An Improved Cotton Leaf Spot Disease Detection using Proposed Classifiers

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Abstract

A machine learning approach based on digital cotton leaf disease classification and retrieval can be achieved by extracting features from its leaf image. Various approaches has been used to classify the class of leaf diseases based on the crops features. In this investigation crops are classified on the foundation of shape, color and texture with SVM, BPN, Fuzzy along with Edge, CMYK features and GA feature selection are combined for training and testing the cotton diseases dataset. Then extract edge, color and texture features using proposed Enchance Particle Swarm Optimization (EPSO) feature selection method adopts Skew divergence features. Variance has been used to recognize the wounded leaf part. After that Proposed classifiers are Cross Information Gain_Deepforward Neural Network, Cross Information Gain_Minimal Resources Allocation used to predict the disease. The overall system Performance evaluation proved the effectiveness of the proposed techniques. Finally the classification accuracy of this system was calculated.

1. Introduction

Leaf diseases play a vital role in the agricultural environment. Presently most probably diseases affected in leaf region. So yield loss increases and profit is reduced.This investigative work overcomes the existing problems and describes the entire performance of cotton leaf disease detection has been alculated by the proposed classifiers along with optimization feature selection methods adopted, the features were extracted the cotton leaf.

The leaf disease is a significant component of the crops [1]. The diseases can be easily recognized with the help of the polluted vicinity of the crop. Usually the leaf will naturally reveal the impure part in a clear way which can be easily recognized. Commonly by naked eyes, we can easily identify the infected region. So we can say the transformation in the crop color is the imperative feature for the notification, when the health of the crop is in good stage. Then the color of the crop is dissimilar but as soon as the crop is going to be affected by some harming pathogens, the color transforms automatically. Crop diseases have turned into a dilemma because it may cause a diminution in productivity [2]. In this research work the goal of identifying foliar diseases is described in cotton crops. The major objective of the developed system has been to identify the existence of pathogens in cotton fillers. Once a disease is recognized, it has to be automatically classified through further processing of the corresponding image. A survey was conducted in one of the south zone, particularly in Andhiyur district, Tamil Nadu. Data set collection for the investigation was congregated from the farmers' side. The suggestion about the cotton crop diseases details.

(Hui Li et al., 2011) has been developed using the Web-Based Intelligent Diagnosis System for Cotton Diseases Control system and proposed a BPN. A research work was designed for the system test, in which 80 samples, including 8 main species of diseases, 10 samples in each sort were included [3]. (Yan Cheng Zhang et al., 2007) Proposed fuzzy feature selection approach - fuzzy curves (FC) and fuzzy surfaces (FS) – to select features and classification of cotton disease levels [4]. (Syed A. Health et al.,) This research work described the automated system that can identify the pest and disease affecting parts such as cotton leaf, boll or flower for this a CMYK based image cleaning technique to remove shadows, hands and other impurities [5]. (Bernardes A. A. et al., 2011) is the proposed method for automatic classification of cotton diseases through feature extraction of leaf symptoms from digital images. Wavelet transform energy has been used for feature extraction while SVM has been used for classification of diseases. The image set of apparently contaminated leaves was classified within one of the four other sub-classes, namely: MA, RA, AS, and NONE [6]. (Meunkaewjinda. A, et al., 2008) This Proposed work discusses how the cotton leaf disease segmentation is performed using modified SOM with genetic algorithms for optimization and support vector machines for classification [7]. (Gulhane. V. A et al., 2011) This work describes the Self organizing feature map together with a back-propagation neural network used to recognize the color of the image. After classified the cotton leaf diseases [8]. (Viraj A. Gulhane. et al., 2012). This proposed work addresses the disease analysis possible for the cotton leaf disease recognition, the analysis of the various diseases present on the cotton leaves can be effectively detected in the early stage before it will injure the whole crops, Initially we are able to detect three types of diseases of the cotton leaves by the methodology of Eigen feature regularization and extraction technique [9]. (Qinghai. H. et al., 2011)This paper the author described RGB color model, HIS color model, and YCbCr color model for extracting the injured image from cotton leaf images developed. This work represents the comparison of the results obtained by implementing in dissimilar color models, the comparison of results represents good accuracy in both color models and YCbCr color space is considered as the best color model for extracting the damaged image [10].

2. Material and Methods

This work depicts the existing classifiers with feature selection (GA). Features and proposed work based on cotton leaf disease categorization has been used for the proposed classifiers are CIG_DFNN, CIG_MRAN and proposed EPSO feature selection method adopts Skew divergences edge, color, texture variance feature techniques used to extract the disease affected part of a leaf image. Features like the shape, color, texture features are methods to investigate. Finally the performance evaluation of six types of diseases based on accuracy and time complexity of this system is obtained.

