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DETECTION OF LEAF DISEASES USING IMAGE SEGMENTATION

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Abstract: Diseases in plants cause decrease in both quality and quantity of agricultural products. The main problem of farmers is the detection of leaf diseases. The leaf disease detection has very important role nowadays. Thus, it is of abundant prominence to diagnose the plant diseases at initial stages so that suitable and timely action can be taken by the farmers to avoid further losses. Early information on crop health and disease detection can encourage the control of diseases through appropriate administration systems. This technique will improve productivity of crops. This paper presents the technique to detect the leaf disease also compares the benefits and limitations of these potential methods.

Index Terms **- leaf disease, crop, farmers, plants, productivity.**

I. INTRODUCTION

India is famous for Agriculture that implies the greater part of the people are engaged towards agriculture industry. The agriculture industry goes about as a huge job in the economic sectors. Most of the plants are infected by variant fungal and bacterial diseases. Due to the exponential inclination of population, the climatic conditions also cause the plant disease. The major challenges of sustainable development are 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.

Data mining is termed as extracting the relevant information from large pool of resources. The advents of data mining technologies have been adopted in the prediction of plant diseases. Rice is one of the major crops cultivated in India. Nowadays, technology is widely used for plant disease prediction. The management of perennial leaf requires close monitoring system especially for the diseases that affects production and post-harvest life. The concept of image processing with data mining technologies assists us in following purposes:

i) Recognizing infected leaf and stem
ii) Measure the affected area
iii) Finding the shape of the infected region
iv) Determine the color of infected region
v) And also influence the size and shape of the leaf.

The user is to select a particular diseased region in a leaf and the cropped image is sent for processing. This paper intends to study about the prediction of the plant diseases, at an untimely phase using k-mean clustering algorithm. Specifically, we concentrate on predicting the disease such as Alternaria alternate, Anthracnose, Cercospora, bacterial blight and leaf spot. It would be useful for identifying different diseases on crops.

It provides various methods used to study crop diseases/traits using image processing and data mining. Furthermore, the infected region and influenced rate is also measured. Back Propagation concept is used for weight adjustment of training database.

II. LEAF DISEASES & SYMPTOMS

Leaves are basically influenced by bacteria, fungal and viral. A symptom of leaf disease is an obvious impact of sickness on the plant. Side effects may remember a noticeable change for shading, shape or capacity of the plant as it reacts to the pathogen. Here, we are examining these sicknesses side effects that ought to be remember whether plant development appears to be low. In this section, we explain about the leaf diseases analysis and its symptoms. The leaf disease is divided into 5 classes as below.

1) Alternaria Alternata
2) Anthracnose
3) Bacterial Blight
4) Cercospora Leaf Spot
5) Healthy Leaves

1 ALTERNARIA ALTERNATA

It is a fungal disease mainly caused by Alternaria Alternata or Alternaria macrospora. The disease is most severe on the lower part of leaves as compared to the upper part and may get confused with the spots of bacterial leaf blight as the symptoms are nearly similar. At the beginning, brown, gray-brown to tan colored small circular spots appears on leaves and vary fro1-10mm in size which later on become dry, dead with gray centers which crack and fall out. Some of the time, old spots join together and make unpredictable dead territories.

Alternaria alternata is a fungus which has been recorded causing leaf spot and different diseases on more than 380 host types of plants. It is a crafty pathogen on various hosts causing leaf spots, decays and curses on many plant parts.

Figure 1: Alternaria alternata Disease Symptoms

2 ANTHRACNOSE

Anthracnose, a gathering of fungal diseases that influence an assortment of plants in warm, muggy regions. Shade trees, for example, sycamore, debris, oak, and maple are particularly defenseless, however the infection is found in various plants, including grasses and annuals. Anthracnose causes the shrivelling, wilting, and passing on of tissues.

Figure 2: Anthracnose Disease Symptoms

3 BACTERIAL BLIGHT:

Bacterial blight is bacterial disease mainly caused by the bacteria “Xanthomonas Campestris pv. Malvacearum”. The symptoms of Bacterial scourge begin as Dark green, water drenched precise spot of 1 to 5 mm on a leaf with red to darker outskirt. Toward the start, theseleaf spots show up as water-splashed regions which later on changes from dim dark colored to dark shading. The spots on the lesion area of leaves may spread over the major veins of leaf and in later petioles and stems get infected and premature fall off of the leaves occur.

Figure 3: Bacterial blight Disease Symptom

4 CERCOSPORA LEAF SPOT:

Cercospora leaf spot occurs on all cucurbits but is most common on watermelon, cantaloupe, and cucumber. This disease is usually found only on the foliage, but if the environment is suitable, symptoms may also occur on petioles and stems. The fungus is not known to infect fruit. On watermelon, leaf spots manifest on young leaves as small grey or white spots with black margins. Larger leaf spots which are circular to irregularly circular develop on other cucurbits. The centers of these leaf spots are tan to light brown becoming transparent and brittle with time. Lesions with surrounding chlorotic halos may coalesce and turn leaves yellow. Although defoliation from the disease may reduce fruit size and quality, serious economic losses are rare.

Figure 4: Cercospora Disease Symptoms

5 HEALTHY LEAVES:

- Leaves create cream-white hued stripes corresponding to the midrib, which in the end spread the entire leaf.
- Infected leaves are narrower than healthy leaves.
- Plants tiller profusely, have short internode length and look bushy.
- Poor ratooning after gather, which brings about sketchy yields.

