



Review on Agricultural Plant Leaf Disease Detection using DIP

¹ Prof. (Dr.) Nilesh N. Kasat, ² Mr. Praful B. Shapamohan

¹ Prof. (Dr.) Nilesh N. Kasat in Department of Electronics & Telecommunication Engineering Sipna College of Engineering & Technology Amravati, ² M.E Student Department of Electronics & Telecommunication Engineering Sipna College of Engineering & Technology Amravati,,

Abstract :-

Leaf spots can be indicative of crop diseases, where leaf batches (spots) are usually examined and subjected to expert opinion. In our proposed system, we are going to develop an integrated image processing system to help automated inspection of these leaf batches and helps identify the disease type. Conventional Expert systems mainly those which used to diagnose the disease in agriculture domain depends only on textual input. Usually abnormalities for a given crop are manifested as symptoms on various plant parts. To enable an expert system to produce correct results, end user must be capable of mapping what they see in a form of abnormal symptoms to answer to questions asked by that expert system. This mapping may be inconsistent if a full understanding of the abnormalities does not exist. The proposed system consists of four stages; the first is the enhancement, which includes HIS transformation, histogram analysis, and intensity adjustment. The second stage is segmentation, which includes adaptation of fuzzy c-means algorithm. Feature extraction is the third stage, which deals with three features, namely color size and shape of spot. The fourth stage is classification, which comprises Leaf disease.

Keywords: Classifier, Feature extraction, Image processing, Leaf disease

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 plant. 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.

Expert systems are intelligent computer programs that are capable of offering solutions advices related to specific problems in a given domain, both in a way and at a level comparable to that of the human experts in the field. One of the advantages of employing expert system is its ability to reduce the information that human users need to process, reduce personnel cost and increase throughput. Another advantage of expert system is it performs tasks more consistently than human experts. Knowledge based expert system technology has been successfully applied to a variety of agricultural problems since the early 1980s. At CLAES (Central Lab of Agricultural Expert System in Egypt) several expert systems have been developed for different agricultural activities . Many of these expert systems are used to diagnose disorders from

Observation symptoms. These diagnosing expert systems depend on the ability of an end user to understand abnormal symptoms of the plant and to convey these symptoms through a textual dialogue . Depending on the user's level of understanding of the abnormal observations, expert system can reach the correct diagnosis. If end user interprets the abnormal observations in a wrong way and chooses a wrong textual answer to a presented question, then expert system will reach a wrong conclusion. Devising a method whereby abnormalities are automatically detected, would greatly reduce the risk of human error and would lead to a more accurate diagnosis. This could be achieved through the integration of an image processing component with a diagnostic problem solver. Image processing is a powerful tool that has been applied in many domains such as remote sensing via satellite, medical image analysis, radar, sonar robotics and automated inspection. Image information can play a crucial role in the diagnosis of different diseases in the agricultural domain where the understanding of image symptoms is often essential to problem solving. Vegetable crops suffer from many leaf batches. Leaf batches differ in color, shape and size according to the

cause. Leaf batches happen as a result of plant pathogens (Fungi, Bacteria and viruses), insect feeding (sucking insect pastes), and plant nutrition (lack of microelements). The importance of the fungal diseases came from its great distribution, short life cycle and propagation. In agricultural mass production, it is needed to discover the beginning of plant diseases batches early to be ready for appropriate timing control to reduce the damage production costs and increase the income. Plant leaves are considered first station for the rest and germination of bacterial, fungal capsules due to suitable macro environment. Leaf batch characteristic plays a crucial role in differentiating between different causes. In the diagnosis of leaf batches there is some confusion due to the similarities between batches shape size and color but only expert could identify it. The first step in fighting against these leaf batches is the adequate recognition of their presence i.e. correct diagnosis. An abnormal symptoms in an indication to the presence of the disease, and hence can be regarded as an aid in diagnosis. Spots are considered as the important units indicating the existence of diseases. Aim of our system is an efficient identification of these leaf spots. The development of such an intelligent system is justified by its economical relevance and by hard efforts necessary to perform a correct diagnosis. This includes the knowledge and experience accumulated by the human experts. Other important aspects are the speed, safety and reliability of the response of the system.

