An efficient method for classification of rice grains using Morphological process

Veena.H
Dept of CSE, VTU
veena.h90@gmail.com

Latharani T R
Dept of CSE, VTU
latharanitr@acharya.ac.in

Abstract- The Agricultural industry is too oldest and most widespread industry in the world. Quality evaluation of grains is a very big challenge since time immemorial. The paper presents an automatic evaluation method for determination of quality of milled rice. Among the milled rice samples the quality of broken rice kernels are determined with the help of shape descriptors and geometric features. Grains are said to be broken kernels whose lengths are 75% of the grain size. This method gives good results in evaluation of rice quality.

Keywords- Quality evaluation, Image filtering, Image segmentation, Morphological processing, parameters, broken rice.

I.INTRODUCTION

Rice is one of the most important cereal grain crops. The quality of rice has distinct effect on the yield of rice, so the proper inspection of rice quality is very important. Rice is first mentioned in the Yajur Veda 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 caloric intake, providing more than one fifth of the calories consumed worldwide by the human species [1].

Rice constitutes the world's principal source of food, being the basic grain for the planet's largest population. For tropical Asians it is the staple food and is the major source of dietary energy and protein. In Southeast Asia alone, rice is the staple food for 80% of the population. The quality of rice has distinct effect on the yield of rice, so the proper inspection of rice quality is very important. During grain handling operations, information on grain type and grain quality is required at several stages before the next course of operation can be determined and performed. The varietals purity is one of the factors whose inspection is more difficult and more complicated than that of the other factors.

Image segmentation has a vital role to play in image processing. There are methods like morphological methods which are used for efficient segmentation of images where physical parameters like length, width, perimeter are key features. The digital images were processed and morphological features were extracted from an individual grain. The grain features extracted were: length, width, area, perimeter and compactness ratio. The images were pre-processed before extracting the above features. The measurements in each dataset were then saved in Microsoft excel and later retrieved for analysis.

II. RELATED WORK

Machine vision provides an alternative for an automated, non-destructive technique. This method quantify the qualities of various rice varieties and figure out features which directly or inversely affect the quality of rice [2]. The automatic detection of rice is the important application of digital image processing as shown in below figure 1.

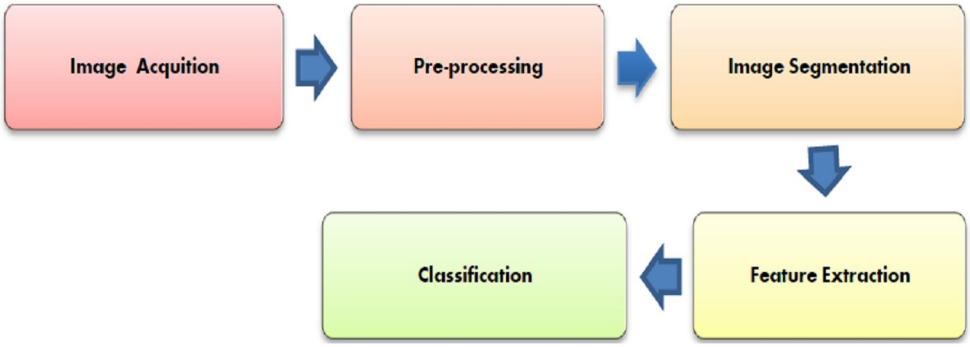

Fig.1 common image processing system configuration [2].

This method presents a quality analysis of different varietal rice through image processing algorithms. Traditionally quality evaluation and assessment done here is more time consuming and expensive.

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Pattern classification using morphological features have been reported in numerous studies as an effective solution for classification problems of food and biological materials [3]. The procedure for recognition and classification of food grain image samples are shown below in figure 2.

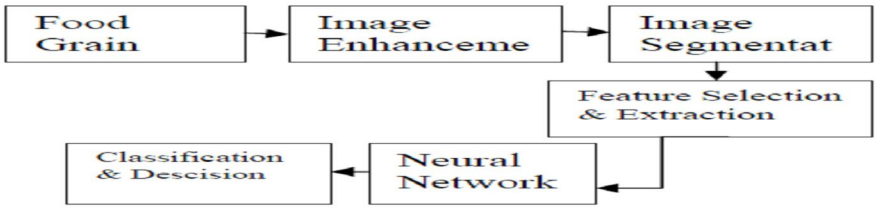

Fig.2 Procedure for food grain identification [3].

