



Detection of Plant Leaf Disease by Using Image Processing Approaches

Dr.Manjunath R¹, Akshay N Mohan², Srinivas G³

Professor, Department of CSE, R R Institute of Technology, Bengaluru, Karnataka, India¹

UG Student, Dept. of CSE, R R Institute of Technology, Bengaluru, Karnataka, India^{2,3}

ABSTRACT: Agriculture is one of the basic need of world. It's important wherever in additional than seventieth population of an Asian country is depends on agriculture. Crop cultivation plays an essential role in the agricultural field. India's agriculture is composed of many crops and according to survey nearly 70% population is depends on agriculture. Which means it feeds nice range of individuals. The foremost necessary consider less amount crop of quality because of disease. Detecting disease may be a key to stop agricultural losses. To identify the plant diseases at an untimely phase is not yet explored. The main challenge is to reduce the usage of pesticides in the agricultural field and to increase the quality and quantity of the production rate. Our paper is used to explore the leaf disease prediction at an untimely action. We propose an enhanced k-mean clustering algorithm to predict the infected area of the leaves. Detecting disease may be a key to stop agricultural losses. The aim of this project is to develop a software system answer that Mechanically find and classify disease. The step like loading an image, PreProcessing, Segmentation, extraction and classification are involves illness detection.

KEYWORDS: Plant disease detection, Segmentation , Classification , K-means Clustering.

I. INTRODUCTION

India is eminent for Agriculture that means most of the people are engaged towards agriculture industry. The agriculture industry act as a significant role in the economic sectors. Most of the plants are infected by variant fungal and bacterial diseases. Anyway, the crops cultivation for maximum profit and standard manufacture is usually scientific. This might be developed by the help of technical assist. The supervision that continually recurring crops needs supreme power especially for the disease management that may have a result on factors of production significantly to make an economic profit. Due to the exponential inclination of population, the climatic conditions also cause the plant disease. The major challenges of sustainable development is to reduce the usage of pesticides, cost to save the environment and to increase the quality. Precise, accurate and early diagnosis may reduce the usage of pesticides. For doing so, a large team experts as well as continuous monitoring of large farms. At the same time, in some countries monitoring of plant is required, which costs very high, when we do with large farms. Biomedical is one of the fields to detect plant diseases. In current day among this field, the image processing methods are suitable, efficient and reliable field for disease detection with help of plant leaf images. Farmers need fast and efficient technique detect all types of diseases of plants that can save time. These systems that can reduce efforts and use of pesticides. For measurement of yields in agriculture different ideas are proposed by scientists with the help of laboratory and systems for efficient identification of plant leaf diseases. The paper we presented here is survey of various types of plant diseases and techniques for detection of disease by different researchers

II. LEAF DISEASE FUNDAMENTAL IN PLANTS

Generally, there are 3 forms of plant diseases. They're microorganism, Viral and fungal as shown in Figure 1.

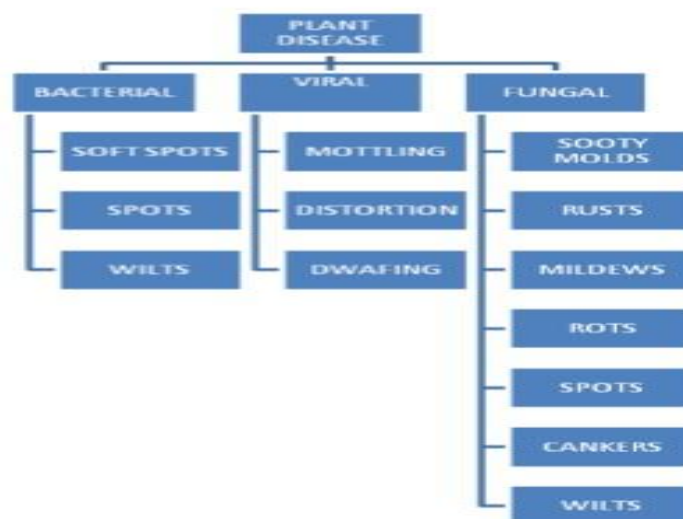


Figure 1: Plant disease fundamental

Many researchers had done research on various plants and their diseases also they had given some techniques to identify that disease. Automation of identifying disease entails the input data collected from different sources. In this review, considering all different research papers we are identifying and discussing key issues, challenges on disease and techniques are as follows.

