International Journal of Electronics and Communication Engineering.
ISSN 0974-2166 Volume 10, Number 1 (2017), pp. 25-33

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Analysis and Identification of Rice Granules Using Image Processing and Neural Network

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Abstract

The quality of food grains is referred to the every aspect of the profit of supply and marketing. The varietals purity is one of the factors whose inspection is more difficult and more complicated than that of other factors. This evaluation process is, however, tedious and time consuming. The farmers are affected by this manual activity. A model of quality grade testing and identification is built which is based on features such as the major axis, minor axis, parameters and area with image processing and neural network technology. Investigation is made on basmati rice by image processing and Neural Network which is implemented based on the features extracted from rice granule. Images are acquired for rice using Web cam. Image Pre-processing techniques, Ostu's Thresholding, Canny edge detection, Feature extraction are performed on the acquired image using image processing method through MATLAB. The features are presented to the neural network for training purposes. The trained network is then used to identify the unknown impurities and its quality.

Keywords: Grain quality, image processing, neural Network, Ostu's Thresholding, Canny Edge Detection.

I. INTRODUCTION

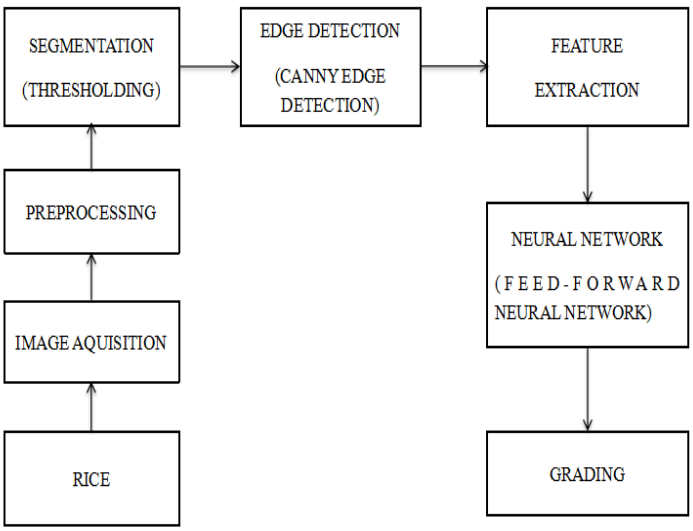
Grains are the prime crop for our country to increase the agricultural income. Also, yield is the most noticeable characteristic to farmers while the crop is in the ground, but when the milled rice reaches the market, quality becomes the key determinant of its sale-ability. These grains consist of several impurities like stones, weed seeds, chaff, and damaged seeds etc. The automation level of testing quality of grain is low and most work is done by manpower. The workload is so mass that it will lead to

workers fatigue and need them to have sample testing experience. And it also makes the testing more costly and long to be made. With the development of import and export trade this contradiction is more and more outstanding. During grain handling operations, types of grain and their quality is required at several stages before the next operation can be determined and performed. In the present grain handling system, grain type and quality are rapidly assessed by visual inspection. This analysis process is, however, tedious and time consuming. There is no convenient method to identify these inferior quality grains in the market. Therefore, this has become a serious issue for the consumer. The farmers are affected by this manual activity. Therefore, it is required to explore the possibility of using technology for a suitable solution. The accuracy of quality checking by using manual method is varied from person to person and it also depends on working stress, persuasion and loyalty for traders and also the knowledge and experience of inspectors are required to accurately perform this evaluation process.

II. MATERIALS AND METHODOLOGY

The samples of Basmati rice grains were collected from store and a camera is used to acquire and record the images of rice granules of different sizes. The camera is mounted on a stand which provides vertical movement. When the camera is fixed at certain distance between the lens and the sample table with uniform background. The background is black. The uniform intensity of light is provided on the sample table. Inside the field of view, the grains were arranged in random orientation and position. Acquired Image stored in jpeg format and parameters were extracted from the image for further analysis. With the parameters interpreted we will establish a Neural Network system using Back propagation algorithm for grading of rice granule.

III. BLOCK DIAGRAM



IV. IMAGE ANALYSIS

It is the process of differentiating the granules from the background and extracting quantitative information, which is used further for decision making process.

A. Image Acquisition and Smoothing:

Image Acquisition is the first step in image processing. Acquisition is done by using PC web cam Camera under uniform lighting setup. Smoothing is done using Median Filters. Median filter is used for pre-processing, because it preserves the edges of the image during noise removal. Median filtering is extensively used in digital imaging since it conserves the ends of the image during noise exclusion. Salt and pepper noise are which with, median filters are predominantly effectual. Using median filter the noise in the input gray color image is removed.

