International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 06 | June -2017 www.irjet.net p-ISSN: 2395-0072

Leaf Disease Detection and Selection of Fertilizers using Artificial Neural Network

Neethu K.S[1] , P .Vijay ganesh[2]

[1]*M.E (ECE), Jayalakshmi Institute of technology, Thoppur, India*
[2]*Assistant professor (ECE), Jayalakshmi Institute of Technology, Thoppur, India*

Abstract - In our country agriculture is the main occupation. Most of the people lead their life from agriculture field, they are fully relying on agricultural products. If any plant is enduring disease, then it causes reduction in both quality and quantity of agriculture crops. Hence it is necessary to detect and analysis of disease. Authentic exposure and recognition of crop disease plays an important role in adequately regulating and inhibiting disease for feasible agriculture and food preservation. Thus detection and diagnosis of disease at the right time is essential to the farmer.

This proposed paper offers a candid and computationally resourceful manner which is useful in the leaf disease detection and selection of fertilizers using artificial neural network. This proposed system involves different concepts related to image processing such as image acquisition, image preprocessing, feature extraction, artificial neural network based training, classification, diagnosis and treatment by using artificial neural network. In this performance, database is a accumulation of different texture features of some leaves. In this paper it is possible to get the disease name and also we can get the fertilizer which is precise for that disease. But in previous attempts it was not happen so because of this we proposed this project, it is better and gives good performance compared to other processing system.

Key Words: Crop disease, Statistical movements, Computer vision, Colour image segmentation, GLCM, Artificial neural network, Diagnosis

1. INTRODUCTION

Plant disease especially on leaves is the one of the major reagent of reduction in both quality and quantity of the food crops. The quality and quantity of food production become reduced only because of pest's presence in the crops and leaves. Thus it leads to increase in difficulty, food insecurity and fatality rate.
In modern years in order to identify the plant disease, so many different concepts of image process technology have been adapted. One of the dominant dilemma for agronomist is to reduce and destroy the progress of pests affecting the crop harvest. The common pests like alphids, fungus, gnats, flies, slugs, snails, caterpillars, etc these pests are most commonly determined in the plant disease. Almost all agriculturist are used to identify pests systemically over examination by using their eyes but this access is high and it takes some time.

The techniques of digital image processing have been organized in the agriculture field in order to analyze the purposes in different agricultural applications like plant recognition, crop yield estimation, soil quality estimation etc. Feature extraction method of neural network with GLCM approach was also established in order to detect the crop disease. The extraction of texture feature will be carried out by both using GLCM. The literature survey suggests that the existing systems do not provide preventive measures since most of them focus on classification of crop disease. In order to overcome such drawbacks, a system is proposed that will provide disease name and suitable fertilizer for that disease. Also features such as texture will also be extracted using Gray Level co-occurrence Matrix (GLCM) along with first order statistical moment's method. GLCM is a matrix which represents the frequency of one gray level presenting in a stated structural linear relationship with another gray level within the area of observation. In order to calculate the texture features the contents of this GLCM matrix can be used, by observing the measure of variation in intensity at the pixel of interest.

2. RELATED WOEK

Since, various researches have been established for detection of leaf disease and the amount of diseases in them has long been an issue of concern in agriculture sector for crop quality management.

Some already developed systems in the problem area are explained below:

Aakanksha Rastogi Sopra et, al[1] offered algorithm for leaf disease identification and grading using digital image process and machine vision technology. It is operated in

two phases. In first phase recognition of plant based on feature of leaf is done and in the second phase classification of disease present in the leaf and grading of disease is done on the basis of the amount of disease present in the leaf. This system is based on Machine Vision Technology and Artificial Neural Network and it is useful for automatically detecting the leaf plant and also leaf disease and grading but from this it is not possible to detect the fertilizer name which is suitable for the disease. Our system covers almost all possible viral diseases for cucumber and imposes less diagnostic restrictions during image acquisition. The proposed system uses Euclidean distance technique and K means clustering technique for segmentation of image to segment the leaf area, disease area and background area of the input leaf image in order to calculate the percentage infection of the disease in the leaf and to grade them into various classes.

