International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

A Review on Recent Methods to Detect Leaf Disease Symptoms Using Image Processing

Chaitali Pandya[1], L. K. Sharma[2]

[1]Research Scholar, Rai University, Ahmedabad, India

[2]National Institute of Occupational Health, Ahmedabad, India

Abstract: ***This paper presents a review on methods that use digital image processing systems to identify, evaluate and categorize plant diseases from digital images. In this research, different algorithms for disease spot segmentation using image processing methods in plant leaf are considered. Various techniques ranging from Image Pre-processing and Filtering, Feature Extraction based Classification, ANN, YCbCr Colour extraction and BPNN have been reviewed. The best use is to find out optimum amount of pesticides to be sprayed on crops and leaves to reduce soil contamination from over usage of pesticides, and to preserve the plants from diseases.***

Keywords: Image Processing, Leaf Disease, Image Classification, Segmentation

1. Introduction

Farming is an obsolete occupation. It assumes an essential part in our everyday life. Food is essential need of every person. To dispense food among huge population needs proper amount of production. In India large number of population lives in rural areas where livelihood of people depends mostly on agriculture. Thus Indian economy mostly depends on agriculture. Hence increasing quality production has become necessary day by day.

Observing of plants and their administration from beginning time is most extreme imperative. It contains different undertakings like preparation of soil, seeding, including compost and manure, irrigation, disease detection, scattering pesticides, harvesting and storage [1]. Among these whole undertakings splashing appropriate quantity of pesticides must be taken proper care. Pesticides are used to attract, seduce and destroy pests hence known as crop protection product. Pesticides are set up by unsafe chemicals or sometimes by biological methods to kill pests, weeds or infections on plants.

Extensive level of agriculturists in India splashes pesticides on money products, vegetables or natural product plants. As a rule it has been watched that overdose of pesticides is over 40% [2]. Hence, it causes harm to plant/crops as well as to human beings. Farmers manually checks diseases and spray pesticides accordingly. Pesticides if sprayed in large amount lead to loss in nutrients which ultimately aims to decrease in quality food production. Due to this, production gets affected by means of both quality and quantity. Also if they are not washed properly causes harmful diseases to human beings like chronic diseases.

A standout amongst the most well-known practices of splashing pesticide is by utilizing sprayer. In customary farming generally mechanical sprayer or pressure driven sprayers are utilized. Farmers fundamentally spray manually sometimes in excess quantity or in less quantity. Promote in the vast majority of the cases ranchers don't utilize defensive attire. Subsequently unsafe pesticides enter in body either by being breathed in or through skin or eyes. Introduction to pesticides thus causes irritation of nose to most deadly infections. Hence to avoid all above things and to increase yield by means of quality and quantity it is necessary to detect disease in proper amount and spray pesticides properly. Also farmer has to pay for labours too. They also have to work whole day with much more efforts. Hence need to overcome these drawbacks various techniques have been invented.

Thus, it's critical to recognize infections on plant/crop appropriately. When they are infested by ailments, there is change in shape, size and colour. These indications can be checked physically however not in appropriate amount. Hence there are several image processing techniques presented that can help farmers to judge the causes and severity of crop diseases, and it takes on important theoretical and practical significance for improving the automatic management of crop. Most scholars have used image processing techniques to detect accurate plant diseases in faster way.

The following steps for the detection of leaf spot diseases is followed: image acquisition, image pre-processing, disease spot segmentation, feature extraction and disease classification. The result accuracy depends on method, which is used for disease spot detection.

Camargo et al. [7] proposed methods to identify visual symptoms of plant disease from analysis of coloured images using image processing. The RGB image of diseased plant has been then converted to H, I3a, and I3b. A set of maximum threshold cut-off has been used. A correct detection of infected part by disease with various ranges of intensities has been obtained using segmentation process. To test the accuracy of their proposed algorithm they used manually segmented images which were compared with those automatically segmented images. Their results showed that the developed algorithm was able to identify a diseased

region even when that region was represented by a wide range of intensities.

Some of the fungal diseases cause brown spots on leaves. Sugarcane plants infected by fungus also causes brown spot appearance on leaves. Simple threshold and triangular threshold methods [8] has been used for segmentation of the leaf area and lesion region area respectively. Results obtained have been proved fast and accurate by using these methods. The accuracy has been resulted to 98.60%.

According to [10] histogram matching is used to identify plant disease. In plants, disease appears on leaf therefore the histogram matching is done on the basis of edge detection technique and colour feature. Layers separation technique is used for the training process which includes the training of these samples which separate the layers of RGB image into red, green, and blue layers and edge detection technique which detecting edges of the layered images. Spatial Gray level Dependence Matrices are used for developing the colour co-occurrence texture analysis method.

2. Literature Review

Ying et al [3] considered the method of image pre-processing for detecting the disease spot. In this study they consider that firstly the Leaves with spots must be pre-processed in order to carry out the smart diagnosis to crop diseases based on image processing and suitable features should be removed on the basic of this. And only in this way, crop diseases can be recognized accurately. In this paper they compared the effect of two filters Simple filter and Median filter, and at last they 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 to get more desired result.

