A SURVEY ON, ANALYSIS AND DETECTION OF DISEASE ON COTTON LEAVES

Deepali Abhang [1], Pallavi Autade [2], Prajyot Autade [3], Sapna Bhokare [4], Pooja Dawange [5]

[1] *Deepali Abhang, BE Computer, SRES' COE Kopargaon, SPPU, Maharashtra, India*
[2] *Pallavi Autade, BE Computer, SRES' COE Kopargaon, SPPU, Maharashtra, India*
[3] *Prajyot Autade, BE Computer, SRES' COE Kopargaon, SPPU, Maharashtra, India*
[4] *Sapna Bhokare, BE Computer, SRES' COE Kopargaon, SPPU, Maharashtra, India*
[5] *Pooja Dawange, BE Computer, SRES' COE Kopargaon, SPPU, Maharashtra, India*

ABSTRACT

Diseases on plants lead to an increased loss in quality and quantity of agricultural crops around the world. So method to identify the disease plays an important role in disease management. Detecting disease from image is more efficient than visiting the farm. But image contains more complex information which human eye can extract and understand after years of training. This article introduces one approach to detect diseases on cotton leaf using cotton leaf image. In this article, we are focusing on cotton leaf instead of focusing on whole cotton plant. There are different types of diseases on cotton leaf with different pattern of color in each disease. Comparing image directly with another image is not an efficient way of disease detection. So the proposed system includes three main phases that are Pre-processing, Feature Extraction and Classification. In pre-processing phase image is blurred and converted into Gray color scale from RGB color scale. Next, in feature extraction phase, color feature and texture features are extracted. Since color feature and texture feature are the most important features that describe the cotton images, the proposed system uses Color Coherent Vectors (CCV) for color feature extraction and Entropy, Local Range, Standard Deviation for texture feature extraction. Using k-means clustering algorithm different clusters are formed. Finally Support Vector Machine (SVM) classifier is used to train dataset during training phase and to identify disease by comparing extracted features with trained dataset during testing phase. After detection of disease, solution for the disease is provided to the user.

Keyword: - *Pre-processing, Color feature, Texture feature, K-means and Support Vector Machine.*

1. INTRODUCTION

India is an agricultural country where large population is dependent on agriculture. India is main cotton growing country which accounts approximately 25 percent of cotton land. Many states in India are growing cotton, in which Maharashtra is main cotton growing state. Cotton is also known as "The White Gold" or the "King of Fibers". Cotton has rich status among all cash crops and it is a raw material for textile industry. Cotton is an important cash crop which provides large income to millions of farmer in both developing and developed countries. In farming any crop quality product is highly important. Cotton diseases are main problem for decreasing cotton production and quality. Cotton production and quality can be improved using technical support.

The main cause of disease on cotton plant is leaf of plant. We are focusing on leaf of disease rather than whole cotton plant as approximately 80 percent of diseases are on cotton plant. Major diseases on cotton leaf are fungus, foliar leaf spot of cotton, Alternaria leaf spot of cotton. Disease management is a difficult task. Different diseases are having different color and texture pattern which is quite difficult to precisely quantifying visual patterns. As human eye cannot differentiate minute variation in color and texture pattern on cotton leaf, so our software will extract

color feature and texture feature present on cotton leaf and depending upon that features, the software will further compare with trained dataset and accordingly result will be provided.

2. LITERATURE REVIEW

Various papers which describe methods for detection of diseases on plant using image processing techniques suggesting the implementation ways as illustrated and discussed here.

Greg Pass, Ramin Zabih and Justin Miller used Color Coherence Vector (CCV) to finely distinguish an image which cannot be achieved by using histogram [1]. In initial stage the image is blurred slightly and the pixel values are replaced with the average pixel values within a local neighborhood pixel values that will remove the variations among the neighborhood pixels. After this the pixels are classified as either coherent and incoherence within a given color bucket. If the group of pixels is of same color then they are classified as coherent pixels whereas the pixels of different colors are termed as incoherent pixels. The pixels are then grouped by computing only connected components within a discretized color bucket. Then all the connected components are converted into individual components by labeling it with letters and maintain a table containing discretized color associated with each label.