Ms.pooja pawar et, al[2] presents algorithm for detecting crop disease early and exactly, this system is developed using image processing techniques and artificial neural network. It includes different concepts relevant to image processing such as image acquisition, image pre-processing, feature extraction, creating database and classification by using artificial neural network. In this, database is a collection of various texture features of leaves. This system involves collecting leaf samples of cucumber crop diseases. Process is executed to diagnose cucumber crop disease and to provide treatment for the detected crop disease. Two cucumber crop diseases downy mildew and powdery mildew are considered in this work. The GLCM and first order statistical moments are used to extract texture features. System provides classification accuracy of only 80.45% not 100%. This is possible to use in more than one crop of different types. But for other crop type, system has to select those features only that can classify their crop diseases accurately.

Erika fujita, yusuke Kawasaki et, al [3] introduced a system of Basic investigation on a robust and practical plant diagnostic system.

This system offers a new practical plant-disease detection system, for this it takes 7,520 cucumber leaf images comprising images of healthy leaves and those infected by different viral diseases. The leaves were photographed on site under only one requirement, that is, each image must contain a leaf roughly at its center, thus providing them with a large variety of appearances. Although half of the images used in this experiment were taken in bad conditions, In this paper classification is done on the basis of convolutional neural networks attained an average of 82.3% accuracy under the 4-fold cross validation strategy. This system covers almost all possible viral diseases for cucumber and imposes less diagnostic restrictions during image acquisition. In all these related works it is possible to get the disease name but not possible to get the fertilizers name which is suitable for that disease. So to overcome this we proposed our system of Leaf Disease Detection and Selection of Fertilizers Using Artificial Neural Network.

PROPOSED TECHNIQUE

The main objective of this proposed methodology is detection of leaf disease and fertilizers which is suitable for that disease using artificial neural network. For experimental analysis mango and lemon leaves are treated having two types of diseases. The proposed approach is shown in Figure 1.

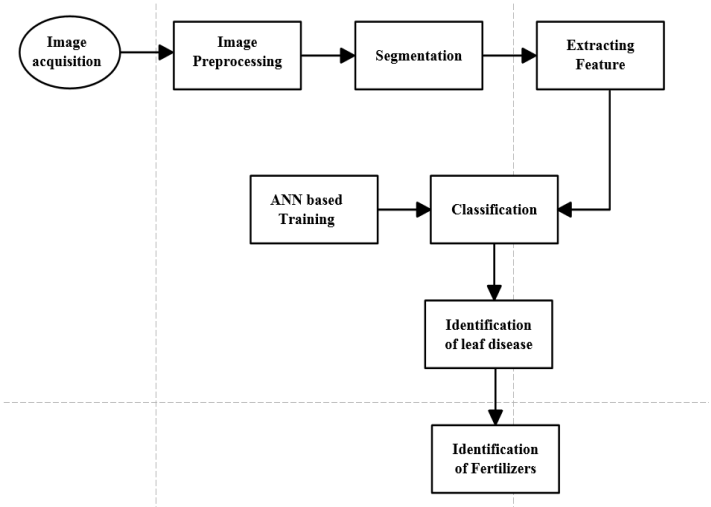

Figure (A)

The above figure (A) shows the block diagram for Leaf Disease Detection and Selection Of Fertilizers Using Artificial Neural Network. This includes image acquisition, image preprocessing, segmentation using k-means clustering, extracting features, ANN based training, classification, finally identification of leaf diseases and fertilizers.

A. Image Acquisition

In this Image Acquisition, receiving an image by means of camera from any real life scene. In today's generation, the method of digital camera is the most frequently used for photography. But other methods can also be used. In this project, there will be a predefined directory through which the images will be fetched and the algorithm will be trained and tested. Sample image of lemon as shown in Fig.1.

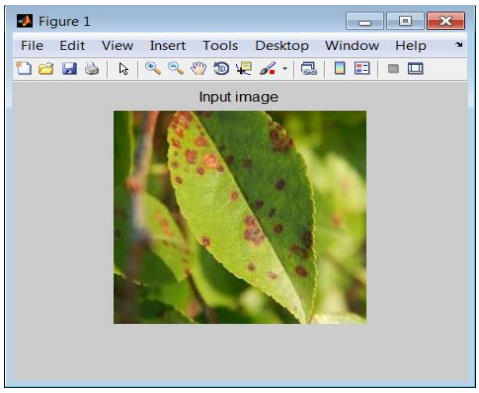

Figure1. Input image of lemon image

B. Image Pre-Processing

Image Pre -processing means working on images in order to convert it in a suitable form on which the algorithm can be trained and tested upon. In this phase of our cycle, the captured images will be cropped and be resized so that it can be effectively tested.