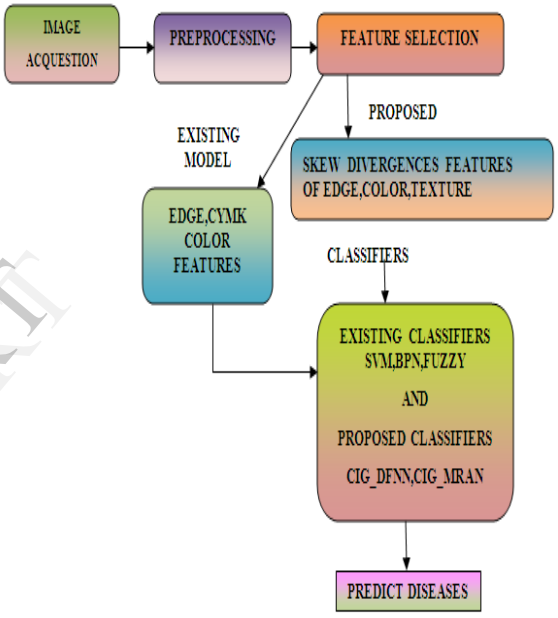


Fig 1: The Proposed Architecture diagram of Cotton Disease Detection System

This work exposes on various approaches where classifiers with a proposed feature selection has been used to gain optimal solution for affected part of leaf images. Proposed classifier is correctly detected and identifies six types of diseases.In this work 270 images have been used to train and 120 images are tested, and finally the performance evaluation of existing with a proposed models are analyzed.

First, in this work subset of feature selection has been used in feature extraction of cotton leaf disease like GA with Edge, CMYK color features and proposed feature selection EPSO method adopts Skew divergences variance features. Feature extraction method adopts has been used to statistically analyze the affected part of the leaf, edge, color, texture variance features. Subsequent to that score level

fusion method has been used in combination based method was such that product rule and sum rule was frequently used to determine the final score. Matching score-level fusion which combines the matching scores from the individual matchers of 16 *16 block wise (JFV) feature variance is calculated by the affected part of the leaf region. The following methods have been used to boost up the accuracy rate from existing features and classifiers.

Second, in this work classification has been performed by using the existing classifiers like SVM, BPN, Fuzzy andproposed classifiers were CIG_DFNN, CIG_MRAN to inspect the results of cotton leaf disease classification. Then performance of this system has been evaluated and compared.

3. Enhance Particle Swarm Optimazation based Feature Extraction Method (EPSO)

Enhanced Particle Swam Optimization method adopts the Skew divergence variance features method applied for feature extraction from diseased cotton leaf images. Feature extraction is performed by splitting the input image into pixels value, then set the color variance and quantization value of edge detector. Existing methods work only with Canny and Sobel edge detector and color splitting (CMYK), it will not check the individual pixel wise or block wise of Edge, color and texture variances. Initially a simple edge detection is carried out and blocks with edge pixels inside are judged into the structural category. Then, the color variance is calculated in the remaining blocks. Find the variation across the edge based on Canny and Sobel along with color splitting methods (CMYK). Variations in the gray levelin a region in the neighborhood of a pixel are a measure of the texture. Then calculate the feature level fusion to combine the Edge, color and texture feature sets, after normalization in order to yield a joint feature vector (JFV). Instead of using GA for selection of the best features in the feature vector, we used proposed EPSO to select the best parameters from both global and local features results. Initially select the feature vectors for training, we define the decision function (W) to classify the feature vectors W, based on decision function. We classify the training samples into -1 or +1. If the objective or decision function f (W) is greater than zero, then we define the class label as +1. Otherwise it is considered as class label of -1. Finally the regions are classified by using the SVM classifier, such that BPN, Fuzzy and Proposed classifiers are CIG_DFNN, CIG_MRAN are used to identify the diseases. Entirely performance evaluation of this system is compared.

4. Comparative Study

The Existing Algorithms were such as BPN, Fuzzy logic and SVM Classifiers with Edge, CMYK color splitting model features and Proposed feature selection based EPSO method adopts Skew divergence variance features extraction algorithm and proposed classifiers CIG_DFNN and CIG_MRAN has been combined with real time collected cotton leaf diseased dataset. In this investigation the existing models show low accuracy rates and error rates are augmented. Then the proposed classifiers and feature selection in EPSO adopts method Skew divergences features have been increasing the accuracy rates. But existing classification algorithms have some disadvantages, so we have overcome such problems. Enhancements of the other best classifier are like as CIG_DFNN and CIG_MRAN to predict the result is required. Finally the performance of this system is obtained. The proposed models achieved high accuracy rate and are less time consuming. The error rate from the other existing models is diminished.

5. Results and Discussion

The real time cotton leaf diseased data set was collected from south zone of Tamil Nadu at Andhiyaur district in the month of June 2012. Surabi and Hybrid varities from maximum incidence was recorded for upto one week. The diseased images 270 data set was collected from the field. The researcher directly met the farmers and got suggestions from them. In this study dataset was captured and collected by camera mobile (Nokia). After that dataset used has an input image and interpretation in advance version 2010a Matlab tool environment. Six types of diseases such as Bacterial Blight, Fusarium wilt, Leaf Blight, Root Rot, Micronutrient and Verticillium wilt was used for analysis.