- ✚ Quality image of plant leaves.
- ✚ Data set need to be considered in large amount.
- ✚ Acquired images are affected by background data and noises.
- ✚ Segmenting the exact spot in a leaf into meaningful disease. Preparation of training and testing samples from input image.
- ✚ Classification plays a role in recognizing segmented spot into meaningful disease.
- ✚ Colour of plant leaf, size and texture are varying when climate changed. • Regular observation is needed for particular plants.
- ✚ Identifying diseases for different plant leaves is challenging.
- ✚ Reviews suggest that image processing and machine learning techniques have more potential to find diseases so, there has to be improving in existing research. Keeping all these in mind and to discuss the techniques used to accomplish these challenges, the literature survey is discussed.

DIFFERENT TYPES OF PLANT DISEASE The reason for this section is that researchers can understand type of image processing operation and type of feature need to be considered by observing various diseases. Disease to the plants that takes place when a virus, bacteria infects a plant and disorders its normal growth. Effect on plant leaves can vary from discoloration to death. Disease causes due to including fungi, microbes, viruses, nematodes. Here we are discussing some common diseases in Maize, arecanut, coconut trees, Papaya, Cotton, Chilli, Tomato, Brinjal. The images of plant disease are shown in Figure 1. Several variants of Diseases are explained further.

- ✚ **Rust:** It is usually found on leaves lower surfaces of mature plants. Initially raised spots on the undersides of leaves. As time passes these spots become reddish- orange spore masses. Later, leaf postules turn to yellow-green and eventually black. Severe infestations will bend and yellow leaves and cause leaf drop.
- ✚ **KoleRoga:** It is a major disease of arecanut. The pathogen is a fungus *Phytophthora palmivora*.
- ✚ **Yellow leaf disease:** This disease caused by pathogen *Phytoplasma* in arecanut where green leaves tuning into yellow that gradually decline in yield.
- ✚ **Leaf rot:** It is caused in coconut tree. It is caused by fungi or bacteria. Leaf spot vary in size, shape and colors.
- ✚ **Leaf curl:** Disease is characterized by leaf curl. It can cause by fungus, genus *Taphrina* or virus.



- ✚ Angular leaf spot: Most of cotton plants die due to this disease because it appears on leaves first then water soaked. Finally turn black and form holes in leaves.
- ✚ Leaf spot: It is serious bacterial disease found in chili spread by *Xanthomonas campestris pv vesicatoria*.
- ✚ The symptoms like small yellow green lesions and patches on leaves.
- ✚ Late Blight: Late Blight spreads rapidly. The development of the fungus due to Cool and wet weather. It forms irregularly shaped ashen spots signs on leaves. Around the spots there will be a ring of white mold.
- ✚ Bacterial wilt: Brinjal cultivation yield drops due to bacterial wilt. Entire plant has fall down due to wilting of the foliage.