Artificial Neural Network (ANN) has been reported in num

Numerous studies as an effective solution for object recognition and classification problems of food and biological materials by Paliwal, 2001; Paliwal 1999 and Jayas 2000 made an extensive studies on the classification of agricultural products and found that multilayer neural network trained using the back propagation learning algorithm generally performed better than the pattern recognition methods. In 2002 Wang and Shephard worked on the broken rice quality analysis [4]. A digital image analysis algorithm based color and morphological features were developed to identify the six varieties (ey7954, syz3, xs11, xy5968, xy9308, z903) rice seeds which are widely planted in Zhejiang Province. Seven color and fourteen morphological features were used for discriminant analysis. Two hundred and forty kernels used as the training data set and sixty kernels as the data set in the neural network used to identify rice seed varieties. When the model was tested on the test data set, the identification accuracies were 90.00%, 88.00%, 95.00%, 82.00%, 74.00%, 80.00% for ey7954, syz3, xs11, xy5968, xy9308, z903 respectively.

III. PROPOSED METHODOLOGY

In this section we discuss about the Morphological process for classifying rice grains by detecting its shape parameters. Morphology is the study of shape and form of objects. Morphological image analysis can be used to perform operations like:

i. Object extraction.
ii. Image filtering operations.
iii. Image segmentation operations.
iv. Measurement operations such as texture analysis and shape description.

In this Morphological processing first we ‘Read image’ from the database or appropriate file. Then we perform morphological opening operation to estimate the background illumination. To create a more uniform background, subtract the background image, background from the original image. After subtraction, the image has a uniform background.

Create a binary version of the image so we can use functions to count the number of rice grains. Use the im2bw function to convert the gray scale image into a binary image by using thresholding. The function gray thresh automatically computes an appropriate threshold to use to convert gray scale image to binary. Remove background noise with bwareaopen. The function bwconn comp finds all the connected objects in the binary image. The accuracy of results depends on the size of objects, the connectivity parameter whether or not any objects are touching (in case they could be labeled as one object). Then here we perform a sophisticated operation that computes physical parameters of individual grain [5]. In this first connected components are identified. One way is to create a label matrix, and then display it as a pseudo-color indexed image.

A.Proposed algorithm:

Input: image of mixed rice samples
Output: Morphological image
.broken rice image

Start

Step1: Input mixed rice samples.
Step2: Extract morphological features.
Step3: Calculation of pre-processing data of known samples, data of test samples.
Step4: If the length of the rice kernel is less than 75% then it is treated as broken rice [6].

Stop

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B. Morphological feature extractions:

Algorithms were developed in windows environment using MATLAB 7.0 programming language to extract morphological features of individual rice kernel. The following morphological features were extracted from images of individual rice seeds [3]:

Area: The algorithm calculated the number of pixels inside, and including the seed boundary (mm2/pixel).

Length: It was the length of the rectangle bounding the seed.

Width: It was the width of the rectangle bounding the seed.

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: K1=Major axis length/Minor axis length.

Rectangular aspect ratio: K2=Length/Width.

The flow chart for classifying rice grains is illustrated in the below figure 3.