In Digital image processing, computer algorithms are applied to execute image processing on digital images. Pre-processing consists of many processes that includes,

- Resize Image
- Filter Image
- Segment Image
- Crop Image
- Binarization

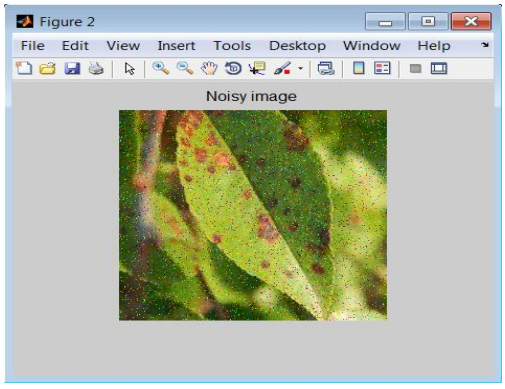

Figure 2. Noisy image

The figure 2 shows the image having noise, but this noise is more inferior and it deceit attainable to recognize so in order to recognize the noise it is necessary to enumerate additional noise. So in this we added soft and pepper noise, after adding this noise it is accessible to identify the noise. Then it is possible to eliminate entire noise which is present in the leaf as shown in the next image.

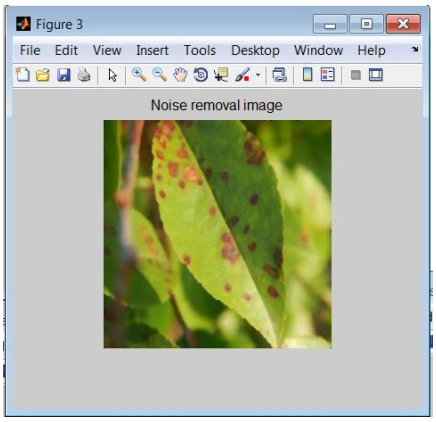

Figure 3. Noise removal image

In order to remove the noise, it required to add additional noise as already explained in the previous section. Adopted median filter, it is a method which is used to remove the noise. In phrase of fringe conservation and elimination of noise, compared to renewed images in the intermittent filters our renewed images represent a meaningful enhancement. This proposed system eliminates the salt-and-peppar-noise in the noise level as shown in above fig 3.

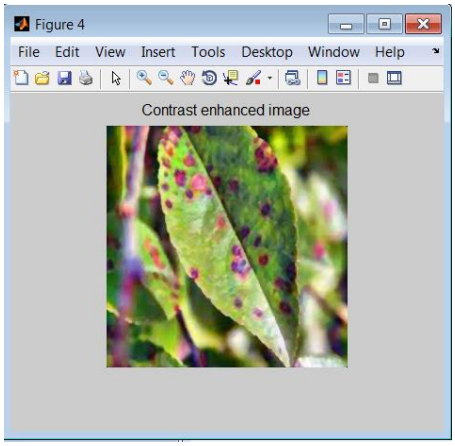

Figure 4.Contrast enhanced image

In this contrast enhanced image, the method called adaptive crystogram equalization is used in order to improve the image quality because after removing the noise the quality of image becomes slightly less so to overcome this effect we are going to use crystogram equalization. This method improves the quality of image then obviously the contrast image also enhanced as shown in the above figure 4.

Segmentation using K-means clustering

In this segmentation, by using K-means clustering method it is possible to identify the diseased area in the leaf. K-means is useful in the image in order to combine the parallel pixels. This method is very faster, in K-means, k no of clusters produced from the input images. RGB space is converted into L*a*b space where L is Luminosity and a*b are the color space. At the time of seeing leaf image, there is no essentiality of handling with radiance factor. Every cluster has a different cluster which start from the original values called seed-point. In the segment image1 it shows the diseased area and also non diseased area, in this we can't get clear diseased area hence we go for segment 2 in that it shows better results compared to 1st image. In order to get the clear picture, we go for segment 3. In the image of 3rd segment it is easily identifies the diseased area as shown below figures 5 and 6 and 7.

