

# An Efficient Rice Variety Identification Scheme Using Shape, Harlick & Color Feature Extraction and Multiclass SVM

M.Senthil Kumar, Md.Javeed



**ABSTRACT**--- Rice is primary food harvests that each and every one person eats in throughout the globe, particularly in Asian nation. It is mostly classified in relation to its texture, color, grain shape etc. In this work, machine vision system is used for rice classification in order to distinguish rice varieties by using some special features like color, harlick and shape. Initially, real rice images are taken from camera for variety of rice such as Basmati rice, IR 18, Ponni, Ponni Leader and Ration rice. These images are taken as input image. Then special preprocessing schemes are introduced like Image thresholding, image enhancement, sharpening and filtering are used to analyze the rice variety. After that feature extraction processes are carried out for both training and testing images. Finally, the multiclass support vector machine (M-SVM) is incorporated to identify the rice variety based on matching between the feature values of training and testing images. These rice classification results such as accuracy and complexity are compared with all other existing classification processes.

**Keywords:** rice classification; harlick feature; shape feature; color feature; multiclass SVM; accuracy.

## I INTRODUCTION

Rice is created in numerous areas all over the earth. Come first by China, India is at next place in yield of rice in the entire globe. In South East Asia, Rice is most important food of 80% of the people. Excellent quality rice grains are required by the consumer for the reason that all country currently becomes self-supporting in rice cropping. A lot of parameters are needed to be judged for identifying the rice grains excellence. Schemes require to be urbanized for processing of rice grain images and entail computerization of method to discover the excellence of rice grains.

As novel technology developing, citizens are adopting novel scheme as contrast to using previous scheme. In the preceding study, researcher proposed special schemes so as to detect the most excellent quality of rice variety identification.

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The examination of excellence rice using naked eye is in well-organized, consequently for examining the excellence and grading of rice proposed several algorithms and schemes. Computer vision and machine vision techniques are used for rice classification processes. Furthermore investigate the excellence of rice variety identification using image processing scheme derived from their physical properties together with area, aspect ratio, length, width and color features in the rice image.

## II. RELATED WORKS

Several investigators worked to detect the excellence of rice grain. In [1], shape and size feature, color and texture features are extracted for milled rice classification. Also four different classifications such as Artificial Neural Network (ANN), Support Vector Machine (SVM), Decision Tree and Bayesian Network are performed to analyze the accuracy. From the obtained results, the ANN classification provides highest accuracy. But complexity and computation time are high in ANN classification. In [2], presents automatic detection and classification of rice grain by using computer vision. Each rice grain is separated and background is eliminated by using histogram and threshold scheme. Three layer error propagation model based neural network is used to classify the rice grain and calculate the accuracy and computation time. This method provides 92.7% accuracy. In [3], Otsu thresholding, morphological operation are performed for feature extraction. Rice classification results are given as whether the given rice image belongs to Full rice or big broken rice or small broken or organic or discolored rice or damaged rice or chalky rice etc.

The size of *Oryza sativa* L rice is calculated using an effective machine vision is presented in [4]. Also chalky and broken rice are detected by using machine vision with higher accuracy than the human inspectors. Multiclass SVM is used for classification. But it provides only 92% average accuracy. In [5], Otsu's Thresholding, Canny edge detection are performed in preprocessing step. Morphological operation based Feature extraction is carried out on image. The neural network based classification is performed for training functions with feature values. Unknown impurities and its quality is identified by using the trained network. In [6], automatic rice grading process is carried out by using image processing method to overcome the drawbacks of manual method.



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Also different types of rice grading process are discussed to analyze the quality of rice and percentage based on its dimension.

In [7], SVM based rice disease classification is presented with PCA to reduce the learning time. It classify whether the given rice planets is healthy or diseased rice planets. It provides more than 95% accuracy based on sensitivity, specificity and effectiveness. In [8], rice classification is carried out by using principle component analysis (PCA) and Near-Infrared Spectroscopy (NIRs). Analyze the carbohydrate content in each and every rice for this classification. In [9], detect the Rice Planthopper (RPH) by using region of interest (ROI) scheme. The binary image of RPHs is taken from decision tree algorithm based classification results. Loading time and execution time are reduced by using decision tree algorithm. In [10], rice production is predicted by using Neural Network method (ANN) and Decision Tree scheme. It is very helpful for farmers. Accuracy is calculated by using four different methods such as Cross-Validation Folds 10, Accuracy, Use training set and Split 80-20. From the obtains results, it is illustrated that ANN algorithm is the most excellent model for execution to an application.

In [11], presents the rice grain and determined the best excellence to measuring the width, length in addition to chalky of the grain. In this work, they applied Vernier caliper to calculate the width and length of rice with the accuracy of 0.02mm and measured the weight of rice using LA114 type investigative balance (0.0001 g). Previously the statistics of rice was estimated the statistics was examined using Excel software. This technique is very difficult and time consuming technique. In [12], suggests a new scheme so as to discover the excellence of rice grain. They graded rice derived from their dimension. High resolution camera is used to take rice grain image. Anyhow, flatbed scanner (FBS) is used to capture rice grain images. Initially, RGB to binary image conversion is carried out meanwhile morphological operation is included for preprocessing steps. The properties of the connected components of the image are finding out and then extract an object feature from the image.