Anand et al [4] presented a method to identify plant leaf disease and a method for careful detection of diseases. The goal of proposed work is to diagnose the disease of brinjal leaf using image processing and artificial neural techniques. In their proposed algorithm they first resized the given image in order to maintain uniform size for all the dataset images. After resizing, the RGB colour transformation is performed on image. The boundaries of the disease-affected images are reduced by applying different masking techniques to an image. Disease attacked clusters from the classifier is converted to HSI translation model. From HSI model they extract the salient texture features such as angular moment, intensity of covariance and entropy features, and then the features set are divided into training and testing feature set. Artificial Neural Network is used as a training algorithm. Based on the training and testing feature set of the neural network, the recognition is performed The leaf spot disease is considered in their work and it is possible to identify the disease using k-means clustering algorithm and Artificial Neural Network (ANN). Various parameters are calculated as Perimeter, Area, Diameter, Centroid, and Mean Intensity to identify a Brinjal diseases.

In paper [5], a research of maize disease image recognition of corn leaf based on image processing and analysis, which is to study diseases of image classification based on spatial gray matrix extraction maize disease markings, using the principle of BP network, and realize to identify diseases of corn image classification. In their proposed technique, if texture characteristics of corn is considered, YCbCr colour space technology is used for segmentation of disease spot, and the co-occurrence matrix spatial gray level layer is used to remove disease spot texture feature, and uses BP neural network to class the maize disease. They do experiments On VC++ platform, for the study design recognition algorithm, the experimental results show that the algorithm can effectively recognize the disease image; the accuracy was as high as 98%.

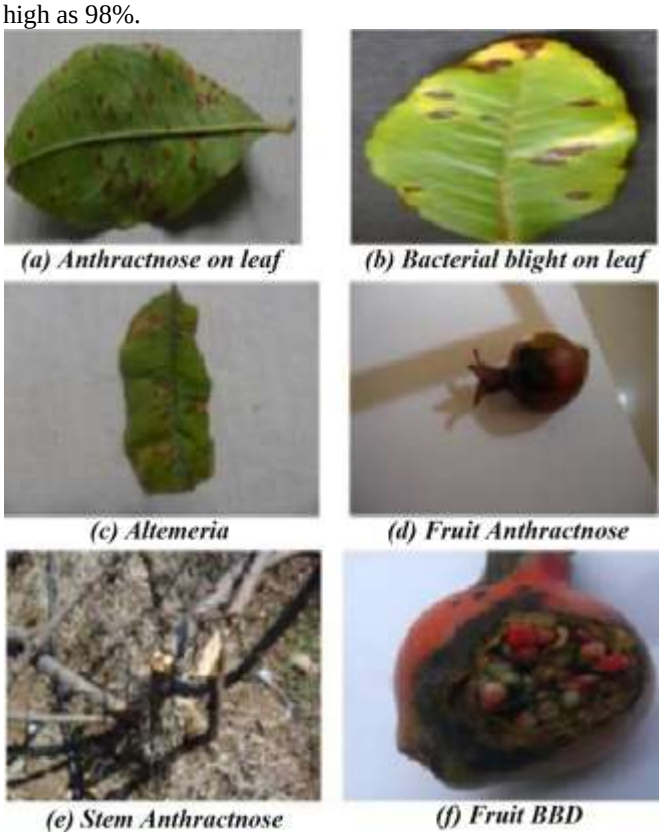

Figure 1: Various diseases affecting Pomegranate [9].

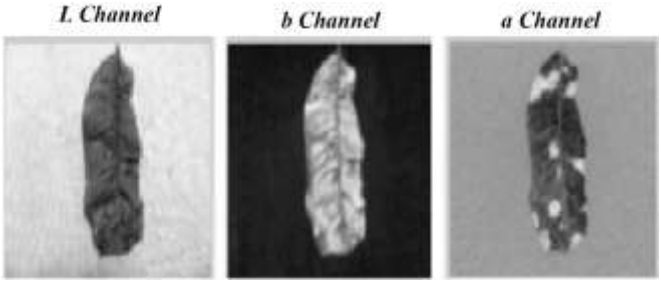

Figure 2: Leaf and disease identification using Lab Colour Space [9]

Al-Hiary et al [6] suggested and experimentally calculate a software solution to detect and classify plant leaf diseases. Their work is categorized in three parts first to identifying the infected object(s) based upon K-means clustering procedure then extracting the features set of the infected objects using colour co-occurrence methodology for texture analysis and at last detecting and classifying the type of disease using ANNs.

They tested their proposed Algorithm on five diseases which effects on the plants; Cottony mold, Early scorch, late scorch, ashen mold, tiny whiteness.