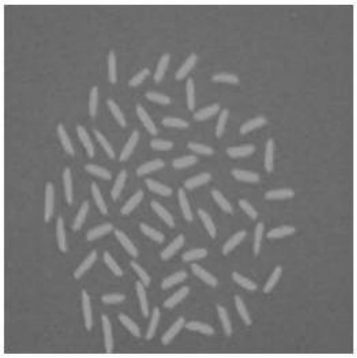


Fig.1. Smoothing Image

B. Segmentation:

The subsequent step is to segment an image, which is one of the imperative stages in image analysis. Segmentation is attained by three techniques such as Edge segmentation, Region segmentation and Thresholding.

C. Thresholding:

It is the method of image segmentation. From a grey scale image threshold can create a binary image.This technique is based on absorption of light in their surfaces to characterize the regions of the image. Threshold is to separate the regions in an image with respect to the objects, which is to be analyzed. The separation of region is based on the variation of intensity between the object pixels and the background pixels. In our work to perform thresholding, ostu's thresholding technique is implemented. After properly separating the necessary

pixels, we can set them with a determined value to identify them (i.e. we can assign them a value of 0(black), 255(white) or any value that suits our needs).

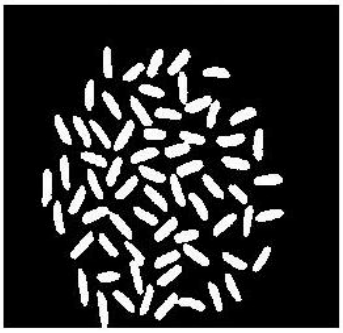


Fig.2. Threshold Image

D. Edge Detection:

Edge detection is based on recognition of edges by diverse edge operators. Discontinuities in color, Grey level, texture, etc. are detected by edge operators.

Canny Edge Detection:

Canny edge detection is an optimal detector which gives optimal filtered image. The Grey scale image edges are detected by this optimal detection technique. The edges in the image are marked only once and false edges are not created due to the noise in the image because this method has good detection and localization with minimal response. This detector has the ability to detect weak edges. Canny edge detector distinguishes the edges by locating the local maxima and minima of the gradient of the intensity function. The advantage of Canny edge detection is that the detected edges are thick. This occurs if the edge is with one pixel thick. Canny edge detector gives a solution to the problem first it blur the images slightly and then applies an algorithm that thins the edges to one-pixel effectively.

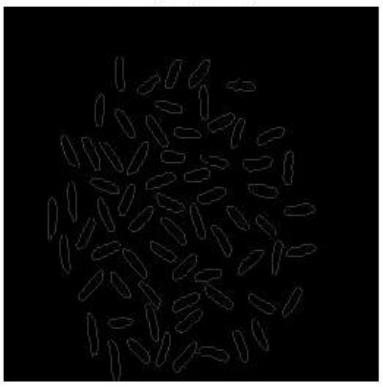


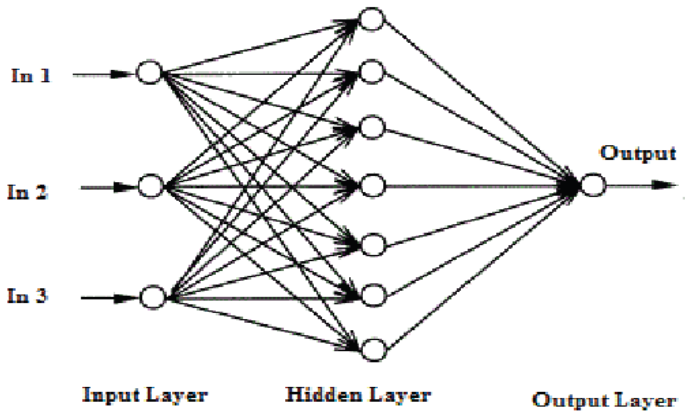
Fig.3. Canny Edge Detection

F. Features Extraction:

Extraction of quantitative information from segmented images is deal with Feature Extraction. Object recognition and classifications is done based on various algorithms of morphological features. Some of the morphological features for classification purposes contain redundant, noisy and irrelevant information. The features which extracted from images of rice granules is Perimeter, Area, Minor-axis Length and Major-axis Length using Contour detection. The collected data is given to Neural Network system for grading of rice granules.

