

# Plant Disease Detection Using Image Processing in MATLAB

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**Abstract:** - Plants are the important factor which contributes to the bio-diversity as well as to the living human being are incomplete without the plants and agriculture. In such case, it is our responsibility to protect our plants and crops. Plant disease detection system is the initial and the most important step taken towards the concern for plant diseases and to understand them. With the basic knowledge of desktop any one can detect the disease, the plant is suffering in just one click. No traditional methods or techniques are needed which can save money and time. In this paper we are drawing the concern to above situation and also mention some technology for detection of plant disease. The main focuses on the detection of the plant disease through the technique of image processing in MATLAB.

**Key Words:** *MATLAB, Image processing, Otsu' Threshold Method, ANN Algorithm.*

## I. INTRODUCTION

India is fully agriculture-based country most of the parts of Indian plain is indulge in farming. Agriculture is the important aspect which contribute to the large part of country's GDP and also leads to increase in Economy.

As being the important aspect, the agricultural plants should be protected and safeguarded. Nowadays problem of pollution and pests is also increasing in wide range. In such situation the most affected field is of farming.

Farmers are unable to understand the problem due to lack of knowledge. In early years there was no standard technique to cope with the diseases of the plants. Farmers usually called the experts to know the cause and also give the solution by certain chemical methods and traditional techniques. But this came out to be the most Time consuming and expensive for the farmers. Therefore, there is the need of such technology which could easily detect the problem in plants.

This paper introduces a technology called Plant Disease Detection System. It is the system based on the concept of Image Processing which will be implemented on MATLAB with the ideology to understand the disease of the Plant.

## II. LITERATURE SURVEY

### 2.1 Survey on existing paper

In this paper author has mentioned three disease that are most common among the plants namely Alternaria Alternata, Bacterial Blight, Cercospora leaf spot and also proposed the method to classify plant disease using SVM Classifier [1].

In this paper author informed about the importance of plants in today' world. With the importance author also mentioned the different possible types of diseases which may occur in plants. Also explained different methodology of segmentation for plant image processing [2].

In this paper author has described machine vision-based plant disease detection application that is being frequently used in agricultural field. This paper also explains the boons of machine vision based over classical machine-based plant disease detection application [3].

### 2.2 MATLAB:

MATLAB or Matrix Laboratory is a platform proposed by H. Wilkinson and his 18 colleagues with the main ideology to propose a system which makes the communication and building of other platforms easy. For the above-mentioned problem

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related to detect plant diseases the interactive and user-friendly solution is MATLAB Software. The thought is to build the standalone application that will detect the plant diseases without any time-consuming methods and will be helpful for the farmers.

The following ideology for building this application will be: In early years the traditional method for the detection of plant diseases includes the naked eye observation of experts and also included the lab tests observation which where time consuming and costly but one of the latest Technology which can detect the plant diseases is image processing.

This application can come up as a solution for farmers to resolve their problem of detecting plant diseases and also save their time and money.

The procedure used by user for this application using MATLAB is: firstly, user will upload the image of affected plant then the image will be processed by the software and executes the detection. As a result, the application will display the type of disease of plant to the user. By the image processing tool, the image will undergo processing through MATLAB.

### 2.2.1 Alternative methods for plant disease detection:

**Deep learning:** Deep learning is the part of machine learning that works on large amount of dataset. In modern world Technology deep learning has many advantages such as accuracy of classification of image (As a result the deep learning will provide the accuracy up to 83.57 %) and faster response for the object detection.

**Machine learning:** Machine learning is the tool based on algorithm which effectively evaluates the result and makes decisions based on evaluation. Diseases detected by machine learning mainly. To differentiate between the affected and unaffected Portion on the leaf some of the machine learning algorithms used are: CNN, KNN, SVM.

**Artificial Intelligence:** The type of science which constructs intelligent devices and follow human behavior is known as artificial intelligence. The main aim of it is to solve the complicate and difficult problem by training the machine. Feature extraction is the main advantage of Artificial Intelligence used in plant pathology.

## III. PROPOSED METHODOLOGY

Following are the basic steps for detection of plant diseases using image processing of the image uploaded by the user is given below.

**Image processing:** It is the technique in which the various operations are performed on the image for the extraction of

useful information and as a result gives the enhanced image. Image processing tools uses algorithm for obtaining the enhanced image.

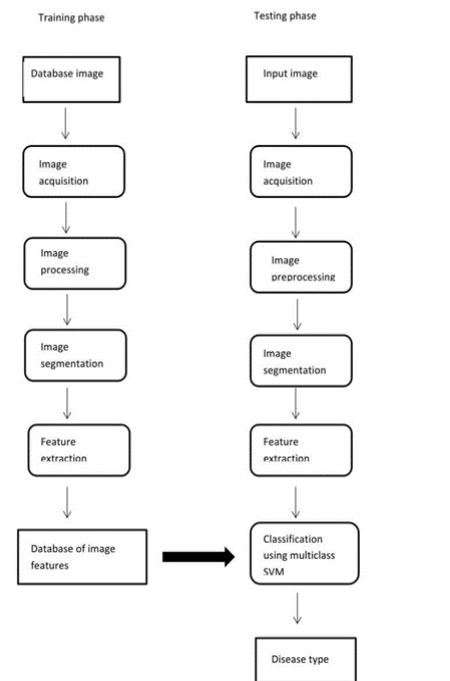


Fig.1. Methodology

**Image acquisition:** Image acquisition process includes hardware for getting input. This process is the initial step of image processing. As it is mentioned above hardware such as camera, sensors, cellphone etc. Is used to capture image of the plant. The image obtained is in unprocessed and in RGB (red, green, blue) form. Color transformation structure is formed.

