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A Review Paper On: Agricultural Plant Leaf Disease Detection Using Image Processing

Prof. Atul Shire[1], Prof. Umesh Jawarkar[2], Mr. Manoj Manmode[3]

[1] Department of EXTC J.D.I.E.T Yavatmal, Maharashtra, India.

[2] Department of EXTC J.D.I.E.T Yavatmal, Maharashtra, India.

[3] Final year EXTC J.D.I.E.T Yavatmal, Maharastra, India.

Abstract:

This paper provides survey on leaf disease detection technique by using image processing. India is an agricultural country and most of peoples wherein about 70% depends on agricultural. So leaf disease detection is very important research topic. Number of crops caused by fungi, bacteria etc. To overcomes this by using automatic leaf detection of plant by different image processing technique.

1. Introduction:

India is an agricultural country and farmers have large number of diversity to select suitable crops. Such crops caused by fungi, bacteria, viruses. Disease management is a challenging task. Huge numbers of disease are seen on leafs or stems of plant. To determine the accurate value of these visually observed diseases has not to learn yet because of the intricacy of visual pattern. In biological science, most of images are produced for using experimental purpose, these images are acquired by digital camera, smart phones etc. Hence to arrange number of experiments on leaf disease detection to extract and analyze the significant content [1].

2. Literature survey:

Some authors are describing to find leaf diseases using various methods and to recommend the various implementations as illustrated and describe here.

The author P. Revathi & et.al [2] describes to identify the affected part of leaf diseases. At first, Edge detection technique is used for image segmentation, and At last proposed a Homogenous Pixel Counting Technique for Cotton Disease Detection (HPCCDD) Algorithm for image analyzing and classification of diseases. The aim of this research to find the diseases of cotton leaf spot by image processing technique, and analyze the input images by RGB pixel counting and recognize the affected part of leaf spot by Sobel and Canny Edge detection technique and output is obtained.

The author Santanu Phadikar and Jaya Sil described a software prototype system for disease detection and used image growing, image segmentation techniques on this [3].

For recognition of crop disease, the author Geng Ying, et al. studied the methods of image processing. For that purpose they used cucumber powdery mildew, speckle and downy mildews as study samples and to relate the details of effect of simple and medium filter [4].

The author Ajay A. Gunjar et al. studied the regularization and extraction technology and describe the Eign features of this technology and this technology gives more accuracy than other detection feature technology [5].

The author H. Al-Hiary & et al. describes the three methods of leaf disease detection: 1) To identify the affected part of leaf by using K-means Clustering. 2) To solve the affected part of leaf by using color co-occurrence methodology for texture analysis. 3) To find and classify the type of disease by Neural Networks (NN's). In details; first is RGB images of leaves are acquired and apply for color-transformation structure. After that image is segmented by K-means clustering technique and masked the green pixels value and remove the green masked pixels and obtained the threshold value of object by Otsu's method. The RGB images are sets the zero value for converting color co-occurrence technique. After that infected clusters was converted into Hue Saturation Value (HSV) and for texture analysis use the SGDM matrix for each image formation. Finally the recognize the process was execute the solution by Neural Network's [6].

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Following table shows the comparison of various detection technique/ algorithm of leaf disease detection:

Authors	Detection technique/Algorithm	Parameters
S. Phadikar & et al.	Baye's and SVM classifier , mean fiitering technique and Otsu's algorithm	Baye's – 68.1 % SVM – 79.5% accuracy
Ajay A. Gurjar & et al.	Eign feature Regularization and Extraction techniques	Accuracy of 90% detection on fungal disease
Dheeb Al Bashish & et al.	K-means techniques	93% accuracy
Ging Yao & et al.	SVM method	Accuracy of 97.2 % on rice disease plant
Stephen gangWu et al.	Probablistics Neural Networks (PNN)	Accuracy of 90% on 32 kinds of plants

Table 1: Comparison of detection technique

3. Basic steps of algorithm:

Firstly, the RGB images of leafs are required. Then RGB images are transformed into Hue Saturation Value (HSV) by color space representation. After that setting the pixel value in an image to zero or some other background value is called as Masking. Hence to associate the green colored pixels. Then infected portion of the leaf is extracted. The infected region is then segmented into a number of patches of equal size.

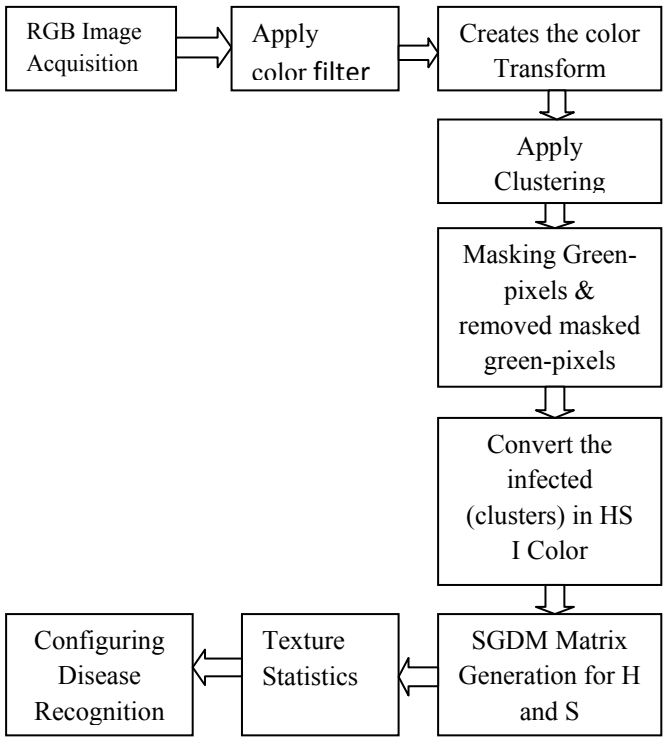

Fig.1: Disease Detection System Architecture.

