ANN CLASSIFIER BASED PLANT DISEASE DETECTION FOR SUSTAINABLE AGRICULTURE

P.Harirexantha[1],S.Kalaivani[2],P.Herashibani[3], S. Senthil Kumar[4],
[1,2,3] UG Scholar, [4] Assistant Professor
EGS Pillay Engineering College,
Nagapattinam, Tamilnadu

Abstract*—Diseases decrease the productivity of plant. Which restrict the growth of plant, quality and quantity of plant also reduces. It is difficult for farmers as well as experts/researchers to identify the symptoms of diseases correctly and to specify right remedy. The proposed method is useful in crop protection especially large area farms, which is based on computerized image processing techniques that can detect diseased leaves using color information of leaves.It can be summarized by capturing an image of a certain plant leaf followed by extracting feature from the captured image then convert RGB(Red Green Blue) to gray image & resize it,Create stem, Stirs, Canny edge detection. In this paper Artificial Neural Network (ANN) techniques, which would decide the disease and would also detect the type of plant diseases at early stages and enables early control and protection measures.

***Keywords*— Artificial Neural Network (ANN), Canny edge detection, Plant disease, MATLAB.**

I. INTRODUCTION

In developing countries like India, the economy is greatly depends on agriculture. As diseases of the plants are inevitable, detecting disease plays a major role in the field of Agriculture. Plant disease is one of the crucial causes that reduces quantity and degrades quality of the agricultural products. Plant disease is caused by micro-organism like fungi and bacteria .The lifecycle of micro-organism is unable to predict .Some disease do not have visibility during early stage it only appear at final stage. The prediction of plant disease by naked eye is used in practice but results are subjective and disease extent is not precisely measured and it is labor intensive, less accurate. Disease management is a challenging task. Mostly diseases are seen on the leaves or stems of the plant. Precise quantification of these visually observed diseases, Pests, Traits has not studied yet because of the complexity of visual patterns. Nowadays automatic detection of plant disease is an important research topic and thus automatically detects the diseases from the symptoms that appear on the plant leaves. There are two main characteristics of plant disease detection machine-learning methods that must be achieved, they are: speed and accuracy. In this study an automatic detection and classification of leaf diseases is been proposed which is based on K-means as a clustering. In this canny edge detection is used for preprocessing, features are extracted from wavelet decomposition and finally classified by ANN classifier. Automatic classification of leaf diseases is done based on high resolution multispectral and stereo images. Depending on the applications, many imageprocessing techniques has been introduced to solve the problems by pattern recognition and some automatic classification tools.
Image analysis can be applied for the following purposes:

1. To detect diseased leaf, stem, fruit.
2. To quantify affected area by disease.
3. To find the boundaries of the affected area.
4. To determine the color of the affected area.
5. To determine size & shape of leaf.
6. To identify the object correctly.

II. LITERATURE SURVEY

The various approaches for detecting the disease in plant leaf using image processing technique is described in this section as below:

KhushalKhairnardetects and diagnosis the diseases using image processing. In which initially the infected region is found then different features are extracted such as color, texture and shape. Finally classification technique is used for detecting the diseases. There are different feature extraction techniques for extracting the color, texture and edge features such as color space, color histogram, gray level Co-occurrence Matrix (CCM), Gabor filter, Canny and Sobel edge detector. There are also different classification techniques such as Support Vector Machine (SVM), Artificial Neural Network (ANN), Backpropagation (BP) Network, Probabilistic Neural Network (PNN), Radial Basis Function (RBF) Neural Network [1].

M.Malathi&et.al., describessurvey on plant leaf disease detection using image processing techniques. Disease in crops causes significant reduction in quantity and quality of the agricultural product. Identification of symptoms of disease by naked eye is difficult for farmer. Crop protection especially in large farms is done by using computerized image processing technique that can detect diseased leaf using color information of leaves[2].

AkashdeepRana& et.al., describesit is very difficult task for farmers to monitor the large farms always so farmers are in great need to develop a computerized system that monitors crop when it is infected with diseases. This can be performed by capturing an image of a crop leaf, then extracting a predefined feature from the captured image and finished by determining the disease. The proposed method is useful in crop protection especially large area farms, which is based on computerized image processing techniques that can detect diseased leaves using color information of leaves[3].

Y.Sanjana& et.al.,develops an image recognition system that can recognize crop diseases. Image processing starts with the digitized color image of diseased leaf. 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.Three major diseases commonly found are Rice blast (Magnaporthegrisea), Rice sheath blight (Rhizoctoniasolani) and Brown spot (Cochiobolusmiyabeanus) were selected for this research[4].