**Image preprocessing:** The main aim of image preprocessing is to enhance the quality of an input image. Unwanted object, noise and unimportant information, dust, distortion is removed using this process. The main motive of this process is to get the clear input image by converting the RGB image into the greyscale using following formula.

$$F(x) = 0.2989 * r + 0.5870 * g + 0.114 * b$$

**Image segmentation:** Image segmentation is the process in which the similar features of the input image are distributed into sub segments. There various methods performed for image segmentation such as K- means clustering, region-based segmentation, age detection segmentation, Otsu's method.

**OTSU Threshold Algorithm:** Otsu Threshold Algorithm form binary from the image obtained in the image preprocessing level and place all pixels below some threshold to 0 and above that threshold to 1.

The following is the Otsu Algorithm:

- According to the algorithm initially it separates the input image into different segments.
- After separating, the mean of each segment is calculated. And square the difference between the mean.
- Multiply the no. of pixels in one segment to the no. of pixel into the other segment.

To detect the disease of plant we consider the Greene's of the leaf as the rest will be infected by the changing color of the leaf. Then the RGB component is considered and threshold is calculated using the Otsu method. If the intensities of the green pixel are below than the calculated threshold the. The green pixels are removed.

*Feature Extraction:* To identify the object Feature Extraction is used in image processing. Smoothness, contrast, texture, age, color etc. are the features which can be used in plant detection system.

*Color co- occurrence method:* To extract features such as color and texture to obtain a special feature for that image. For this extraction we need to convert RGB image into HIS translation.

- For calculating the texture feature computation of SGDM (Special grey dependency matrix using GLCM (Gray level co-occurrence method) function.
- Leaf color extraction: The image is intensified by securing the information of the affected part before extraction the background color. We consider H and B components from HIS. To identifying the color of diseased leaf SOFM (Self Organization Feature Map) algorithm with back propagation neural network is executed.

*Classification:*

- Using ANN: Neural networks concept is used to classify the learning database of image. The extracted features of images are behaved as neurons in ANN algorithm. Neuron as a result is the function of weighted sum of the input image. For this, Back propagation algorithms, modified SOM Multiclass Support Vector Machine can be used.
- Neural weights are fixed and used to calculate output values for new images.
- After getting accurate weight of learning database, then testing part is done of new image.

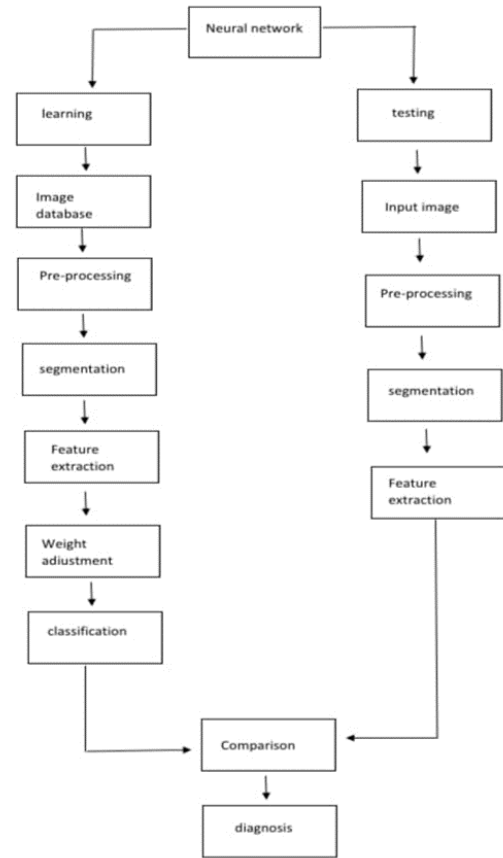


Fig.2. Working Principle of ANN

#### IV. CONCLUSION

This paper successfully mentioned about the technique of image processing in MATLAB which is used for efficient detection of plant disease. Methods suggest Otsu' method, color-occurrence method and ANN method has also been used. MATLAB provides the accurate and user-friendly platform for image processing and ANN method which comes up as efficient and less time consuming.

#### REFERENCES

- [1]. "Monoculture Farming Explained: What Are the Pros and Cons?" EARTH OBSERVING SYSTEM, 29 Dec. 2021.
- [2]. Otani, Saria, et al. "Disease-Free Monoculture Farming by Fungus-Growing Termites." Scientific Reports, vol. 9, no. 1, 2019.
- [3]. Manu BN (2022). Plant Leaf Disease Detection and Classification using Multiclass SVM Classifier MATLAB Central File Exchange.

- [4]. Kumar, M., Gupta, P., Madhav, P., & Sachin, "Disease Detection in Coffee Plants Using Convolutional Neural Network", 2020.
- [5]. G. Shrestha, Deepsikha, M. Das and N. Dey, "Plant Disease Detection Using CNN," 2020 IEEE Applied Signal Processing Conference (ASPCON), 2020, pp. 109-113.
- [6]. André S. Abade, Paulo Afonso Ferreira and Flávio de Barros Vidal "Plant diseases recognition on images using convolutional neural networks: a systematic review", 2020.