A SURVEY ON CROP DISEASE DETECTION USING IMAGE PROCESSING TECHNIQUE FOR ECONOMIC GROWTH OF RURAL AREA

Yashpal Sen[1], Chandra Shekhar Mithlesh[2], Dr. Vivek Baghel[3]

[1]Asst. Prof, KITE

[2]Asst. Prof , Shri Rawatpura Group of Institutions, New Raipur, C.G.

[3]HOD, ET &T , KITE

E-mail: csmithlesh1987@gmail.com, yashpal.sen@rediffmail.com

ABSTRACT

Development of an automated system for identifying and classifying different diseases of the contaminated plants is an emerging research area in precision agriculture. This paper provides survey on crop disease detection using image processing techniques. Disease in crops causes significant reduction in quantity and quality of the agricultural product. Manual detection of the diseases is very difficult and not accurate for farmer. This creates a need for Image processing techniques which will help in accurate and timely detection of the diseases and overcome the limitations of the human vision. The production rate can be improved by disease detection in well-time. Crop protection especially in large farms is done by using computerized image processing technique that can detect diseased leaf using color information of leaves.

Key words: *leaf disease, image processing techniques, agriculture.*

1.Introduction

India is a predominantly agriculture based economy country. Ancient time former are used climate based irrigation system where there is productivity is very low, i.e. depend on the climate, now improving the productivity of crops increasing the irrigation area, irrigation system. But, it is not true in Eastern India as a whole and Chhattisgarh in particular due to diverse crop growing environment, land situations, physiographic and socio-economic conditions of the farmers. Crop production occurs in a dynamic environment. It has been experienced that cropping system of a region is the mirror of socio-economic condition of farmers, irrigation network, marketing and processing infrastructure of the area and ultimately agricultural scenario of the state. Farmers with their vast experience and practicability have established the best suited cropping systems in different region that are economically viable and environmentally sustainable. The information on crop cover in growing period with the use of internal and external resources can be used to intensify the cropping system or to adjust additional crop to make cropping system more profitable

The spine of economy is agriculture in most of the developing countries, especially in India. The crop production quantity and quality depends on the crop growth. Therefore, crop disease detection is very essential in earlier stage and take necessary steps prevent it from spreading to others parts of the field. Normally, the farmer identifies the disease by observe the colour and shape of the leaves. This method needs long time experience and lots of regular efforts. This is practically not possible for the large fields.

Chhattisgarh is one out of twenty-nine state in India. Chhattisgarh is located northern part of India, this area is fully fertile land and total economy is based on crops i.e. rice, wheat, Maize, Gram, Tur, Soybean, Rape and Mustard. Production of rice in Chhattisgarh is large as compare to other crops. All this crops are suffering various diseases, nursery

to reproductive stage. Technology involving in agriculture is an improving productivity, tracking climate changes, protecting the environment and also increasing the food securities. Agriculture and engineering involve for forming new branches agriculture engineering. Automation, machinery, disease analysis involve in agriculture to improve rural area that why we called rural development (RD). In the context of rural development (RD) electronics based agriculture involve wireless, Image processing, automation, e-mobile are playing a role. In this survey paper we include the Image processing part for rural development for crops diseases detection. Various diseases occur in different parts of the plant can be identified by observing the change in symptoms, spots, colour etc. The less time consuming and automatic diagnosis technique is the major requirement in agriculture to improve the crop production rate. Recently, image processing approaches have been used to solve the different problems based on agriculture applications like to detect disease leaf, stem, and fruit [1-2]. Leaf disease severity measurement and detection using image processing had reported by different researchers [3-5].

Depending on the applications, many image processing techniques has been introduced to solve the problems by pattern recognition and some automatic classification tools. In the next section this papers present a survey of those proposed systems in meaningful way.

2.Literature Review

The various approaches for detecting the disease in crops using image processing technique is described in this section:

Pawanp. Warne & et.al., [6] describes the approach to prevent the crops from heavy loss by careful detection of disease. In cotton, diseases in leaf are critical issue because it reduces the production of cotton. The region of interest is leaf because most of diseases occur in leaf only. The diseases that occur in cotton leaf are Alternaria, Cercospora and Red Leaf Spot.Histogram equalization is used to pre-process the input image to increase the contrast in low contrast image, K-means clustering algorithm which classifies objects. Segmentation is based on a set of features that partition the pre-processed image into number of classes and finally classification is performed using Neural-network. Diseases in cotton leaf are detected accurately using image processing technique. It is used to analyze the cotton diseases which will be useful to farmers.

Daisy shergill & et.al.,[7] describes a approach is useful in crop protection especially in large area farms, which is based on automated techniques that can detect diseased leaves using color information of leaves. The disease can be detected by capturing an image of a certain plantleaf followed by extracting feature from the captured image. First the captured RGB image is converted to gray image &then gray image is resized and perform canny edge detection, apply various comparison techniques, which detect the presence of disease and also the type of diseases . it enables early control and protection measures for specific diseases.

Malvika Ranjan & et.al.,[8] describes a diagnosis process that is mostly visual and requires precise judgment and also scientific methods. Image of diseased leaf is captured .As the result of segmentation Colour HSV features are extracted. Artificial neural network (ANN) is then trained to distinguish the healthy and diseased samples. ANN classification performance is 80% better in accuracy.