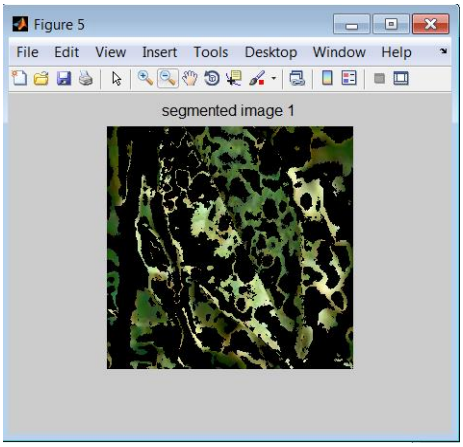

Figure 5. Segment image 1

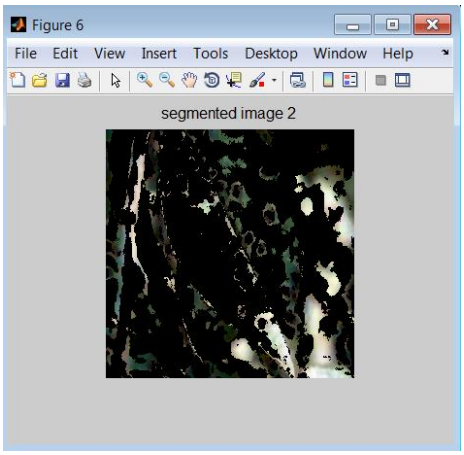

Figure 6. Segment image 2

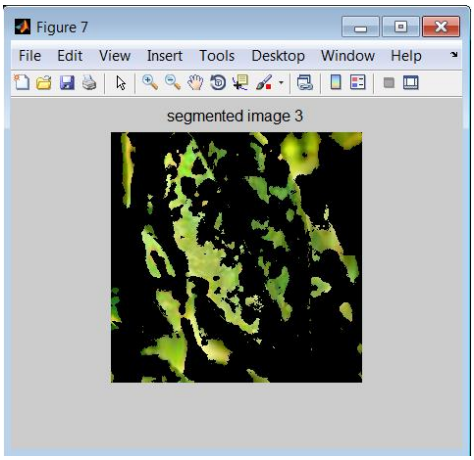

Figure 7.Segment image 3

The image of texture feature as shown in the below figure 8, there are various type of methods are available in order to find the texture feature. In this proposed technique we used gabour texture method. From this method it is easy to find mean value, standard deviation, q ness value. By using these feature values it is possible to find the feature of current image.

(1) Mean: The mean takes the average level of intensity of the image or texture being examined.

$$\text{Mean } \mu=\frac{1}{n}\sum_{i=1}^{n} xi$$

2) Standard deviation: It is a most widely used measure of variability or diversity used in statistics. In terms of image processing it shows how much variation or "dispersion" exists from the average (mean, or expected value). A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data points are spread out over a large range of values.

$$\text{Standard deviation } = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(xi-\mu)^2}$$

A fundamental task in many statistical analyses is to characterize the location and variability of a data set. A further characterization of the data includes skewness and kurtosis. Kurtosis and skewness are defined below where μ is the mean and is the variance of random variable X.

3) Kurtosis: Kurtosis is used to measure data whether it is heavy-tailed or light-tailed compared to a normal distribution. It is related to a fourth order moment, and is given by

$$\text{kurt} = E\left[\left(\frac{X-\mu}{\sigma}\right)^4\right]$$

4) Skewness: Skewness is normally designed to measure dataset's symmetry or lack of symmetry. The skewness for a normal distribution is zero, and any symmetric data should have skewness near zero. It is a related to a third order moment. Darker and glossier regions are tending to be a more positively skewed as compare to lighter and dull surfaces.