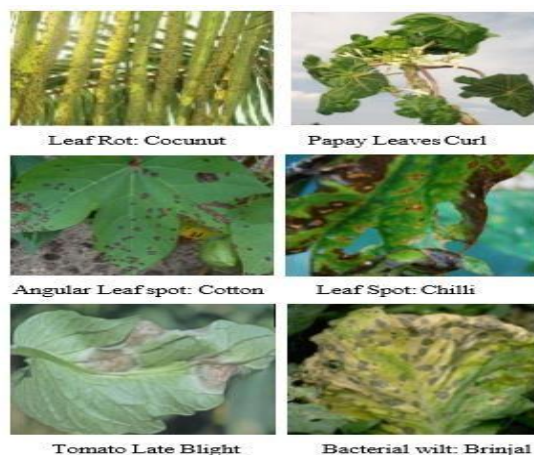


Figure 2: Different types of leaves and roots Diseases

III. RELATED WORK

An Overview of the Research on Plant Leaves Disease detection using Image Processing Techniques by Kiran R. Gavhale, and U. Gawande, Gavhale and Gawande (2014) presented reviews and summarizes image processing techniques for several plant species that have been used for recognizing plant diseases. The major techniques for detection of plant diseases are: back propagation neural network (BPNN), Support Vector Machine (SVM), K-nearest neighbor (KNN), and Spatial Gray-level Dependence Matrices (SGDM). These techniques are used to analyse the healthy and diseased plants leaves. Intelligent Diagnose System of Wheat Diseases Based on Android Phone by Y. Q. Xia, Y. Li, and C. Li, In 2015, Xia and Li have proposed the android design of intelligent wheat diseases diagnose system. In this process, users collect images of wheat diseases using Android phones and send the images across the network to the server for disease diagnosis. After receiving disease images, the server performs image segmentation by converting the images from RGB color space to HSI color space. The color and texture features of the diseases are to be determined by using colour moment matrix and the gray level cooccurrence matrix. The preferred features are input to the support vector machine for recognition and the identification results are fed back to the client. Implementation of RGB and Gray scale images in plant leaves disease detection –comparative study by Padmavathi and Thangadurai (2016) have given the comparative results of RGB and Gray scale images in leaf disease finding process. Indetecting the infected leaves, color becomes an important feature to find the disease intensity. They have considered Grayscale and RGB images and used median filter for image enhancement and segmentation for extraction of the diseased portion which are used to identify the disease level. This study [9] summarizes major image processing used for identification of leaf diseases are k-means clustering, SVM. This approach can considerably support an correct detection of plant disease. There are 5 steps for the plant disease identification that are same to be image acquisition, image pre-processing, segmentation, feature extraction, classification. By using this idea the illness identification is completed for all types of leaves and additionally the user can recognize the affected space of leaf in share by distinctive the illness properly the user will rectify the matter terribly straightforward and with less price. The authors introduced FCM Clustering Technique for Segmentation. SVM used for Classification of Plant diseases. Sickness level of the accuracy with the help of this approach, it supply varied bar technique, the extent of destruction and helps to visualize whether or not the sickness spreads or not. The authors introduced plant disease Detection in Image processing mistreatment MATLAB. leaf & fruit pictures are segmental mistreatment k-means clustering methodology to make clusters. Options are extracted mistreatment GLCM methodology. Apply K-means and SVM



formula for coaching and prediction. Automatic and correct estimation of illness severity is important for food security, illness management, and yield loss prediction. Deep learning, the most recent breakthrough in computer vision, is promising for fine-grained illness severity classification, because the methodology avoids the effortful feature engineering and threshold-based segmentation. Exploitation the apple plant disease pictures within the Plant Village dataset that are additional annotated by botanists with four severity stages as ground truth, a continuous of deep convolution neural networks are trained to diagnose the extremity of the illness.

IV. PROPOSED SYSTEM

In our proposed system we are providing a solution to recover from the leaf diseases and also show the affected part of the leaf by image processing technique. The existing system can only identify the type of diseases which affects the leaf. We will provide a result within fraction of seconds and guided you throughout the project. The steadily planned method consists of leaf picture information assortment, pre-processing of these pictures; segment of these pictures using k-means cluster methodology, GLCM is used to extracting the feature and at last the random forest algorithmic used for coaching of method. A. Image Acquisition Loading of an image is that the 1st technique of digital picture process and it's represented as capturing the image through digital camera and stores it in digital media for additional MATLAB operations. it's additionally an action of retrieving a picture from hardware, so it will be capable further method. In our work, using camera we tend to captured healthy and diseased pictures of leaf and two for MATLAB image processing system.