Wasim Khan, Shiv Kumar, Neetesh Gupta and Nilofar Khan proposed a method for retrieving an image using histogram values and texture feature extraction to describe an image with less number of descriptors in image retrieval system [2]. Initially the original image is converted into gray level image and to get gray level variations the histogram values are computed. After this based on the color histogram values the image is retrieved from the database. In extracting the texture features 3 main performance parameters are considered namely entropy, local range and standard deviation.

Le Hoang Thai, Tran Son Hai and Nguyen Thanh Thuy had developed two models namely Artificial Neural Network (ANN) and Support Vector Machine (SVM). These models are used for classifying an image collectively called as ANN_SVM [3]. Where ANN_SVM is an integrating model and easy to design and deploy for a particular classification problem. It is 2 layered, first layer provides classifying result depending on images feature vector and second layer includes SVM used for integrating the entire results of first layer. It is used for classifying the complex image unlike facial image. Finally depending on the increase in the number of classes the ANN_SVM model is redesigned.

Mr. Gulhane, Dr. Gurjar used segmentation as feature extraction technique in which image is segmented according to color [4]. Color pixels are extracted for cotton leaf disease color by using modified self organization feature map (MSOFM). Support vector machine is trained for 20 diseased images and 25 non-diseased images. To obtain optimum number of color group Genetic Algorithm (GA) is used.

Sonal Patil, Rupali Zambre used two features that are shape features and color features. In shape feature extraction, general descriptors such as number of the object, area of the shape object, width and length of the object, and area of image are considered [5]. CIELab color space, which is a uniform chromaticity color space to get boundary color, spot color and broken leaf color is used for color features. Statistical analysis is used select the best features that represent the image. Support vector machine is used as a classifier.

Vivek Chaudhari, C. Y. Pati used k-means clustering algorithm for segmentation of image. In this paper wavelet transform is used as it is proper method for feature extraction. Feature reduction is performed using Principal Component Analysis (PCA) [6]. Multi-layered feed forward network with nonlinear sigmoid function is used for leaf recognition and classification.

Sushma S. Patil, Suhas K. C applied edge detection algorithm to get diseased spot area and used k-means clustering algorithm for segmentation [7]. Color, shape and texture feature are extracted and support vector machine classifer is used for classification of image.

3. DISEASE ON COTTON LEAVES

Diseases on cotton leaves are classified as

1. Bacterial disease: e.g. Bacterial Blight, Crown Gall, Lint Degradation.
2. Fungal diseases: e.g. Anthracnose, Leaf Spot.
3. Viral disease: e.g. Leaf Curl, Leaf Crumple, Leaf Roll.
4. Diseases Due To insects: e.g. White flies, Leaf insects.

The above types of diseases dramatically affect the leaf of cotton plant and its leaves. Various diseases are found on the cotton plant out of this we discuss the disease some of the major diseases which are often found on the leaves of cotton.

3.1 Foliar leaf spot on cotton

Fig -1: Foliar leaf spot on cotton

Fig -2: Foliar leaf spot on cotton

Above figure shows foliar leaf spot disease which arises due to potassium deficiency. The early stage of this disease is as shown in figure 1, now if spots increases then it results into final stage of Foliar spot of cotton plant as shown in figure 2.The leaf is having multiple no of spots which clearly denotes more potassium deficiency in the plant[4][5][7].

3.2 Alternaria leaf spot

Fig -3: Alternaria Leaf Spot-alternaria Macro Spora

The disease may occur in all stages but more severe when plants are 45-60 days old. This causes small, gray, pale to brown, round or irregular spots as shown in figure 3. Affected leaves become dry and fall off[4][5][7].

3.3 Bacterial Blight

Fig -4: Bacterial Blight

Xanthomonas campestis PV. Malvacearum Bacterial blight starts out as Dark green, water soaked angular leaf spot of 1 to 5 mm across the leaves and bracts, especially on the under surface of leaves with a red to brown border[4][5][7]. The angular appearance is due to restriction of the lesion by fine veins of the cotton leaf. Spots on infected leaves may spread along the major leaf veins as disease progresses, leaf petioles as shown in figure 4.

3.4 Cerco Spora-leaf Spot Cerco Spora

Fig -5: Cerco Spora-leaf Spot Cerco Spora

The disease affects older leaves of mature plants[4][5][7]. The spots are round or irregular in shape yellowish brown, with purple, dark brown or blackish borders and white centers affected leaves become pale in color and finally fall off as shown in figure 5.

