A Review Paper on: Commercial Crops DiseaseDetection for Maharashtra State using Image Processing

Deepak R. Khadse **Dr.Ranjana D.Raut** **Abhishek D. Raut**

Abstract—**Paper discusses a survey on various types of diseases found on the commercial crops such as Cotton, Soybean, Rice, Wheat, Javari, Maize etc. in Maharashtra State. India is an Agriculture country. Various types of diseases are found on the commercial crops and it's very difficult to diagnose the symptoms by naked eye by every farmer in the farm. Diagnosis is most difficult task to perform manually. So disease detection on commercial crops is very important. Now a day's different image processing techniques are used for detection of diseases. NN classifiers perform optimally in classifying crop diseases. Objective is to obtain highest accuracy by developing less complex NN model.**

I. INTRODUCTION

The present review explores various diseases on cash crops and recognizes the need for developing a rapid, cost-effective and reliable system for detecting diseases that would upgrade the agricultural sector. It describes the currently used technologies to assist in monitoring health and diseases in Crops under field conditions. These technologies include spectroscopic and imaging based and volatile profiling-based plant, artificial neural network, machine vision, using machine learning database and real data for Site-specific crop diseases management for agriculture field.

Now with the recent advances in science and technology, evaluation of crops has become highly scientific. Plant diseases reduce both quantity and quality of plant products. The prime objective of plant pathology is to prevent epidemic which are widespread outbreak of destructive diseases. Knowledge of different disease causing pathogen and their control is very essential in order to prevent the epidemics of the disease. With a growing human population and a changing climate, there is an increasing threat to many ecosystems an expert on one species or family may be unfamiliar with another. Commercial production of Cotton, Soybean, Rice, Wheat, Javari, Maize etc.is a potential source of income to farmers.

II. LITERATURE REVIEW

Xiao jing Niu proposed an automatic and efficient solution with K-means clustering and Implementation of K-means clustering algorithm in wheat leaf disease segmentation. Firstly, the color image is transformed to Lab color space from RGB. Clustering is then done by taking the absolute difference between each pixel and the clustering center in Lab color space. Unlike traditional methods, proposed method does not need manual setting for threshold value and is not affected by the selected channel. Segmentation accuracy rates for three common diseases such as powdery mildew, leaf rust and stripe rust can be increased, which will prove the efficacy of proposed method [1].

Zhaobin Wang proposed a new method for plant recognition based on leaf image using ICM and SVM. In this method, entropy sequence from ICM represents the texture feature of leaf. Shape feature of leaf also is employed in the form of center distance sequence. Principal Component Analysis (PCA) is employed to reduce redundant data of feature vector. Support Vector Machine (SVM) was taken as the classifier [2].

Xiaojun Yin proposed a cotton pest and disease collection system based on mobile terminal, combined with cotton pests and diseases related database design. The system is easy to use, and bears the property of multi-point collection, real-time update of wide range of cotton pests and diseases data. Finally, a new technology consisting of the region-oriented cotton pest and disease data collection and processing, as well as active service model is proposed. It manages to realize the collection and interaction of information of cotton pests and diseases and to realize the display of data; by way of 3G/Wi-Fi, it transfers data to the web server and enters into the database after pre-processing. The network layer aims to explain users' different types of request to the application layer and data layer, and then sends back the processing results [3].

Shanwen Zhang identified and diagnosed the plant disease using computer vision intellectively in the agriculture, feature extraction or dimensionality reduction is a key step in plant disease recognition. So far, Bayesian maximum likelihood (BML), artificial neural networks (ANNs), Decision Trees, K means, K-nearest-neighbors, Support Vector Machines (SVMs) and linear discriminate analysis (LDA) were introduced into plant leaf disease classification and recognition looking for fast, automatic, less expensive and accurate method to detect plant diseases is of great realistic significance. By using the symptoms of the plant disease leaves, a supervised orthogonal nonlinear dimensionality reduction algorithm, named orthogonal locally discriminate projection (OLDP), is presented for plant disease recognition in this paper. The proposed algorithm aims to find a projecting matrix by pulling the data points in the same class as close as possible, while

pushing the data points in different classes as far as possible. The highlights of OLDP include 1) It takes both of the local information and the class information of the data into account; 2) It considers the effect of the noisy points and outliers; 3) It is supervised and orthogonal. The experimental results on real maize disease leaf images demonstrate that the proposed method is effective and feasible for the detection of plant leaf diseases [4].