4. Detection algorithm:

Using digital camera, the digital image is acquired. Then to the acquired image the image processing technique are applied to take out useful features that are essential for further analysis. After that to classify the image according to the specific problem, several analytical methods are use.

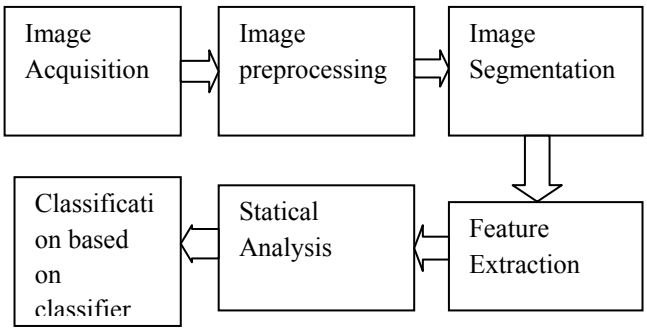

Fig. 2: Detection algorithm

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4.1 Image Acquisition and Preprocessing:

From the location referring different sites, the digital image is acquired. Regardless of what image acquisition device are adopted, the image which have input always not satisfactory. If noises are present in image the region of curiosity in the image is not clear and other objects interference exists. In the image clipping, smoothing, enhancement are the three steps included in preprocessing phase. The process of image collection and lots of information may bring noise which may easily lead from operating and saving to the image would make the quality of image dropped, thereby affects following of diseases. To perform denoising different kinds of reduction technique are applicable .By choosing the appropriate threshold, medium filter perform better with the salt and pepper noise. The image will have dark pixel in bright region and will have bright pixel in dark region, when it has salt and pepper. Medium filter is a non linear filter which is an effective method to remove the noise. By removing black dots called pepper, medium filter fill the image with bright dots called the salt. It simply placed each pixel value with medium of the intensity level in the neighborhood of pixel.

4.2 Image Segmentation:

According to the region of interest, the image will be segmented into different parts. To divide the image into same meaningful region is the image segmentation. K-medoids clustering is a partitioning which is based on clustering method is a image segmentation method. By o of the object in the cluster, every cluster is represented. As medoids is less influenced by outlines or other extreme values than the mean, the k-medoids are more robust than the k-mean, in the presence of noise and the outlines.

K-medoids Algorithm:
Input: 'k' the number of cluster to be segmented, 'n' the number of objects.
Output: A set of k'cluster that minimize the sum of dissimilates of all objects to their nearest medoids
Steps:
I: Choose K' objects as the initial medoids, arbitrarily.
II: Do it again.
A: Assign with the nearest medoids to each remaining objects to the cluster.
B: Select a non-medoids objects randomly.
C: compute the newly selected non-medoids objects with the total cost of swapping old medoids.
D: Perform the swap operation to form a new set of k-medoids, if the total cost of swapping is less than zero.
E: Until no change.
To associate each data objects with its nearest medoids calculate the distance by using Manhattance distance between two vector x and y is sum-(abs(x-y)). While cost is cost(x, y) =$\sum_{i=1}^{n} xi - ci$ k-medoids are sensitiveless to noisy data, outlines and effective to array scale[11].

4.3 Extraction of features and statistic analysis:

The features extraction is the input data transform into set of features. The feature set will extract the relevant information so should carefully chosen. To describe shape by statically sampling co-occurrence methodology is used. The probability that a pixel at one particular gray level will occur at a distinct distance orientation from any pixel given are measure by this matrix. The function P (i, j, d, ϑ) represents the SGDMs. Where 'i 'is gray level of location and ' θ ' is angle of orientation.. In a clockwise direction 1 to 8 are numbered, neighbor 1 and 5 are locate at a distance of 1 and θ° orientation on same plant. The feature set of H and S will be calculated after transformation.

4.4 Classification based on classifier:

For automatic detection of leaves disease, the neural network is used, which is a classification tool. The training feature set which are used to train the NN mode and whilst a testing feature state which verify the accuracy using the feed-forward back propagation network, these are the two important steps for dataset for training and validation. Until the connection weight reaches to the defined iteration number, they are always updated. Thus using the mean square error the capacity of ANN model to respond accurately is assured.

5. Conclusion:

Disease detection is a system which identifies the affected part of leaf spot by using image processing technique. For salt and pepper noise, medium filter performs better. The disease is accurately detected by CIELAB in color model and is not affected by background, type of leaf, type of distance. Spot and camera flash. K-medoids algorithm which is better

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than k-means work for gray scale image and performs for large databases. For clustering and classification of diseases the application of medium filter, CIELAB color model, and clustering and texture analysis are formulated. The paper proposed is a valuable approach which can significantly support an accurate detection of leaf diseases in little computation efforts.

Future Scope:

Future work can developed in hybrid algorithm such as other clustering method and NNS is order to improve the recognition rate of final classification process.Further needed to compute amount of disease preset on leaf.

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