International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 4 Issue 1, December 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Disease Detection in Plant Leaves using K-Means Clustering and Neural Network

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ABSTRACT

The most contributing variable for the Indian Economy is Agriculture yet at the same time there is absence of mechanical improvement in many parts of it. The harm caused by rising, re-developing and endemic pathogens, is vital in plant frameworks and prompts potential misfortune. The harvest generation misfortunes its quality because of much infections and some of the time they happen however are indeed, even not obvious with stripped eyes. Plant malady recognition is one such dull process that is hard to be inspected by exposed eye. This paper shows an answer utilizing image processing calculations by loading the image, preprocessing and feature extraction using K-means clustering and segmentation method to identify the disease with which the plant leaf been affected.

KEYWORDS: *Image processing, pre-processing, feature extraction, K-means clustering, Segmentation*

How to cite this paper: P. Harini | V. Chandran "Disease Detection in Plant Leaves using K-Means Clustering and Neural Network" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-1, December 2019, pp.442-445, URL: https://www.ijtsrd.com/papers/ijtsrd29562.pdf

IJTSRD29562

I. INRODUCTION

The foundation of Indian economy is farming. Right around 78% individuals depend on farming. Horticulture contributes real offer in the development of Gross Development product (GDP) of the nation. Trim sicknesses contribute specifically and in a roundabout way to the spread of human irresistible illnesses and natural harm. As these infections are spreading and making harm, the typical working of the plant is affected. In the field of horticulture, plant sickness identification assumes an imperative job in a legitimate way. General checking of the plant that is developed is prime undertaking for each rancher. Keeping in mind the soundness of plants assumes a critical job. The traditional strategy utilized is the discovery of malady utilizing bare eye, in this technique an extensive number of specialists are required though in image processing, this confinement has been survived.

This paper gives an unmistakable view about the job of image processing in the recognition of plant infection In this phase, k-means clustering algorithm is used to detect the disease of the plant. The image of the plant is loaded, that is needed to be checked. The image is then segmented followed by the cluster details. The above datas are processed with iterations. The name of the disease that attacked the plant along with the data for accuracy will be shown.

II. DISEASE DESCRIPTION

1. Althernia Alternata:

It is a fungal disease. It causes leaf spots, it affects more than 300 species of plant. It needs a warm and humid atmosphere. The symptom is browning and yellowing of leaves.

Fig 1: a leaf affected by althernia alternate

2. Anthracnose:

It is a fungal disease, it causes withering of tissues. The severity varies from mild attack to death. Trees like oak, maple are affected.

Fig2: Anthracnose disease in a leaf

3. Bacterial Blight:

It is caused by bacterial pathogen. The bacteria enter through the stomata or any wounds. The early symptom is the brown spots on the margin. Then the centre of the leaf will turn dark reddish brown and dry out.

Fig3: leaf with Bacterial blight attack

4. Cercospora leaf spot:

It affects the smooth texture of the leaf. First the spot occurs on the leaf at the bottom of the plant and after that it spreads upward. Cercospora is less severe under shady conditions.

Fig4: Cercospora spotted in a leaf

III. LITERATURE SURVEY

1. The proposed technique involves development of the new spectral indices for identifying the winter wheat disease. They consider three different pests (Powdery mildew, yellow rust and aphids) in winter wheat for their study. The most and the least relevant wavelengths for different diseases were extracted using RELIEF - F algorithm.
2. The proposed technique uses image processing for detection of disease and the fruit grading. It includes artificial neural network for detection of disease.
3. The proposed technique includes capturing of the chilli plant leaf image and processed to determine the health status of the chilli plant.
4. The proposed technique includes detection of plant disease using otsu algorithm and k-means clustering algorithms.
5. The proposed system used FPGA and DSP based system developed by Chunxia Zhang, Xiuqing Wang and Xudong Li, for monitoring and control of plant diseases.

