

A Survey on Various Plant Leaf Diseases & Its Detection Techniques

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Abstract— In this survey paper, we present survey on the variety of leaf disease in plants and also their classification and identification. When plants are affected by the diseases, it may affects the production as well as the economy of the country. In order to find out which disease affect the plants, the farmer need to contact the expert for the solution. The expert provide the suggestions which is based on its knowledge and information whereas sometimes searching the expert suggestion is time consuming, expensive and may be not precise. Therefore to resolve this problem, Image processing techniques provides the accurate and fast solution. Here this survey paper gives different detection and classification techniques. There are various successful detection techniques like Probabilistic Neural Network, Genetic algorithm, Artificial Neural Network, Back propagation neural network and Support vector machine (SVM).

Key words: Leaf disease, Image Pre-Processing, Feature Extraction, Dicot Plant Disease, Monocot Plant Disease

I. INTRODUCTION

India is a farming nation. Agriculturists have an extensive variety of assorted variety to choose reasonable fruit and vegetable crop. Research work builds up the propelled processing system to distinguish the diseases utilizing contaminated images of different leaf spots.

Images are caught by digital camera mobile and prepared utilizing picture developing, at that point the piece of the leaf spot has been utilized for the grouping reason for the prepare and test. The method developed into the system is both Image preparing strategies and advance computing methods.

Image analysis can be applied for the following purposes:

- To identify diseased leaf, stem, fruit.
- To measure influenced region by infection.
- To discover the boundaries of the influenced territory.
- To decide the color of the influenced territory.
- To decide size and shape of a leaf.
- To distinguish the Object accurately, etc.

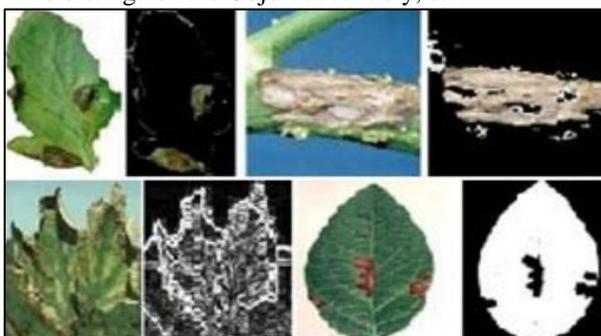


Fig. 1: Image Analysis of Plant

Disease administration is a challenging assignment. For the most part diseases are seen on the leaves or stems of the plant. Exact measurement of these outwardly watched diseases, bothers, attributes have not considered yet as a result of the many-sided quality of visual patterns. Consequently there has been expanding interest for more particular and complex picture design understanding [1].

Different types of leaf spot diseases:

- Bacterial
- Fungal
- Viral

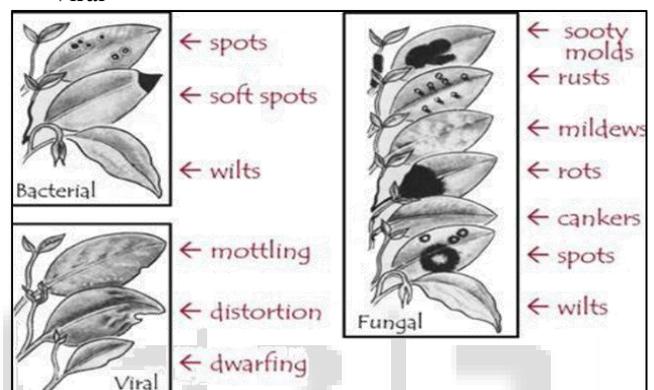


Fig. 2: Different Types of Leaf Diseases

Most leaf diseases are caused by fungi, bacteria, and viruses. Fungi are distinguished principally from their morphology, with accentuation set on their regenerative structures. Bacteria are viewed as primitive than fungi and for the most part have more straightforward life cycles. With couple of special cases, bacteria exist as single cells and increment in numbers by separating into two cells amid a procedure known as binary fusion viruses are greatly small particles comprising of protein and hereditary material with no related protein [9].

In natural science, now and then a great many images are produced in a single analysis. There images can be required for additionally examines like ordering lesion, scoring quantitative qualities, ascertaining territory eaten by insects, and so on. All of these assignments are prepared physically or with unmistakable software packages.

