Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques

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***Abstract*— This Proposed Work exposes, a advance computing technology that has been developed to help the farmer to take superior decision about many aspects of crop development process. Suitable evaluation and diagnosis of crop disease in the field is very critical for the increased production. Foliar is the major important fungal disease of cotton and occurs in all growing Indian regions. In this work we express new technological strategies using mobile captured symptoms of cotton leaf spot images and categorize the diseases using HPCCDD Proposed Algorithm . The classifier is being trained to achieve intelligent farming, including early Identification of diseases in the groves, selective fungicide application, etc. This proposed work is based on Image RGB feature ranging techniques used to identify the diseases (using Ranging values) in which, the captured images are processed for enhancement first. Then color image segmentation is carried out to get target regions (disease spots). Next Homogenize techniques like Sobel and Canny filter are used to Identify the edges ,these extracted edge features are used in classification to identify the disease spots. Finally,pest recommendation is given to the farmers to ensure their crop and reduce the yeildloss.**

***Keywords*—: Image RGB feature, Cotton leaf spot diseases, HPCCDD Algorithm, Mobile camera Capture**.

I. INTRODUCTION

India is an agricultural country; where in about seventy percentage of the population depends on agriculture. Farmers have wide range of diversity to select suitable Fruit and Vegetable crops. However, the cultivation of these crops for optimum yield and quality product is highly technical. It can be improved with the aid of technological support. The management of perennial fruit crops requires close monitoring especially for the management of diseases that can affect production significantly and subsequently the post-harvest life.

Cotton," The White Gold" or the "King of Fibers" enjoys a pre-eminent status among all cash crops in the country and is the principal raw material for flourishing textile industry. It provides livelihood to about sixty million people and is an important agricultural commodity providing remunerative income to millions of farmers both in developed and developing countries. In India, in spite of severe competition from synthetic fibers it is occupying the premier position with a seventy percentage share in the textile industry.Cotton (Gossypium spp.) is a crop of warm climate and requires a regular supply of water either naturally in the form of rainfall or assured through canals from the above surface and/or from underground sources. Although cotton is not a water loving plant, it requires a regular supply of water for maintaining growth and balance between vegetative and reproductive phase. About fifty five percentages of the world cotton area are under irrigation and the balance is rain fed. Country seventy percentage of the cotton cultivated area in India is under rain fed conditions.

A. The Image analysis in agriculture

The Image RGB feature pixel counting techniques is extensively applied to agricultural science, and it has great perspective especially in the plant protection field, which ultimately leads to crop management.

Image analysis can be applied for the following purposes:

1. To detect diseased leaf, stem, fruit
2. To quantify affected area by disease.
3. To find the boundaries of the affected area.
4. To determine the color of the affected area
5. To determine size & shape of fruits.
6. To identify the Object correctly.

This Research work develops the advance computing system to identify the diseases using infected images of various cotton leaf spots. Images are captured by digital camera mobile and processed using image growing, Then the infected part of the leaf spot has been used for the classification purpose of the train and test the proposed HPCCDD Algorithm. This technique evolved into the system is both Image processing techniques and advanced computing techniques.

B. VARIOUS TYPES OF COTTON LEAF SPOT DISEASES

The diseases identify on the cotton leaf spots are classified as

- Fusarium wilt
- Verticillium wilt
- Root rot
- Boll rot

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- Grey mildew
- Circular dry brown lesions up to 10mm across may also be seen on the bolls. A. alternata causes usually purple specks or small lesions with purple margins on leaves and bolls Leaf blight
- Bacterial blight
- Leaf curl

C. Symptoms of Cotton Diseases

Grey mildew (Areolate Mildew/ Dahiya) - Ramularia areola*:*

This disease[1] primarily appears on older leaves as the plants reach maturity, in the form of irregularly angular, pale translucent spots, 1-10mm (usually 3-4 mm) in diameter and with a definite and irregular margin formed by the veins of the leaf (called areolate). The lesions are light to yellowish green on the upper surface. As the spots grow older, the leaf tissues turn yellowish brown while a whitish frosty growth appears chiefly on the under surface but occasionally also on the upper surface. This is the conidial stage of the causal fungus. Lesions occur on the bracts subtending the bolls. As the leaf becomes chlorotic, the lesion turns reddish brown and defoliation takes place. Early and severe defoliation leads to premature boll opening and immature lint.