Plant Diseases- Fundamentals: In the field of crop production, plant disease is a significant factor that degrades the eminence and quantity of the plants. The common approach followed in plant diseases are the classification and detection model. Both the classification and detection model are widely studied by the Engineering and IT fields.

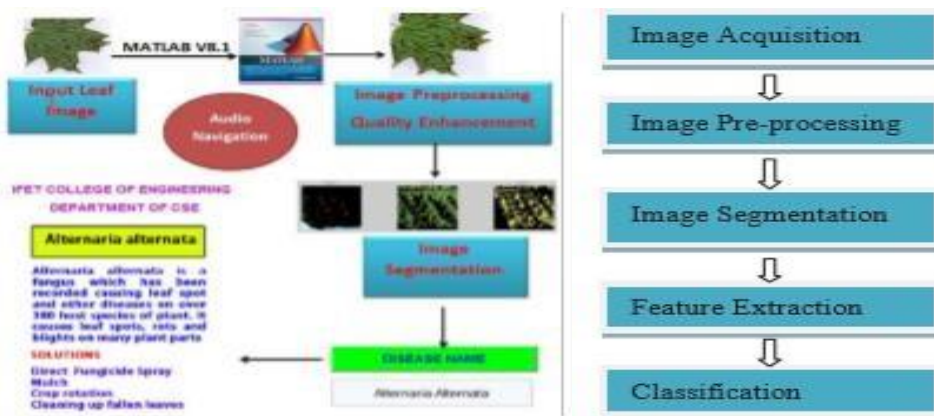


Figure 3: Architecture of proposed system

A. Image Acquisition

Loading of an image is that the 1st technique of digital picture process and it's represented as capturing the image through digital camera and stores it in digital media for additional MATLAB operations. it's additionally an action of retrieving a picture from hardware, so it will be capable further method. In our work, using camera we tend to captured healthy and diseased pictures of leaf & fruit as shown in figure for MATLAB image processing system.

B. Image Preprocessing

The main motive of image pre-processing is to enhance the image information contained unwanted distortions or to reinforce some image features for any processing. Preprocessing technique uses various techniques like dynamic image size and form, filtering of noise, image conversion, enhancing image and morphological operations. in this work, we used numerous MATLAB code to change size of the image, to enhance contrast and RGB to grayscale conversion as shown in Fig. 4 and Fig. 5 for additional operations like making clusters in segmentation.

C. Image Segmentation



Segmentation of image is that the technique for conversion of digital picture into many segments and rendering of a picture into something for easier analysis. using image segmentation is employed for locating the objects and bounding line of that image. In segmentation, we tend to used K-means cluster technique for partitioning of pictures into clusters during which a minimum of one part of cluster contain image with major space of unhealthy part. The kmeans cluster algorithmic rule is applied to classify the objects into K variety of categories per set of features. The classification is completed by minimize the total sq. of distances among information entities and therefore the particular cluster. Image is regenerate from RGB Color space to $L^*a^*b^*$ Color space during which the $L^*a^*b^*$ area contains of a luminousness layer ' L^* ', chromaticity ' a^* ' and ' b^* '.

K-means Clustering Algorithm

- a. Load the input images.
- b. Commute the RGB image into $L^*a^*b^*$ color space.
- c. RGB images are combination of primary colors (Red, Green, Blue).
- d. RGB image feature Pixel Counting technique is extensively applied to agricultural science.
- e. The $L^*a^*b^*$ space consists of a radiance layer ' L^* ', chromaticity-layer ' a^* ' indicating where color falls along the red-green axis and chromaticitylayer ' b^* ' indicating where the color falls along the blue-yellow axis. All of the color information is in the ' a^* ' and ' b^* ' layers.
- f. Clustering the variant colors using k-mean method.
- g. The Euclidean distance between two objects is defined as follows:

Each pixel is labeled under clusters based on its estimated variant cluster-centers. Otsu's classifier In image processing technique, Otsu's strategy is utilized to perform clustering based image Threshold. The diminishment of a gray level image to a binary image is done by Nobuyuki Otsu .This algorithm assumes , image contains two classes of pixels .It incorporates bi-modal histogram (foreground pixels and background pixels).We can calculate the optimum threshold by isolating the two classes and their combined spread (intraclass variance) is negligible or equivalently.

