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AN EFFICIENT DISEASE DIAGNOSTIC AND TREATMENT SYSTEM FOR COTTON PLANT USING DIGITAL IMAGE PROCESSING

SACHIN DIGAMBAR CHAVHAN [1] Prof A.S.DUDHE [2]

[1]ME 2nd Year, CSE Department, BNCOE, Pusad, Maharashtra.
[2]Assistant Professor, CSE Department, BNCOE, Pusad, Maharashtra.

ABSTRACT

Cotton is the most beneficial cash crop in India and Maharashtra is one of those states which produces large amount of cotton (especially Vidarbha region).In this paper we expose an approach that regularizes and extracts eigen feature from cotton leaf image. In this method scatter matrix is developed which is within class type, at this time the created matrix is decomposed into various subspaces related to various diseases. Eigen features are regularized differently in these subspaces based on that eigen spectrum is modeled. This enables the discriminated evaluation performed in the whole space feature extraction or dimensionality reduction occurs at the last stage, after comparison of this feature results to disease identification. We diagnostic a diseases like Bacterial leaf blight, Red Leaf Blight ,Black Spot , fungus, Anthracnose. Red Spots, White Spots. Leaf Curl, Leaf Roll, Leaf Blight and to gave appropriate treatment for this diseases.

Keywords: Digital Image Processing, Eigen Feature, Sacatter Matrix

I. INTRODUCTION

India is a country where most of the population depends on agriculture having wide range of diversity for fruit and vegetable crop. However the cultivation of these crops is for optimum capitulates and quality. Cotton is the most significant economic crop. India producing and using cotton since very long time, might from the period of Indus Valley Civilization. India is the initial country in the world to domesticate cotton and utilize its fiber to construct fabric and 2nd largest producer of cotton in world also most of this cotton is use in India only. In India, Maharashtra is the vital cotton growing state with 31.33 lack hector area (2008-09). In Maharashtra, Vidarbha is an area which is well known for cotton growing and exporting. In-progress conditions show that India is among the largest cotton exporter countries. Cotton plays a decisive role in changing the Agricultural Production Structure [1]. Disease which spread on cotton is the main problem that decreases the productivity of the cotton. Annual survey shows that as much as 25% of cotton production is reduced due to numerous diseases. These diseases mainly infect the leaf of the cotton plant. Near about 85% of disease which occurs on the cotton plant is on its leaves. Thus our area of interest is the leaf of cotton tree rather than whole cotton plant. Cotton leafs are mainly suffered from diseases like alternaria leaf spot, fungus, foliar leaf spot of cotton, cotton mite etc. In the current domestic agricultural production, many experts use personal experiences with advanced pathological knowledge to analyze what above diseases are and what its harshness. Above mention work is tedious so we need some fast and accurate solution. In today world rapid development of computer vision technology gives its promise. The image processing is the key technique for the diagnosis of various skin textures. Image recognition ideas are applied to the field of pattern recognition of plant leaves; it can be used in the agricultural applications for the following purposes. i) To find shape of affected area. ii) To verify affected area by disease. iii) To sense diseased leaf. So we use image processing in diagnosing the cotton leaf diseases providing new approach to explore in

the field of agriculture. Different methods have been proposed in this area which is not fully solved or somewhat hard to implement. The issue is how to extract the discriminative and stable feature for classification. It is found that linear subspace analysis has been extensively studied and becomes a popular feature extraction method. Linear discriminate analysis was introduced into cotton leaf disease classification. In this project we will study a Eigen feature regularization and extraction technique. Image space spanned by the Eigen vectors of the class scatter matrix is decomposed into three subspaces. Eigen features are regularized differentially in these subspaces. Feature extraction and classification could be the last stage.