Hrishikesh proposed external quality inspection of leaves using image processing technology, the proposed methodology used leaf features for disease detection where feature extraction is done on segmented diseased area. Hue image from HSI gave clear discrimination of diseased spots, and which is more helpful for extracting size, color, proximity and centroids. These features served as inputs to neural network for the classification of 4 different leaf diseases which shows accurate classification [5].

P. Revathi proposed work is based on Image Edge detection segmentation techniques in which, the captured images are processed for enrichment first. Then R, G, B color Feature image segmentation is carried out to get target regions (disease spots). Later, image features such as boundary, shape, color and texture are extracted for the disease spots to recognize diseases and control the pest recommendation [6].

M. Hemalatha detected Cotton leaf spot diseases in by using Homogenous Segmentation based Edge Detection Techniques. This system is analyzed with eight types of cotton leaf diseases they are fusarium wilt, verticillium wilt, root rot, boll rot, Rey mildew, leaf blight, bacterial blight, leaf curl. Symptoms of cotton leaf spot images are captured by mobile and classification is done by using neural network [7].

Viraj A. Gulhane proposed work addresses the disease analysis 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 will be able to detect three types of diseases of the cotton leaves by the methodology of Eigen feature regularization and extraction technique. In this proposed method 90% of detection of Red spot i.e. fungal disease, it is most dangerous disease; it can highly affect the productivity of the cotton crop to a large extent. If it detects in early stage we can say that, we will able to make better manufacture [8].

Song Kai proposed work is based on maize disease image recognition of corn leaf based on image processing and analysis, which is to study diseases of image classification. According to the texture characteristics of corn diseases, it uses YCbCr color space technology to segment disease spot, and uses the co-occurrence matrix spatial gray level layer to extract disease spot texture feature and uses BP neural network to class the maize disease. Application YCbCr color space technology segmented disease spot, and using the co-occurrence matrix spatial gray level layer extracted disease spot texture feature of using BP neural network, on maize disease classification identification[9].

MrunaliniBadnakhe proposed the application of K- means clustering and neural network has been formulated for the clustering and classification of disease that affect a plant leaves. This work has been done for five diseases [10].

Hui Li proposed work describes about the diagnosis of cotton leaves using various approaches suggesting that the various implementation ways as illustrated and discussed below. It has been implemented the Web-Based Intelligent Diagnosis System for Cotton Diseases Control system the author proposed a BP neural network for his system. A research scheme was designed for the system test, in which 80 samples, including 8 main species of diseases, 10 samples in each sort were included. The result showed the rate of correctness that system could identify the symptom was 89.5% in average, and the average running time for a diagnosis was 900ms [11].

Yingfeng Zhou Approach improvement in segmentation of other rice diseases, a modified BPNN is proposed to rice blast disease spots segmentation and experiments are made on 20 rice blast samples. BP neural network with a hidden layer could be used to approach a continuous function in any closed interval, and a three-layer BP neural network could realize any mapping from n dimension to m dimension. The BP neural network containing a hidden layer is adopted, in other words, the network consists of three layers: input layer, hidden layer and output layer [12].

Yuan Tian proposed method to monitor four main wheat plant diseases: powdery mildew, leaf rust pucciniatriticina, leaf blight, pucciniastriiformis. These proposed systems make use of stacked structure to combine the results obtained from three support vector machines (SVMs)-based classifiers. The three features obtained are color feature, texture feature, and shape feature which further used as training sets for three corresponding classifiers. This system is mainly divided into three main steps: data acquisition, feature extraction and classifier design. Multiple Classifier System (MCS) includes number of classifiers which can provide higher classification accuracy [13].

Zhang Jian applied support vector machine method for the identification of cucumber diseases. It carried out two sets of tests using different kernel functions. The results showed that, the SVM method based on the RBF kernel function when we took each spot as a sample made the best performance for classification of diseases of cucumber. This method could not only improve the recognition accuracy of cucumber diseases, but also make the automatic identification of diseases possible [14].

Jinghui Li proposed method of automatic identification of three wheat diseases were applied by analyzing the morphological characteristics extracted from their images. Segmenting, three kinds of wheat diseases images on wheat powdery mildew,

wheat sharp eyespot, and wheat stripe rust. Extracting and optimizing the morphological data and using statistical analysis software to analysis the data with the principal component analysis and the discriminated analysis, five characteristic parameters such as Sphericity, Roundness, Hu1, Hu2, equivalent radius were selected as the identification factors. The recognizable rates of the samples among the three wheat diseases were 96.7%, 93.3%, and 86.7% respectively using the factors [15].

