"TEXTURE BASED FEATURES APPROACH FOR CROP DISEASES CLASSIFICATION AND DIAGNOSIS"

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Abstract: Agriculture is the main element of economic growth in developing countries. Plant diseases cause major economic and production losses as well as curtailment in both quantity and quality of agricultural production. Now a day's, for supervising large field of crops there has been increased demand for plant leaf disease detection system. The critical issue here is to monitor the health of the plants and detection of the respective diseases.

In this paper, Image processing is used to detect and classify crop diseases based on the texture features approach. The images are taken through a high resolution digital camera and after preprocessing, these are then run through the various machine learning algorithms and classified based on their color and texture features. In this project basically three machine learning algorithms are used namely K-Nearest Neighbors, Support Vector Machine, Random Forest. The implementation will be done using MATLAB.

***Keywords*-Classification, Textures features approach ,K-Nearest Neighbors, Support Vector Machine, Random Forest**

I. INTRODUCTION

Agriculture is an integral part of the economy of a country. Especially in developing countries like India.. A large number of factors are responsible for the contributions by the agriculture sector to be this low like low literacy rates among farmers, bad quality seed and availability of resources like water. One of the most critical factors is the diseases that the crops contract. High quality crop production is the big challenge for farmers. . The crop production rates are directly proportional to the each day plant growing progress. So plant disease detection is very important. Also the external appearance of agricultural products is the main quality attribute. The outer appearance greatly affects their scale value and customer's buying behaviour.

Therefore, disease diagnosis and correct treatment essential for the healthy crop production process as early as possible. The farmer's wrong diagnosis of crop disease causes insecticides spray inappropriately. Various image processing techniques can be significantly applied to observe the crop growth rogress and disease diagnosis. Generally, unhealthy plant leaves change their shape, colour, size, texture etc. The following figure shows samples of healthy leaves and diseased leaves of respective species.

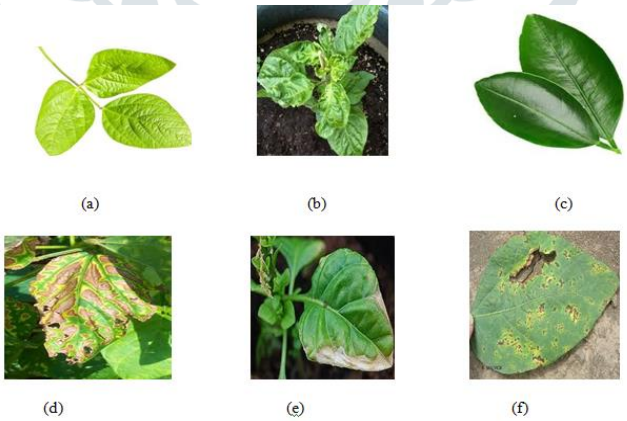

Fig (A) Example of healthy leaves (a),(b),(c) and diseased leaves (d),(e),(f)

In this project, crop disease detection system using image processing with texture based features approach is discussed. In this project, the diseases are classified using an image of the leaf taken by a high resolution camera. As symptoms in most cases are noticed on the leaves, Color and texture features are extracted from the image and passed through the machine learning algorithm for classification. Machine learning-based detection and recognition of plant diseases can provide extensive clues to identify and treat the diseases in its very early stages. Comparatively, visually or naked eye identification of plant diseases is quite expensive, inefficient, inaccurate and difficult. Automatic detection of plant diseases is very important to research topic as it may prove the benefits in monitoring large fields of crops, and thus automatically detect the symptoms of diseases as soon as they appear on plant leaves.

II. literature review

The disease can manifest in different parts of the plant such as roots, stem, fruit or leaves. In this section, various methods of image processing for classification of crop and plant diseases, which were proposed, are discussed .

S. Arivazhagan et al[1], proposed an approach where, first conversion of an image from RGB to HSI is done and then green pixels are masked using threshold values. The proposed system is a software solution for detection of plant diseases.The developed processing scheme consists of four main steps, first a color transformation structure for the input RGB image is created,then the green pixels are masked and removed using specific threshold value followed by segmentation process,the texture statistics are computed for the useful segments,finally the extracted features are passed through the classifier .Texture analysis is then done using color co-occurrence matrix (SGDM). The image is then classified using either minimum distance criterion or SVM classifier which has 86.77% and 94.74% accuracy respectively.

Loyce Selwyn pinto, proposed an approach [2]In which, Image processing is used to detect and classify sunflower crop diseases based on the image of their leaf. The images are taken through a high resolution digital camera and after preprocessing, are subjected to k-means clustering to get the diseased part of the leaf. These are then run through the various machine learning algorithms and classified based on their color and texture features. A comparison based on accuracy between various machine learning algorithms is done namely K-Nearest Neighbors, Multi-Class Support Vector Machine, Naive Bayes and Multinomial Logistic Regression to achieve maximum accuracy. The proposed methodology is able to classify diseases of the sunflower crop in a very accurate and efficient way.

