AN EFFICIENT CLASSIFICATION OF PLANT DISEASE DETECTION USING IMAGE PROCESSING

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Abstract:- Identification of plant disease is very difficult in agriculture field .If identification is incorrect then there is a huge loss on the production of crop and economical value of market..Leaf disease detection requires huge amount of work, knowledge in the plant diseases, and also requires the more processing time. It is very difficult to monitor the plant disease manually.It requires tremendous amount of work, expertise in the plant diseases, and also require the excessive processing time .Hence, image processing is used for the detection of plant diseases. Disease detection involves the steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. This project discusses the methods used for the detection of plant diseases using their leaves images.

I. INTRODUCTION

India is a cultivated country and about 70% of the population depends on agriculture.Farmers have large range of diversity for selecting various suitable crops and finding the suitable pesticides for plat. Disease on plant leads to the significant reduction in both the quality and quantity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. Monitoring of health and disease on plant plays an important role in successful cultivation of crops in the farm. In early days, the monitoring and analysis of plant diseases were done manually by the expertise person in that field. This requires tremendous amount of work and also requires excessive processing time. The image processing techniques can be used in the plant disease detection. In most of the cases disease symptoms are seen on the leaves, stem and fruit. The plant leaf for the detection of disease is considered which shows the disease symptoms. This paper gives the introduction to image processing technique used for plant disease detection.

1.1PROBLEM DEFINITION

This paper suggests a system which can provide more accurate results related to the identification and classification of disease. It tries to replace the need of the experts to certain extent. Here, the captured image is first pre-processed to resize it and then converted to HIS(hue, saturation, intensity) colour space format by using segmentation. The features such as major axis, minor axis, eccentricity are extracted from the image. In the last step, these features are given to the classifier to classify the disease occurred on the leaf.

1.2 PROJECT OVERVIEW

Diseases in plants cause major production and economic losses as well as reduction in both quality and quantity of agricultural products. Now a day's plant diseases detection has received increasing attention in monitoring large field of crops. Farmers experience great difficulties in switching from one disease control policy to another.The naked eye observation of experts is the traditional approach adopted in practice
for detection and identification of plant diseases. In this paper we review the need of simple plant leaves disease detection system that would facilitate advancements in agriculture. Early information on crop health and disease detection can facilitate the control of diseases through proper management strategies. This technique will improves productivity of crops. This paper also compares the benefits and limitations
of these potential methods. It includes several steps viz. image acquisition, image pre-processing, features extraction and neural network based classification.

BASIC STEPS FOR DISEASE DETECTION

In this section, the basic steps for plant disease detection and classification using image processing are shown (Fig. 1)).

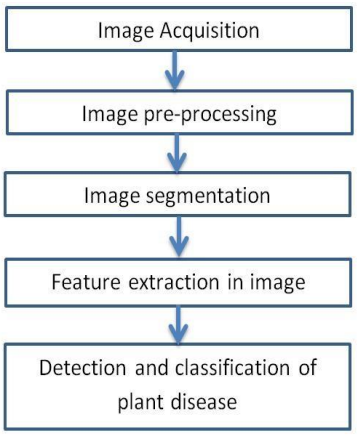

Fig. 1) Basic steps for plant disease detection and classification

A] **Image Acquisition**

The images of the plant leaf are captured through the camera. This image is in RGB (Red, Green And Blue) form. color transformation structure for the RGB leaf image is created, and then, a device-independent color space transformation for the color transformation structure is applied [6].

B] **Image Pre-processing**

To remove noise in image or other object removal, different pre-processing techniques is considered. Image clipping i.e. cropping of the leaf image to get the interested image region. Image smoothing is done using the smoothing filter. Image enhancement is carried out for increasing the contrast. the RGB images into the grey images using colour conversion using equation (1). f(x)=0.2989*R + 0.5870*G + 0.114.*B - - - - - - - - - - - - - - (1) Then the histogram equalization which distributes the intensities of the images is applied on the image to enhance the plant disease images. The cumulative distribution function is used to distribute intensity values [2].

C] **Image Segmentation**

Segmentation means partitioning of image into various part of same features or having some similarity. The segmentation can be done using various methods like otsu' method, k-means clustering, converting RGB image into HIS model etc.

1] Segmentation using Boundary and spot detection algorithm: The RGB image is converted into the HIS model for segmenting. Boundary detection and spot detection helps to find the infected part of the leaf as discussed in [9]. For boundary detection the 8 connectivity of pixels is consider and boundary detection algorithm is applied [9].

2] K-means clustering:

The K-means clustering is used for classification of object based on a set of features into K number of classes. The classification of object is is done by minimizing the sum of the squares of the distance between the object and the corresponding .

The algorithm for K –means Clustering:

1. Pick center of K cluster, either randomly or based on some heuristic.
2. Assign each pixel in the image to the cluster that minimizes the distance between the pixel and the cluster center.
3. Again compute the cluster centers by averaging all of the pixels in the cluster. Repeat steps 2 and 3 until convergence is attained.

