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Research Article

COTTON PLANT LEAF DISEASES IDENTIFICATION USING SUPPORT VECTOR MACHINE

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ABSTRACT

This project presents a technique used image processing techniques for fast and accurate detection of plant diseases. The steps followed by these researchers in detection of leaf spot diseases are: image acquisition, image pre-processing, disease spot segmentation, feature extraction and disease classification. The accuracy of result depends on method used for disease spot detection. The main obstacle in disease spot detection is noise, which is introduced by camera flash, change in illumination, noisy background and presence of vein in the plant leaf. Therefore a method which wipes out the noise and provides better disease spot segmentation is needed.

INTRODUCTION

Dheeb Al Bashish *et al*. [7], proposed image processing based work is consists of the following main steps : In the first step the acquired images are segmented using the K-means techniques and then secondly the segmented images are passed through a pre-trained neural network .The images of leaves taken from Al-Ghor area in Jordan. Five diseases that are prevalent in leaves were selected for this research; they are: Early scorch, Cottony mold, Ashen mold, late scorch, tiny Whiteness. The experimental result indicates that the neural network classifier that is based on statistical classification support accurate and automatic detection of leaf diseases with a precision of around 93%.

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 in [8]. 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 pixel 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 [9].

S. Phadikar, J. Sil, and A. K. Das [10] developed an automated classification system based on the morphological changes caused by brown spot and the leaf blast diseases of rice plant. To classify the diseases Radial distribution of the hue from the centre to the boundary of the spot images has been used as feature by using Bayes and SVM Classifier. The feature extraction for classification of rice leaf diseases is processed in the following steps: firstly images acquired of diseased rice leaves from fields. Secondly preprocessing the images to remove noise from the damaged leaf and then enhanced the quality of image by using the [mean filtering technique. Thirdly Otsu's segmentation algorithm was applied to extract the infected portion of the image, and then radial hue distribution vectors of the segmented regions computed which are used as feature vectors.

Pranjali Vinayak Keskar & *et al*.[11] developed a leaf disease detection and diagnosis system for inspection of affected leaves and identifying the type of disease. This system is comprised of four stages: To improve the appearance of acquired images image enhancement techniques are applied. The enhancement is done in three steps: Transformation of HSI to color space in first stage .In the next stage analyzing the histogram of intensity channel to get the threshold. Finally intensity adjustment by applying the threshold. The second stage is segmentation which includes adaption of fuzzy feature

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algorithm parameter to fit the application in concern. The feature extraction stage is comprised of two steps spot isolation and spot extraction. For identification of spot identification algorithm is used is called component labeling. In feature extraction phase three features are extracted namely color, size and shape of the spots. In fourth stage classification is performed by Artificial Neural Network.

Here classification was performed in two different phases

1. In first phase uninfected and the diseased leaves are classified based on the number of peaks in the Histogram.
2. In the second phase the leaf diseases are classified by Bayes' classifier. This system gives 68.1% and 79.5% accuracies for SVM and Bayes' classifier based system respectively.

In (PiyushChaudhary, Anand K. Chaudhari, Dr. A. N. Cheeran and ShardaGodara)[12] this paper a comparison of the effect of CIELAB, HSI and YCbCr colour space in the process of disease spot detection is done. Median filter is used for image smoothing. Finally threshold can be calculated by applying Otsu method on color component to detect the disease spot on rice leaf.

In Method 1: disease sports are segmented by applying Otsu threshold on RGB image.

In Method 2: RGB image is first converted into YCbCr colour space using colour transform formula. Then median filter is used for image smoothing. Disease spots are detected by applying Otsu threshold on „Cr" component of filtered YCbCr colour space.

In Method 3: this is similar to method 2. Only difference is that in place of YCbCr colour space RGB image is transformed into HSI colour space and disease spot are detected by applying Otsu threshold on „H" component of filtered HSI colour space. In Method 4; again same process is repeated using CIELAB colour space. Disease spots are segmented by applying Otsu threshold on „A" component of filtered LAB colour space. All these colour models are compared and finally „A" component of CIELAB colour model is used.

Based on the Literature Survey some of the limitations of previous work is as follows.

1. Accuracy of classification is only upto 93%.
2. Only 3 diseases can be identified.
3. Diseases with same physical characteristics but different colour could not be accurately classified.
4. Different colour space and single colour channels have been applied for Rice crop leaves but not for Cotton leaves.
5. New disease if arises due change in climatic conditions can be classified into one of the types of classes formed or a new class has to be formed based on features.
6. Pesticide recommendation can be done correctly for the new disease.
7. Also prediction of a disease based on weather conditions or climate change should be done.