D. Classification

Classification technique is used to coaching and testing of the leaf of the plants. The Random forest classifier is used for classification.

E. Extraction

Feature extraction is the important part to gracefully predict the infected region. Here shape and textural feature extraction is done. The shape oriented feature extraction like Area, Color axis length, eccentricity, solidity and perimeter are calculated. Similarly the texture oriented feature extraction like contrast, correlation, energy, homogeneity and mean.

V. RESULTS & DISCUSSION

The results which we have found by using plant disease detection method is discussed below

A. AernariaAlternata

It is a fungus which influences the leaf spots over 380 have species of plant.It can too influences leaf spots, rots, blight and other plant parts.



Figure 4:..Alternariaalternate

B. Bacterial Blight

Bacterial Blight is characterized by small, pale green spots or streaks appeared as water-soaked. The lesion will expand then appear as dry dead spots. It may extend until the full length of the leaf.

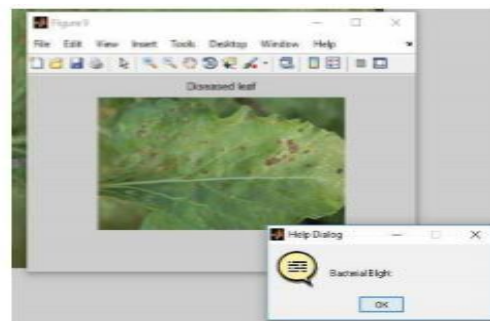


Figure 5: Bacterial Blight

C. Cercospora leaf spot

Infested leaf has tan to brown spots with curled leaf margin and afterward it withers. Because the illness progresses, the leaflets flip yellow and additionally with curled margins. Spots on the leaf petioles, stems, and flower components become elongated and have brown color. On heavily troubled plant shows in Fig. 9 defoliation might occur.

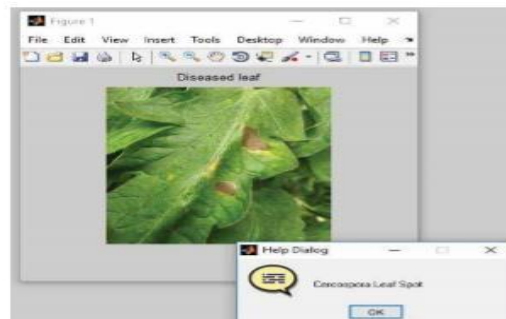


Figure 6: Cercospora leaf spots



VI. CONCLUSION AND FUTURE WORK

The present study deals with Alternaria Alternata, Antracnose, Bacterial Blight and Cercospora Leaf Spot these automatic illness detection using image processing techniques in MATLAB. It involves loading an image, image preprocessing, image segmentation, feature extraction and classification. Development of automatic detection system using advanced technology like image process facilitate to support the farmers within the identification of diseases at an early or initial stage and supply helpful data for its management. we might prefer to extend our work additional on a lot of disease detection. This project implements an innovative idea to identify the affected crops and provide remedy measures to the agricultural industry. By the use of k-mean clustering algorithm, the infected region of the leaf is segmented and analyzed. The images are fed to our application for the identification of diseases. It provides a good choice for agriculture community particularly in remote villages. It acts as an efficient system in terms of reducing clustering time and the area of infected region. Feature extraction technique helps to extract the infected leaf and also to classify the plant diseases. The embedded voice navigation system helps to guide us throughout the process. As future enhancement of the project is to develop the open multimedia (Audio/Video) about the diseases and their solution automatically once the disease is detected. To have a meaningful impact of plant diseases & techniques in the area of agriculture, deliberation of proper input is necessary. Research issues addressed here are to develop a systematic approach to detect and recognize the plant diseases would assist farmers and pathologist in prospect exploration. The importance of plant disease to be identified sooner by using plant diseases and in the future plant disease technique will be improved for the future work.