It isn't just a colossal measure of work yet additionally experiences two noteworthy issues: unnecessary preparing time and subjectiveness ascending from various people. Subsequently to direct high throughput tests, plant researcher require effective PC programming to consequently remove and break down critical substance. Here picture preparing assumes an essential part [1].

II. BASIC TYPES OF PLANT FAMILIES

There are mostly of two sorts of plant Monocot family plant and Dicot family plant.

A. Monocot Family Plant

Disease identification be detected on the basis of their sort of plant family. The Monocot family plant has different characteristics such as one seed leaf, leaf veins, seed leaf are straight and parallel, which are in absence of wood. The Monocot plant diseases are mention in detail in the following section.

1) Leaf Blotch

The leaf blotch has mainly small oval and rectangular or in the form of irregular brown spots seen on leaves and will become dirty brown as shown in Figure 3. The disease is controlled by use of Mancozeb pesticides.



Fig. 3: Leaf Blotch

2) Leaf Spot

Leaf spot causes greyish or whitish spots with brown boundary of different sizes which seen on the upper most surface of leaves and the spots are greyish or whitish dark in the center. Due to leaf spot, leaves will get dry and died as shown in Figure 4.



Fig. 4: Leaf Spot

B. Dicot Family Plant

Dicot family plant has significance such as two seed leaf, nested leaf veins and complex structured, woody as well as woodless. The examples of Dicot family plants are honeysuckle, roses, peppers, strawberry, cotton, coffee, potatoes, tomatoes, beans etc.

The Dicot plant diseases are mention in detail in the following section.

1) Bacterial Blight

It is the most dangerous disease obtained in cotton plant which infects all the various parts of plant leaf as shown in Figure 5(a). Because of bacterial disease about 10% to 30% are losses in cotton production.



(a)



(b)

Fig. 5: (a) Early Blight & (b) Fusarium Wilt

2) Fusarium Wilt

It is fungal disease as shown in Figure 5(b). It usually affects the plant at any growing stage. Fusarium disease can causes the drooping of the older lower leaves, yellowing of the lower leaves, and followed by stunting of the plant and death of the plant.

3) Target Spot

It is disease formed tan to brown color spot that have concentric rings like a bull's-eye as shown in Figure 6 affected plant may look healthy from the top view, so it is very important to inspect lower leaves, where the first spot usually seen.



Fig. 6: Target Spot

III. LITERATURE SURVEY

Aakanksha Rastogi et al. [1], concentrated in the present situation it is imperative to have a built up approach for evaluating the defects on the plant leaves naturally. For this a framework in view of Machine Vision Technology and Artificial Neural Network (ANN) is of extraordinary use for consequently recognizing the leaf plant and additionally for leaf disease identification and evaluating. These frameworks will be extremely useful for agriculturist since it is proficient than the manual technique. The proposed framework utilizes Euclidean distance method and K means clustering system for division of image to portion the leaf region, disease territory and background zone of the information leaf image

with a specific end goal to ascertain the rate infection of the disease in the leaf and to review them into different classes.

Md. Nazrul Islam et al. [2], concentrated on a trial result shows that the proposed approach is profitable, can altogether assess two classifiers GA and PNN to help an exact identification of leaf diseases in a little computational exertion where fruitful classification rate of GA is more than PNN.

Garima Tripathi et al. [3], concentrated on a programmed image processing and neural network based approach has been considered and proposed for plant leaf disease discovery. The shading co-event strategy has been connected for removing set of shading and surface highlights particular to the sort of leaf diseases. The separated arrangement of highlights has been utilized as contribution to prepare a bolster forward back propagation neural network and resulting recognition of leaf diseases. In view of proposed approach, a proficient, straightforward, completely programmed, shabby, quick and solid framework can be created for identification and classification of plant diseases.

S. Arivazhagan et al. [4], concentrated on a utilization of surface examination in identifying and ordering the plant leaf diseases has been clarified in this paper. Along these lines the proposed algorithm was tried on ten types of plants in particular banana, beans, jackfruit, lemon, mango, potato, tomato, and sapota. The diseases particular to those plants were taken for our approach. The exploratory outcomes demonstrate the proposed approach can perceive and group the leaf diseases with a little computational exertion. By this technique, the plant diseases can be distinguished at the underlying stage itself and the nuisance control instruments can be utilized to take care of bug issues while limiting risks to individuals and the earth.