First, initialize the training database, resize the images to 150*150 sizes. Subsequently edges detected by using Canny with Sobel techniques are combined, finally find out edge features. Mean (or) average filter was used to remove the noise. Features extracted from the test image (new features) are compared with the features available in the training set (features). RGB2 CMYK color features are extracted and stored in GG, RGB2 IND features are extracted and stored in II.Rgb2 gray features. The

histogram was obtained and stored in the variable Imgh1.

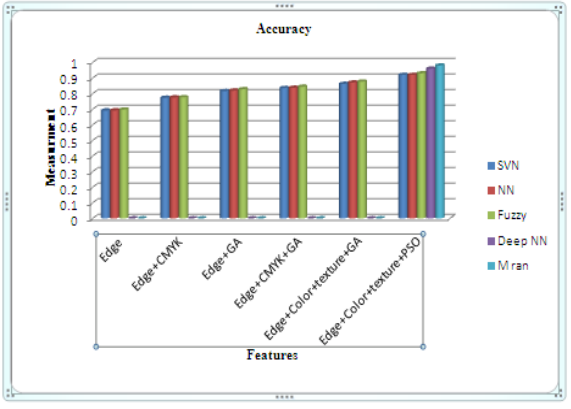
The Existing algorithms such as BPN, Fuzzy logic and SVM Classifiers with Edge, CMYK Color splitting model features and proposed classifiers were CIG_DFNN, CIG_MRAN with feature selection resembling Enchance Particle Swarm Optimization (EPSO) method adopts Skew divergence such that edge, color, texture variance features have been combined, trained and tested with real occasion collected cotton leaf diseased dataset. This paper exposes the existing and proposed models that have been used to analyze. Lastly the performance evaluation of this system is obtained.

Table 1: The Performance Evaluation of different methods

Features	SVN	NN	Fuzzy	Proposed CIG_DFFN	Proposed CIG_MRAN
Edge	0.69183	0.69245	0.69771	0	0
Edge+CMYK	0.77315	0.77558	0.77633	0	0
Edge+GA	0.81661	0.81958	0.82786	0	0
Edge+CMYK+GA	0.83568	0.83757	0.84414	0	0
Edge+Color+texture+GA	0.8625	0.87135	0.87679	0	0
Edge+Color+texture+PSO	92%	92%	93%	96%	98%

Table 1: Represents the Performance Evaluation of cotton diseases detection system. All the models discussed the proposed models were better than other existing models.

Fig 2: The Performance evaluation of different methods.



2: The chart owes the performance evaluation of this system. These terms determine the proposed models. were given the best results from other existing models.

Table 2. Time Complexity of different models

Features	SVN	NN	Fuzzy	Proposed CIG_DFNN	Proposed CIG_MRAN
Edge(Canny+Sobel)	2.7705	2.1808	1.5912	0	0
Edge+CMYK	2.0909	1.0551	0.019316	0	0
Edge+GA	1.6508	0.83201	0.013254	0	0
Edge+CMYK+GA	1.6125	0.80679	0.001052	0	0
Edge+Color+texture+GA	1.5205	0.76049	0.00048	0	0
Edge+Color+texture+PSO	1.5052	0.75282	0.00047	0.80626	0.53751

Table 2: Shows the time complexity of existing along with proposed models. The terms explained the proposed features along with classifiers used to analyze disease, Its time was very less from other existing features with classifiers.

Fig 2: Chart for the Time Complexcity

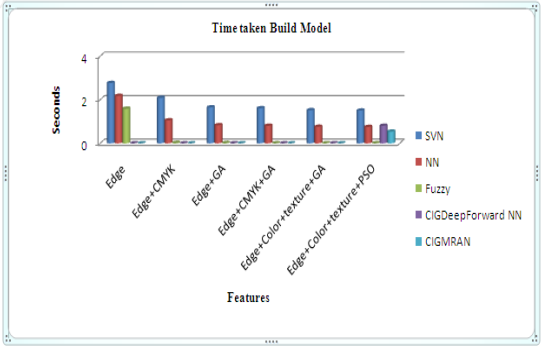


Figure2: Chart exposes the time complexity of existing and proposed models. The terms expose proposed classified diseases analyzed. Its time was very less from other existing methods.

6. Conclusion

In this work the new feature selection method has been used by proposed Enhance PSO method adopts Skew divergence techniques and proposed classifiers were CIG_DFNN and CIG_MRAN. Subsequently classifiers SVM, BPN and Fuzzy have been used.The experimental results were obtained by testing all the existing and proposed methods with real time cotton

leaf disease dataset. Table 1, 2 and Fig 1, 2 outcome terms showed higher accuracy when our proposed EPSO algorithm is combined with fuzzy classifiers. When comparing all the results, the experimental results clearly show that, the proposed classifiers and EPSO feature method gives better performance when combined with SVM, BPN and Fuzzy classifier. The accuracy of 96% and 98% is obtained using proposed classifiers and EPSO feature selection, which extracts edge, color and texture features and a feature vector, is constructed using Skew divergence features variance (distance methods). The performance of Fuzzy classifier is compared with SVM and BPN classifiers with proposed classifiers. Finally performance is obtained. The proposed models gave better results than other existing models. The system proved the diseases were appropriately classified and less time consuming than other existing techniques.

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8. References

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