Bacterial blight (Xanthomonas axonopodis pv. Malvacearum:

Dark green, water soaked, angular lesions of 1 to 5 mm across the leaves and bracts, especially on the under surface of leaves. Hence called angular leaf spot. Sometimes extensive dark green, water soaked lesions along the veins known as vein blight. Symptoms are usually more prevalent on lower leaves than on upper leaves. Lesions dry and darken with age and leaves may be shed prematurely resulting in extensive defoliation. Black lesions on the stem which girdle and spread along the stem or branch known as black arm. Dark green, water soaked, greasy, circular lesions of 2 to 10mm across the bolls, especially at the base of the boll under the calyx crown. As the boll matures the lesions dry out and prevent normal boll opening. This phase of symptom is called as "Boll rot". .

Leaf Curl virus disease - Gemini virus:

The initial symptom is characteristic Small Vein Thickening (SVT) on young upper leaves of plants. Later, upward curling of leaves occurs due to the uneven growth of veinal tissues on the abaxial side of the leaves. Subsequently, formation of the cup shaped or leaf laminar outgrowth called enations appear on the underside of the leaf. In severe cases and in plants affected at an early age, reduction of inter-nodal length leading to stunting and reduced flowering/fruiting is observed.

Alternaria leaf spot - Alternaria macrospora, A. Alternata:

Alternaria macrospora causes brown, gray brown or tan lesions 3–10mm in diameter, especially on lower leaves. Sometimes with dark or purple margins and with concentric zones. . Affected leaves develop an abscission layer, senesce and drop to the ground.

D. THE MAJOR TARGET OF THIS RESEARCH WORK

This Research work presents an effort of using Advance computing technology (ICT) to overcome the information gap by:

- Creating sophisticated agriculture atmosphere to sustain the farmers to simply identify the diseases and get pest recommendation .
- Attempting to automate disease recognition process using Advance color image processing.
- Easy way to take decision support system to farmers.

In this work Carried out the Crop growing Suggestion Center has an information repository of the individual farms collected using a mobile phone for data and image capture. Continuous updating of data is carried out and the interactions with recommendation center advisory are captured. Farmers can upload additional information and pictures of the crop using their mobile phones. The extension worker handles the calls from farmers and conferences in experts as and when necessary.

II. LITERATURE REVIEW

Earlier papers are describing to diagnosis the cotton leaves using various approaches suggesting the various implementation ways as illustrated and discussed below. [1] Cotton Diseases Control has been developed in a BP neural network as a decision-making system. [2] Cotton foliar diseases presented a method for automatic classification of cotton diseases used Wavelet transform energy has been used for feature extraction while Support Vector Machine has been used for classification. [3] Existing the research work described in the features could be extracted using a self organizing feature map with a back-propagation neural network is used to recognize the color of the image. [4] Earlier paper the fuzzy feature selection approach fuzzy curves (FC) and surfaces (FS) - is proposed to select features of cotton disease leaf the image. [5] Presented work carried out RPM and Dis Bin and compared with the classical PCA based technique. [6] The cotton leaf disease segmentation is performed using modified self organizing feature map with genetic algorithms for optimization and support vector machines for classification.[7] proposed use this techniques to extract Eigenfeature from cotton leaf.

Presently, in the recent agricultural system, advance computation techniques have been developed to help farmers (or) agricultures to monitor the proper development of their crops. In our early agricultural system, during the harvesting process of the crops, the exposed eye observation of farmers or experts is the main approach adopted in practice for the detection and identification of crop diseases under microscopic conditions in the laboratory. However, this requires continuous

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monitoring of experts which might be prohibitively expensive in large farms. Further, in some developing countries, farmers may have to go long distances to contact experts, this makes consulting experts too expensive and time consuming. The basic problems regarding with crop is on the field, a fast and accurate recognition and classification of the diseases is required by inspecting the infected leaf spot images also identify the severity of the diseases. There are two main characteristics of plant-disease detection machine-learning methods that must be achieved, they are: performance and accuracy.

Proposed Research work will describe the process of Advance computing techniques for recognition of leaf spot diseases as this can give much benefit in monitoring large fields of crops and discover the symptoms of diseases. In this work we have to find out the computer systems which analyze the input images using the RGB pixle counting values feature used and identify (each and every disease) wise and next using homogenization techniques Sobel and canny using edge detection to identify the affected parts of the leaf spot to recognize the diseases boundary is white lightning and then result (recognition of the diseases and pest recommended) is given as output to the farmers.

