

# Leaf Disease Detection of Cotton Plant Using Image Processing Techniques: A Review

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**Abstract** — India is an agricultural country and 70% people's income depends on crop. Crop loss due to diseases is approximates 20to30% .Normally to avoid such losses conventional method has done to judge the diseases but it is not an accurate. The proper identification of disease is important case to provide better treatment to protect the plant. Image processing with spatial FCM & PNN classifier give best result to identify the type of disease in cotton plant. In which Image acquisition is done. Later pre-processing is obtained using median filter. The pre-processed leaf images are then segmented using Spatial FCM clustering method. Then the color features texture features like energy, entropy, correlation, contrast, edges are extracted from diseased leaf image using repeated configuration in the texture & then compared with normal cotton leaf image. Image processing along with availability of communication network can change the situation of getting the expert advice well within time and at affordable cost. Probabilistic Neural Network (PNN) method is used to classify the Disease in cotton crop.

**Key Words** —cotton plant disease, image processing, spatial FCM, median filter, PNN.

## I. INTRODUCTION

India is known as agricultural country. Mostly the population depends on agriculture .in India there is wide range of variety to select for farmer. The recent accounts in India approximately 25% of words cotton area & among this 16% is total cotton production.in cotton textile industry basic raw material is provided by cotton .cotton in India provides livelihood to 6 million farmers and about 40 to50 million people employed in cotton trade and its processing [3] Its large effect of the disease is on leaves of the plants .about 80% on the plants it's on leaves [1].There are many methods to identify the cotton plant disease like by using clustering algorithm, texture statistic, mean filter, k-means clustering, scatter matrix, RGB method , SVM classifier etc.[7]. in this paper we are more focusing on the spatial FCM and PNN to identify the pest and type of disease on cotton plant, Now a days image processing and neural networks are used for implementation of automatic system which purely identifies the plant disease[2]. Image processing is the process of analyzing and modifying a signal to optimize or improve its efficiency or performance artificial neural networking is a mathematical form or computation model based or biomedical neural network used to extract the leaf feature as of database [2]. .ANN are parallel distributed systems composed of simple processing elements(neuron)

that calculate given mathematical function(usually nonlinear ) the probabilistic neural network is one of them. [1].

## II. DISEASE ON COTTON LEAF

Cotton is important crop as it directly related to economy of farmer and country. But diseases on cotton plants are main disturbance that decreases the productivity. Cotton crop is *kharip* crop which requires to 7 month. So it is the time for sowing to harvesting during maintained of crop is taken for good production [3]. The cotton plant can be subjected for attack of pest and disease having reason such as climate change and many more.it is significant to diagnosis the disease [4].Thus it helps to selecting the right chemical and fertilizer. As plant can effect by disease have many sources but plant leaf is the main source is plant leaf. Nearly 80 to 90 % disease on cotton plant is effect to leaf. Thus main researcher have study of interest is leaf instant of whole cotton plant or other part such as roots, stems [1]

### A. Red Spot Disease (Lalya):

It is a major and potentially destructive bacterial disease caused by a bacterium, Firstly look as water-soaked region and in later stages turn dark brown to black the disease spot causes stems may get infected resulting in off of the leaves fall.



Fig.1: Red Spot Disease (Lalya):

### B. White Spot Disease (Pandhari Mashi):

It observe in the form of circular spot of size 1 to 15 mm in size and Having color which can vary from circular brown holes on leaf Irregular dead areas may develop as a result of union of older spots on edges. Mature spots have dead centers which Crack and fall out normally. The disease is more prominent on lower leaves

of the plants as compared to the upper part leaves of leaf part leaves of leaf.



Fig.2: White Spot Disease (Pandhari Mashi):

**C. Crumple Leaf Disease (Kokada):**  
 Cotton plant leaf sometime have green or yellow in color are found, but may be pink, red or black and little bit brownish depending on species. It is easy to identify.



Fig.3: Crumple Leaf Disease (Kokada)

**D. Turcicum leaf blight:**  
 Easily recognized by the slightly oval shapes .and mostly affect the plant. They appear firstly on lower leaves and then complete burn the foliage



Fig.4: Turcicum leaf blight

### III. FLOW CHART

There are mainly 5 steps used for the detection of leaf diseases [8].