II Review of Prior Leaf Disease Detection Techniques

In this section, various method of image processing for plant disease detection is discussed.

The vegetation indices from hyper spectral data have been shown for indirect monitoring of plant diseases. But they cannot distinguish different diseases on crop. Wenjiang Huang et al developed the new spectral indices for identifying the winter wheat disease. They consider three different pests (Powdery mildew, yellow rust and aphids) in winter wheat for their study. The most and the least relevant wavelengths for different diseases were extracted using RELIEF-F algorithm. The classification accuracies of these new indices for healthy and infected leaves with powdery mildew, yellow rust and aphids were 86.5%, 85.2%, 91.6% and 93.5% respectively. Enhanced images have high quality and clarity than the original image. Color images have primary colors red, green and blue. It is difficult to implement the applications using RGB because of their range i.e. 0 to 255. Hence they convert the RGB images into the grey images. Then the histogram equalization which distributes the intensities of the images is applied on the image to enhance the plant disease images. Monica Jhuria et al uses image processing for detection of disease and the fruit grading. They have used artificial neural network for detection of disease. They have created two separate databases, one for the training of already stored disease images and other for the implementation of the query images. Back propagation is used for the weight adjustment of training databases. They consider three feature vectors, namely, color, textures and morphology. They have found that the morphological feature gives better result than the other two features. Zulkifli Bin Husin et al, in their paper, they captured the chilli plant leaf image and processed to determine the health status of the chilli plant. Their technique is ensuring that the chemicals should apply to the diseased chilli plant only. They used the MATLAB for the feature extraction and image recognition. In this paper pre-processing is done using the Fourier filtering, edge detection and morphological operations. Computer vision extends the image processing paradigm for object classification. Here digital camera is used for the image capturing and LABVIEW software tool to build the GUI. The segmentation of leaf image is important while extracting the feature from that image. Mrunalini R. Badnakhe, Prashant R. Deshmukh compare the Otsu threshold and the k-means clustering algorithm used for infected leaf analysis. They have concluded that the extracted values of the features are less for k-means clustering. The clarity of k-means clustering is more accurate than other method. The RGB image is used for the identification of disease. After applying k-means clustering techniques, the green pixels is identified and then using otsu's method, varying threshold value is obtained. For the feature extraction, color co occurrence method is used. RGB image is converted into the HSI translation. For the texture statistics computation the SGDM matrix is generated and using GLCM function the feature is calculated. The FPGA and DSP based system is developed by Chunxia