The detection of plant leaf is an very important factor to prevent serious outbreak. Viruses are extremely tiny particles consisting of protein and genetic material with no associated protein.
The term disease is usually used only for the destruction of live plants. **Prof. Sanjay B. Dhaygude**developed a processing scheme consists of four main steps, first a color transformation structure for the input RGB image is created, this RGB is converted to HIS(Hue Saturation Intensity) because RGB is for color generation and for color descriptor. Then green pixels are masked and removed using specific threshold value, then the image is segmented and the useful segments are extracted, finally the texture statistics is computedfrom SGDM

matrices. Finally the presence of diseases on the plant leaf is evaluated[5].

AshwinPatil R. K.aimed to develop a simple disease detection system for plant diseases. The work begins with capturing the images, Filtered and segmented using Gabor filter. Then, texture and color features are extracted from the result of segmentation and Artificial Neural Network (ANN) is then trained by choosing the feature values that could distinguish the healthy and diseased samples appropriately. Experimental results showed that classification performance by ANN taking feature set is better with an accuracy of 91%[6].

III. METHODOLOGY

The methodology for diagnosing paddy diseases can be simplified as shown in Fig. This process involves several tasks, such as image acquisition and collection, image segmentation and pre-processing, shape feature extraction and color feature extraction, and paddy diseases lassification based on lesion type, boundary color, spot color, and broken leaf color.

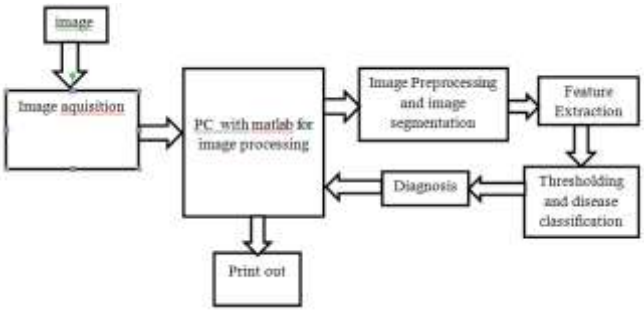


Figure 1. Block Diagram

The step-by-step procedure of the proposed system:
1. RGB image acquisition
2. Convert the input image from RGB to HSI format.
3. Masking the green-pixels
4. Removal of masked green pixels
5. Segment the components
6. Obtain the useful segments
7. Computing the features using color-co-occurrence methodology
8. Evaluation of texture statistics

A. Image Acquisition

The RGB colour images of paddy leaf are captured using a Canon PowerShot G2 digital camera, with pixel resolution 768x1024. The digitized images are about 225 KB size each. Those images are cropped into a smaller image with dimension of 109 x 310 pixels. There have collected about 94 data samples. It consists of three types of paddy diseases as shown in Fig. Images are stored in BMP format. The prototype uses Matlab image processing library.

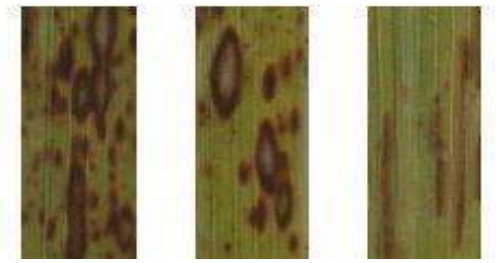


Fig 1.1: (a) Blast Disease ; (b) Brown Spot Disease; (c) Narrow Brown Spot Disease

B. Image Segmentation and Pre-Processing

The main objective of this process is to obtain the binary image with less noise or noise free. In order to achieve high accuracy, an appropriate silhouette should be obtained. The RGB image (Fig. 2.6(a)) is converted into a binary image using threshold method, as shown in Fig. 2.6(b). They used local entropy threshold methods of Eliza and Chang [11] and Otsu method. A morphological algorithm is used to remove noises by using region filling technique.

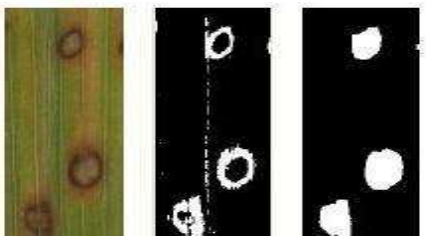


Fig 1.2 : (a) RGB image ; (b) Binary image with noise; (c) Binary image with noise free

C. Feature extraction

The image analysis focused on the shape feature extraction and color based segmentation. Feature extraction is a superior form of dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant then the input data will be transformed into a reduced representation set of features (also named features vector). Transforming the input data into the set of features is called feature extraction.

IV. ALGORITHM

A. Median Fileter

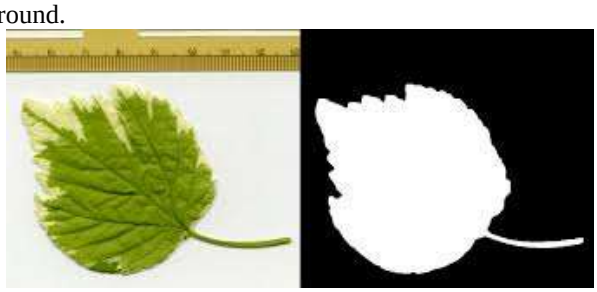
The **median filter** is a nonlinear digital filter technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise.

