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SURVEY ARTICLE

IMAGE RECOGNITION BASED CROP DISEASE IDENTIFICATION SYSTEM: A SURVEY

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Abstract-***The diseases on the cotton are a crucial issue which makes the sharp decrease in the production of cotton. These require careful diagnosis and timely handling to protect the crops from heavy losses. Now a day's crop faces many diseases. The naked eye observation of experts is the main approach adopted in practice for detection and identification of cotton plant diseases. But, this needs continuous monitoring of experts which might be prohibitively expensive in large farms. So automatic detection of cotton plant diseases are an important research topic as it may prove benefits in monitoring large field of crops, and thus automatically detect diseases from symptoms that appear on plant leaves. For detecting diseases on the cotton early and accurately we can use image processing technique. This paper provides a various methods to detect plant diseases using image processing technique***

Keywords— ***Plant leaf disease; feature extraction; image processing***

I. INTRODUCTION

Agriculture is the mother of all cultures. It has played a key role in the development of human civilization. Agricultural practices such as irrigation, crop rotation, fertilizers, and pesticides were developed long ago, but have made great progress in the past century. By the early 19th century, agricultural techniques had so improved that yield per land unit was many times that seen in the middle ages. Agricultural production system is an outcome of a complex interaction of soil, seed and agro chemicals (including fertilizers). Therefore, there is need to take good judgment for management of all the inputs is essential for the

sustainability of a complex system. The focus on increasing the productivity, without considering the ecological impacts has resulted into environmental degradation. Without any adverse effect, increment of the productivity can be done in a sustainable manner. Plants exist everywhere on the earth. Many plants play a significant role for the development of human society. As diseases of the plants are inevitable, detecting disease plays a major role in the field of Agriculture. Plant disease is one of the important factor causes that reduces quantity and degrades quality of the agricultural products.

Diseases and insect pests are the major problems in agriculture. These require careful diagnosis and timely handling to protect the crops from heavy losses. In plant, diseases can be found in various parts such as fruit, stem and leaves. Plant diseases cause periodic outbreak of diseases which leads to large scale death and famine. It is estimated that the outbreak of helminthosporiose of rice in north eastern India in 1943 caused a heavy loss of food grains and death of a million people. Since the effects of plant diseases were very destructive, some of the crop cultivation has been uncontrolled. It is estimated that 2007 plant disease losses in Georgia (USA) is approximately $653.06 million. In India no estimation has been made but it is more than USA because the preventive steps taken to protect our crops are not even one-tenth of that in USA [1].

The naked eye observation of experts is the main approach used in practice for detection and identification of plant diseases. But, this needs continuous monitoring of experts. When there is a large farm, this approach might be prohibitively expensive. Further, in some developing countries, farmers may have to go long distances to contact experts, this makes consulting experts too expensive and time consuming and moreover farmers are unaware of non-native diseases.

Automatic detection of plant diseases is an important research topic as it may prove benefits in monitoring large field of crops, and thus automatically detect diseases from symptoms that appear on plant leaves. Thus automatic detection of plant disease with the help of image processing technique provides more accurate and robot guidance for disease management. Comparatively, visual identification is less accurate and time consuming

II. LITERATURE REVIEW

Various paper are suggesting to diagnosis the cotton leaves using various approach suggesting the various implementation ways as discussed below. In the research of identifying and diagnosing cotton disease using computer vision intellectively in the agriculture, feature selection is a key question in pattern recognition and affects the design and performance of the classifier. Image features usally include color, shape, and texture.

A. Detection of disease by extracting color feature

Mohmmad Ei-Helly in paper of title "Integrating Diagnostic Expert System with Image Processing via Loosely Coupled Technique", developed diagnostic expert system with the help of image processing technique. A CLASE (Central Lab. of Agricultural Expert System) diagnostic model is used to manage cucumber crop. The develop expert system finds out the diseases of user observation. In order to diagnose a disease from a leaf image, four image processing phases are used: enhancement, segmentation, feature extraction and classification. They tested three different disorders such as Leaf miner, Powdery and Downey. The proposed approach has greatly reduced error prone dialogue between system and user [3].

Rakesh Kundal & Amar Kapoor in paper of title "Machine learning technique in disease forecasting: a case study on rice blast prediction" proposed a prediction approach based on support vector machines for developing weather based prediction models of plant diseases. In this paper they compared the performance of conventional multiple regression, artificial neural network (back propagation neural network, generalized regression neural network) and support vector machine (SVM). It was concluded that SVM based regression approach has led to a better description of the relationship between the environmental conditions and disease level which could be useful for disease management [4]

Alexander A. Doudkin in "Three Level Neural Network for Data Clusterzation on Images of Infected Crop Field" proposed neural network approach for segmentation of agricultural landed fields in remote sensing data. A neural network algorithm based on back propagation is used for segmentation of the color images of crop field infected by diseases that changes usual color of plants [5].