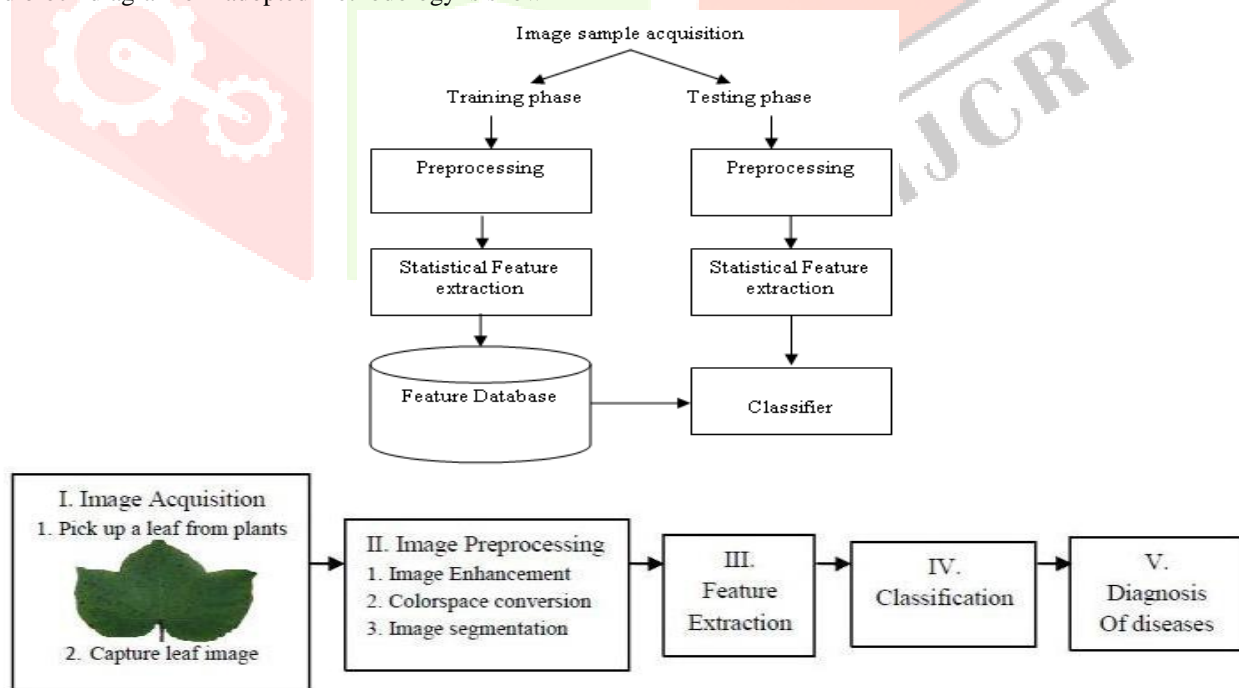
III LITERATURE SURVEY

s.no	Author Name	Title	Publication	Comments
1	Vijai Singh, Varsha, Prof. A K Misra	Detection of unhealthy region of plant leaves using Image Processing and Genetic Algorithm	2015 International Conference on Advances in Computer Engineering and Applications (ICACEA) IMS Engineering College, Ghaziabad, India	This paper presents an algorithm for image segmentation technique used for automatic detection as well as classification of plant leaf diseases and survey on different diseases classification techniques that can be used for plant leaf disease detection. Image segmentation, which is an important aspect for disease detection in plant leaf disease, is done by using genetic algorithm.
2	Mrunmayee Dhakate, Ingole A. B. Assistant Professor	Diagnosis of Pomegranate Plant Diseases using Neural Network	978-1-4673-8564-0/15/\$31.00 ©2015 IEEE	The Pomegranate fruit as well as the leaves are affected by various diseases caused by fungus, bacteria and the climatic conditions. These diseases are like Bacterial Blight, Fruit Spot, Fruit rot and Leaf spot. The system uses some images for training, some for testing purpose and so on. The texture features are extracted using GLCM method, and given to the artificial neural network. The overall accuracy of this method is 90%. The results are proved to be accurate and satisfactory in contrast to manual grading and hopefully take a strong rise in establishing itself in the market as one of the most efficient process.
3	Davoud Ashourloo, Ali Akbar Matkan, Alfredo Huete, Hossein Aghighi, and Mohammad Reza Mobasheri	Developing an Index for Detection and Identification of Disease Stages	IEEE GEOSCIENCE AND REMOTE SENSING LETTERS, VOL. 13, NO. 6, JUNE 2016	This study aimed at developing a spectral disease index (SDI) that is able to identify the stages of wheat leaf rust disease at various DS levels. To meet the aim of the study, the reflectance spectra (350–2500 nm) of infected leaves with different symptom fractions and DS levels were measured with a spectroradiometer. Then, pure spectra of the different disease symptoms at the leaf scale were analyzed, and a new function was developed to find the wavelengths most sensitive to disease symptom fraction.