Libo Liu proposed a system for classifying the healthy and diseased part of rice leaves using BP neural network as classifier. Rice brown spot was select as a research object and the images of rice leaves were acquired from the northern part of Ningxia Hui autonomous region. Here the color features of diseases and healthy region were served as input values to BP neural network. The result shows that this method is also suitable to identify the other diseases [16].

G. Anthonys' is to develop an image recognition system that can recognize paddy diseases. Images were acquired under laboratory condition using digital camera. Three major diseases commonly found in Sri Lanka, Rice blast (Magnaporthegrisea), Rice sheath blight (Rhizoctoniasolani) and Brown spot (Cochiobolusmiyabeanus) were selected. Image processing starts with the digitized a color image of paddy disease leaf. Then a method of mathematics morphology is used to segment these images. Then texture, shape and color features of color image of disease spot on leaf were extracted, and a classification method of membership function was used to discriminate between the three types of diseases [17].

SantanuPhadikar "Rice Disease Identification Using Pattern Recognition Techniques" proposed the system for disease detection based on the infected images of various rice plants and they used image growing, image segmentation techniques to detect infected parts of the plants. Zooming algorithm and Self Organize Map (SOM) neural network are used to extract features of the images and for classifying disease rise images respectively [18].

Geng Ying proposed work A Study on the Method of Image Pre-Processing for Recognition of Crop Diseases is the method of image pre-processing for recognizing crop diseases was studied and compared the effect of two filters-Simple filter and Median filter, and at last we chose median filter to wipe out the disturbance of noise effectively, and two-apex method was applied to separate the disease images from the background. Disease spots were separated through performing image edge detection and Snake model, and the latter got more desired result. Thus the image pre-processing made a good foundation for following effective characteristic parameters for the disease diagnoses and setting up pattern recognition system [19].

Yan-chengzang the fuzzy feature selection approach -fuzzy curves (FC) and surfaces (FS) for cotton leaves disease image feature selection. This research is done in two steps .First to automatically and quickly isolate a small set of significant features from a set of original features according to their significance and to eliminate spurious features they make use of FC. Secondly to isolate the features dependent on the significant features, utilize FS. This approach is useful for practical classification applications which reduce the dimensionality of the feature space. The feature selection technique has faster execution speed and higher classification success rate because it does not suffer from the local minima problems inherent in the nonlinear modeling techniques typically used in forward selection and backward elimination [20].

Stephen Gang Wu Probabilistic Neural Network (PNN) with image and data processing techniques to implement a general purpose automated leaf recognition for plant classification. 12 leaf features are extracted and orthogonal zed into 5 principal variables which consist the input vector of the PNN. The PNN is trained by 1800 leaves to classify 32 kinds of plants with accuracy greater than 90%. Compared with other approaches, algorithm is an accurate artificial intelligence approach which is fast in execution and easy in implementation [21].

III. BASIC FLOW OF IMAGE DETECTION ALGORITHM

The main purpose of image analyzer is to extract the symptom from abnormal leaf. As depicted in Figure 1, it consists ofvarious steps of image enhancement and edge detection, image segmentation, feature extraction, statistical analysis, and classification. Image is captured by the digital camera having high resolution. Then image-processing techniques are applied to the acquired images to extract useful features that are important for further analysis. After several analytical techniques are used to classify the images according to define various problems.

CONCLUSION

Present paper discusses different approaches taken by researchers for detection and diagnosis of diseases on crops.Various diseases can be detected using image processing, neural network, artificial neural network, statistical techniques.Similarly, to unfold the same facts we can use the techniques like, basic image processing, segmentation, image processing with matched filter, fuzzy logic methods, features extraction etc.

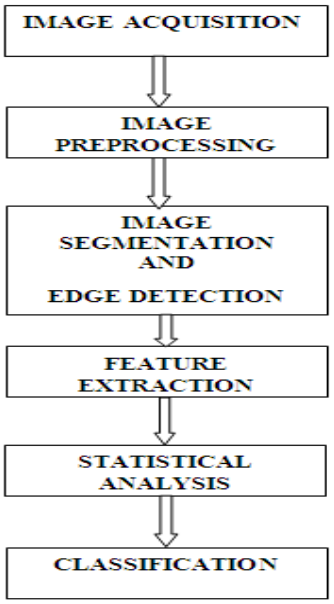

Fig.1. Basic Flow of Image Detection Algorithm

REFERENCES

[1] XiaojingNiu , ShihuiGuo, Meili Wang, Hongming Zhang, Xianqiang Chen, Dongjian He, " Image Segmentation Algorithm for Disease Detection of Wheat Leaves'', IEEE Transaction on Advanced Mechatronic Systems, August 10-12, 2014.

