A Survey on Various Classification Techniques Applied on Grain Crop Seeds

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Abstract *- The application of machine vision is very important in agricultural industry. Seed analysis and classification can provide additional knowledge in their production, which includes seeds quality control and in impurities identification. Generally these activities are performed by specialists by visually inspecting each sample, which is a very tedious and time consuming task. So automation is required in this field. Now a days, computer vision technology is applied in a large variety of fields to increase the efficiency of the work. So This paper uses various classification techniques for the recognition aspect of the said problem.*

Key Words**: Euclidean Distance Method, Artificial Neural Network, Histogram Intersection Distance, Support Vector Machine , Colour Recognition.**

1. INTRODUCTION

An effective data classification process is important because it can help organizations determine the appropriate levels of control to separate and distinguish the data sets.In this study, with the help of an online dataset, attempts to identify such factors. Data analysis was made by using Euclidean Distance Method, Artificial Neural Network algorithms and Support Vector classifier and histogram intersection distance have results with 85% accuracy and 84.8% precision for classification. The proof of concept is provided for result validation. The causes behind the varying performance algorithms are elaborated. The factors that influence these algorithms are identified based on the classifier with the best results.

2. RELATED WORKS

2.1 Automatic Seed Classification by Shape and Color Features using Machine Vision Technology. by Naveen pandey, Satyanarayan Krishna, Shanu Sharma.

2.1.1 Euclidean Distance Method

Benjamaporn Lurstwut and chomtip pornpanomchai developed a method using size, color, texture feature extraction with the Euclidean distance technique to classify seed Images. The system's recognition rate was 95.1 % for trained dataset and 64.0 percent for unknown in untrained dataset. Dr. H.B.Kekre, Mr. Dhirendra Mishra, Ms. Stuti Narula and Ms.Vidhi Shah applied the color feature extraction to recognize different kinds of image. They applied Euclidean distance technique with the different images of the same class which gave results varied from 30% to 60% for a database of size 300. Poulami Haldar and Joydeep Mukherjee used Euclidean matrix method to calculate the distance vector. System provides overall accuracy 87.50 % for the images of different class.

2.1.2 Artificial Neural Network

Dayanand Savakar designed algorithms which is used to extract 18 color and 27 texture features from food grains. For the Recognition and Classification of similar looking food grain images this system uses artificial neural network. Recognition of Mustard is about 87% and for Soya is 78% using color feature and on the basis of texture feature, maximum extraction and classification rate is 84%. Ai-Guo OuYang, Rong-jie Gao, Yan-de Liu,Xu-dong Sun, Yuan-yuan Pan and Xiao-ling Dong designed a system in which color features in RGB color space is computed. A back feed forward neural network was trained to identify rice seed, where 86.5 % rice seeds were identified by the system.

2.1.3 Histogram Intersection Distance.

Manimala Singha and K.Hemachandran used histogram intersection distance for feature similarity matching. Experiment was performed on standard "Wang Database" containing 1000 image. In it texture and color feature was extracted through wavelet transformation and color histogram.

2.2 Color and Texture for Corn Seed Classification by Machine Vision. by Kantip Kiratiratanapruk , Wasin Sinthupinyo.

In this paper, Support Vector Machine (SVM) was used for seed classification. A Support Vector Machine is a learning algorithm typically used for classification problems. The goal of SVM is to optimize the "General" to classify unseen data correctly. It can solve problems seen in other learning algorithms such as errors due to local minima, over fitting and an inconveniently large number of tunable parameters. It maps training data in the input space into a high dimensional feature space and determines a linear decision boundary in the feature space by constructing the optimal separating hyper plane distinguishing the classes. This allows the SVM to achieve

a nonlinear boundary in the input space. The support vectors are those points in the input space which best defines the boundary between the classes. Difficult computations in the feature space are avoided by using a kernel function, which allows computations to be performed in the input space.

2.3 Rapeseed Seeds Colour Recognition by Machine Vision. by Li Jinwei, Liao Guiping , Xiao Fen.

In this paper, the recognition of rapeseed seeds colour is done by the following methods.

2.3.1 Nine Color Model

For single seed, the mean of h, s and v of each pixel of a seed in an image is calculated. Then those mean values were transformed into NCM colour space. For an image or a sample also, the mean of h, s and v of each seed is calculated. And those mean values also were transformed into NCM colour space.