Santanu & Jaya in paper of title "Rice Disease Identification Using Pattern Recognition Techniques" describe the system for disease detection based on the infected images of various rice plants. In this paper, 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 diseased rise images respectively [6].

Di Cui, Oin Zhang, Minzan Li, Youfu Zhao and Glen L. Hartman in "Detection of soybean rust using a multispectral image sensor" described method for fast & accurate detection & classification of plant diseases. They used Otsu segmentation, K-means clustering & back propagation feed forward neural network for clustering & classification of diseases that affect on plant leaves [7].

In a paper of title "Detection of diseases on cotton leaves and its possible diagnosis" gives the colour image segmentation technique to extract the colour feature of the cotton leaves. This technique provides easy way to extract the various features of diseased leaf of cotton image. After that the unsupervised SOFM network and back propogation neural network are applied for clustered the resulting colour pixels and extract cotton leaf colour from diseased part of image respectively [8].

Kamljot Singh Kailey and Gurjinder Singh Sahdra in paper title "Content based image retrival (CBIR) for identifying image based plant disease" presents a method for identify plant disease based on color, edge detection and histogram matching. This research is divided is into two main phase. In the first phase all the healthy and diseases leaves are given input to the MATLAB. Then RGB color component are separated into gray scale image and apply CANNY's edge detecting technique. After that histogram is plot for each component of healthy and disease leaf image. In the second phase same process is repeated for testing leaf and compared all the stored result and identifies result [9].

An algorithm for disease spot segmentation using image processing technique in plant leaf is implemented by Piyush Chaudhari, Anand K. Chaudhari, Dr. A. N. Cheeran and Sharda Godara. Color transform of RGB image can be used for better segmentation of diseased spot. In this paper they compared the effect of three different color space i,e, CIELAB, HSI, & YbCr. Median filter is used for image smoothing. They found that CIELAB color model is better than other two models [10].

Diao Zhihuo, Wang Huan and Song Yinmao in paper of title "Image segmentation method for cotton mite disease based on colour feature and area threshold" proposed segmentation algorithm based on colour features and area thresholding. This proposed algorithm combined 2G-R-B, single threshold and area thresholding to get disease spot very greatly [11].

B. Detection of disease by extracting shape feature

Panagiotis Tzionas presents design and implementation of an artificial vision system in paper "Plant leaves classification based on morphological feature and fuzzy surface selection technique" which extracts specific geometric and morphological features from plant leaves. In this paper, morphological features of leaves are used for plant classification and in the early diagnosis of certain plant diseases. The proposed system consists of an artificial vision system (camera), a combination of image processing algorithms and feed forward neural network based classifier. A fuzzy surface selection technique for feature selection was used querying image is calculated and the images with the smallest distances are selected and sorted as matching images to the query [12].

Prasad Babu & Srinivasa Rao proposed Back propagation neural network for recognition of leaves in "Leaves Recognition Using Back Propagation Neural Network-Advice For Pest and Disease Control On Crops". In this paper, they found that just a back propagation network and shape of leaf image is enough to pest and disease control on crops. Prewitt edge detection and thinning algorithm is used to find leaf tokens as input to back propagation algorithm [13].

"Leaf disease severity measurement using image processing" by Sanjay B. Patil and Dr. Shrikant K. Bodhe gives the technique for disease detection in sugarcane leaves. In this paper two thresholding methods are used for segmentation. Simple threshold segmentation is used to calculate leaf area but this method is not suitable for lesion area because of varying characteristic of the lesion region. So for that purpose we use Triangle threshold segmentation. The average accuracy of the experiment is 98.60% [14].

"Identification of nitrogen deficiency in cotton plant by using image processing" by Swapnil Ayane, M. A. Khan and S. M. Agrawal considered the pattern that appeared on the leaf for detection of disease. The various feature of image of leaf are extracted such as shape, area, shape of holes present on the leaf, diseases spot, etc. These extracted feature are used determine

the occurrences of particular deficiency related to primary nutrient of cotton leaf. Nitrogen deficiency can be detected by two preliminary steps, histogram analysis and measurement of leaf area. The leaf with deficiency has compared to that normal leaf [15].

Hrushikesh Marathe, Prerna Kothe in paper title of "Leaf disease detection using image processing technique" disease is diagnosis by calculating leaf area through pixel number statics. Leaf spot can be indicative of crop disease. To calculate the leaf area they use 'Regionpros' instruction. Infected area is calculated by subtracting total green leaf area [16].

