will be used in our image processing technique. By using this operator we can close all minimum values in the image and highlight the high values.

We will be separate the chalky portion in the grain images by applying this operator

3) Algorithm for Chalky Calculation

The major steps that are going to involved in detection of the chalky in rice like applying of morphological opening which creates a square shaped structuring element with specified length and width. Then perform the morphological opening operation on the image. Then apply morphology erosion and reconstruction ,erosion is one of the fundamental operation in morphological image processing. Then apply morphology closing operation. In image processing closing is, combine with opening the basic concept of morphological noise removal. After that apply Extended maxima transform which will apply to identify the chalky in rice grain. Then apply superimposed regional maxima on the original image then compute the area of chalky, that will be extract the chalky portion in the rice grain and will calculate the area of this chalky by the properties of region props .Finally we will going to compare this value with the original area of rice. Then next step will be color detection in the rice grain.

F. Histogram

In image processing context, the histogram of an image normally refers to a histogram of the pixel intensity values. This histogram is a graph showing the number of pixels in an image at each different intensity value found in that image.

G. Classification of results

Classification is based on all standard, measured and calculated data from above procedure. I will classify different rice grains based on their shape, color, internal broken, width etc. In this we will consider percentage of normal rice grain parameters for grading purpose. And according to that we decide quality. In our case, we will classify the grading according to percentage of measurement factor that we have considered. If for particular sample testing of rice grain, we'll find max components parameters and average of all components, if that average value has 80 to 100 % of max components value then it will classify as grade 1, similarly if it is 60-80% then grade 2 and if its below 60 % then grade3.

Percentage factor (Avg to Max Component)	Grading scale
80-100	Grade 1
60-80	Grade 2
0-60	Grade 3

III. CONCLUSION

The quality of grain is an important requirement. There are different methods are use for quality testing of rice grains. It concluded that the image processing algorithms will develop to segment and identify rice grains. It will be shows that the use of image processing algorithm is an efficient method to analyze grains quality by its size.

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