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A novel segmentation method for classification of Diseased and Healthy Maize and Paddy Leaves Using OCLBP

T. Harisha Naik[1*], M. Suresha[2]

[1]Department of Computer science and MCA, Kuvempu University, Shimoga, India
[2] Department of Computer science and MCA, Kuvempu University, Shimoga, India

[*]*Corresponding Author: : harishtkola_email@gmail.com, Tel.: 9886897968*

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***Abstract*—** In this paper we have proposed a novel segmentation method for classification of diseased and healthy maize and paddy leaves using Opposite Color Local Binary Pattern (OCLBP). The proposed works have been done on the maize and paddy leaves, the dataset has the diseased and healthy leaves, diseased leaves have the yellowish brown patches. Disease in maize and paddy leaves may be due to biotic causes. Generally, leaves spotted with yellow at initial stage and appear bronzed brown color at end stage at its disease levels. The diseased spots are all having color transition from yellow to Bronzed brown color. This yellow to bronzed brown color transition is appeared in between red and green colors of RGB color cube. This color transition motivated us to use OCLBP as a segmentation tool. The OCLBP textured image is the image of segmented diseased part which helps in extract the features. So here considered red color channel against green color channels to get the OCLBP textured image. SVM is used for diseased and heathy leaves classification. We have attempted to introduce the best segmentation, feature selection and dimensionality approaches for image texture which support fast and accurate pattern recognition and object identification.

***Keywords*—**Feature Selection, Local Binary Pattern, Gabor features, OCLBP.

I. INTRODUCTION

The main objective of segmentation is to partition an image input into number of components, which has a well build association with other things in the real world enclosed within the object. The accuracy of segmentation decides the overall accomplishment or non-accomplishment of segmentation method. Because of this reason necessary attention must to taken for improving the probability of uneven segmentation. There are number of issues in the process of image segmentation which needs a careful review. Selecting a best method to isolate unlike things from the rest of the image background is a major issue in the segmentation process. If the gray levels are not uniform then the segmentation does not well perform. The kind of operator has been chosen will have an effect on the performance of a resultant image. The ideal operator is the one, which enhances the border difference in between the objects and its background, which easier the segmentation tasks.

Disease in maize and paddy leaves due to biotic (fungi,bacteria,viruses) causes leaves spotted with yellow at initial stage and appear bronzed brown color at end stage. The diseased spots are all having color transition from yellow to Bronzed brown color. This yellow to bronzed brown color transition is appeared in between red and green colors of RGB color cube.So here considered red color channel against green color channels to get the OCLBP textured image. Features contain information about the target, more features means more information or better classification or better discrimination power. This doesn't be in all the cases because some features may be irrelevant and redundant which doesn't contribute any valuable information and such features may leads towards complexity in classification and which may be the main factor for curse of dimensionality. To overcome such problem feature reduction must be done. General feature reduction methods are feature selection and feature extraction. In feature selection given an initial set of features f={x1, x2, x3,… ,xn} find the subset of those prime features to find optimal solution. In feature extraction method, it transform or projects original set of features into new subsets which are smaller number of dimensions that is M<N. Dimensionality reduction research strategies that efficiently reduce data dimensionality for efficient data processing task such as pattern recognition, machine learning, text retrieval, and data mining. Dimensionality reduction categorized into two divisions that is feature extraction and feature selection. Feature extraction creates new features resulting from the combination of the original features and feature selection

produces a subset of the original features. Both attempt to reduce the dimensionality of a dataset in order to facilitate efficient data processing tasks. Key concepts of feature extraction and feature selection describe some basic methods and illustrate their applications with some practical cases.