In [13], image processing technique is used to analyze the quality of the rice. In the proposed system, rice classification is performed by using neural network. In [14], suggests the multi-layer feed forward neural network based rice classification in order to achieve high degree of accuracy. Small and large seed are counted in rice image to find out the feature of rice grain. In [15], propose a novel method to estimate the quality o rice based on top-Hat transformation. Different kinds of feature of rice grain image are analyzed by using top-Hat transformation. Non-uniform elucidation information is corrected by using top-Hat transformation. In this work, propose simple and high accuracy rice variety identification by using multiclass SVM with shape, harlick and color features when compared to all other existing rice classification processes..

### III. BIODIESEL PRODUCING WAY: RESEARCH METHODOLOGY

The main aim of this research work is to design easy and high accuracy automatic rice variety identification by using

multiclass support vector machine (M-SVM). The block diagram of proposed rice variety identification process is shown in fig.1. Initially, various real rice images are taken from mobile camera. Here five types of rice images are taken by using mobile camera such as Ponni, Ponni Leader, Basmati rice, IR 18 and Ration rice. Large number of rice images for each types of rice is given in the training image. Because machine doesn't know about variety of rice images. Training dataset has more than 100 images for each types of rice for machine learning purpose. Matlab 2014a is used for simulation process.

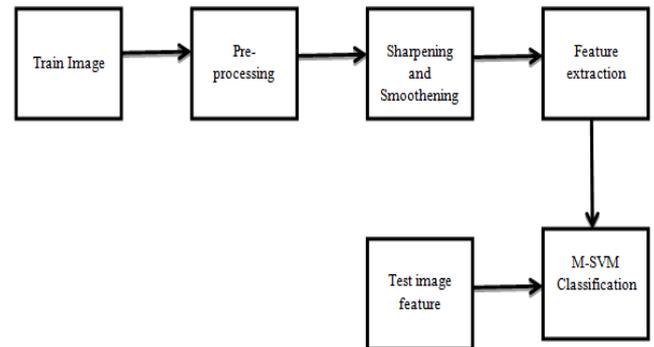


Fig.1 Block diagram of rice variety identification

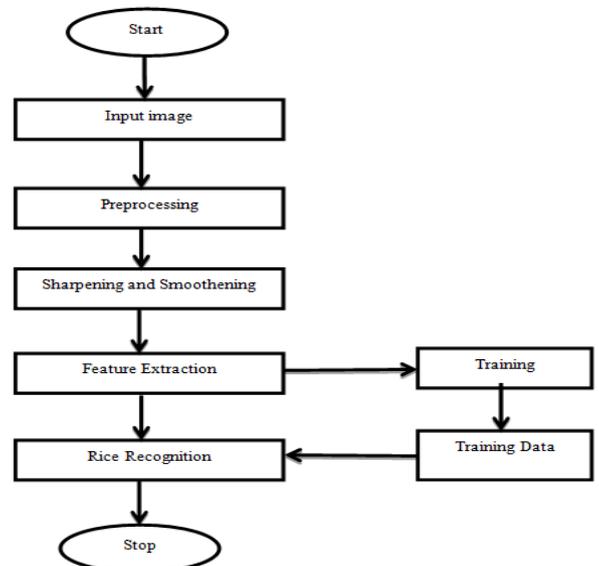


Fig.2 Flow diagram of rice variety identification

From the Fig.2, test image are given as input image. After that pre-processing step is done for image enhancement.

#### A. Pre-processing:

Initially, image resizing is performed to reduce the running time. Then gray threshold operation is carried out to compute global threshold. It is used to convert intensity image into binary image. Also it uses Otsu's to convert block and white pixel (i.e) [0,1]. Finally, image enhancement output is obtained by adjusting the intensity value of the image.

#### B. Sharpening and Smoothing

In the sharpening process, the edge of the image is sharpened based on unsharp masking scheme.

Then smoothing process is carried out by using 2D median filter. Median filter is used for de-noising (i.e) eliminates salt and pepper noise.

C. Feature Extraction (Shape, harlick and color)

Shape feature is extracted by measuring the properties of the region of image. Shape features are extracted to get the following parameters of the binary image like Major Axis Length, Minor Axis Length, Equiv Diameter, Solidity and Perimeter.

Harlick feature or texture feature is extracted by using the properties of gray-level co-occurrence matrix (GLCM). Normalize the GLCM therefore sum of its element is one. This feature is extracted to obtain Contrast, Correlation, Energy and Homogeneity.