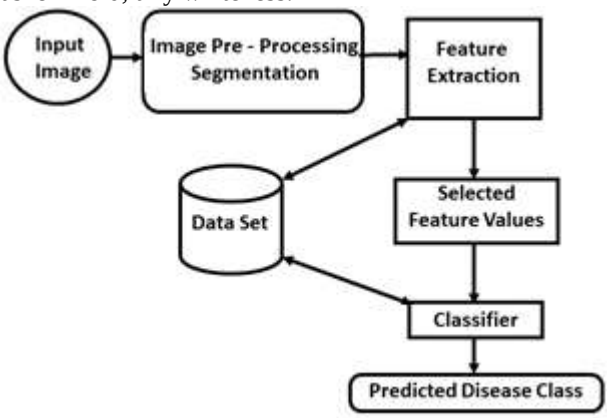

Figure 3: Algorithm to identify disease after extraction using Lab colour space by ANN [9]

Kulkarni et al. [9] presented a methodology for early and accurately plant diseases detection, using artificial neural network (ANN) and diverse image processing techniques shown in Fig (1) (2) and (3). As the proposed approach is based on ANN classifier for classification and Gabor filter for feature extraction, it gives better results with a recognition rate of up to 91%. An ANN based classifier classifies different plant diseases and uses the combination of textures, colour and features to recognize those diseases.
Camargo et al [7] proposed methods to identify visual symptoms of plant disease from analysis of coloured images using image processing. The RGB image of diseased plant has been then converted to H, I3a, and I3b. A set of maximum threshold cutoff has been used. A correct detection of infected part by disease with various ranges of intensities has been obtained using segmentation process. To test the accuracy of their proposed algorithm they used manually segmented images which were compared with those automatically segmented images. Their results showed that the developed algorithm was able to identify a diseased region even when that region was represented by a wide range of intensities.

Some of the fungal diseases cause brown spots on leaves. Sugarcane plants infected by fungus also causes brown spot appearance on leaves. Simple threshold and triangular threshold methods [8] has been used for segmentation of the leaf area and lesion region area respectively. Results obtained have been proved fast and accurate by using these methods. The accuracy has been resulted to 98.60%.

According to [10] histogram matching is used to identify plant disease. In plants, disease appears on leaf therefore the histogram matching is done on the basis of edge detection technique and color feature. Layers separation technique is used for the training process which includes the training of these samples which separate the layers of RGB image into red, green, and blue layers and edge detection technique which detecting edges of the layered images. Spatial Gray level Dependence Matrices are used for developing the color co-occurrence texture analysis method.

3. Conclusion

Multiple techniques ranging from Image Pre-processing and Filtering, Feature Extraction based Classification, ANN, YCbCr Colour extraction and BPNN, Histogram Matching with Edge Detection, Simple and Triangular Threshold method, have been reviewed in this paper. Best results obtained with high accuracy of 98.60% have been observed in Simple Threshold and Triangular threshold based segmentation technique.

References

[1] H. Durmus, E. Gunes, K. Murvet and B. B.Ustundag, “The design of general purpose autonomous agricultural mobile robot: Agrobot”, IEEE Fourth International conference on Agro-Geoinformatics, 2015, pp. 49-53.
[2] S. K.Pilli, B. Nallathambi, S. J. George, and V. Diwanji, “eAgrobot-A robot for early crop disease detection using image processing”, 2nd International Conference on Electronics and communication system, 2015. DOI: 10.1109/ECS.2015.7124873
[3] G. Ying, L. Miao, Y. Yuan and H. Zelin, “A Study on the Method of Image Pre-Processing for Recognition of Crop Diseases”, International Conference on Advanced Computer Control, 2008 IEEE, pp. 202-206. DOI: 10.1109/ICACC.2009.10
[4] R. Anand, S. Veni, J. Aravinth “An Application of image processing techniques for Detection of Diseases on Brinjal Leaves Using K-Means Clustering Method” International Conference On Recent Trends In Information Technology, 2016. DOI: 10.1109/ICRTIT.2016.7569531
[5] S. Kai, L. Zhikun, S. Hang “A Research of Maize Disease Image Recognition of Corn Based on BP Networks” International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2011 IEEE, pp. 246-249. DOI: 10.1109/ICMTMA.2011.66
[6] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. ALRahamneh “Fast and Accurate Detection and Classification of Plant Diseases” International Journal of Computer Applications, Vol. 17, No. 1, pp. 31-38, 2011.
[7] A. Camargo, J. S. Smith, “An image-processing based algorithm to automatically identify plant disease visual symptoms”, Elsevier Biosystems Engineering, Vol. 102, Issue 1, pp. 9-21, 2008.
[8] S. B. Patil, and S. K. Bodhe, “Leaf disease severity measurement using image processing,” International Journal of Engineering and Technology, Vol. 3, No. 5, pp. 297-301, 2011.
[9] A. H. Kulkarni and A. Patil, “Applying image processing technique to detect plant diseases”, International Journal of Modern Engineering Research, Vol. 2, Issue 5,pp-3661-3664, 2012
[10] S. Naikwadi and N. Amoda, “Advances in image processing for detection of plant diseases”, International Journal of Application or Innovation in Engineering & Management, Vol. 2, Issue 11, pp. 168-175, 2013.