Based on the above mentioned work and by the results obtained from the previous work, a new technique used for identification and classification of plant diseases that can overcome the disadvantages of the previous work that has been put forward.

Proposed Algorithm

Software flow diagram of Cotton Leaf disease detection system using machine vision.

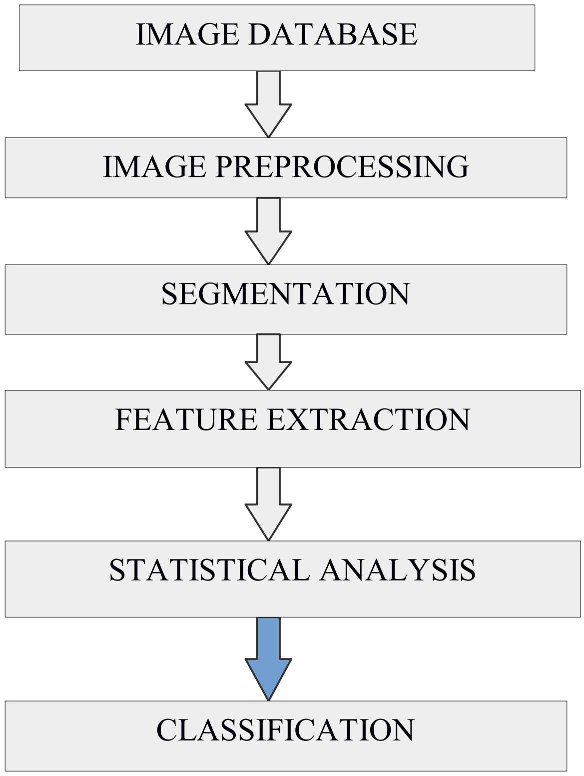

Fig 1 Overview of Diagnosis system using feature extraction

Image pre-processing

A set of pre-processing steps are applied to the input image so that it becomes suitable for further processing.

Leaves with spots must be pre-processed firstly in order to carry out the intelligent diagnosis to crop based on image processing and appropriate features should be extracted on the basic of this. Some of the important image pre-processing methods used are

1. Image clipping: Separating the leaf with spots from the complex background.
2. Noise reductions: Median filter is used to wipe noises for the image.
3. Thresholding: to segment or partition image in to the spot and background. In another words, the image pre-processing can make following extracting of characteristic parameters not to be affected by background, shape and size of leaf, light and camera.

Colour Transformation

The input images which are in RGB format are transformed into Hue Saturation Value (HSV) colour space [19]. HSV colour model is used since it is more close to human visual system.

The HSV (sometimes called HSB) colour model can be obtained by looking at the RGB colour cube along its main diagonal (or gray axis), which results in a hexagon shaped colour palette. As we move along the main axis in the pyramid in Figure below.

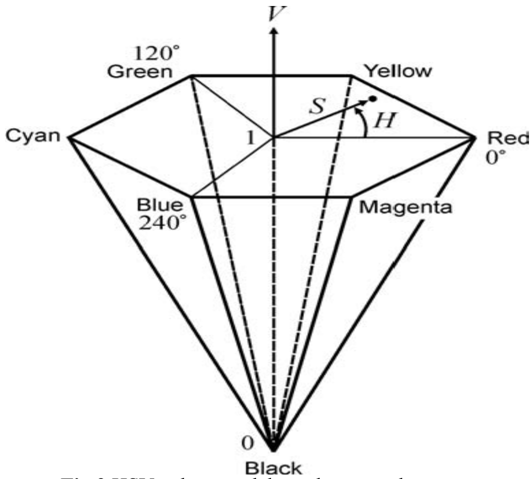

Fig 2 HSV colour model as a hexagonal cone.

In summary, the main advantages of the HSV colour model (and its closely related alternatives) are its ability to match the human way of describing colours and to allow for independent control over hue, saturation, and intensity (value). The ability to isolate the intensity component from the other two-which are often collectively called chromaticity components-is a requirement in many colour image processing algorithms.

Its main disadvantages include the discontinuity in numeric values of hue around red, the computationally expensive conversion to/from RGB, and the fact that hue is undefined for a saturation of 0.

Image Smoothing

During image collection, some noise may be introduced because of camera flash. This noise can affect the detection of disease. To remove unnecessary spot, Image smoothing technique is needed.

In this step a smoothing filter applied is a Median filter

Median Filter

The median filter is a popular nonlinear filter used in image processing. It works by sorting the pixel values within a neighborhood, finding the median value, and replacing the original pixel value with the median of that neighborhood (Figure 10.8).

The median filter works very well (and significantly better than an averaging filter with comparable neighborhood size) in reducing "salt and pepper" noise (a type of noise that causes very bright-salt-and very dark-pepper-isolated spots to appear in an image) from images. Figure 10.9 compares the results obtained using median filtering and the averaging filter for the case of an image contaminated with salt and pepper noise.