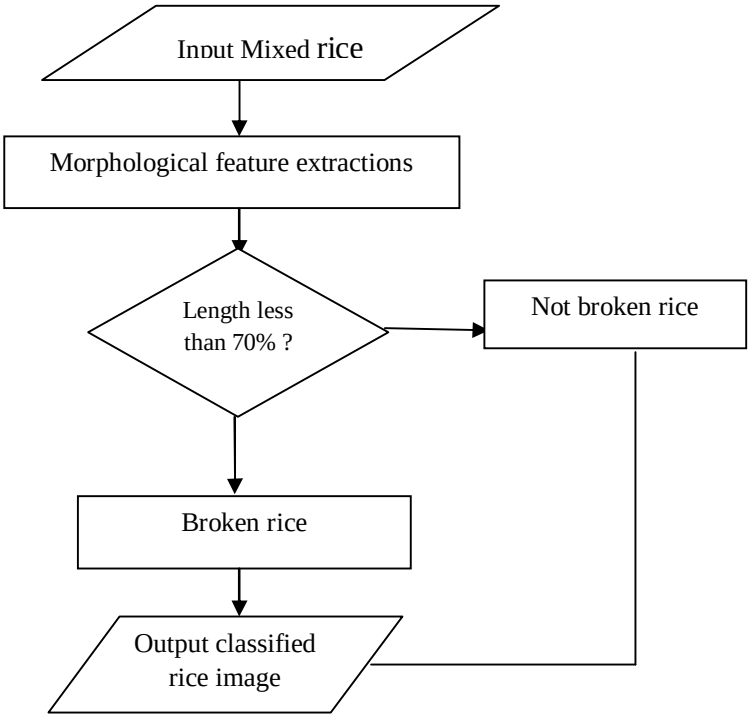

Fig.3 Flow chart for classifying rice grains.

IV. RESULTS AND DISCUSSION

Fig.4.a. Original image.

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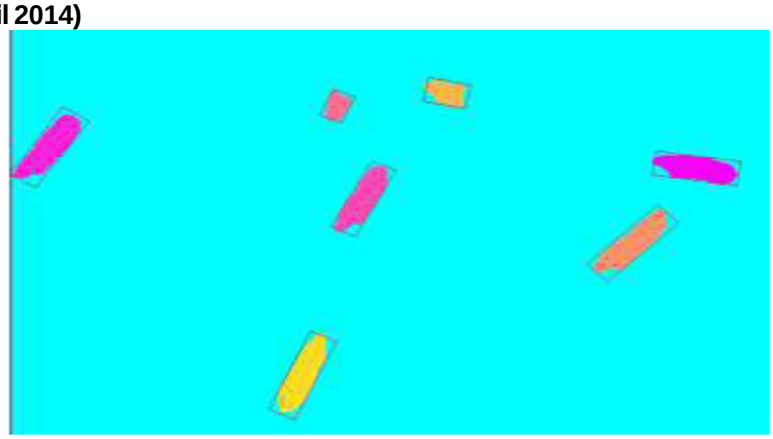

Fig.4.b. Morphological image.

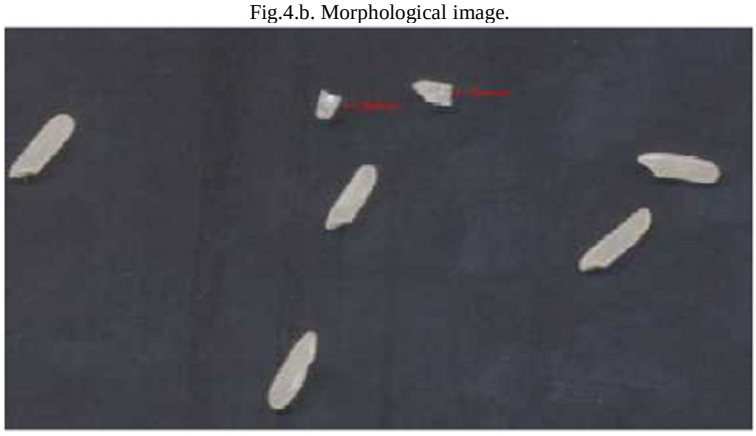

Fig.4.c. Broken rice image.

Here Fig4.a represents the original image of mixed rice samples, Fig4.b represents the Morphological image and the Fig4.c represents the classified broken rice image [7].

V.CONCLUSION

A proposed method called Morphological process for classification of broken rice grains was developed which is computationally efficient and improved method compared to previous methods. To perform the classification of broken rice kernels this method is faster and simple. This is also more accurate than the human visual inspection methods. All this leads to better quality in food processing by image processing.

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