[2] Zhaobin Wang, Xiaoguang Sun, Yide Ma, HongjuanZhang ,YurunMa,WeiyingXie, "Plant Recognition Based on Intersecting CorticalModel'', IEEE Transaction on Neural Networks (IJCNN) July 6-11, 2014.

[3] QingzhanZhao, ChuanjianWang, Guangcai Jin, Xiaojun Yin, ''Design and Implementation of the Pests and Diseases Information Collection System for Cotton Fields Based on Mobile terminals", IEEE Transaction on Information Technology and Applications, 2013.

[4] Shanwen Zhang, Chuanlei Zhang, ''Orthogonal locally discriminant projection for classification of plant leaf diseases", IEEE Transaction on Computational Intelligence and Security, 2013.

[5] Mr. Hrishikesh P. Kanjalkar, Prof. S.S.Lokhande, "Detection and Classification of Plant Leaf Diseases using ANN", International Journal of Scientific & Engineering Research, Volume 4, Issue 8, August-2013.

[6] P. Revathi M. Hemalatha, "Advance Computing Enrichment Evaluation of Cotton Leaf Spot Disease Detection Using Image Edge detection", IEEE Transaction on ICCCNT'12, 26 _28 July 2012.

[7] P. Revathi M. Hemalatha, "Homogenous Segmentation based Edge Detection Techniques for Proficient Identification of the Cotton Leaf Spot Diseases", International Journal of Computer Applications, Volume 47, No.2, June 2012.

[8] Ajay A. Gurjar and Viraj A. Gulhane, "Disease Detection on Cotton Leaves by Eigenfeature Regularization and Extraction Technique". IJECSCSE.Volume 1, ISSUE1,PP. 1-4, 2012.

[9] Song Kai, "A Research of maize disease image recognition of Corn Based on BP Networks", IEEE Transaction on Measuring Technology and Mechatronics Automation, 2011.

[10] Mrunalini R. Badnakhe , "An Application of K-Means Clustering and Artificial Intelligence in Pattern Recognition for Crop Diseases ", International Conference on Advancements in Information Technology With workshop of ICBMG 2011IPCSIT, vol.20, 2011, IACSIT Press, Singapore.

[11] Hui Li, RonghuaJi, Jianhua Zhang, Xue Yuan, Kaiqun Hu and LijunQi,"WEB-Based Intelligent Diagnosis System for Cotton Diseases Control", IEEE Transaction on Advances in Information and Communication Technology, 2011.

[12] Yingfeng Zhou, Yaming Wang, Qing Yao, "Segmentation of Rice Disease Spots Based on Improved BPNN", IEEE Transaction 2010.

[13] Yuan Tian, ChunjiangZhao,ShenglianLu,andXinyuGuo, ''SVM- based Multiple Classifier System for Recognition of Wheat Leaf Diseases", IEEE Transaction on Dependable Computing (CDC'2010) November 20-22, 2010.

[14] Zhang Jian, Zhang Wei "Support Vector Machine For Recognition Of Cucumber Leaf Diseases", IEEE Transaction 2010.

[15] Jinghui Li "Extraction and analysis of digital images feature of three kinds of wheat diseases", IEEE Transaction on Image and Signal Processing, 2010.

[16] Libo Liu, Guomin Zhou, "Extraction of the Rice Leaf Disease Image Based on BP Neural Network", IEEE Transaction, 2009.

[17] G. Anthonys', N. Wickramarach ,"An Image Recognition System for Crop Disease Identification of Paddy fields in Sri Lanka '', IEEE Transaction on Industrial and Information Systems, ICIIS 2009..

[18] SantanuPhadikar& Jaya Sil "Rice Disease Identification Using Pattern Recognition Techniques," IEEE Transaction on Computer and Information Technology 2008..

[19] Geng Ying, Li Miao, Yuan Yuan , "A Study on the Method of Image Pre-Processing for Recognition of Crop Diseases", IEEE Transaction 2008.

[20] Yan Cheng Zhang, Han Ping Mao, Bo Hu, Ming Xilinx,"Features Selection of Cotton Disease Leaves Image Based on Fuzzy Feature Selection Techniques", IEEE Transaction on Wavelet Analysis and Pattern Recognition, Beijing, China, 2-4 Nov. 2007.

[21] Stephen Gang Wu, Forrest Sheng Bao, Eric You Xu, Yu-Xuan Wang, Yi-Fan Chang , "A Leaf Recognition Algorithm for Plant Classification Using Probabilistic Neural Network", IEEE Transaction on Signal Processing and Information Technology, 2007.