II. LITURATURE REVIEW

Ajay A. Gurjar, et.al., suggested "Eigen spectrum modeling and it proposes a approach that regularizes and extracts Eigen feature from cotton leaf image". Gives approach for cotton leaf image Eigen feature regularization extraction. Image space spanned by the eigenvectors of the within class scatter matrix is decomposed into three subspaces. Eigen features are regularized differentially in these subspaces. Initially they can be able to detect 3 diseases on the cotton leaves by the methodology. Also from this method about 90% of detection of Red spot i.e. fungal disease is detected, it is most dangerous disease, it can highly affect the productivity of the cotton plant in more extent. [1]. P.R.Rothe, et.al. proposed "SVM-based Classifier System for Recognition of Cotton Leaf Diseases" which describes a modus operandi for automatic classification of cotton leaf diseases through feature extraction of leaf symptoms from digital images. The proposed system will help identification of three types of leaf diseases namely Bacterial Blight, Myrothecium and Alternaria. The proposed system will take care of only Bacterial Blight, Myrothecium and Alternaria leaf diseases. There are other leaf, root and fruit diseases which are not addressed by the system. The proposed work for cotton leaf diseases namely Myrothecium, Bacterial Leaf Blight and Alternaria with average accuracy of 90% provide good tool for the farmers in the region. The efficiency of the system may get affected in case of faulty images [2]. P. Revathi, et.al., proposes "Cotton Leaf Spot Diseases Detection Utilizing Feature Selection with Skew Divergence Method " which exposes the novel approach of analysis at existing works based on machine vision system for the identification of the visual symptoms of cotton crop diseases, from RGB images. In this research work described that goal of identifying foliar diseases in cotton plantations. The primary goal of the developed system has been to identify the existence of pathogens in cotton fillers. Once a disease is identified it has to be automatically classified through further processing of the corresponding image. In this work the new feature extraction method has been proposed using Enhance PSO with Skew divergence technique. The obtained features have been classified using SVM, BPN and Fuzzy classifiers. The cotton leaf disease dataset was collected from south zone of Tamil Nadu at Andhiyaur district. Selection method when used with SVM, BPN and Fuzzy classifiers gives the accuracy of only 91%-93%. The Experimental result has been obtained by testing all the existing and proposed method with our own dataset [3]. Diao zhihua, et.al., In their paper on " Image segmentation method for cotton mite disease based on color features and area thresholding" shows the experimental results of above mentioned topic algorithm is of effective in segmenting cotton disease spots. In this article, the study object is cotton mite disease and the main study contents would include: 1) the segmentation of analogous disease spots and green plants under background 2) the segmentation of cotton mite disease spots and stems. They found 26 kinds of common grape diseases. This proposed algorithm canbetter complete segmentation of color images of cotton mite-disease; average correct extraction rate could reach up to high percentage. It could lay a foundation for automatic identification of cotton mite disease [4]. Mr. V. A. Gulhane, et.al., suggested " Detection of Diseases on Cotton

Leaves and Its Possible Diagnosis" which discussed the segment cotton leaf pixels within the image. The software can provide the exactly differentiate the variation of color present on these leaves and depending upon that variation the further compare with database stored image features related to the colour. Here there is more scope to reduce the various errors which will be occurred during the simulation, that can be minimize as the more no of input is provided accordingly. ANN method is providing 85 to 91% of exact disease detection depending upon the quality of image provided by the portable scanner and the training. That is because of training feature of ANN approach which will not available with fuzzy method [5]. Ashish Miyatra, et.al., presented "A Survey on Disease and Nutrient Deficiency Detection in Cotton Plant " which is a survey on techniques and methodologies used for disease and nutrient deficiency detection in cotton plant and have been studied thoroughly and then compared to get a single view to the user. All the techniques and methodologies proposed by researchers have been discussed. Not only techniques but their performance, limitations, accuracy everything has been analyzed and discussed in this paper, Very high accuracy and least time are major advantages offered, but it backs away hen implementing practically. It will come with alternate ways in future as lot of research is going on in this area. Use of optical sensors is probably not too much useful as far as detection is concerned [6];

III. PROBLEM DEFINITION

Disease on the cotton is the main problem that decreases the productivity of the cotton. The main source for the disease is the leaf of the cotton plant. About 85% of disease on the cotton plant is on its leaves. Mainly the detection and identification of leaf diseases can be done by naked eye observation by manual recognition or diagnosed by farmers because they usually judge the symptom by their experiences. But it might leads to some erroneous control measurements. So accurate technique is needed which is given by only computers. Various methods are suggested to diagnosis the cotton leaves using various approach suggesting the various implementation. In the research of identifying and diagnosing cotton disease using computer image in the agriculture, feature selection is a key question in pattern recognition and affects the design and performance of the classifier. The fuzzy feature selection approach fuzzy curves (FC) and surfaces (FS) but it reduces the dimensionality of the feature space. Segmentation algorithms with its two classes are as, algorithms focusing on locating discontinuities in the data are primarily edge-based, while algorithms concerned with locating adjacent pixels based on similarities are primarily region-based. Threshold techniques are the one method. Another method of disease detection from color imaginary using hybrid intelligent system, in that automatic plant disease diagnosis using multiple artificial intelligent techniques. The system can diagnose plant leaf disease without maintaining any expertise once the system is trained.

IV. EIGEN SPECTRUM MODELING

From a given set of w-by-h images of leaves, we can from a training set of column image vectors{Xij} where Xij € IRn=wh, the ordering of pixel elements of image j of test image i. Now the number of total training sample is l=Σi=1p qi. For image recogination, each disease leaf image is a class with prior probability ci. The within class scatter matrix[18] is defined by

Sw=Σi=1p ci/qiΣj=1q i (Xij-Xi ')(Xij-Xi ')T (1)
The between class scatter matrix Sb and the total scatter matrix are defined by

Sb=Σi=1pci(Xi '-X')(Xi'-X')T (2)
St=Σi=1pci/qiΣj=1qi (Xij-X')(Xij-X')T (3)
Now where, Xi'=qi-1Σj=1qi Xij and Xi=Σi=1pciXi'

Let Sg, g€{t,w,b} represents one of the above scatter matrices. If we regard the elements of the image vector and the class mean vector as a features decorrelated by solving the eigenvalue problem.