B. Canny Edge Detection

Canny Edge, detect an image significantly reduces the amount of data and filters out useless information, while preserving the important structural properties in an image.

C. Background Subraction

Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground.



D. ANN Classifier

ANN Classifier is an example of Supervised Learning. Known class labels helps to indicate whether the system is performing correctly or not. This information can be used to indicate a desired response, validate the accuracy of the system, or be used to help the system learn to behave correctly. The known class labels can be thought of as *supervising* the learning process

V. RESULTS

Smart plate for the detection of food quality is designed to ensure quality of the food used by the consumers and improve their health. The sensor plate is able to detect spoilage of common household items like dairy, meats and fried items. The integration of PIC16F877A Microcontroller to control the status of food items at their homes wirelessly. The display system accurately displays the freshness level of the food, enabling consumers to be well aware of the quality of the food. This design is simple, effective, feasible and cost effective.

Table 1: Results after extracting 5 basic geometrical features

Leaf/Feature	Diameter	Physiological Length	Physiological Width	Leaf Area	Leaf Perimeter
	877.4058	766.5445	523.2447	7.0955e+004	1.7424e+003
	791.0209	529.3611	534.0206	2.2625e+005	1757
	751.8045	423.8629	531.7377	1.1498e+005	4523e+003
	842.0665	806.2175	385.5412	204990	1.9344e+003
	746.8829	464.9033	690.1884	2.1268e+005	1.9494e+003
	838.9857	776.4044	501.1846	290166	2.0861e+003

VI. CONCLUSION

In this paper we have proposed feature extraction based concept of detecting leaf disease. On one hand visual analysis is least expensive and simple method, it is not as efficient and reliable as others, but image processing is a technique most spoken of very high accuracy and least time are major advantages offered, but it backs away when implementing practically. An ANN based classifier is adopted which uses the combination of color and texture features to recognize and classify different plant diseases. This application is helpful for farmer and laboratory where they can easily protect their crops and there will be increase in growth of production. After doing review on various techniques and algorithms we have come to conclusion that, ANN algorithm gives the better result as compare to other algorithms.

REFERENCES

[1] KhushalKhairnar, Rahul Dagade, "*Disease Detection and Diagnosis on Plant using Image Processing*",International Journal of Computer Applications (0975 – 8887) Volume 108 – No. 13, December 2014.

[2]M.Malathi 1, K.Aruli 2, S.Mohamed Nizar3, A.Sagaya Selvaraj4, "*A Survey on Plant Leaf Disease Detection Using Image Processing Techniques*", International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 09 | Dec-2015.

[3] Daisy Shergill*, AkashdeepRana, Harsimran Singh, "*Extraction of Rice Disease using Image Processing*", International Journal of Engineering Sciences & Research Technology, shergill*, 4.(6): june, 2015.

[4] Shreya B. Bhavsar, Prof. Dipti B. Shah, "*Plant Disease Identification Techniques using Image Processing: A Study*", International Journal of Advanced Research in Computer Science and Software Engineering,Volume 5, Issue 8, August 2015.

[5] Savita N. Ghaiwat, ParulArora, "*Detection and Classification of Plant Leaf Diseases Using Image processing Techniques",* International Journal of Recent Advances in Engineering & Technology (IJRAET), ISSN (Online): 2347 - 2812, Volume-2, Issue - 3, 2014.

[6] Prof. Sanjay B. Dhaygude, 2Mr.Nitin P.Kumbhar, "*Agricultural plant Leaf Disease Detection*
Using Image Processing", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 1, January 2013.

[7] Anand.H.Kulkarni, AshwinPatil R. K., "*Applying image processing technique to detect plant diseases*", International Journal of Modern Engineering Research (IJMER) Vol.2, Issue.5, Sep-Oct. 2012 pp-3661-3664.

[8] Y.Sanjana, AshwathSivasamy, SriJayanth, "*Plant Disease Detection Using Image*
Processing Techniques", International Journal of Innovative Research in Science,
Engineering and Technology, Vol. 4, Special Issue 6, May 2015.

[9] HarshadShetye, TejasRane, TanmayPawar, Prof. AnuradhaDandwate, "*An Analysis of Methodologies for Leaf Disease Detection Techniques*", International Journal of Research in Advent Technology, Vol.4, No.2, February 2016.

[10] PrajaktaMitkal, PriyankaPawar, Mira Nagane, PriyankaBhosale, Mira Padwal and PritiNagane, "*Leaf Disease Detection and Prevention Using Image Processing using Matlab*", International Journal of Recent Trends in Engineering and Research, Volume 02,Issue 02;February – 2016.