III. PROPOSED METHOD

Initially, the digital images are acquired from the circumstances using a digital mobile camera. Then image-processing techniques are applied to the acquired images to extract RGB Pixel counting features that are necessary for further analysis. After that, some analytical perceptive techniques are used to classify the images according to the specific problem at hand. In this work farmers can take decision immediately at the time. They want to get the best solution to diseases and pest recommendation is 3 languages Tamil, English, Hindi, Production can be improved, the yield loss can be reduced, they minimum cost of ultimate system very useful to farmers and we can increase the economic of the country. Main farmers life protects and reduces their burden.

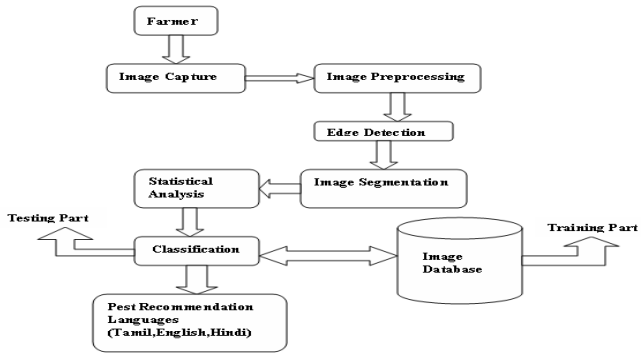

Fig. 1: Advance computing diseases identification System Architecture

Users acquire images of the leaves from the field using sensors and pass it to the computer system which analyze the input images using the homogenous edge detection algorithms and diseases wise the pixels call function logic used for diseases wise detect the affected parts of the leaves to recognize the diseases and then result (recognition of the diseases and pest recommended) is given as output to the farmers in three languages.

A. Proposed Homogeneous Pixel Counting technique for Cotton Diseases Detection (HPCCDD)

I. RGB image acquisition
II. Create the color transformation structure
III. Convert the color values in RGB to the space specified in the color transformation structure.
IV. Apply Color Filtering
V. Masking green-pixels
VI. Remove the masked cells inside the boundaries of the infected clusters
VII. Find Edge detection (using Sobel and Canny with Homogenous operator techniques)
VIII. Calling the pixel Ranging function to calculate the RGB features (each and every disease)
IX. Texture Statistics Computation
X. Configuring Disease Reorganization and Pest Recommendation .

B .Evaluation of the Existing Algorithms

The presented work has taken cotton diseases and control system, [1]WEB-based Intelligent Diagnosis System for Cotton Diseases Control has been developed in BP neural network as a decision-making system to establish an intelligent diagnosis model is 89.5%, [8] and another related work was Thai Herb leaf Image Recognition System used KNN and accuracy is 76%62, next related [9] study Fast and Accurate Detection and classification of plant Diseases used in k-means and NN and found results is 94%.and k-means and ANN is better than other related research studies.

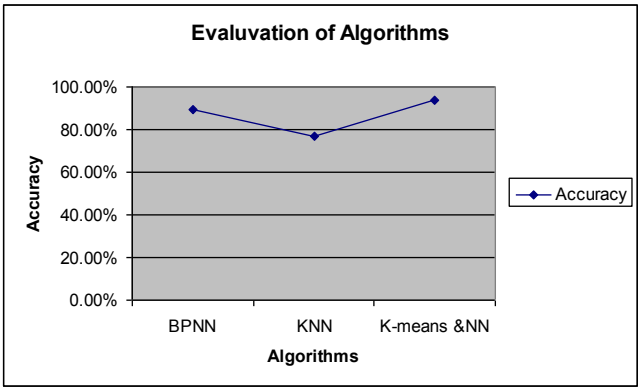

Fig. 2: Evaluation of Existing Algorithms

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IV. EXPERIMENTAL RESULTS

Take the Image a leaf as an input image and convert into a grayscale image, and next applied color filter and affected leaf spot color used RGB Pixel counting values (each and every disease) feature Segmented. Next segmentation the edge detect by using Canny and Sobel Edge detection homogenous techniques used to identify the clarity for the edges, and we get centered pixel of opposite neighboring one, two, three pixels of clarity of edges getting white lightning. This lightning identified is denoted as the diseases affected is represented in the edges of leaf boundary. The dissimilarity edge detector can take the dissimilarity of opposite pixels in instead of a 3x3 area.

The Homogeneity-based edge detector takes the result of any edge detector and divides it by the average range of the part. This division removes the effect of not level lighting in the image. The average range of an area is available by convolving the part with a mask containing all ones and separating by the size of the area.

