LEAF DISEASE DETECTION AND CLASSIFICATION SYSTEM FOR BRINJAL CULTURE

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ABSTRACT

Agriculture plays a vital role all over the world in satisfying human needs as well as economic growth of a nation. India has the richest flora and fauna in the world because of its geographical conditions hence contribution of agricultural sector in Indian economy is much higher than world average 6.4%. Nowadays agricultural production faces the challenge of increasing population and diseases. Variability of viruses and diseases that affect the plant reduces the yield because of less attention in the knowledge of it. Accurate and rapid diagnosis in disease detection and control has the positive effect to overcome it. A semi-automatic system using concepts of k-means is designed and employed to discriminate diseased leaves in a plant. Trials are performed by separately utilizing color features, texture features, and their combinations to train four models based on Support Vector Machine(SVM) classifier to detect the diseased leaf. Images collected from Plant Village dataset are trained and generated results are analyzed. From the analysis, a diseased leaf is detected and two major diseases are categorized (bacteria blight, anthraconas) which is found to be better than existing ones. The proposed system also efficiently computes the disease severity as well.

Keywords: Support Vector Machine, K–means algorithm, Histogram Equalization, Feature Extraction

I INTRODUCTION

India is one of the developing countries wherein the majority of the population of the country depends on agriculture and agricultural products. Studies show that plant leaf disease reduces the quality and quantity of agricultural production. Therefore detection and identification of disease at an early stage is an important task for farmers. Detection of disease at an early stage can save the whole crops from disease. Identification and recognition of plant leaf disease by the open naked eye is a quite difficult task for farmers and consult scientist or expertise person is very costly for farmers in our developing countries like India.

The diseases are an important cause of the reduction of agronomics in India. Farmers are facing several problems for controlling the diseases on crops. Detecting the disease is an important part of the agriculture field and these involve judicious diagnosis and appropriate supervision to control the massive losses. Therefore, consider for quick, low cost and precise way to automatically recognize and identify the disease from the leaf of plants is of pragmatic significance for large farms. Further several developments have been taken place in leaf disease detection and different types of classifiers are used in order to find the precise disease in the leaf. The proposed system in general concentrates more on disease detection and recognition which is helpful for decision making. The proposed system consists of four main phases namely pre-processing, segmentation, color, texture and feature extraction, and classification. In general, the

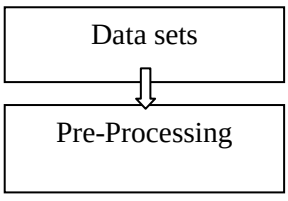
leaf disease detection mechanism is focused on the image segmentation and different image classification techniques that are used to identify the disease type.

II LITERATURE SURVEY

Xihai Zhang *et al* (2018) proposed the identification of maize leaf disease detection is using cipher 10 models along with deep neural network with an accuracy of 98.9% and eight types of leaf image disease are detected[21]. Sukhvir kaur *et al* proposed the idea of leaf disease detection of soybean using K- means clustering and SVM classification this method is used to detect the disease that are present in the soybean leaf, three type of leaf diseases are detected in this paper[18].Y.W Tian *et al* (2007) proposed the method of grape leaf disease identification, in this paper the pre -processing is done by vector median filter to remove the noise or disturbances present in the images the static pattern recognition is used to segment the images and the images are classified using support vector machine technique[17]. G.L.Li *et al* (2011) proposed the method of identification of disease in wheat stripe rust and wheat leaf rust the diseases are classified using Support Vector machine and the tool used for feature extraction is RGB[11] .

III METHODOLOGY

The brinjal leaf images are used for training and testing. The leaf image obtained from training and testing undergoes pre-processing in which the image is resized and enhanced. After pre-processing the image is segmented using K-means clustering. Then GLCM (Gray Level Co-occurrence Matrix), method takes place where the images undergo feature extraction. After extraction the images are classified using SVM (Support Vector Machine) classifier. The classifiers are used to classify the leaf after the feature extracted information as healthy leaf or diseased leaf. More the images can be collected for training and testing the images, better the accuracy can be obtained.



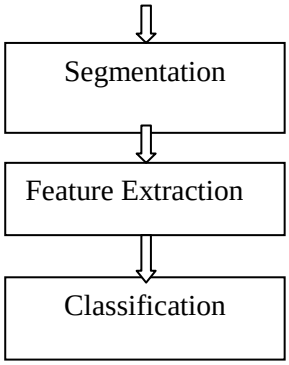


Fig 1 Flow chart of the proposed method

The flow chart gives an overview of the process of the proposed method and Fig 2 explains the proposed method in detail. In this process, the leaf images are collected from plant village data set and are pre-processed. In pre-processing the image resizing and image enhancement takes place. After pre-processing the images undergo segmentation using K means algorithm the images are segmented into three different clusters. After clustering, the feature extraction method takes. After extraction, the SVM classifier process happens.

A PRE-PROCESSING

Pre-processing is a process that works with images at the lowest level of abstraction. The aim of Pre-processing is to improve the quality of the image by removing unwanted distortions or enhances some image features important for further processing. Different Images of healthy and diseased brinjal leaves are collected from the dataset. Histogram equalization is performed on the image in order to increase the image quality prior to the clustering process.

B Segmentation

A well known k-means clustering algorithm is utilized to separate infected and healthy leaf regions. The iterative k-means reassign each pixel to the nearest cluster so as to decrease the sum of distances and recalculate cluster centroids. This process results in an input image partitioning into three regions, each containing different portions of a leaf image sample[18] clusters are used to label image pixels in the original image. Grey level values of the resultant three color clusters are then utilized for further processing.