$$\text{Skewness} = E\left[\left(\frac{X-\mu}{\sigma}\right)^8\right]$$

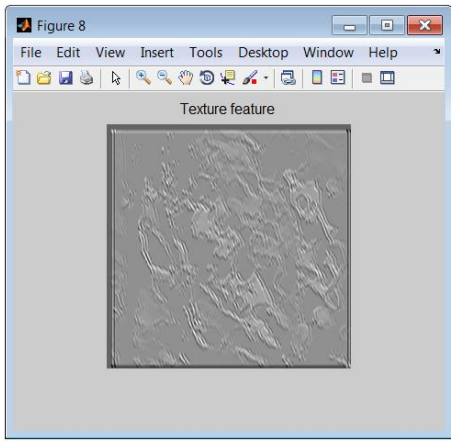

Figure 8. Texture feature

Diagnosis and Treatment

Diagnoses the lemon leaf disease is classified by using Artificial neural network(ANN). Once the classifier diagnoses leaf disease, indication of diseases is given by the system. And also it will give fertilizer name and preventive measures for disease.

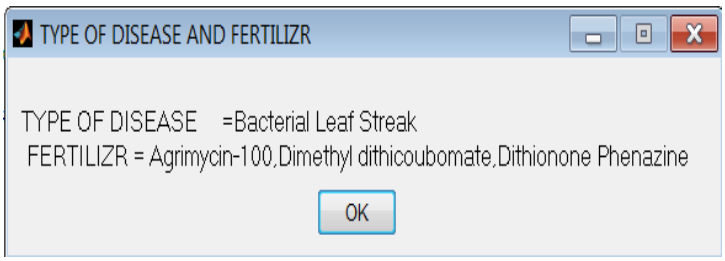

Figure 9. Type of disease and fertilizer

In the above figure 9, it shows the type of image and the fertilizer name. The main advantage of this proposed technique is it shows the fertilizers name. In the existing techniques we obtained only the disease name but without knowing the fertilizers it is difficult to solve the diseases to overcome this we proposed this project

The wavelength obtained from the texture feature image is compared to predefined wavelength obtained from Artificial neural network. If the wavelength is in-between 11.7990 which is standard value obtained from ANN, then it displays the disease of "Fungal Leaf Spot" and for this disease it also displays fertilizer name called "Dithane M_45 WP\n foliar spray of copper oxychloride". Similarly, If the wavelength is in-between 11.2803 which is standard value obtained from ANN, then it displays the disease of" leaf spot (Mycospharella musicola)" and for this disease the suitable fertilizer is "Chlorothanelonil and Bavistin".

If the wavelength is in-between 13.5976 which is standard value obtained from ANN, then it displays the disease of "Black spot" and for this disease it also displays the suitable fertilizer is "Myclobutani or Captan".

If the wavelength is in-between 13.8100 which is standard value obtained from ANN, then it displays the disease of "Gray mold Spot" and for this disease it also displays the suitable fertilizer is "Diochlandra, Trichoderma".

If the wavelength is in-between 11.9795 which is standard value obtained from ANN, then it displays the disease of "Phyllosticta Spot" and for this disease it also displays the suitable fertilizer is "Benomyl, Xyleborus".

If the wavelength is in-between 12.1627 which is standard value obtained from ANN, then it displays the disease of "Algal Leaf Spot" and for this disease it also displays the suitable fertilizer is "Copper Spray".

If the wavelength is in-between 11.2795 which is standard value obtained from ANN, then it displays the disease of "Linden Leaf Blotch" and for this disease it also displays the suitable fertilizer is "Mancozeb or Triadimefon".

If the wavelength is in-between 9.6555 which is standard value obtained from ANN, then it displays the disease of "Bacterial Leaf Streak" and for this disease it also displays the suitable fertilizer is "Agrimycin-100,Dimethyl dithivoubomate, Dithionone, Phenazine".

If the wavelength is in-between 12.9815 which is standard value obtained from ANN, then it displays the disease of "Septoria Leaf Sppot" and for this disease italso displays the suitable fertilizer is "Copper Spray (serenade), Chlorothalonil".

Similarly we are chosen another leaf called mango leaf, the below images shows the input image and final image of texture feature. In this also same procedure is done as explained in the above leaf. And the disease in this mango life is "Gray Mold Spot", and for this disease the precise fertilizer is "Diochlandra and Trichoderma".