VI. REFERENCES

- [1] Malti K. Singh, Subrat Chetia “Detection and Classification of Plant Leaf Diseases in Image Processing using MATLAB” International Journal of Life Sciences Research ISSN 2348-3148 Vol. 5, Month: October - December 2017, Available at: www.researchpublish.com.
- [2] Sujatha R, Y Sravan Kumar and Garine Uma Akhil “Leaf Disease Detection using Image Processing” Article in Journal of Chemical and Pharmaceutical Sciences March 2017 <https://www.researchgate.net/publication/318109025>.
- [3] Sujeet Varshney, Tarun Dalal “Plant Disease Prediction using Image Processing Techniques- A Review” International Journal of Computer Science and Mobile Computing, Vol.5 Issue.5, May- 2016, pg. 394398
- [4] Ms. Kiran R. Gavhale, Prof. Ujjwala Gawande “An Overview of the Research on Plant Leaves Disease detection using Image Processing Techniques” IOSR Journal of Computer Engineering (IOSRJCE) 7 Volume 16, Issue 1, Ver. V (Jan. 2014).
- [5] Pranita P. Gulve, Sharayu S. Tambe, Madhu A. Pandey, Mrs. S.S. Kanse.” Leaf Disease Detection of Cotton Plant Using Image Processing Techniques” IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834, p-ISSN: 2278-8735. PP 50-54 www.iosrjournals.org Innovation
- [6] Arti N. Rathod, Bhavesh A. Tanawala, Vatsal H. Shah “ Leaf Disease Detection Using Image Processing and Neural Network” International Journal of Advance Engineering and Research Development (IJAERD) Volume 1, Issue 6, June 2014.
- [7] Guan Wang, Yu Sun, and Jianxin Wang “Automatic Image-Based Plant Disease Severity Estimation Using Deep Learning” Hindawi Computational Intelligence and Neuroscience Volume 2017, Article ID 2917536, 8 pages <https://doi.org/10.1155/2017/2917536>
- [8] Y. Q. Xia, Y. Li, and C. Li, “Intelligent Diagnose System of Wheat Diseases Based on Android Phone,” J. of Infor. & Compu. Sci., vol. 12, pp. 6845-6852, Dec. 2015.
- [9] Wenjiang Huang, Qingsong Guan, Juhua Luo, Jingcheng Zhang, Jinling Zhao, Dong Liang, Linsheng Huang, and Dongyan Zhang, “New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases”, IEEE journal of selected topics in applied earth observation and remote sensing, Vol. 7, No. 6, June 2014
- [10] Monica Jhuria, Ashwani Kumar, and Rushikesh Borse, “Image Processing For Smart Farming: Detection Of Disease And Fruit Grading”, Proceedings of the 2013 IEEE Second International Conference on Image Information Processing (ICIIP-2013)
- [11] Zulkifli Bin Husin, Abdul Hallis Bin Abdul Aziz, Ali Yeon Bin Md Shakaff Rohani Binti S Mohamed Farook, “Feasibility Study on Plant Chili Disease Detection Using Image Processing Techniques”, 2012 Third International Conference on Intelligent Systems Modelling and Simulation.



- [12] Mrunalini R. Badnakhe, Prashant R. Deshmukh, “Infected Leaf Analysis and Comparison by Otsu Threshold and k-Means Clustering”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 3, March 2012.
- [13] 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 (0975 – 8887) Volume 17– No.1, March 2011
- [14] Chunxia Zhang, Xiuqing Wang, Xudong Li, “Design of Monitoring and Control Plant Disease System Based on DSP&FPGA”, 2010 Second International Conference on Networks Security, Wireless Communications and Trusted Computing.
- [15] RajneetKaur , Miss. ManjeetKaur “A Brief Review on Plant DiseaseDetection using in Image Processing”IJCSMC, Vol. 6, Issue. 2, February 2017