Color feature is extracted from RGB image. Separate red, green and blue individually. After that takes mean, variance, skewness and kurtosis for separate Red, green and blue image. Some special color feature values are taken by subtraction red-green, green-blue and red-blue. Finally, all these feature values for training mage and testing image are taken separately.

$$Mean = \mu = \sum_{i=0}^{G-1} ip(i)$$

$$Variance = \sigma^2 = \sum_{i=0}^{G-1} (i - \mu)^2 p(i)$$

$$Skewness = \mu_3 = \sigma^{-3} \sum_{i=0}^{G-1} (i - \mu)^3 p(i)$$

$$Kurtosis = \mu_4 = \sigma^{-4} \sum_{i=0}^{G-1} (i - \mu)^4 p(i) - 3$$

$$Energy = E = \sum_{i=0}^{G-1} [p(i)]^2$$

$$Correlation = \sum_{i,j=1}^{N_g} \frac{\{i X j\}X P(i, j) - \{\mu_x X \mu_y\}}{\sigma_x \sigma_y}$$

$$Contrast = \sum_i \sum_j (i - j)^2 P(i, j)$$

$$Homogeneity = \sum_{i,j} \frac{P(i, j)}{1 + |i - j|}$$

$$Solidity = A_s / H$$

MajorAxisLength

$$= \text{sqrt}((x(\text{index1}) - x(\text{index2}))^2 + (y(\text{index1}) - y(\text{index2}))^2)$$

D. Rice variety identification using Multiclass SVM

Finally, the rice image classification is carried out by using multiclass support vector machine (M-SVM) classification scheme. MSVM classification is one the supervised classification method. So we have to perform both training and testing operation. We will apply features extraction for all training image with label name. The same processes are performed for testing image. Finally, the euclidean distance is calculated to find out the matching in both training and testing image feature value. Totally five types of classification are carry out such as Ponni, Ponni

Leader, Basmati rice, IR 18 and Ration rice. The matched value is specified whether the rice belongs to Ponni or Ponni Leader or Basmati rice or IR 18 or Ration rice. It provides low complexity and high accuracy is 97.67 also false classification rate is very low in M-SVM based classification with Gaussian radial basis function (RBF) method.

IV. RESULTS AND DISCUSSION

In this work, the multiclass SVM based rice variety identification of images is presented in the proposed system. In the existing technique ANN based classification is performed to find the variety in rice. Comparison between existing and proposed rice variety identification in image are carried out to analyze the accuracy and complexity.

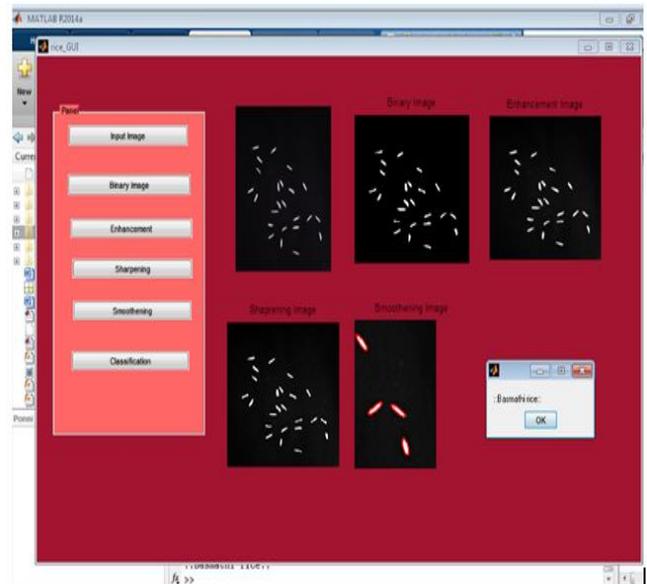


Fig.3 Proposed rice variety identification output1 in GUI

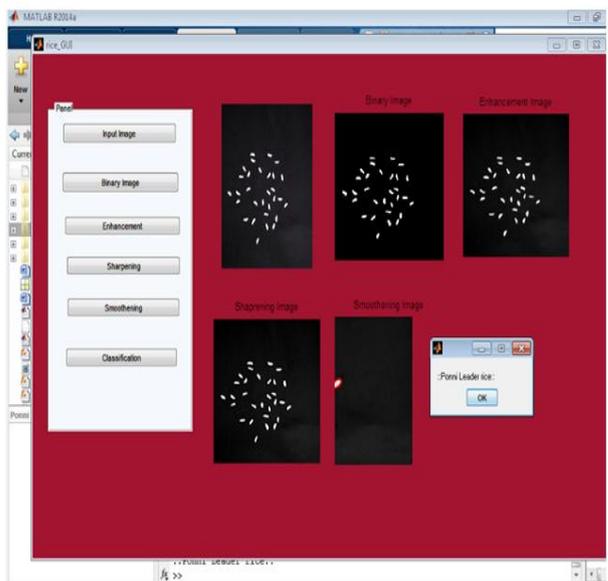


Fig.4 Proposed rice variety identification output2 in GUI

From the fig.3 and fig.4, rice classification is performed by using multiclass support vector machine. Initially, test image is given as input image to perform preprocessing for image enhancement and de-noising processes. Graphical user interface (GUI) is used to view all the outputs in single screen. Finally, the rice classification output is presented in message box. From the Fig.3 shows the given input image belongs to Basmati rice. Similarly, the given input image is ponni leader rice as shown in fig.4. Likewise all other rice variety are identified by using M-SVM. This classification results are obtained by matching the feature values of training and testing images.

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