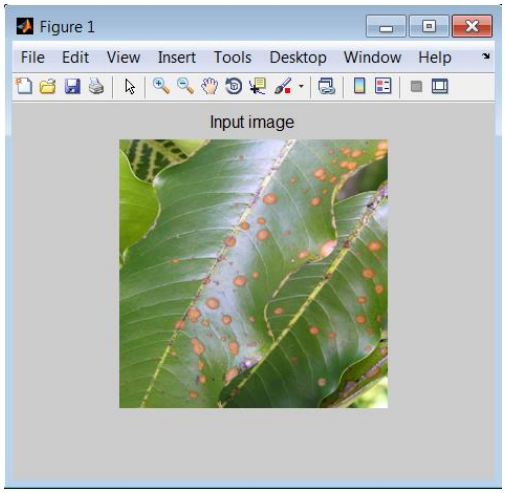

Figure 10. Input image of mango leaf

The above image of mango leaf and it is the input image, which shows the disease of Gray mold spot. After this same procedure will carried out as shown in the lemon leaf image. Finally, we got texture feature as shown in below image.

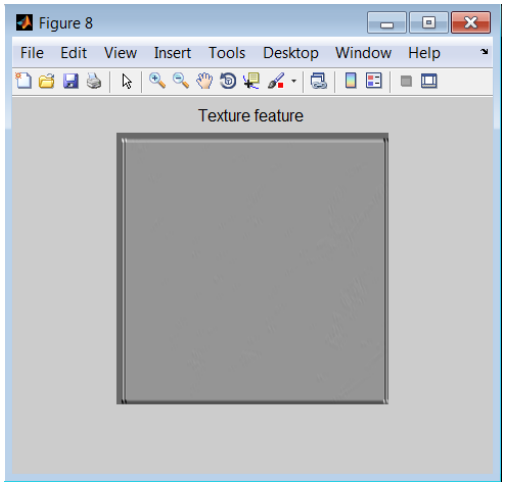

Figure 11. Texture feature of mango leaf

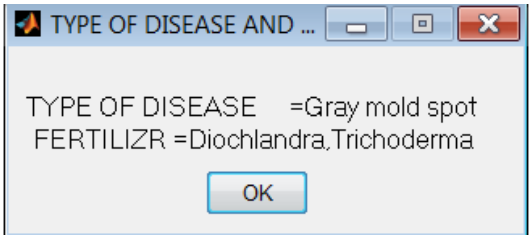

Figure12. Type of disease and fertilizer

From this it shows the type of disease and the fertilizer name. In this mango leaf the disease is Gray mold spot and for this disease the fertilizer is Diochlandra, Trichoderma. By using this fertilizers, we can easily remove the disease without risk.

3. CONCLUSIONS

In this proposed technique it is important to have an established approach for grading the defects on the plant leaves automatically. In this system by using Artificial Neural Network (ANN) is of great use for automatically detecting leaf disease and fertilizer for that disease. These systems are going to be very helpful for agriculturist since it is efficient than the manual method. The proposed system uses K means clustering technique for segmentation of image to segment diseased area and background area of the input leaf image in order to calculate the percentage infection of the disease in the leaf. These systems can be helpful to trade the manual disease identification technique and can be used by agricultural experts in identifying correct pesticide and from this proposed techniques agriculturist can be easily find the disease and also fertilizer for that disease hence they can easily remove the disease in a short period and can get the good results and profit from the plants.

REFERENCES

[1]Aakanksha Rastogi, Ritika Arora, Shanu Sharma "advances in image processing for Leaf Disease Detection and Grading using Computer Vision Technology &Fuzzy Logic" International conference on signal processing and integrated network SPIN, pp 500-505

[2] Ms.pooja pawar, Dr.varsha turkar, Prof.pravin patil presents "algorithm for detecting crop disease early and exactly, this system is developed using image processing techniques and artificial neural network".

[3]Erika fujita, yusuke Kawasaki, Hiroyuki uga, Sathoshi kagiwada, Hitoshi lyatomi introduced a system of "Basic investigation on a robust and practical plant diagnostic system".