Several algorithms like image enhancement, image filtering which suit for cotton leaf processing were explained in the paper "Cotton pests and diseases detection based on image processing". Three different color models for extracting the damaged image from cotton leaf image were implemented namely RGB, HSI and YCbCr color model.The ratio of damage chosen as feature to measure the degree of damage which caused by disease or pests. By comparing the result obtained from three models, YCbCr color space is considered as best color model for extracting the damaged image [17].

C. Detection of disease by extracting texture feature

Dheeb Al Bashish, Malik Braik and Sulieman Bani Ahmad in paper of title "Detection and classification of leaf disease using K-mean based segmentation and neural network based classification" proposed detection model based neural network and they found that this model is very effective in recognizing leaf disease, while K-means clustering provides efficient result in segmentation RGB image [18].

H. Al-Hiary, Bani-Ahmad, M-Reyalat and M. Braik in paper of title "Fast and accurate detection and classification of plant diseases" developed more accurate and fast detection technique of plant disease. In this paper, respectively K-means clustering and neural network have been formulated for clustering and classification of diseases that affect on plant leaf. They found that proposed approach, which can significantly support an accurate detection of leaf diseases in little computation effort [19]. "

Identification and classification of normal and affected agriculture / horticulture produce based on combined color and texture feature extraction" by Basvaraj S. Anami, J.D. Pujari, Rajesh Yakkundinath proposed better machine vision system in the area of disease recognition. In this paper, both the feature color and texture are used to recognize and classify different agriculture produce into normal and affected using neural network classifier. For some product use the color feature and other product use texture feature for their disease recognition [20].

"Applying image processing technique to detect plant diseases" by Anand Kulkarni and Ashwin Patil developed good classification system for plant diseases. The Gabor filter is used for segmentation and Artificial neural network used for classification of diseases. Artificial neural network based classifier is adopted which uses the combination of color and texture feature to recognize and classify different plant diseases. Experimental result showed that classification performance by ANN taking feature set is better with accuracy 91% [21].

Tushar J. Haware, Ravindra D. Badgujar and Prashant G. Patil in paper of title "Crop disease detection using image segmentation" proposed an efficient algorithm with high clustering accuracy for detection of crop diseases. In this paper, K-means clustering are used for segmentation and ostu method for computed threshold value. Pixels with zeros red, green, and blue values and pixels on the boundaries of the infected cluster are removed. It gives more accurate disease classification and identification result [22].

"Feature extraction of diseased leaf images" by Patil J. K. and Raj Kumar proposed approach for disease identification on maize leaves. This paper describes the method for extraction of color and texture feature of diseased leaves of maize. Color feature are extracted by computing first, second and third order moments of HSV histogram of an image. The texture features like correlation, energy, inertia and homogeneity are obtained by computing gray level co-occurrence matrix on image [23].

Prof. Sanjay B. Dhaygude and Nitin P. Kumbhar in paper "Agricultural plant leaf disease detection using image processing" worked on the texture feature of plant. The texture features of infected leaf are compared to texture features of normal leaf. The developed processing consists of four main steps, first the color transformation structure for input RGB image is created then RGB image is converted into HSI because RGB is for color generation and HSI for color descriptor. Then green

pixels are masked and removed using specific threshold value, then the image is segmented and useful segments are extracted, finally the texture statics is computed using Spatial Gray level Dependence Matrices (SGDM) [24].

III. CONCLUSION

The literature survey done in this paper provides a new insight in detection of the diseases of plant. The scope in doing research in this field is to design such system that automatically estimating the severity of the detected disease. Also developed a innovative, efficient and fast interpreting algorithms which will not only detect the disease but also classified it in to various categories.

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REFERENCES

[1] S. Arivazhagan, R. Newlin Shebiah, S. Ananthi, S. Vishnu Varthini, "Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture feature," *CIGR Journal*, vol. 15, no. 1, March 2013

[2] Jaymala K.Patil and Raj Kumar "Advances in image processing for detection plant diseases," *Journal of Advanced Bioinformatics Applications and Research* ISSN 0976- 2604 Vol 2, Issue 2, , pp 135-14, June-2011

[3] Mohammad Ei –Helly, Ahmed Rafea, Salwa Ei – Gamal And Reda Abd Ei Whab ,"Integrating Diagnostic Expert System With Image Processing Via Loosely Coupled Technique," *Central Laboratory for Agricultural Expert System(CLAES*), 2004