Renuka Rajendra Kajale [9] describes the approach for detection and computation of texture information for plant leaf diseases. The processing system consists of four main steps, color image is converted to HSI, then the green pixels are masked and removed using specific threshold value, then the pre-processed image is segmented and the useful segments are extracted, finally the texture information is obtained. The diseases present on the plant leaf are evaluated based on the texture information.

Prakash M. Mainkar& et.al.,[10] provides a software solution to automatically detect and classify plant leaf disease. This approach will increase productivity of crops. It includes several steps that are image acquisition, image pre-processing, segmentation, feature extraction and classification.

Mr. Sachin B. Jagtap& et.al. [11] Describes a system consists of four stages; the first stage is the image enhancement, which includes, histogram analysis, HSI enhancement and intensity adjustment. Fuzzy c-means algorithm is used for segmentation of captured image. Color, shape of spot, size is three features used to extract features from leaf. Then classification is based on back propagation based neural networks.

Niket Amoda& et.al., [12] provide image processing based solutions that are automatic, cheap, and accurate. Solution is composed of four main steps; in the first step the RGB leaf image is transformed to other colour model. Next, in the second step, the transformed images are segmented to obtain better information .the K-means clustering techniques used for segmenting the input image. In the third step, the features based on texture of leaf for the segmented infected objects are calculated. Finally, in the fourth step the classification is done by using pre-trained neural network based on the result of feature extraction.

Smita Naikwadi & et.al.,[13]describes the approach that has different steps. In first step, mostly green coloured pixels are identified. Next, based on specific threshold values green pixels are masked. Otsu's method computes threshold value to mask the green pixels. The other additional step is that the pixels in the image which has zero RGB values and infected cluster (object) pixels at boundary were completely removed. This is the robust technique for the detection of plant leaves diseases. The precision of this technique for classifying diseases is between 83% and 94**%.**

Anand H. Kulkarni et.al., [14] describes the approach begins with capture of leaf the images from agricultural field. Gabor filter is used segment the input image before feature extraction. Then segmentation of input image is done to extract the texture information and colour features .proper selection of the feature values to train artificial neural network to exactly distinguish the healthy and diseased samples leaf correctly. ANN based classifier has accuracy of 91%.

3.Comparison Of Different Crop Disease Detection Methods

The different advance image processing based leaf disease detection methods are reported in literature. The merits and demerits with potential application of each method are given in Table 1.

TABLE I. COMPARISON OF DIFFERENT LEAF DISEASE DETECTION METHODS

S. No.	Technique	Merits	Demerits	Potential application
1	Hybrid method of Noise reduction	Multiple Gaussian and speckle noise can be removed.	Choice appropriate threshold value in wavelet analysis	Leaf image becomes noise free and produces clear vein.
2	Genetic algorithm For segmentation	Very less computational efforts and the optimum results.	Efficiency and time of the process depends upon the initial generated population of chromosomes.	Genetic algorithm optimizes continuous or discrete variable efficiently. Large searches area and

				large number of variables can be processed at the same time.
3	K-means clustering techniques	Guaranteed to converge, to reduce the number of false edges.	Guaranteed to converge, to reduce the number of false edges.	K mean clustering method is used in image segmentation. It can be hybrid with other optimization method easily.
4	KNearest Neighbor (KNN) for classification	The cost of the learning process is zero No assumptions About the characteristics.	The model cannot be interpreted (there is no description of the learned concepts) It is computationally expensive to find the k Nearest neighbours when the dataset is very large.	Higher resolution remote sensing image classification and computer vision.
5	Naïve Bayes Classifier	Simple classifier, high accuracy, and Good classification speed with large database.	Very strong assumption on the shape of data distribution, data scarcity.	Image classification, reduce the possibility of tasks underestimation in future work.
6	Support Vector Machine (SVM)	robust, even when the training sample has some bias, gives unique solution.	Lack of transparency in result for high dimension data.	face and speech recognition, face detection and leaf image recognition, text categorization etc.
7	Decision Tree Classifier (DTC)	Decision trees indirectly perform variable screening or Feature selection, Require relatively	Instability, over fitting, unstable in small variations, cannot guarantee to achieve	Classification and prediction, risk analysis.

		little effort from users for data preparation, easy to interpret and explain to executives.	the globally optimal decision tree.	
8	Recurrent Neural Networks	Less computation time, used for difficult and complex problems.	the training outcome can be nondeterministic and depend crucially on the choice of initial parameters.	Leaf disease detection, Standard speech recognition.

4.Key Issues And Challenges

Different image processing techniques are reported in literature to detection of leaf disease. However, some key issues and challenges of these techniques are as follows:

1. The background data affect the resulting image.
2. In the real world field conditions, optimization technique used for a particular crop diseases and continuous computerized intensive care of plant can be done by automation technique.
3. Leaf colour, size and texture are changes with climate and environment conditions. The field expert and regular observations are required well in time.
4. The review suggests that disease detection techniques show good potential with an ability to find crop diseases and some limitations. Therefore, there is scope of improvement in the existing research.

5.Conclusion

This paper presents a survey on different method for crop disease detection using image processing technique. There are many methods in automated or computer vision for disease detection and classification but still there is lack in this research topic. All the disease cannot be identified using single method .The future work is to develop a method for processing an image that acquired with different background. Since this review, we can conclude that there are number of ways by which we can detect diseases in crop. Each technique has some pros as well as limitation. This paper evaluates the techniques in data mining and image processing in use by researchers designed for detection, diagnosis and recognition of plant diseases.

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