V. GRADING USING NEURAL NETWORK

The collected data is given to the Neural Network Pattern Recognition system for grading of rice granules.



- Extracting patterns and detecting trends are complex to be noticed by either humans or other computer techniques.
- Neural network is used for the classification based on the extracted features from the rice samples.
- The neural network is built with three neurons in input layer, seven neurons in the hidden layer and one neuron in the output layer.
- The network which used for classification is back propagation algorithm.
- During the training, neural network weights are initiated with random values.
- The weights are stored during the end of training.
- When the training completed, the network tested to calculate the accuracy with stored weights.

VI. ALGORITHM

Input: Original Color Image

Output: Classified food grains along with Quality

Step1: Acquire the food grain images.

Step2: Enhance image to remove noise

Step3: Identify Patches and Do the image segmentation.

Step4: Extract Color and morphological features.

Step5: Use these features to recognize and classify the food grain image samples using Neural network

VII. RESULT

Quality evaluation of rice seeds is performed via image processing. Calculations of perimeter, minor axis length, area, major axis length are done for a given sample. The rice granules are graded depending on the size of grains present in the sample.

- 55% of long grains are graded as grade 1.
- 33.33% of small grains are graded as grade 2.
- 11.11% of stones are present in sample.

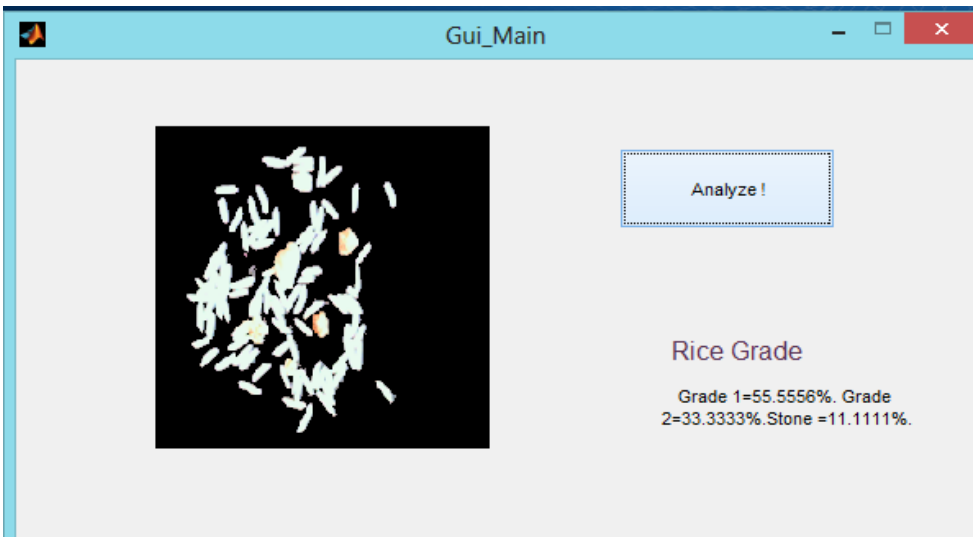


TABLE I: ANALYSING SEVERAL GRAINS IN ONE SAMPLE

Sr.No.	Area	Major-axis	Minor-axis	Perimeter
1	129	26.45215568	6.474056681	56.28427125
2	116	22.61338124	6.753313574	48.870.05769
3	125	23.09343348	7.051399628	48.52691193
4	129	27.18976437	6.241474347	57.45584412
5	108	21.15132969	6.705329553	46.28427125
6	115	28.46547094	5.36493914	57.3137085
7	115	24.29226898	6.269345856	49.35533906
8	120	21.60775281	7.291891729	48.04163056
9	102	29.25358896	4.581519015	56.48528137
10	113	24.94454879	6.011378942	52.87005769
11	109	24.96749463	5.718731565	51.3137085
12	115	20.14895685	7.4728345060	44.97056275

The rice granules are graded depending on the size of grains present in the sample.

- 100% of long grains are graded as grade 1.
- 0% of small grains are graded as grade 2.