In order to perform median filtering, first window is moved and all the pixels enclosed by the window are shorted. After then median is computed and this value is assigned to center pixel. If the number of elements in K*K window is odd, middle value is assigned as median value, else average of two middle values is assigned as median value [16], [17].

Disease Spot Segmentation

After image smoothing, a technique to detect the disease spot is needed. It is important to select a threshold of gray level for extract the disease spot from plant leaf. If the histogram has sharp and deep valley between two peaks, bottom of the valley can be chosen as threshold. But problem occurs when valley is flat and broad. In that case this technique can't be used to separate objects from background. Therefore, Otsu method [15]is used here paper to automatically select most desirable threshold .

Otsu Threshold

Thresholding creates binary images from grey-level ones by turning all pixels below some threshold to zero and all pixels about that threshold to one. The simplest property that pixels in a region can share is intensity. So, a natural way to segment such regions is through thresholding, the separation of light and dark regions.

In Otsu's method we exhaustively search for the threshold that minimizes the intra-class variance (the variance within the class), defined as a weighted sum of variances of the Otsu shows that minimizing the intra-class variance is the same as maximizing inter-class variance:

Segmentation Efficiency

Segmentation of diseased leaves can be efficiently done by using a Median Filter before OTSU Thresholding as compared to Global Thresholding. This can seen from the results obtained from Experimentation

Disease Type

Various types of diseases can be detected such as Powdery Mildew. Downy Mildew and Leaf Miner using image processing techniques such as colour space conversion, Filtering, Thresholding, Segmentation, Feature Extraction and SVM Classifier. Features such as AREA, Number of Connected Components or Blobs, Eccentricity and Perimeter were extracted in the Experimentation and SVM was trained using these features.

Fig 3 Diseased Image

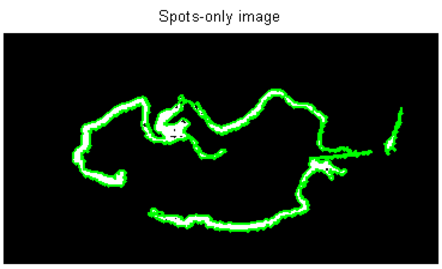

Fig 4 Segmented image

Threshold Selection

For all the test images thresholds were obtained manually by using trace bar and trial and error basis as shown below. But these values varied significantly from each other and so an automatic threshold selection method (OTSU Method) was used.

Future Scope

There are two main characteristics of plant disease detection using machine-learning methods that must be achieved, they are: speed and accuracy. Hence there is a scope for working on development of innovative, efficient & fast interpreting algorithms which will help farmers in detecting diseases in early stages.

2. Work can be done for automatically estimating the severity of the detected disease. 3. New Colour Space needs to be designed specifically for enhancing leaf disease segmentation efficiency where diseases with same physical characteristics but different colour could not be accurately classified.
4. Hardware implementation of the project can be done.

References

1. Management of seeding diseases of Cotton by Thomas Isakeit, Associate professor and extension plant pathologist Texas A&M University college station.
2. JiazhiPan, Young He. “Recognition of plants by leaves digital image and neural network” IEEE proceedings on 2008 International Conference on Computer Science and Software Engineering.
3. Yan Cheng Zhang, Han Ping Mao, Bo Hu, Ming Xili “features selection of Cotton disease leaves image based on fuzzy feature selection techniques” IEEE Proceedings of the 2007 International Conference on Wavelet Analysis and Pattern Recognition, Beijing, China, 2-4 Nov. 2007.
4. Mrunalini R. Badnakhe, Prashant R. Deshmukh, “Infected Leaf Analysis and Comparison by Otsu Threshold and k-Means Clustering”, *International Journal of Advanced Research in Computer Science and Software Engineering*, Volume 2, Issue 3, March 2012.
5. H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z.ALRahamneh, “Fast and Accurate Detection and Classification of Plant Diseases”, *International Journal of Computer Applications* (0975 - 8887) Volume 17-No.1, March 2011.
6. M. S. Prasad Babu and B. SrinivasaRao[2007] Leaves Recognition Using Back Propagation Neural Network-Advice For Pest and Disease Control On Crops, IndiaKisan.Net: Expert Advissory System.
7. Otsu.N, “A threshold selection method from gray-level histograms”, IEEE Trans. Sys., Vol. 9, pp. 62-66, 2010.
8. Geng Ying, Li Miao, Yuan Yuan and Hu Zelin, “A Study on the Method of Image Pre-Processing for Recognition of Crop Diseases”, *International Conference on Advanced Computer Control*, 2008 IEEE, pp. 202-206.

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