IV. METHODOLOGY

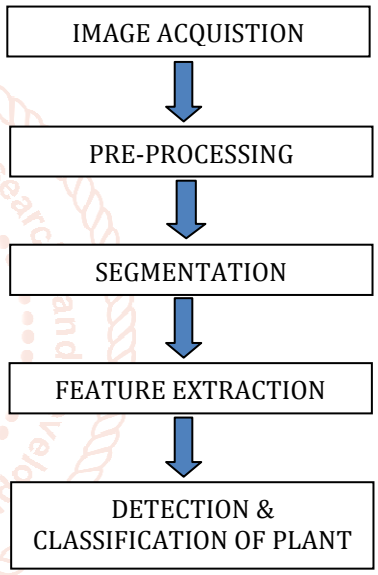


Fig 5: Proposed workflow

1. IMAGE ACQUISITION:

The procedure includes coordinate obtaining of pictures from any equipment sources or from any database which has been as of now nourished. This is the initial phase in the work process of picture handling. This progression of gaining any preforming picture is preeminent vital in light of the fact that with no picture none of the accompanying procedure + should be possible. This picture is totally a natural picture.

2. IMAGE PREPROCESSING:

The main motive of going for image pre-processing is to improve the image data .It is used to supress unwanted distortions .It also enhances the image features

- Pixel brightness transformations
- Geometric transformations
- Grey scale transformations

3. IMAGE SEGMENTATION:

It is the process of dividing an image into multiple parts. The main aim of segmentation is to simplify the image into a form that is much easier to analyse. Different types of segmentation are

- Region based segmentation
- Threshold segmentation
- Edge detection segmentation
- Regional growth segmentation

4. FEATURE EXTRACTION:

The features of the image include colour, texture, morphology, edges etc. Initially some data is measured and by using it some derived values are obtained that gives some information about the image.

5. DETECTION AND CLASSIFICATION:

After feature extraction classification is done by using neural network. The output of the neuron is the weighted sum of the inputs. Once the neural network weights are fixed, it can be used to compute output values for new images.

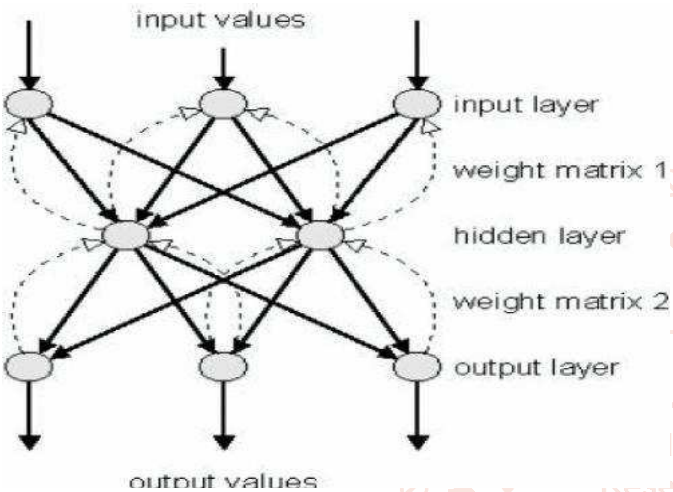


Fig6: Back propagation network

K-MEANS CLUSTERING:

It is used to classify the object into K number of classes.

Algorithm:

- Select the centre of K cluster
- Minimise the distance between the pixel and cluster centre by assigning every pixel in the image
- Average all the pixels in the cluster and compute the cluster centre.
- Repeat this process until convergence is obtained.