[4] Rakesh Kaundal, Amar S Kapoor and Gajendra PS Raghava "Machine learning technique in disease forecasting: a case study on rice blast prediction," *BMC Bioinformatics,* 2006

[5] Alexander A. Doudkin, Alexander V. Inyutin, Albert I. Petrovsky, Maxim E. Vatkin "Three Level Neural Network for Data Clusterzation on Images of Infected Crop Field," *Journal of Research and Applications in Agriculture Engineering*, Vol.52(1), 2007

[6] Santanu Phadikar & Jaya Sil "Rice Disease Identification Using Pattern Recognition Techniques," *Proceedings Of 11th International Conference On Computer And Information Technology,25-27,* 2008

[7] Di Cui, Oin Zhang, Minzan Li, Youfu Zhao and Glen L. Hartman "Detection of soybean rust using a multispectral image sensor," *SpringerLink – Journal article*,2009

[8] Viraj Gulhane and Dr. A. A. Gurjar "Detection of diseases on cotton leaves and its possible diagnosis," *IJIP*, Vol(5), Issue(5), 2011

[9] Kamljot Singh Kailey and Gurjinder Singh Sahdra "Content based image retrival (CBIR) for identifying image based plant disease," *IJCTA,* Vol 3(3), 1099-1104, May–June 2012

[10] Piyush Chaudhari, Anand K. Chaudhari, Dr. A. N. Cheeran and Sharda Godara, "Color transform based approach for disease spot detection on plant leaf," *IJCST*, vol 3, Issue 6, June 2012

[11] Diao Zhihuo, Wang Huan and Song Yinmao "Image segmentation method for cotton mite disease based on colour feature and area threshold," *JATIT*, Vol 48, Feb 2013.

[12] Panagiotis Tzionas, Stelios E. Papadakis and Dimitris Manolaki, " Plant leaves classification based on morphological feature and fuzzy surface selection technique," *International Conference On Technology and Automation ICTA*`05,

Thessaloniki, Greece, pp 365-370,15-16, 2005

[13] M. S. Prasad Babu and B. Srinivasa Rao "Leaves Recognition Using Back Propagation Neural Network-Advice For Pest and Disease Control On Crops," *IndiaKisan.Net: Expert Advissory System*, 2007

[14] Sanjay B. Patil and Dr. Shrikant K. Bodhe "Leaf disease severity measurement using image processing," *International Journal of Engineering Technology (IJET),* vol 3(5), 297-301, 2011

[15] Swapnil Ayane, M. A. Khan and S. M. Agrawal "Identification of nitrogen deficiency in cotton plant by using image processing," *IJPRET,* Vol 1(8), 112-118, 2013,

[16] Hrushikesh Marathe, Prerna Kothe, "Leaf disease detection using image processing technique," *IJERT,* vol 2, Issue 3, March 2013

[17] Qinghai He, Benxue Ma, Duanyang Qu, "Cotton pests and diseases detection based on image processing," *TELKOMNIKA,* vol 11, no 6, June 2013

[18] Dheeb Al Bashish, Malik Braik and Sulieman Bani Ahmad "Detection and classification of leaf disease using K-mean based segmentation and neural network based classification," *International Technology Journal,* ISSN 1812-5638, pp 267-275, 2011

[19] H. Al-Hiary, Bani-Ahmad, M-Reyalat and M. Braik, "Fast and accurate detection and classification of plant diseases," *IJCA,* vol 17, no. 1, March 2011

[20] Basvaraj S. Anami, J.D. Pujari, Rajesh Yakkundinath, "Identification and classification of normal and affected agriculture / horticulture produce based on combined color and texture feature extraction*," International Journal of Computer Applications in Engineering*, vol 1, Sept 2011

[21] Anand Kulkarni & Ashavin Patil R. K. "Applying image processing technique to detect plant diseases ," *Intrnational Journal of Modern Engineering Research (IJMER), ISSN 2249-6645* Vol 2,Issue 5, pp 3661-6264, Sep-Oct 2012

[22] Tushar J. Haware, Ravindra D. Badgujar and Prashant G. Patil, "Crop disease detection using image segmentation," *World Journal of Science & Technology,* ISSN 2231-2587, vol 2(4):190-194, 2012

[23] Patil J. K. and Raj Kumar, "Feature extraction of diseased leaf images," *Journal of Signal & Image Processing,* vol 3, Issue 1, pp 60-63, ISSN 0976-8882, 2012

[24] Prof. Sanjay B. Dhaygude , Nitin P. Kumbhar, "Agricultural plant leaf disease detection using image processing," *International Journal of Advanced Research in Electrical, Electronics & Instrumentation,* vol 2, Issue 1, Jan 2013

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