II. RELATED WORK

A new method for classification of structural textures proposed by Lee, B [1]. This paper combines the characteristics of edge in-formation and second-order neural networks for the classification of structural textures. The methods used in this investigation follows the pattern recognition schema image segmentation using Otsu method, feature extraction and classification using SVM Halimi, A. et al.[2], the evaluation of yarn quality in fabric using image processing techniques, to automatically determine yarn mass parameters using Image Processing (IP) techniques. The sample images were analyzed and processed through a custom made application developed in LabVIEW from National Instruments using IMAQ Vision Toolkit Bahl, K. et al.[3], fabric fault detection using digital image processing, introduced to identify the fault detection called as Automatic Fabric fault inspection .Due to this method, at the time of manufacturing itself we get high quality fabric it implies the high speed of production Nadaf, F. S. et al.[4], study for texture feature extraction of high-resolution satellite images based on a direction measure and gray level co-occurrence matrix fusion algorithm aimed at reducing the suppression of texture directionality by extracting feature values from traditional methods and obtaining the relationship between spatial correlation and texture information. Texture feature extraction based on direction measure and a gray level co-occurrence matrix (GLCM) fusion algorithm, is proposed in this paper Zhang, X. et al.[5], image texture feature extraction using GLCM approach Gray Level Co-Occurrence Matrix (GLCM) has proved to be a popular statistical method of extracting textural feature from images. According to co-occurrence matrix, Haralick defines fourteen textural features measured from the probability matrix to extract the characteristics of texture statistics of remote sensing images. In this study four important features were discussed that is angular second moment (energy), (inertia moment), correlation, Entropy, and the Inverse Difference Mohanaiah, P. et al.[6], feature level fusion using hand and face biometrics discuss the fusion at feature level in 3 deferent scenarios (i) fusion of PCA and LDA coefficients of face (ii) fusion of LDA coefficients corresponding to the R,G,B channels of a face image; (iii) fusion of face and hand modalities. Preliminary results are encouraging and help in highlighting the pros and cons of performing fusion at this level Ross, A. et al.[7], survey of dimensionality reduction and classification methods discuss the dimensionality reduction can be implemented using various algorithms like singular value decomposition, support vector machines, independent component analysis, principal component analysis, canonical correlation analysis, locally linear embedding, linear discriminant analysis, partial least squares regression algorithms.

Feature selection and feature extraction being the two techniques of reducing dimensionality Varghese, N. et al.[8], Significance of dimensionality reduction in image processing in which the most two popular dimensionality reduction algorithms used in recognition and classification are principal component analysis[PCA] and linear discriminant analysis[LDA]. These two methods show improvements in recognition rates when the neural network classifier is used Shereena, V. et al.[9], image classification by feature dimension reduction and graph based ranking discuss the 2 novel methods non-terrible matrix factorization (nmf) and dimension reduction trains a subspace projection matrix to assignment unique records space into a few low-dimensional subspaces which have deep structure, so that the low - dimensional codes could be discovered Nan, Y. et al.[10], image quantization as a dimensionality reduction procedure in color and texture feature extraction, The PCA approach become found to be the great linear technique, at the same time as lbp turned into highlighted because the approach with the nice precision/complexity ratio, particularly for nonlinear spaces. then again, the identical have a look at talked about that manifold strategies (such as the lbp) can be volatile and want parameter tuning, but keep the accuracy of the unique function set Ponti, M. et al.[11] . Guyon, I et al[12].proposed work on introduction to variable and feature selection in this focus mainly on constructing and selecting subsets of features that are useful to build a good predictor. This contrasts with the problem of finding or ranking all potentially relevant variables. Selecting the most relevant variables is usually suboptimal for building a predictor, particularly if the variables are redundant. Conversely, a subset of useful variables may exclude many redundant but relevant variables. Zhou, X. S. et al[36]. Contributed work on feature extraction and selection for image retrieval. Feature extraction process is examined and a new set of edge features is projected. A revised edge-based structural feature extraction approach is presented. A principle feature selection algorithm is also projected for new feature analysis and feature selection. The results of the PFA is tested and compared to the original feature set, random selections, as well as those from principle component analysis and multivariate linear discriminant analysis. Liu, L., Fieguth, P. et al[13].Presented a work on evaluation of LBP and deep texture descriptors with a new robustness benchmark. According to the survey computational complexity and effects of poor image quality are often neglected. In this paper, a new extensive benchmark (RoTeB) for measuring the robustness of texture operators against different classification challenges, including changes in rotation, scale, illumination, viewpoint, number of classes, different types of

image degradation, and computational complexity. Fourteen datasets from the eight most commonly used texture sources are used in the benchmark. Rauber, P. E.,et al[14]. Contributed work on an interactive image feature selection aided by dimensionality reduction. The selection is guided by dimensionality reduction plots and feature scoring metrics. The approach was evaluated for feature selection in the task of skin lesion image classification. Sun, Z.,et al[15].presented a paper on Neural-network-based gender classification using genetic search for eigen-feature selection. A Genetic Algorithm (GA) is then used to select a subset of features from the low-dimensional representation by removing certain eigenvectors that do not seem to encode important information about gender. Kushwaha, P.,et al[16]. In this system, multi feature extraction such as colour, texture and shape. The three techniques are used for feature extraction such as colour moment, gray level co-occurrence matrix and edge histogram descriptor. To reduce curse of dimensionality and find best optimal features from feature set using feature selection based on genetic algorithm. These features are divided into similar image classes using clustering for fast retrieval and improve the execution time.

