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A Review : Classification of Food Grains and Quality Prediction

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ABSTRACT

This review paper discuss about recent techniques and methods used for grain classification and grading. Grains are important source of nutrients and they play important role in healthy diet. The production of grains across worldwide each year is in terms of hundreds of millions. The common method to classify these hugely produced grains is manual which is mind-numbing and not accurate. So the automated system is required which can classify the verities and predict the quality (i.e. grade A, grade B) of grain fast and accurate. As machine learning had done most of the difficult things easy, many machine learning algorithms can be used which can easily classify and predict the quality of grains. The system uses colour and geometrical features like size and area of grains as attributes for classification and quality prediction. Here, several image procession methods and machine learning algorithms are reviewed.

Keywords: Geometrical Features, Machine Vision, Grain Classification, Quality Analysis.

I. INTRODUCTION

In this Morden world, the key factor for Morden food industries is quality and classifying the varieties of grains. And normally it is done by manpower which is time consuming, monotonous, and costly resulting in inconsistent evaluation which may also affect the farmers. These methods may rise many problems because it is influenced by human working conditions and it is highly subjective which may leads to unreliable results. If this can be done automatically then the speed and efficiency of products can be improved.

Digital Image Processing is process of applying different algorithms to implement image processing on digital images. Machine vision systems are now used as tools for quality evaluation which can provide accurate and fast information about external quality aspects of grains. Quality of grains depends on shape, size, colour and texture of the grains, these features can be extracted by using image processing techniques.

Using machine vision and image processing techniques an automated system can be developed which is based on Pattern Recognition, which uses

colour, morphological and textual features as attributes. In an image it finds the area of interest around the boundary of the edge. The morphological features are obtained from the binary image which contain the pixel of edge.

The paper is divide as follows, section II gives the detailed overview of the methods used, section III consists conclusion of paper.

II. LITERATURE

Harpreet k [1], used Multi-Class SVM algorithm to determine the quality grade(Grade A, Grade B, Grade C) of rice kernel. They applied Maximum Variance method to remove the background from the image. The percentage of Brewers and broken rice were determined with 10 geometric features. The classification of rice kernel is based on shape and percentage of broken kernel. The model provided 86% accuracy using SVM algorithm. H.K. Mebatsion, J. paliwal [2] discussed about a method to classify the grains- barley, oats, rye and wheat. They used Morphological and colour features as input for the model for which they got 98.5% accuracy for barley, 99.93% for oats and 100% for rye. Vidya patil, V. S. Malemath [3] used different varieties of rice grains for quality assessment. Mainly it was based on size of the rice kernel. Grading was mainly based on morphological features. They used 105 set of images and decision tree classification technique was used for classification. They got 93% as average accuracy for classification. Harish s Gujjar, Dr. M. Siddappa [4] used Back Propagation Neural Network classifier to classify the grains. Segmentation is used to remove foreign bodies this was mainly for quality assessment. They finally concluded that ANN provides the fast and accurate result. L.A.I Pabamalie, H, L, Premaretne [5] worked on rice quality using Neural Network and DIP Algorithms. BPNN was used for quality classification. They extracted 31 features from rice images for analysis. Type admixture, foreign bodies and brown grain contents are used as parameters for sample preparing. The model shows the accuracy in between 94%to 64% for 4 grades. R. V. Ronge, M. M. Sardeshmukh[6] classified 4 Indian wheat seeds into 4 class and used 2 layer ANN and KNN to identify and classify these classes for feature extraction they used textual algorithms which contains LBP(local binary patter), LSP(local similarity pattern), LSP(local similarity number), GLCM(gray level Co-Occurrence Matrix) and GLRM(gray level run length matrix). Using ANN they got 100% accuracy for inter class and 66.68% for intra class classification and with KNN 85%for inter class and 39% for intra class classification. They concluded that ANN accuracy is better than KNN. Neelam et al., [7] proposed model based on computer vision for identification and classification. For training Neural Network Levenberg Marquardt algorithm is used and performance is calculated using Mean Square error. The accuracy of model is 89.7%.Priyank S, Uttam P [8] proposed a mobile application for classification and quality analysis of wheat grains .For quality analysis Machine Learning algorithms are used like SVM, K nearest neighbour. The results are sent to mobile application. The accuracy of quality analysis was between 80%-90% and for classification it was between 86%-88%. Iman G, Jafar Amiri [9] used five Rice cultivars and applied image processing algorithms on them. They used 36 colour features of rice as input to Back Propagation Neural Network for classification of verities (paddy, white rice, brown rice) 2 layer neural network is used. They concluded that neural network had highest mean classification accuracy i.e. for paddy 98.8%, brown rice 100% and white rice 100%.Deepika S, Sharad D[10], proposed a system which include hardware part. Food grains move along the conveyor belt and random images of grains are captured. These images are processed using MATLAB, Classification is based on Morphological features and Neural NetworkN is used for training the data. The results are displayed on LCD screen regarding the quality of grain (good, medium, bad).

Table-1 Comparisons of Some of the Reviewed Methods

References	Dataset	Pre-processing techniques	Extracted Features	Training	Accuracy
Harpreet K	Mixed rice varieties	Maximum variance	Geometric features	Multi-Class SVM	86%
Neelam et,al.,	4 rice varieties	Image Segmentation	Morphological features	Levenberg Marquardt	89.70 %
Vidya P	3 rice varieties	Image Segmentation	Geometric	NIL	93%
R. V. Ronge et,al.,	4 class wheat(120 images)	LBP, LSN, LSP,LSN	Texture features	ANN	100%
Priyanka.S et,al.,	Wheat varieties(150 images)	Remove noise, Segmentation and Smoothing	Colour and Morphological	K-NN, SVM	80-90%
Iman Golpour	5 rice varieties	Image Segmentation ad noise reduction	Colour features	NN	Paddy - 98.8%, brown - 100,white-100

III. CONCLUSION

The paper presented a survey on the methods and techniques used for classification and quality analysis of food grains. Most of the models are based on image processing techniques like feature extraction, background subtraction, classification and training. Many machine learning algorithms like SVM, K-nearest, decision tree, neural network are used for classification and quality analysis. Some of the models are Mobile application based. These existing methods can fulfil many real time need and also they are less time consuming. These approach can contribute to optimizing global food production.

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