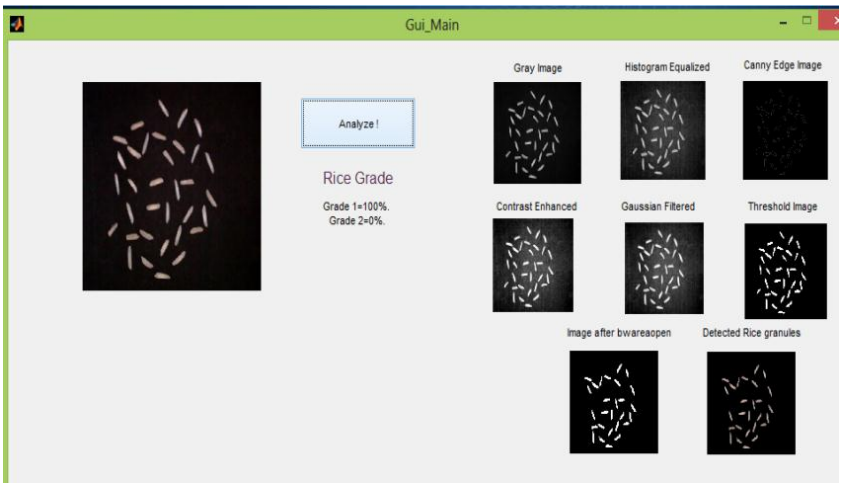


TABLE II
ANALYSING SEVERAL GRAINS IN ONE SAMPLE

Sr. No.	Area	Major-Axis	Minor-Axis	Perimeter
1	109	21.27274431	6.731781567	46.38477631
2	171	31.44453235	7.233455645	68.76955262
3	139	28.26205889	6.516883231	58.97056275
4	245	25.55930446	12.34474398	61.9411255
5	1257	87.52459029	27.8875262	285.1787156
6	127	22.64991562	7.377160346	50.04163056
7	288	37.72154801	10.77883982	95.74011537
8	1241	72.47722805	27.65020717	272.1492783
9	122	25.51442466	6.410072105	53.3137085
10	1419	81.21597842	31.39301005	328.9777054
11	133	22.45174055	7.765079172	50.28427125
12	103	17.12139522	8.963775079	56.627417
13	124	20.47362601	12.2480396	73.35533906
14	291	24.45989512	16.08607454	79.01219331
15	179	31.14552939	7.720417384	64.97056275

VII. CONCLUSION

The grading system is developed for easing the labor intensive work and creates consistency in the quality of product. There are several inferior quality grains arriving at the market day by day. This system is helpful for categorization grades of granules using Neural Network Pattern Recognition Tool. This system is based on features extraction from rice granules. Features which extracted from image of rice granules are Area, perimeter, major axis, minor axis.

REFERENCES

[1] B. S. Anima, V. Burkpalli, S. A. Angadi, and N. M. Patil,"Neural network approach for grain classification and gradation," Proceedings of the second national conference on document analysis and recognition, pp. 394408, July 2003.

[2] N. S. Visen, J. Paliwal, D. S. Jayas, and N. D. G. White, "Image analysis of bulk grain samples using neural networks," Canadian Bio systems Engineering, vol. 46, pp. 7.11-7.18, 2004.

[3] R. M. Haralick, K. Shanmugam, and I. Din stein, "Texture features for image classification," IEEE Trans. on System. Man, and cybern, vol 6, pp. 610-621, 1973.

[4] L. Zhao yan, C. Fang, Y. Yibin, and R. Xiuqin. "Identification of rice seed varieties using neural network", Journal of Zhejiang University SCIENCE, September 2005.

[5] M. A. Shahin and S. J. Symons, "Seed sizing from images of nonsingulated grain samples", Can. BioSyst.Eng, vol. 47, 2005. J. Paliwal, M. S. Borhan and D. S. Jayas, "Classification of cereal grains using a flatbed scanner", Can BiosystEng, vol. 46, 2004.

[6] Sanjivani Shantaiya, MrsUzma Ansari, "Identification of Food Grains and Its Quality Using Pattern Classification," International Journal of Computer & Communication Technology, vol 2, 2010.

[7] H. Rautio and O. Silvn, "Average Grain Size Determination using Mathematical Morphology and Texture Analysis".

[8] S. Deena Christilda, M. Pratibha and P. Neelamegam, "Quality Inspection of Parenteral Vials Using Digital Image Analysis," Sensors & Transducers Journal, Vol. 145, Issue 10, pp. 130-137, October 2012.

[9] R. Deepak Prasanna, P. Neelamegam, S. Sriram, NagarajanRaju, "Enhancement of vein patterns in hand image for biometric and biomedical application using various image enhancement techniques," Procedia Engineering, vol. 38, 1174 – 1185, 2012.

[10] Sonka, M, Hlavac, V, Boyle, R., "Image Processing, Analysis, and Machine Vision", PWS publishing, California, USA, 1999.