∧g=ΦgTSgΦg∧g is the diagonal matrix of eigenvalues λ1 g,…, λng
corresponding to the eigenvectors, now we have to stored this eigenvectors in descending order.

V. FLOW OF OPERATIONS

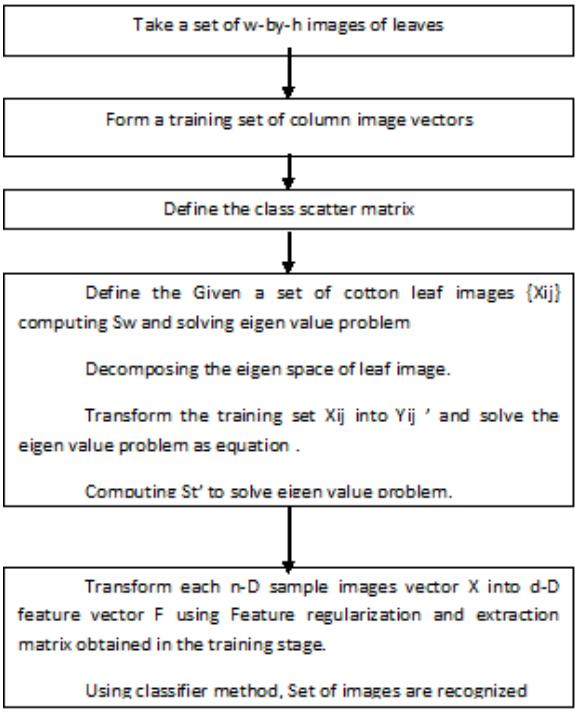

Fig 1.Flow of Operations

VI. RESULTS

A. Sample Train Matrix

As in fig 2, it is called as the finally obtained sample train matrix containing training values of disease detection and based on this the image which is analyzed is compare for its disease. Here the database is created called as N sample train matrix.

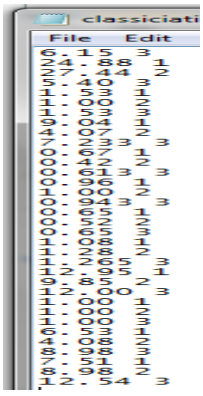

Figure 2. Sample Train Matrix

The train matrix which is obtained here is for the 100 sample images. i.e. it having N=50, it contains the various feature values of diseases.

B. Disease Detection

Now Here we consider an image as shown in figure 3, these images we choose randomly for analysis point of view from the database of 50 images it is majority found that the cotton leaf is mostly affected by the disease called Black spots. As shown fig below during the period of August to December, is about 90% means out of 50 samples, about approx. 45 out of them are highly affected by Black Spots i.e. fungal disease.

Fig 3. Sample Image

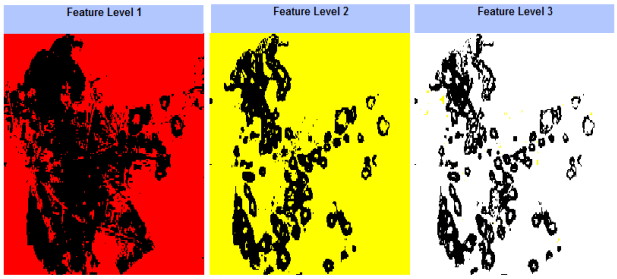

Fig 4. Feture Extraction

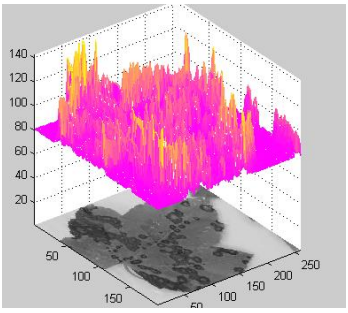

Fig 5. Eigen Feture

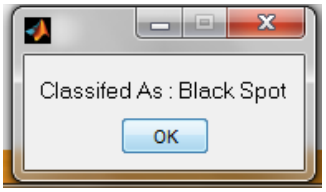

Fig 6. Disease Detected

The detection of The Black spot Disease (Fungal Disease) is as shown in figure 6.

VII. CONCLUSION

This paper addresses an appropriate method i.e. Eigen feature regularization and feature extraction which shows, how the disease analysis is possible for the cotton leaf disease detection. We able find out the various diseases present on the cotton leaves in the early stage before it will damage the whole plant and if it detects in early stage we can say that, we able to make better Productivity.

The result obtained as in figure 6 motivates us to detect more possible diseases on the leaf of cotton plant. From this method about 97% of detection of Back spot i.e. fungal disease is detected, Also a disastrous disease like Anthracnose is detected with about 95%.

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