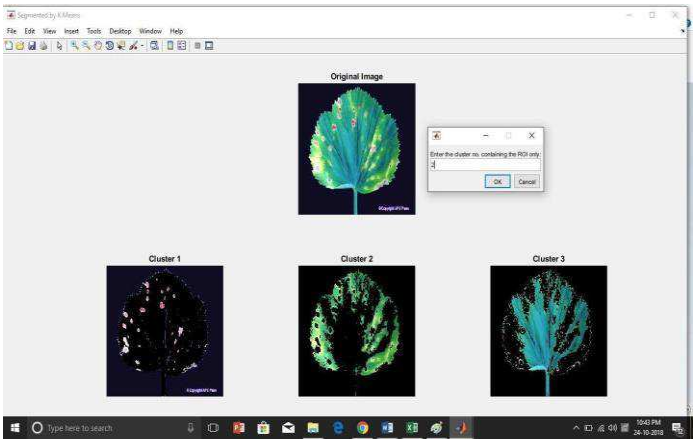


Fig7: Cluster selection and display

V. RESULT AND ANALYSIS

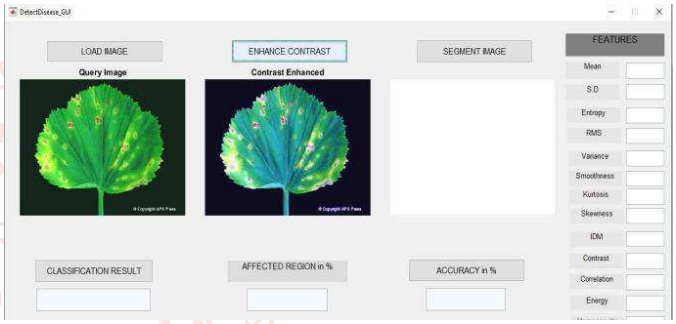
Plant disease detection and identification using image processing is a major breakthrough to solve many challenges of agriculture by the farmers. The method evolved with this paper came up with a greater accuracy.

STEP 1:

First the query image is loaded by the user.

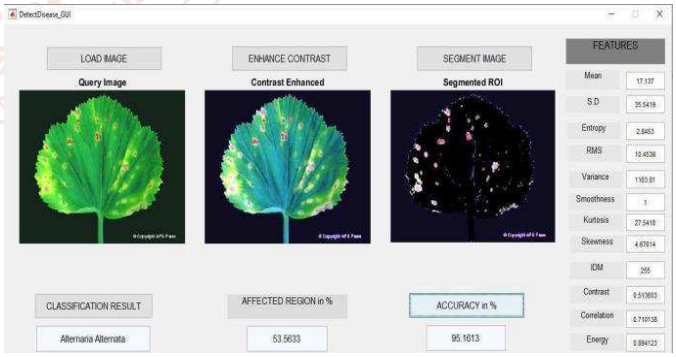
STEP 2:

The brightness and other attributes of the image is enhanced.



STEP 3:

In this final step, the image is segmented and the cluster number is chosen followed by the classification of the image. The result is displayed along with the affected region and accuracy.



Result Analysis for Althernia Alternata:

The accuracy analysis and plot of Alternaria Alternata is very unique and it is highly efficient. The average accuracy is calculated by considering 'n' number of leaves and the accuracy plot is drawn below.

Disease name	Leaf number	Accuracy
Althernia Alternata	**1**	98.5
	2	97.3
	5	96.6
	4	96.6
	5	95.8
	Average	95.8

Table1: Accuracy table for althernia

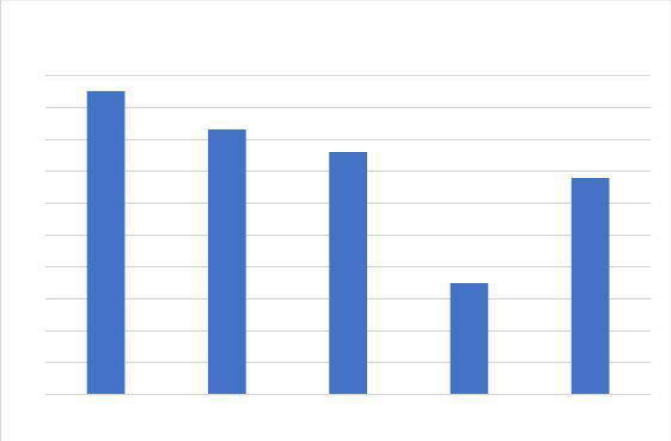


Fig8: Accuracy plot for althernia alternate

VI. FUTURE WORK

The precise recognition and grouping of the plant infection are vital for the effective development of plants and this is possible by utilizing image processing. This paper examines different procedures to section the infected part of the plant. It also talked about some feature extraction and grouping procedures to separate the tainted leaf and the characterization of plant ailments. The utilization of ANN techniques for order of sickness in plants is done. From these strategies, we can precisely recognize and arrange different plant ailments utilizing image processing procedures.

In future we have planned to increase the efficiency and accuracy of the disease detection by using other algorithms like Otsu algorithm. Also, we will increase the number of diseases that could be identified by this algorithm.

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