[4]Jayamala K. Patil1 and Raj Kumar, "Advances in image processing for detection of plant diseases", Journal of Advanced Bioinformatics Applications and Research, ISSN 0976-2604Vol 2, Issue 2, pp 135-141,June-2011.

[5] Pokrajac, D. Lazarevic, A. ; Vucetic, S. ; Fiez, T. and Obradovic, Z.,"Image Processing in Preciion Agriculture", 4th International Conference on Telecommunications in Modern Satellite, Cable and Broadcasting Services, pp. 616-619, 2009.

[6] R. Pydipati, T.F. Burks and W.S. Lee, "Identification of citrus disease using color texture features and discriminant analysis", Computer and Electronics in Agriculture, Elsevier, Vol 52, Issue 2, pp. 49-59, 2009.

[7] Murakami, Paula F., Turner, Michelle R., Van Den Berg, Abby K. Schaberg, Paul G. 2005, "An instructional guide for leaf color analysis using digital imaging softwrae," U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 33p.

[8] Yan-Cheng Zhang, Han-Ping Mao and Bo Hu, Ming-Xi Li, "Features selection of cotton diseases leaves images based On fuzzy features selection techniques", Internationa Conference on Wavelet Analysis and Pattern Recognition, Beijing, pp. 124-129, 2007.

[9] Santanu Phadikar and Jaya Sil, "Rice disease identification using pattern recognition techniques", Proceedings Of 11th International Conference On Computer And Information Technology,25-27, 2008.

[10] Shen Weizheng, Wu,Yachun, Chen Zhanliang and Wei Hongda,"Grading method of leaf spot disease based on image processing Proceedings Of 2008 International Conference On Computer Science And Software Engineering, Volume 06,2008.

[11] A.Meunkaewjinda, P.Kumsawat, K.Attakitmongcol and A.Srikaew,"Grape leaf disease detection from color imagery system using hybrid intelligent system", proceedings of ECTICON, IEEE, PP-513-516,2008.

[12] Stephen Gang Wu, Forrest Sheng Bao, Eric You Xu, Yu – Xuan Wang and Yi – Fan Chang, "A leaf recognition algorithm for plant classification using probabilistic neural network", IEEE 7th International Symposium on Signal Processing and Information Technology,2007.

[13] Vijay Satti, Anshul Satya and Shanu Sharma, "An Automatic Leaf Recognition System for Plant Identification Using Machine Vision Technology", International Journal of Engineering Science and Technology (IJEST) ISSN:0975-5462, Vol 5, Issue 4, pp. 874-879,2013.

[14] Xu Pengyun and Li Jigang, "Computer assistance image processing spores counting",International Asia Conference on Informatics in Control, Automation and Robotics, IEEE computer society, pp-203-206,2009.

[15] Xinhong Zhang and Fan Zhang, "Images features extraction of tobacco leaves",Congress on Image and Signal Processing, IEEE computer society, 2008.

[16] University of Waterloo, Canada, "Homepage of Fuzzy Image Processing", June 1997, Webpage Retrieved from http://pami.uwaterloo.ca/tizhoosh/fip.htm.

[17] H. G. Wang, G. L. Li, Z. H. Ma, and X. L. Li. "Application of neural networks to image recognition of plant diseases", International Conference on Systems and Informatics, 2012.

[18] Naveen Kumar Pandey, Satyanarayan Krishna and Shanu Sharma, "Automatic Seed Classification by Shape and Color Features using Machine Vision Technology", International Journal of Computer Applications Technology and Research (IJCATR) ISSN: 2319-8656,Vol 2, Issue 2, 2013, pp. 208-213, doi-10.7753/IJCATR0202.1023

[19] Jayanta Kumar Basu1, Debnath Bhattacharyya and Tai-hoon Kim, "Use of Artificial Neural Network in Pattern Recognition", International Journal of Software Engineering and its Applications, Vol 4, Issue 2,2010.

[20] Rafael C.Gonzalez, Richard E.Woods and Steven L.Eddins, "Digital Image Processing", Pearson Education, 2nd Edition

[21] Shiv Ram Dubey, Pushkar Dixit, Nishant Singh, Jay Prakash Gupta: Infected Fruit Part Detection using K-Means Clustering Segmentation Technique. IJIMAI 2(2): 65-72 (2013)