Manisha A. Bhange et al[3], proposed three methods for extracting features, histogram for color, erosion concept morphology for obtaining boundaries of the images and color coherence vector to classify pixels.This approach majorly consists phases namely image preprocessing,feature extraction,clustering,training and classification.color coherence vector features and color morphology are used for feature extraction. K-means clustering is used for segmentation and SVM is used for classification of the images the accuracy is 81%. The disease considered here is the bacterial blight of the pomegranate leaf.

It is difficult to determine the accurate disease in noisy image.Image should be noise free for processing. Therefore,noise reduction techniques and image enhancement are required for desirable processing. Valliammai and Geethaiakshmi [4] have found that the appropriate feature extraction of leaf can be possible if input image is noise free. The leaf vein edges not exactly visible in Gaussian noise method. The speckle noise affected the leaf size, shape and pattern.Therefore, Gaussian and speckle noise removal techniques are essential to restore the noise free leaf images for further process. These Hybrid filter method is developed to eliminate the noise, improve the quality of image and thereby produces better results compared to other traditional filters.

Implementation of RGB and Gray scale images in plant leaves disease detection –comparative study by Padmavathi and Thangadurai [5] have given the comparative results of RGB and Gray scale images in leaf disease finding process. In detecting the infected leaves, color becomes an important feature to find the disease intensity. They have considered Grayscale and RGB images and used median filter for image enhancement and segmentation for extraction of the diseased portion which are used to identify the disease level. The plant disease recognition model, based on leaf image classification, by the use of deep convolution networks have developed. 13 kinds of diseases are identified from the healthy leaves with the capability to differentiate leaves from their surroundings.

Rupesh G. Mundada et al[6] have proposed an approach where images are converted from RGB to Greyscale first, followed by resizing and filtering them.This approach proposes a software prototype system for early pest detection.Images of the infected leaf are captured by a camera and processed using image processing techniques to detect presence of pests. This approach is mainly used to detect whiteflies,aphids and thrips on the affected crops at their early stages. Feature extraction with features like contrast and entropy is performed. Classification is done using a Support Vector Machine.

Bindushree H B et al [7], proposed an approach where the processed image is first is segmented using k means clustering .out of the three clusters created one of the clusters contains the disease affected area and image features are extracted from the particular cluster using Gray Level Co-occurrence Matrix (GLCM). These features are later fed into support vector machines (SVM).The final classification results from SVMs indicate whether the leaf in the image dataset is healthy or disease affected.The results using SVM are obtained from various kernels such as linear,polynomial,quadratic,RBF .

P. Revathi, M. Hemalatha [7] worked on classification of diseases in cotton leaves. Authors have considered six types of diseases in the cotton plant for classification. Based on advanced computational techniques the significance of this work design is to reduce the time, cost and complexity. To identify the affected region of a leaf the author has used Enhanced Particle Swarm Optimization (EPSO) for feature selection. For calculating the edge, color, texture variance for feature analysis of the diseased part Skew divergence is used.The result obtained using skew divergence and EPSO technique is 98%.

Hrishikesh P. Kanjalkaret al[8], proposed the approach where, the image is first converted from RGB to HIS. Segmentation is done using connected components labeling, thresholding is used to avoid unwanted regions. 11 features are used in this approach and classification is done using back propagation neural network. The accuracy of this method is 83%.

Dheeb Al Bashish proposed an approach where[10], the images are segmented using K-means clustering and are then converted from RGB to HSI.The color co-occurrence texture analysis method is used using spatial grey level dependence matrices. Features are calculated from H and S components. The neural network used here is a feed forward back-propagation with 93% of overall success.

Prof. Sanjay B. Dhaygude et al, [11], have proposed an approach in which firstly by color transformation structure RGB is converted into HSV space because HSV is a good color descriptor.Masking and removing of green pixels with pre-computed threshold level.Then in the next step segmentation is performed using 32x32 patch size and obtained useful segments.These segments are used for texture analysis by color co-occurrence matrix. Finally if texture parameters are compared to texture parameters of normal leaf.

II. CONCLUSION

An application of texture analysis in detecting and classifying the plant leaf diseases has been explained in this project. The image will be taken through high resolution digital camera and in preprocessing stage the system will perform segmentation of leaf and will analyse it with feature extraction algorithms. The machine learning algorithms like K-Nearest Neighbors and Support Vector Machine,Random Forest will be used for feature extraction purpose. Plant diseases will be detected based on their texture.Various parameters like accuracy,precision,sensitivity,error rate will be considered . By this method , the crop disesases will be identified at the initial stage itself and remedial measures will be suggested to solve the respective problem .The accuracy and low cost of the classification allow for an effective automatic surveillance. The accuracy can be increased by using various enhancement techniques and by increasing the size of training dataset.

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