4. SYSTEM ARCHITECTURE

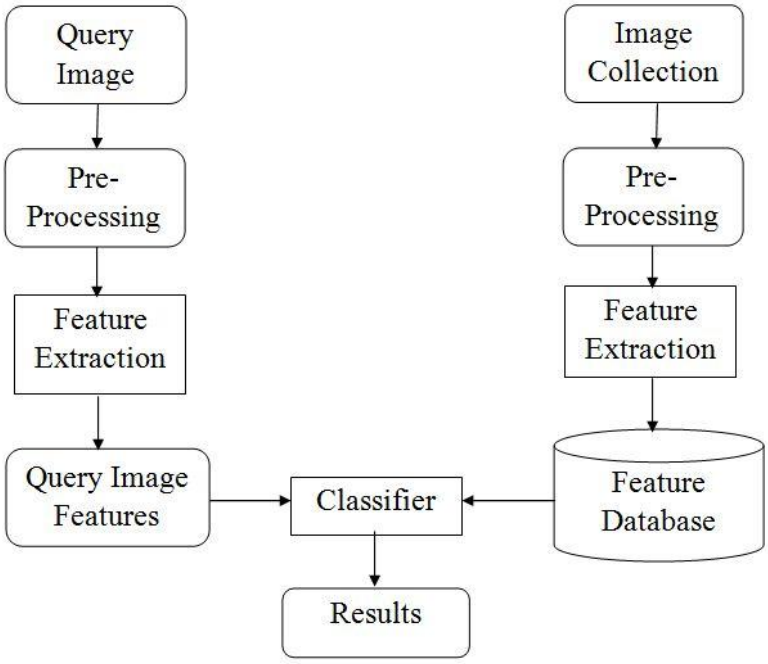

Fig -6: Proposed System Architecture

The proposed system architecture is described as shown in figure 6. Farmer uploads image of cotton as Query Image. Image will go through some of the pre-processed techniques such as resizing of an image and converting the color image into gray-scale image. Different features such as color and texture will be extracted. Finally using Support vector machine Classifier the extracted features will be compared with the trained dataset and accordingly result will be displayed. There are three main modules:
1. Pre-processing.
2. Feature Extraction.
3. Classification.

4.1 Pre-processing

The pre-processing task involves some procedures to prepare the image for feature extraction. First step in pre-processing is to find intensity values of pixels. Then blurring operation is performed. Cotton leaf image is in RGB color format. The RGB image is converted to gray scale image.

4.2 Feature Extraction

Feature extraction means reducing the dimensions of an object. Feature extraction is important part of image processing. After pre-processing feature extraction comes into picture. Features that are extracted carry important information about image. There are various types of features like color, texture, shape, pixel etc. We mainly focus on color and texture feature.

4.2.1 Color Feature Extraction

For extracting color features we use color coherence vector. The color coherence means the degree to which the pixels of that color are members of large similarly-colored regions. These regions are called as coherent regions.
For color feature extraction we convert the RGB image into gray level image. After conversion of image into gray level we form bucket. Then we classify the pixels within bucket as coherent or incoherent. A pixel is called coherent if the size of its connected component exceeds a fixed value τ; otherwise, it called incoherent pixel. The pixel in bucket are representing with single color (i.e., the pixel with R/G/B values 10/10/10 will be written as 10).the pixels

in range of 1 to 10 are replace by 1, 11 to 20 are replace by 2, 21 to 30 are replace by 3 and so on. After that, next step is block formation. In which for each bucket is labeled with letter like A, B, C and so on. Finally we get the color vector that is given as input to the next step that is classification.

4.2.2 Texture Feature Extraction

Feature extraction is extremely important phase in image processing. It describes the image with minimum number of Descriptors. Texture is an important property of many types of images. We can calculate the texture feature using entropy, standard deviation, local range as,
Texture= (Entropy +Standard deviation + local Range)

1) Entropy
Entropy is a statistical measure of randomness that can be used to characterize the texture of the input image.
The value of entropy can be calculated using equation (1).

$$ENT = \sum_{K=1}^{M} Pk \log 1/Pk \quad \ldots\ldots\ldots(1)$$

Where,
ENT = Entropy of Input.
M = Total number of samples
P = Probability of Input occurrences.