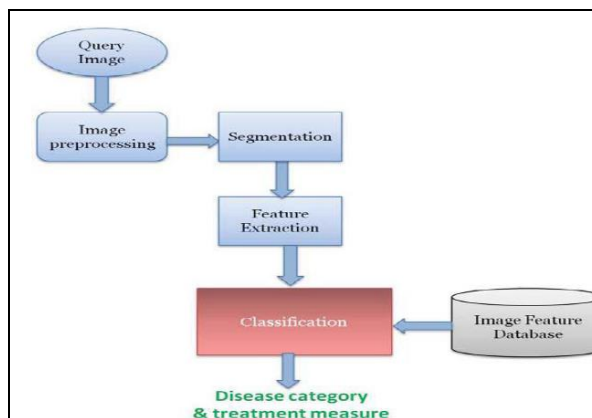


Fig 5: step for diseases detection and classification

## IV. PROPOSED METHOD

### A. Median filter

Median filters are statistical nonlinear filters. The concept was introduced by Turkey in 1977. Following tasks are performed by median filter to find each pixel value in processing image:

1. The entire neighborhoods pixels which are identified by the mask are stored in the ascending or descending order.
2. The median of stored value is computed and chosen as the pixel value for the processed image.

A color image corrected by salt and paper noise, we can't apply median filter directly. Divide the image in three planes (i.e.RGB) and the median filter to individually so due to this impact of salt- noise gets suppressed.

Median filter is efficient in removing the salt and paper noise. Increases the size of window better the efficiency.

### B. Segmentation using Spatial FCM

Clustering is "the process of organizing objects into groups whose members are similar in some way".

A *cluster* is therefore a collection of objects which are "similar" between them and are "dissimilar" to the objects belonging to other clusters.

The spatial function is the weighted summation of the Membership function in the neighborhood of each pixel [6].

$$S_{ij} = \sum_{k \in NB(x_j)} U_{ik}$$

Let the data  $X = \{x_1, x_2, x_3 \dots, x_n\}$  be the set of data points also  $C = \{c_1, c_2, c_3 \dots, c_n\}$  be the set of centers. Thus

Following equations explain the membership and cluster center for each iteration respectively [2].

$$\mu_{ij} = \frac{1}{\sum_{k=1}^c (d_{ij}/d_{ik})^{(2/m-1)}}$$

$$c_j = \frac{\sum_{i=1}^n \left( \frac{(\mu_{ij})^m \cdot x_i}{(\mu_{ij})^m} \right)}{\sum_{i=1}^n (\mu_{ij})^m}$$

Where

$d_{ij}$  represents the distance between  $i$ th data and  $j$ th cluster Centre.

$C$  represents the number of cluster

$M$  is the fuzziness index

$\mu_{ij}$  represents the membership of  $i$ th data to  $j$ th cluster center.

$n$  is the number of data points.

$c_j$  represents the  $j$ th cluster center

The advantages of the spatial fcm are as following:

1. It removes noisy spots.
2. It yields regions more homogeneous than those of other methods.
3. It is less sensitive to noise than other techniques.

It is a powerful method for noisy image segmentation and works for both single and multiple featured data with spatial information.

### C. Probabilistic neural network :

After image feature extraction using spatial FCM, the next step is image classification. A probabilistic neural network is used for classification and pattern recognition. In PNN algorithm, the parent probability distribution function (PDF) is approximated by a parzen window and nonparametric function. Following are four layers in PNN [1]

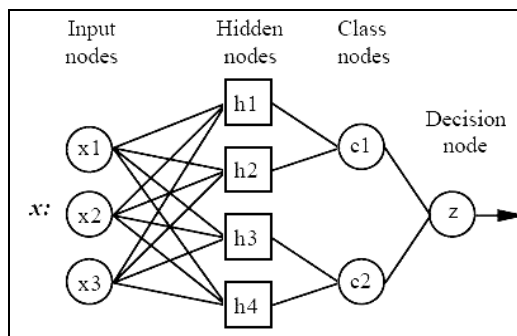


Fig 5: Architecture of PNN

#### 1. Input layer :

Input layer represent a periodic variable for each neuron. There are  $N$  number of categories in which  $N-1$  are used. The stabilization of the range of the values is done by subtracting the median and dividing by the interquartile range. This neuron feed the values to each of the neuron in hidden layer [5].

#### 2. Hidden layer:

A hidden neuron computes the Euclidean distance of the test case from the neuron center point.

#### 3. Pattern layer/Summation layer:-

In this layer each neuron for each case is collected in data set and it stores all values of the periodic variables along with target value.

The weighted value coming out of a hidden neuron is feed only to the pattern layer neuron. The pattern neuron adds the values for the class they represent.

#### 4. Decision layer:-

This layer compares the weighted votes for each target category accumulated in the pattern layer and uses the largest votes to predict the target category.

## CONCLUSION

This review paper used to study some cotton crop leaf disease detection technique. The main causes of disease on cotton plant are leaf of plant. Normal human eye cannot able to differentiate variation in color and texture change on cotton leaf.so software is applicable to extract color feature and texture feature. Another used of software will further compare with trained database and according to that disease can be identify. Here image processing technology used to deploy the classification system. Thus image processing with spatial fcm and pnn used to make system automatic to detect and classify the diseases.

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