K-means clustering

Computation of disease severity requires diseased area of the leaf. This leads to the

segmentation of the diseased portion of the leaf from the healthy portion. Segmentation partitions the image into meaningful parts for better analysis and understanding of the image. Thresholding is the basic approaches of segmentation. Thresholding is simplest where the gray image can be partitioned based on a threshold value. The image is converted into a binary image based on whether the image pixels fall below or above the threshold .

C Feature Extraction

The image after segmented is converted into a gray level co –occurrence matrix to find the parameters like energy, homogeneity, contrast, entropy.

D Support Vector Machine

SVM (Support Vector Method) is used to classify the images that are obtained after the feature extraction. The images are classified from healthy leaf to a diseased leaf. The SVM classifier classifies the images more precisely with the help of a decision boundary. The 2 dimensional images can be classified using a polynomial function and 3 dimensional images can be classified using kernel tricks method.

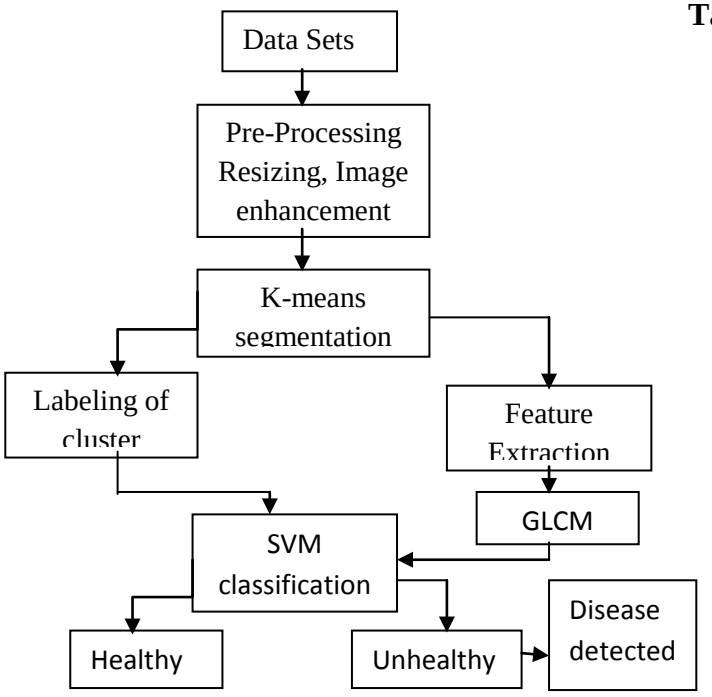


Fig 2 Block diagram of the proposed method

IV RESULTS AND ANALYSIS

The images are segmented into 3 clusters such as cluster 1 cluster 2, cluster 3. The cluster 1 consist of higher gray level value, cluster 2 consist of intermediate gray level value and cluster 3 consists of lower gray level value. The Region of interest(ROI) is entered after which the classification process takes place. In this paper, the mathemetical values of each leaf are identified and are tabulated.

Fig 3 Bacterial Blight disease leaf

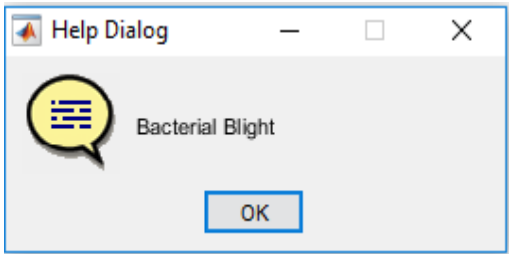


Fig 4 Disease identified as bacterial blight

Table1 Tabulated values for bacterial blight

NAME	VALUE
Entropy	4.6493
Homogenity	0.8562
Mean	47.7211
RMS	11.1789
Standard deviation	56.5488
Variance	2.8507e+03

Fig 5 Anthracnose disease leaf

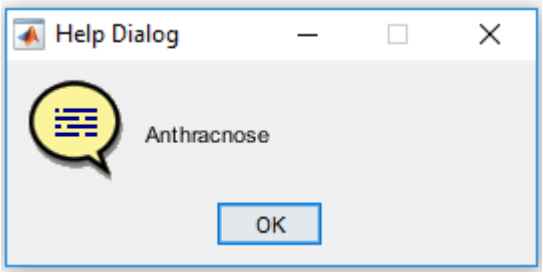


Fig 6 Disease identified as Anthracnose

Table2 Tabulated value for anthracnose

NAME	VALUE
Entropy	2.8179
Homogenity	0.9321
Mean	22.6915
RMS	7.7412
Standard deviation	51.8716
Variance	2.5672e+03

V CONCLUSION AND FUTURE SCOPE

It is important to detect whether a leaf is healthy or diseased. Once detected, the disease needs to be identified. The proposed system utilises SVM classifier, although it is flexible to work with different classifiers as well. Based on several combinations of colour and texture features, classification is performed using the proposed rules. The proposed method is found to be better on many criteria as compared to existing studies. Moreover, the proposed system is designed and tested using a sufficiently large dataset collected from Plant Village which contains images with complex backgrounds. The maximum average classification accuracy is reported. However, the system is trained using leaf images with the complex diseases.

The future scope is to convert the image from two dimension into a three dimensional image and to improved the colour features and texture features than the existing one and to identify more leaf diseases that are not discovered in the existing method and to increase the number of images that are used for training and testing leaf images so that the accuracy of leaf disease identification can be improved during classification.

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