K. Muthukannan et al. [5], concentrated on the neural network algorithm is proposed for diseased plant leaf classification. The neural network systems, for example, feed-forward neural network (FFNN), learning vector quantization (LVQ) and radial basis function network (RBF) were tried for two distinctive diseased leaf image classifications, for example, bean and intense gourd clears out. The execution is estimated utilizing classification parameters, for example, Accuracy, Precision, Recall ratio and F measure. With these four parameters the execution is broke down and in light of the examination the FFNN classification approach gives better outcome.

Ajay A. et al. [6] proposed that, the features could be removed utilizing self-sorting out element outline with a back-propagation neural network is utilized to perceive shade of image. This data is utilized to portion cotton leaf pixels

inside the image, now image which is under consideration is very much examined and relying on this product perform assist examination in light of the idea of this image. As indicated by them this framework is giving 85 to 91% of correct disease location relying on the nature of image gave by the versatile scanner and the training. More prepare network prompts an extremely productive conclusion of the cotton leaf disease.

Prashant R. et al. [7] has looked at two fundamental procedures utilized for image processing that is edge and k-means and presumed that k-means is better strategy when contrasted with limit as Difference separated for edge are more than the same extricated an incentive for k-means clustering.

P. Revathi et al. [8] proposed a framework that utilizations versatile caught manifestations of cotton leaf spot images and group the diseases utilizing neural network. The significant goal of their Research work is to utilize Homogeneity-based edge finder division, which takes the aftereffect of any edge indicator and partitions it by the normal estimation of the zone. In this work accomplishing the objective of Homogeneity-based edge finder takes the aftereffect of any edge identifier and partitions it by the normal estimation of the region. This division expels the impact of uneven lighting in the image. The normal estimation of a region is accessible by convolving the zone with a mask containing every one of the ones and partitioning by the extent of the zone and prepare and test utilizing a neural network classifier.

Hrushikesh et al. [9] proposed a framework which distinguishes disease by computing leaf region through pixel number statistics, the proposed algorithm will recognize measure of disease display on the leaf, by means of essence of gaps and changes in the color. It will be anything but difficult to go for the seriousness estimation of disease.

Swapnil Ayane et al. [10] considered the example that showed up on the leaf for location of disease. The different element of image of leaf are removed, for example, zone, shape, state of gaps display on the leaf, diseases spot, and so on. These highlights are removed utilizing diverse image processing strategies. These separated component are utilized decide the events of specific insufficiency identified with essential supplement of cotton leaf. Nitrogen insufficiency can be distinguished by two preparatory advances, histogram examination and estimation of leaf region. The leaf with insufficiency has contrasted with that ordinary leaf, the leaf with inadequacy has diminished region contrasted with that of typical leaf.

S. No.	Author	Method Used	Plant Leaf	Findings	Problem Identified
1	Aakanksha et al.	<ul style="list-style-type: none"> - GLCM - Artificial Neural Network - K-Means clustering - Fuzzy logic 	Hydrangea Leaf	<p>Proposed framework is separated into two phases</p> <ul style="list-style-type: none"> - In the primary phase, the plant is perceived based on the highlights of leaf, it incorporates pre-processing of leaf images, and highlight extraction took after by Artificial Neural Network 	<ul style="list-style-type: none"> - Do not be able to learn and adjust to taking care of an issue. - Require extensive testing - Require expert who knows solution