2.3.2 Histogram

For single seed, the histogram of nh of each pixel of a seed in an image is calculated. For an image or a sample also, the histogram of major colour of each seed is calculated. And the maximum of the histogram was the major colour. The ratio of the maximum of the histogram and the total pixels of a seed was major colour rate Yellow-seeded colour grade. For distinguishing the colour grade of rapeseed yellow-seeded, the yellow- seeded colour grade and yellow degree were inducted.

2.4 Evaluation of Texture and Shape Features for Classification of Four Paddy Varieties. by Archana Chaugule and Suresh N. Mali.

In this paper, Artificial Neural Network and Back Propagation Network is used.

2.4.1 Artificial Neural Network

Artificial neural network (ANN) classifier is emerging as the best suited classifiers for pattern recognition which are regarded as an extension of many classification techniques. They are based on the concept of biological nervous system. NNs explore many hypotheses simultaneously using massive parallelism instead of sequentially performing a programme of instructions.

2.4.2 Back Propagation Network

Pattern classification was done using a two-layer (one-hidden-layer) back propagation supervised neural network with a single hidden layer of 20 neurons with Levenberg-Marquardt training functions. A back propagation network (BPN) consists of an input layer, one or more hidden layers, and an output layer and has ability to generalize. The number of neurons was varied to see any significant improvement in performance. As no improvement was observed, the number of neurons as 20 was used to train the network. The choice of the BPN classifier was based on previous researches. The transfer function used was tangent sigmoid. The data division function divided the targets into three sets, Training (70%), Validation (15%), and Testing (15%), using random indices. The feature vectors were split into Training and Testing sets. The accuracy was computed on Testing set. The trained neural network was tested with the testing samples to find how well the network will do when applied to data from the real world. One measure to find how well the neural network has fit the data, the confusion matrix, was plotted across all samples. The sixty-four features were used as inputs to a neural network and the type of the seed was used as target. Given an input, which constitutes the features of a seed, the neural network is expected to identify the type of the seed which is achieved by neural network training.

3. CONCLUSIONS

[2.1] In the proposed system 25 shape, color and statistical features are calculated. Image recognition is done using both techniques Euclidean distance and artificial neural network. System is 95 % accurate using Artificial Neural Networks and 84.4 % accurate using Euclidean distance method.

[2.2] In this experiment, the technique was evaluated from 14,000 seed sample images of a normal seed type and 13 defect seed types. The obtained accuracies are 76% and 56% for individual feature. From the error rate, it is found that one defect seed type can be sometimes misclassified into other defect seed types. However, probability of misclassification of defect seeds into normal seeds is very low. In a practical situation, misclassification of defect seeds into normal seeds leads to an acceptance of low quality or banned raw materials to a production line which is far more severe than misclassification of normal seeds into defect seeds. Therefore, the proposed technique which should promises a very high performance.

[2.3] Color recognition of rapeseed seed is not an easy task. even though very much research has been done on this topic, comparative studies which involves different automatic recognition techniques were still missing. To Overcome this, NCM color space transformation and major color recognition technique were implemented for the automatic color identification of rapeseed seed. The performance of this method excelled the common method. Due to the complexity and particularity of yellow-seeded seeds colour, we induct the yellow-seeded colour grade and the yellow degree to identify the yellow-seeded rapeseed.

[2.4] The texture, shape, and texture-*n*-shape features were extracted from images of individual grains and the same were assessed for classification of grains. The

accuracy shown is 82.61%, 88.00%, and 87.27% with texture, shape, and texture-*n*- shape features, respectively. The most satisfactory results were delivered by the shape feature set. Texture feature set gave lower accuracy than all the other sets because the difference between the features (contrast, energy, and homogeneity) of different varieties is negligible. It can be concluded that invariant moments, standard moments, and central moments of shape have a significant role in discriminating the paddy varieties. Thus shape moments have the potential to improve the classification accuracy of the computer vision systems used for classification of paddy grains.

4. ACKNOWLEDGEMENT

We express our sincere gratitude towards our guide Assistant Prof. Mr Vishwanath Y for his valuable guidance. We also thank Dr. Jitendranath Mungara, Prof. & Head, Department of ISE, for his encouragement and support. Their insight and comments will definitely lead to a better presentation for the ideas expressed in this paper.

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