FUSARIUM WILT

Fig. 3(a1)InputImage

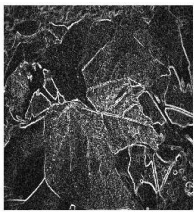

Fig. 3(a2)InvertusingHomogeneousedge detection

VERTICILLIUM WILT

Fig. 3 (b1) Input Image

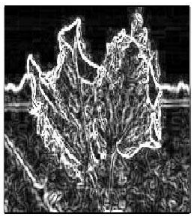

Fig. 3 (b2) Invert using Homogeneous edge detection.

LEAF BLIGHT

Fig. 3 (c1) Input Image

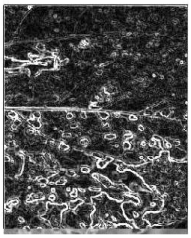

Fig. 3 (c2) Invert using Homogeneous edge detection.

This work is analyzed with eight types of disease in cotton leaves. The above figures show the example for edge detected diseases. Results are for three types of cotton leaves. The figure 3a1.Fusarium Wilt and Figure 3b1.Verticillium Wilt. Figures 3c1.Leaf Blight is shown as normal image. After the diseases are recognized in the figures 3a2, 3b2& 3c2 homogenous edge detection used Sobel and canny with Homogenous techniques are shown in fair light part is diseases find out that part is affected boundary of the leaf.

First the farmer captures the cotton leaf spot disease symptom of the image is sent to the mobile camera,Then send to the server,Next the server already stored symptoms of disease Images is there, then the system automatically analysis through the proposed algorithms and train and test the using a neural network based approach classifier and recognition the image path and achieving an output result. Image and due to what diseases, what symptoms and recommendation to the pest details assist to the farmer's precaution the disease awareness. Finally send Sms to the farmers in three languages like Tamil, English, and Hindi.

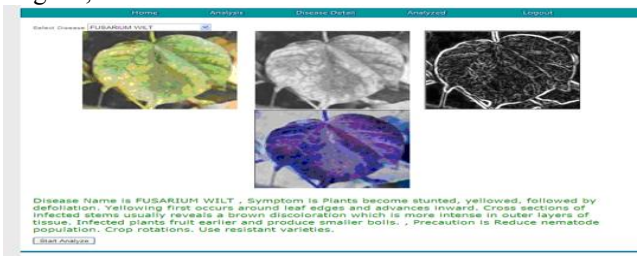

Fig. 4: Report of Farmer and diseases Description

Figure4: show the first normal image , next RGB image converts into the grayscale image, then using edge detection techniques to identify the leaf spot image disease affected part. Then using color filter checking RGB Rangfeatures used to identify the disease part. And recognition image part and achieving an output result. Image and due to predict the disease and recognition the symptom and recommended to the pest details help to the farmer's .(Precaution the disease awareness).

TABLE I. COMPARATIVE RESULTS OF PROPOSED METHOD

ALGORITHMS	ACCURACY(%)
SOM+BPNN PCA +Eigen Vector	90
RPM and Dis bin CYMK Components	83
BP Neural Network	89.5
Wavelet transforms and Support Vector Machine	97
Proposed HPCCDD	98.1

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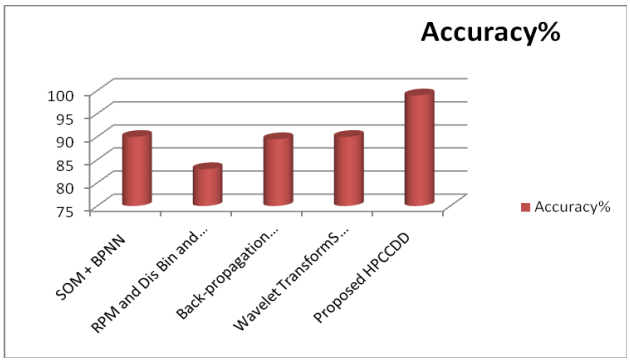

Fig. 5: Chart Showing The Comparitive Results

We have compared the obtained results of our proposed method with other existing algorithms. The results of the comparison made is shown in table 1. The chart showing the results of a comparison is given in figure 5. The obtained results clearly show that our proposed method has higher accuracy than other existing algorithms.

V. CONCLUSION

This work consists of two phases to identify the affected part of the disease. Initially Edge detection based Image segmentation is done, and finally image analysis and classification of diseases is performed using our Proposed HPCCDD Alorithm.The goal of this research work is to develop an Advance Computing system that can identify the disease affected part of a cotton leaf spot by using the image analysis technique. Prediction of the diseases and pest recommendation is done in three languages like Tamil, English, and Hindi. The producers can amend the Yield and reduce the loss. Through this proposed system the farmers' burden has been reduced and saves their life.

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