2) Standard Deviation
The standard deviation value can be calculated using equation (2).

$$S = (1/n-1 \sum_{i=1}^{n} (xi-x)2)1/2 \quad \ldots\ldots\ldots(2)$$

where,

$$x=1/n \sum_{i=1}^{n} xi$$

Where, n = Number of elements in the sample.

3) Local Range
LC = maximum value of selected pixel - minimum value of selected pixel.

4.3. Classification

The goal of image classification is to identify the categories of the input image using its features like color and texture. There are many ways for solving the problem of classification such as k nearest neighbor, Adaptive boost, Artificial Neural Network, Support Vector Machine (SVM).We use SVM classifier for classification.

In classification first we form the clusters. Cluster is nothing but the grouping of objects of same functionality into one class and the dissimilar object into another class. SVM is statistical classifier. Support vector machines (SVM) are a group of supervised learning method that can be applied to classification. SVM classifier takes the set of input data and classifies them into distinct classes.

4. CONCLUSIONS

In this paper, we proposed a method for identifying the disease on cotton leaves by using the image processing technique. In this first image is preprocessed, in which intensity values of image are calculated, then image is blurred and converted into gray scale image. Color feature extraction is done using color coherent vector (CCV) and texture feature extraction is done using entropy, standard deviation, local range. Then clusters are formed using k-

means algorithm. Finally Support vector machine (SVM) classifier is used for categorization of disease and accordingly result is displayed.

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REFERENCES

[1]. Greg Pass, Ramin Zabih, Justin Miller, "Comparing Images Using Color Coherence Vectors" http://www.cs.cornell.edu/home/rdz/ccv.html.

[2]. Wasim Khan, Shiv Kumar, Neetesh Gupta, Nilofar Khan, "A Proposed Method for Image Retrieval using Histogram values and Texture Descriptor Analysis". International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-I Issue-II, May 2011.

[3]. Le Hoang Thai, Tran Son Hai, Nguyen Thanh Thuy, "Image Classification using Support Vector Machine and Artificial Neural Network". I.J. Information Technology and Computer Science, 2012, 5, 32-38 Published Online May 2012 in MECS (http://www.mecs-press.org/) DOI: 10.5815/ijitcs.2012.05.05

[4]. Mr. V. A. Gulhane, Dr. A. A. Gurjar, "Detection of Diseases on Cotton Leaves and Its Possible Diagnosis", International Journal of Image Processing (IJIP), Volume (5) : Issue(5) : 2011.

[5]. Prof. Sonal P. Patil, Ms. Rupali S.Zambre, "Classification of Cotton Leaf Spot Disease Using Support Vector Machine". ISSN: 2248-9622, Vol. 4, Issue 5 (Version 1), May 2014, pp.92-97.

[6]. Vivek Chaudhari, C. Y. Pati, "Disease Detection of Cotton Leaves Using Advanced Image Processing". ISSN: Volume-4 Number-2 Issue-15 June-2014.

[7]. Sushma S. Patil, Mr. Suhas K. C, "Identification and Classification of Cotton Leaf Spot Diseases using SVM Classifier".International Journal of Engineering Research & Technology(IJERT), Vol. 3 Issue 4, April - 2014.

BIOGRAPHIES

Miss. Deepali Abhang student of BE Computer Engineering, studying in SRES' COE Kopargaon of pune university. Has completed diploma in Computer Technology from K. B. P Polytechnic Kopargaon of mumbai university in 2012-13

Miss. Pallavi Autade student of BE Computer Engineering, studying in SRES' COE Kopargaon of pune university.

Miss. Prajyot Autade student of BE Computer Engineering, studying in SRES' COE Kopargaon of pune university. Has completed diploma in Computer Technology from K. B. P Polytechnic Kopargaon of mumbai university in 2012-13.

Miss. Sapna Bhokare student of BE Computer Engineering, studying in SRES' COE Kopargaon of pune university. Has completed diploma in Computer Technology from K. B. P Polytechnic Kopargaon of mumbai university in 2012-13.

Miss. Pooja Dawange student of BE Computer Engineering, studying in SRES' COE Kopargaon of pune university.