III. PROPOSED METHODOLOGY

A. The Local Binary Patterns (LBP) features

This method was proposed by Ojala , it is used to classify the texture. Because of its ease of use it is also used in medical imaging and other applications. The input of this method is an image with small window size. In this method by comparing all the pixels with the center pixel a binary value (0 or 1) is allocated depends upon the difference in the intensity. The result will be assigned finally by multiplying these bits with exact weights it will be replaced with the center pixel.

By replacing all the center pixel by means of its binary pattern of values a local may of binary is generated with its gray level. From this a histogram will be computed. The formula is given below:

$$LBP(N) = \sum_{k=1}^{N} 2^k * \nabla_1(I_k, I_c) \quad (1)$$

$$\nabla_1(I_k, I_c) = \begin{cases} 1, I_k \geq I_c \\ 0, Otherwise \end{cases} \quad (2)$$

$$Hist(N)|_{LBP} = \sum_{k=1}^{X}\sum_{I=1}^{Y} \nabla_2 (LBP(L,I), L); L\epsilon[0, (2^{N-1})] \quad (3)$$

$$\nabla_2(b_1, b_2) = \begin{cases} 1, b_1 \geq b_2 \\ 0, Otherwise \end{cases} \quad (4)$$

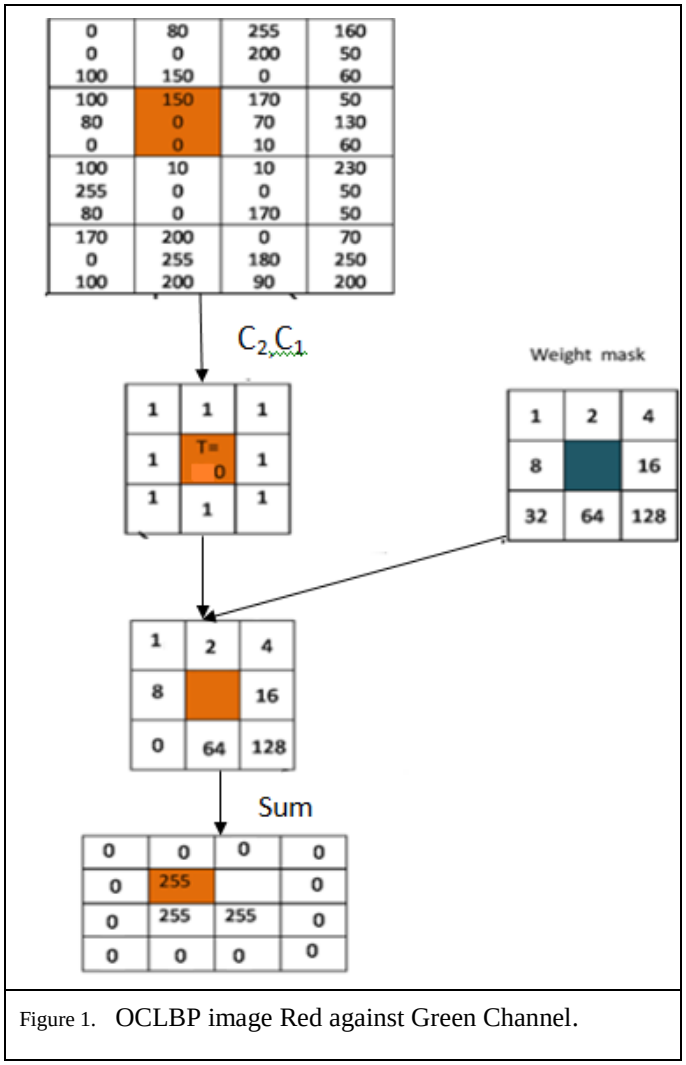


Figure 1. OCLBP image Red against Green Channel.

In this formula N indicate the number of neighbour pixels. Ik indicates the kth surrounding pixel. Ic indicates center pixel. The equation 5 calculates the final histogram.

B. Extraction of OCLBP Texture Feature

The LBPP, R operator defined as

$$LBP_{P,R}(x_C, y_c) = \sum_{P=0}^{P-1} S(g_P - g_C)^{2^P} \quad (5)$$

Where g_p is

$$g_P = I(x_p, y_p), \qquad P = 0,1,2,\ldots\ldots\ldots,P-1 \quad (6)$$

Thresholding is done by using

$$t\left(s(g_0 - g_c), s(g_1 - g_c), \ldots\ldots, s(g_{p-1} - g_c)\right) \quad (7)$$

where g_c is the central pixel of the green channel and g_0, g_1, ..., g_{p-1} is 8 neighbour pixel g_c is the corresponding central pixel of the green channel to corresponding g_c of green channel.