3] **Otsu Threshold Algorithm:**

Thresholding creates binary images from grey-level images by setting all pixels below some threshold to zero and all pixels above that threshold to one. The Otsu algorithm defined in [5] is as follows:

i) According to the threshold, Separate pixels into two clusters

ii) Then find the mean of each cluster.

iii) Square the difference between the means.

iv) Multiply the number of pixels in one cluster times the number in the other

The infected leaf shows the symptoms of the disease by changing the color of the leaf. Hence the greenness of the leaves can be used for the detection of the infected portion of the leaf. The R, G and B component are extracted from the image. The threshold is calculated using the Otsu's method. Then the green pixels is masked and removed if the green pixel intensities are less than the computed threshold.

D**] Feature Extraction**

Feature extraction plays an important role for identification of an object. In many application of image processing feature extraction is used. Color, texture, morphology, edges etc. are the features which can be used in plant disease detection. In paper [3], Monica jhuria et al considers color, texture and morphology as a feature for disease detection. They have found that morphological result gives better result than the other features. Texture means how the colour is distributed in the image, the roughness, hardness of the image. It can also be used for the detection of infected plant areas.

i] **Color co-occurrence Method :**

In this method both color and texture are taken into account to get an unique features for that image. For that the RGB image is converted into the HSI translation.

$$H = \begin{cases} Theta & if\ B \leq G \\ 360 - Theta, & B > G \end{cases} \text{ - - - - - - - (2)}$$

- - - - - - (3)

$$S = 1 - \frac{3}{(R+G+B)}[\min(R,G,B)] \quad \text{- - - - - - - - - - (4)}$$

$$I = \frac{1}{3}(R+G+B)$$

For the texture statistics computation the SGDM matrix is generated and using GLCM function the feature is calculated.

ii) Leaf color extraction using H and B components:

The input image is enhanced by using anisotropic diffusion technique to preserve the information of the affected pixels before separating the color from the background [8]. To distinguish between grape leaf and the non-grape leaf part, H and B components from HIS and LABcolor space is considered. A SOFM with back propagation neural network is implemented to recognize colors of disease leaf.

E] Classification i) Using ANN:

After feature extraction is done, the learning database images are classified by using neural network. These feature vectors are considered as neurons in ANN [3]. The output of the neuron is the function of weighted sum of the inputs. The back propagation algorithm, modified SOM; Multiclass Support vector machines can be used. ii) Back propagation:

BPNN algorithm is used in a recurrent network. Once trained, the neural network weights are fixed and can be used to compute output values for new query images which are not present in the learning database.

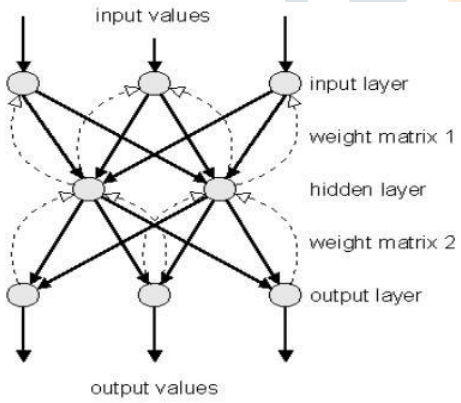

Fig. 2) Back propagation Network

Testing of query images :

After getting the weight of learning database, then testing of query image is done. The fig. 3) shows the flowchart for the testing of query image using the neural network techniques.

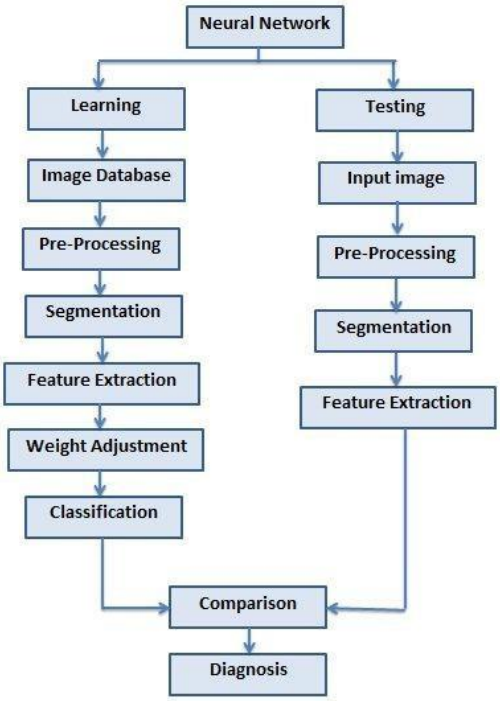

Fig. 3) Working principle of ANN

CONCLUSION

The accurately detection and classification of the plant disease is very important for the successful cultivation of crop and this can be done using image processing. This paper discussed various techniques to segment the disease part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. The use of ANN methods for classification of disease in plants such as selforganizing feature map, back propagation algorithm, SVMs etc. can be efficiently used. From these methods, we can accurately identify and classify various plant diseases using image processing techniques.

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