				<p>based training and classification for acknowledgment of leaf.</p> <ul style="list-style-type: none"> - In the second phase the disease show in the leaf is ordered, this procedure incorporates K-Means based division of defected region, include extraction of the defected divide and the ANN-based classification of disease. 	
2	Md. Nazrul Islam et al.	<ul style="list-style-type: none"> - Probabilistic Neural Network (PNN) - GLCM 	Tomato Leaf	<p>Author proposed arrangement is a change to the future augmentation proposed with an additional phase named Genetic Algorithm which depends on standards of determination, hybrid, and transformation.</p>	<ul style="list-style-type: none"> - The recognition rate for dynamic image acquisition is varies. - Require more learning time Need to maintain huge leaf
3	Garima Tripathi et.al	<ul style="list-style-type: none"> - K- means clustering - Color Co-occurrence Method - Feed forward back propagation neural network 	Three Disease of Leaf	<p>Propose and assess a framework for detection and classification of plant leaf/stem diseases utilizing image processing and neural network strategy.</p>	<ul style="list-style-type: none"> - Neural networks cannot be retrained - NN requires a long training period. - NN include complex computation, which is time consuming
4	S. Arivazhagan et al.	<ul style="list-style-type: none"> - SVM classifier 	Rose, Beans, Banana, Lemon Leaf	<p>The proposed framework is a product answer for programmed location and classification of plant leaf diseases. The created processing plan comprises of four primary advances, initial a shading change structure for the info RGB image is made, at that point the green pixels are masked and expelled utilizing particular edge esteem tool after by division process, the surface statistics are registered for the helpful sections, at long last, the removed highlights are passed through the classifier.</p>	<ul style="list-style-type: none"> - lack of transparency - high algorithmic complexity - Extensive memory requirement
5	K. Muthukannan et al.	<ul style="list-style-type: none"> - Feed Forward Neural Network (FFNN) - Learning Vector Quantization (LVQ) - Radial Basis Function Networks (RBF) 	Bean and Bitter Gourd Leaf	<p>Proposed the neural network algorithm is proposed for diseased plant leaf classification. The neural network techniques such as a feed-forward neural network (FFNN), learning vector quantization (LVQ) and radial basis function network (RBF) were tested for two different diseased leaf image classifications such as bean and bitter gourd leaves.</p>	<ul style="list-style-type: none"> - Do not provide explanations - Not used for little Data.
6	Ajay A. et al.	Neural Network	Plant Leaf	<p>The system provides 85 to 91% of exact disease detection depending upon the quality of the image</p>	<ul style="list-style-type: none"> - Require more prepare network which prompts an

				provided by the portable scanner and the training.	exceptionally productive analysis of the diseases on the cotton leaf.
7	Prashant R. et al.	K-Means Clustering	Plant Leaf	The author presumed that k-means are better method when contrasted with the limit as Difference extricated for the edge is more than the same separated an incentive for k-means clustering.	– Require extensive testing
8	P. Revathi et al.	– Edge Based Segmentation – Neural network	Cotton Leaf Diseases	Classification of the diseases and accomplishing exceptionally fantastic accuracy, the product is extremely fast and time extraordinary, decrease the cost, consequently recognize the diseases and bug proposal to agriculturists through a cell phone.	– Neural networks cannot be retrained – NN requires a long training period.
9	Hrushikesh et al.	Neural Network	Rose Leaf	Paper exhibits an algorithm for image division procedure utilized for programmed recognition and also classification of plant leaf diseases and overview on various diseases classification methods that can be utilized for plant leaf disease location. Image division, which is an essential part of disease location in plant leaf disease, is finished by utilizing a hereditary algorithm.	– To enhance acknowledgment rate in classification process Artificial Neural Network, Bayes classifier, Fuzzy Logic and hybrid algorithms can likewise be utilized.
10	Swapnil Ayane et al.	Histogram based method	Cotton Leaf Diseases	Separated highlights are utilized to decide the event of the specific insufficiency identified with essential supplements of the cotton plant. Ill-advised utilization of a pesticide for plant diseases treatment expands the cost and natural contamination so their utilization must be fitting.	There is need to compare the results of area measurement with the standard methods.

Table 1: Comparisons of Various Techniques & Method used in Existing System

IV. CONCLUSION

The strategies which are essentially utilized for the identification and classification of leaf disease in plants which are K-means clustering for segmentation, artificial neural network, Probabilistic Neural network and GLCM and SGLDM for texture investigation. There are a portion of the difficulties show up in these procedures are, it require tremendous dataset for classification and diseased manifestations are fluctuates. Thusly a few phases assortment of disease has same side effects then the classification strategy will be unable to characterize the right disease. Along these lines, there is extension for more enhanced procedures.

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