where s(z) is the thresholding or step function

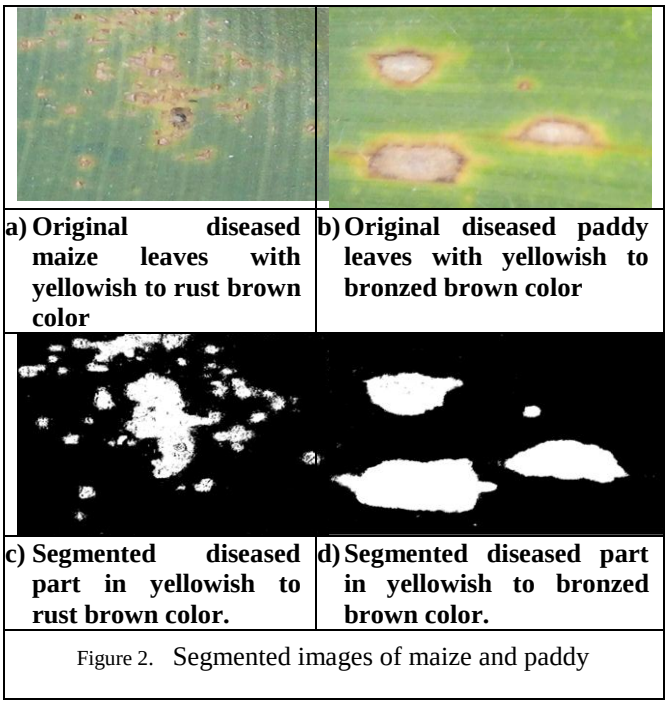
$$s(z) = \begin{cases} 1, & z \geq 0 \\ 0, & z < 0 \end{cases} \quad (8)$$

IV. RESULTS AND DISCUSSION

In this paper we extracted features using OCLBP. Considered 90 healthy leaf images and 60 diseased leaf images for classification of healthy and diseased leaf. Considered 180 of Healthy Paddy Leaves and 160 of diseased paddy leaves for classification purpose. Support Vector Machine a binary classifier is used for classification purpose. Confusion matrix which includes classification rates reached by proposed method using SVM for Maize Leaves. The following table 1 shows the classification rates reached by proposed method using SVM classifier for maize leaves. The following table 1 shows the classification rates reached by proposed method using SVM classifier for maize leaves. Fig. 2 shows segmentation results.

Table1. Confusion matrix which includes classification rates reached by proposed method using SVM for Maize Leaves.

Presented	Responded		Accuracy %
	Healthy Paddy leaves	Diseased Paddy Leaves	
Healthy Paddy leaves	165	15	91.66%
Diseased Paddy leaves	142	18	88.75%



a) Original diseased maize leaves with yellowish to rust brown color

b) Original diseased paddy leaves with yellowish to bronzed brown color

c) Segmented diseased part in yellowish to rust brown color.

d) Segmented diseased part in yellowish to bronzed brown color.

Figure 2. Segmented images of maize and paddy

Table2. Confusion matrix which includes classification rates reached by proposed method using SVM for Paddy Leaves.

Presented	Responded		Accuracy%
	Healthy Maize leaves	Diseased Maize Leaves	
Healthy Maize leaves	85	5	94.44%
Diseased Maize leaves	6	54	90%

V. CONCLUSION

In this paper we have proposed a novel segmentation method for classification of diseased and healthy maize and paddy leaves using Opposite Color Local Binary Pattern (OCLBP). This method performed well for our dataset and accuracy in segmentation is better because segmented images of maize and paddy leaves have no loss of information in region of interest. The proposed works have been done on the maize and paddy leaves, the dataset has the diseased and healthy leaves, diseased leaves have the yellowish brown patches. Features extracted from segmented region using OCLBP. Result obtained using SVM classifier which yields the result

for healthy and diseased as 94.44% and 90% respectively. For paddy healthy and diseased leaves result has derived 91.66% and 88.75% respectively. Comparative result between two datasets have difference in accuracy, this is because of number of samples used in both datasets are different.

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Authors Profile

Mr T. Harisha Naik received MCA degree from Kuvempu University, Karnataka, India and M.Phil degree from Periyar University, Tamil Nadu, India. Presently persuing Ph.D from Kuvempu University Karnataka India. His research interests include Machine Learning and Pattern recognition.

Mr. M Suresha received MCA degree from Kuvempu University, Karnataka, India, Presently working as an Assistant Professor, Dept of computer Science, Jnana sahyadri, Kuvempu University, Karnataka, India. His research interests include Machine learning and Pattern Recognition.