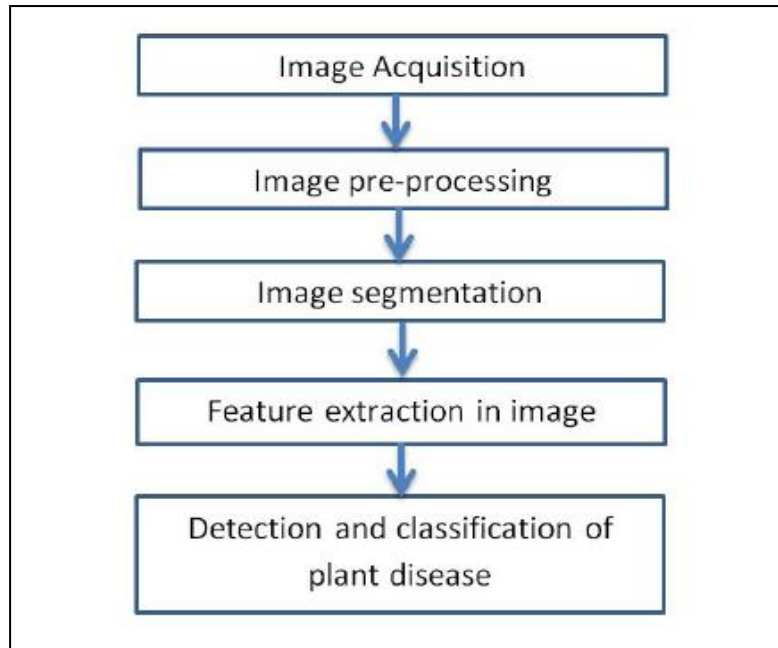
4	H. Sabrol and K. Satish	Tomato Plant Disease Classification in Digital Images using Classification Tree	International Conference on Communication and Signal Processing, April 6-8, 2016, India	The disease like fungal, bacterial and virus are the destructive disease for any plant. In the study, five types of tomato diseases i.e. tomato late blight, Septoria spot, bacterial spot, bacterial canker, tomato leaf curl and healthy tomato plant leaf and stem images are classified. The classification conducted by extracting color, shape and texture features from healthy and unhealthy tomato plant image
5	Rajat Kanti Sarkar, Ankita Pramanik	Segmentation of Plant Disease Spots Using Automatic SRG Algorithm: A Look Up Table Approach	2015 International Conference on Advances in Computer Engineering and Applications (ICACEA) IMS Engineering College, Ghaziabad, India	In this paper, an automatic seeded region growing (SRG) algorithm for coloured images proposed by Y. Shih and S. Cheng is modified for segmentation of plant leaf diseases. The colour difference between adjacent regions is computed using Euclidean distance metric in the algorithm. This paper proposes a novel two dimensional look up table for labeling the neighbours for region merging. The look up table is created by traversing the image vertically and horizontally and any change in the labels of pixel is noted in the table

VI Proposed Methodology

In the present work, tasks like image acquisition, preprocessing, feature extraction, classification are carried out. The detailed block diagram of adopted methodology is shown in



V IMAGE ACQUISITION AND FEATURES EXTRACTION

**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.

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 color conversion. 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.

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. For boundary detection the 8 connectivity of pixels is consider and boundary detection algorithm is applied.

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 done by minimizing the sum of the squares of the distance between the object and the corresponding cluster.

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.
- 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.

VI. CONCLUSION

Proposed System shows usefulness of integration of an image analyzer aided with pattern recognition within a diagnostic expert system model. In order to diagnose a disorder from leaf image four image processing phases have to be applied: Image enhancement, Image segmentation, Feature extraction, & classification. In order to employ proposed system we first have to train it with a set of images of disorders. Applying this model to any other crop disorder requires only spatial care to be taken in order to acquire a sufficient set of images for training purpose as representative of these disorders. Due to integration of this proposed system diagnosis accuracy will increase. Proposed system focuses on specific disorders identification, it can be extended in order to include more disorders. Extension of system in such a way that it will be capable to detect and identify abnormalities on the other parts of plants also e.g. fruit, stem, & root. Potential future work will be development of a robotic expert system which may capable to see abnormalities of plant understand it and do treatment operations directly. Other important future work will be integration of diagnosis prior to disease in the proposed system with the help of extensive plant characteristics, behavioral study at micro level

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