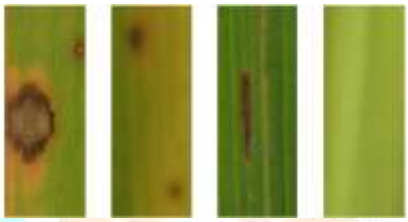

Figure 5: Cercospora Disease Symptoms

III. LITERATURE SURVEY

As of late, image processing techniques are utilized in different fields such as automation, medical etc. Indeed, even the distinguishing proof of plant contamination utilizing customary strategy is supplanted by image processing. The image processing frameworks requires camera, PC and essential software. Steps associated with plant disease detection are image acquisition, pre-processing, segmentation, feature extraction and classification. Performing image enhancement, improves the quality of the picture just as the clearness. Basic primary colours red, green and blue combinations produce many varieties of colours. Hence, implementing image processing using RGB components is difficult and its range is very high. Changing over RGB picture into its proportionate grey image is accomplished for simpler implementation. Automated plant disease using image processing technique is beneficial for the farmers as it reduces large human labours and can help to detected by symptoms at early stage MATLAB software's tools are utilized for recognizing the disease of the plants. Image acquisition is performed using digital cameras. K-mean clustering algorithm used Euclidean distance metric method and clusters the image based on the specified number of groups [4][5]. Gray-Level Cooccurrence Matrix (GLCM) is one of the most popular methods for texture analysis. It creates an element based gray level matrix for the shading picture and measures the spatial separation between the pixels. GLCM represents the distance and angular spatial relationship of an image in a specific size. GLCM calculates how regularly the pixel with gray level power happens. Horizontally values are represented as „i" and vertically or diagonally values to adjacent pixels are labelled as „j".

IV. PROPOSED METHOD

The proposed method has the following steps:
Step 1: Acquisition of the image
Step 2: Pre-process the image
Step 3: Segment the image
Step 4: Extraction of features from image
Step 5: Detection and classification of plant disease

There are five principle steps utilized for the location of plant leaf diseases as appeared in fig.3.The handling plan comprises of image acquisition through advanced camera or web, image pre-processing incorporates image enhancement and image segmentation where the influenced and helpful territory are segmented, feature extraction and classification. At last, the nearness of diseases on the plant leaf will be recognized.

In the underlying advance, RGB pictures of leaf samples were gotten. The step-by-step procedure as shown below:

1) RGB image acquisition;
2) convert the input image into color space;
3) Segment the components;
4) obtain the useful segments;
5) Computing the texture features;
6) Configuring the neural networks for recognition.

The previous system will solely determine the kind of illness which affects the leaf. We are going to give a solution with less time and lead you throughout the project. The architecture of the planned work is shown in below Fig. 3. 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.

In this section, we explain about the leaf disease prediction using k-mean clustering algorithm. This project includes several steps Image Acquisition, Image Pre-Processing, Feature Extraction, and neural network-based classification. It works as follows:

- Image Acquisition
- Image Preprocessing
- Image segmentation
- Feature extraction
- Classification

1 Image Acquisition

First step in image acquisition is to capture the leaves using mobile phone or digital camera. These stored images of the leaves from the database are load by specifying the path. Figure 6 shows the images of the samples of plant leaves.

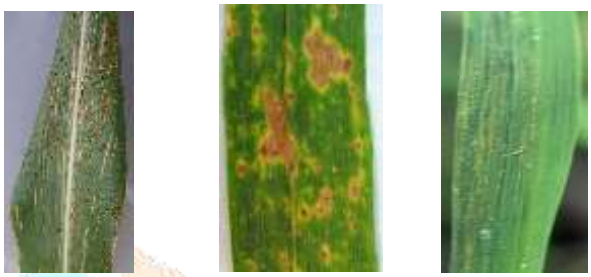

Figure 6: Images of the Leaf Affected by Alternaria Alternata, Healthy Leaves and Cercospora Leaf Spot.

2 Image Preprocessing

Pre-processing improves the quality of the image by removing unsought distortions. Clipping the images based on the region of interest (ROI), image smoothing and contrast enhancement are done here. Figure 7 shows the images after performing image enhancement.

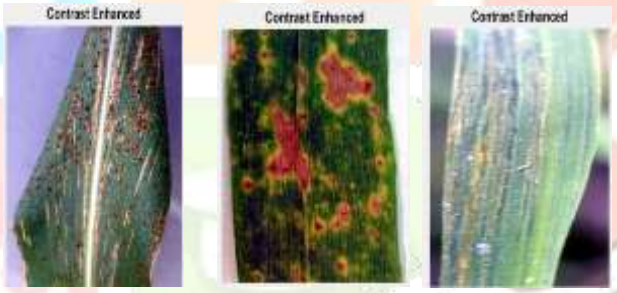

Figure 7: Enhanced Images after Pre-processing

3 Image segmentation

Image segmentation is the method of dividing an image into different sub images. Here we use K-mean segmentation technique which uses hue estimation method for dividing and clustering the image. Since the green colour of the leaves is normal, we do not consider them. We select the cluster image showing the infected area for feature extraction. Figure 8, below shows the segmented images of the leaves.

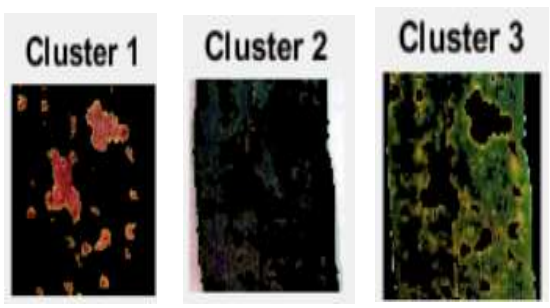

Figure 8: Image clustering

K-means clustering algorithm, the data vectors are grouped into clusters based on the closeness of the pixels by the Euclidian distance measurement. Centroids of the clusters are initialized randomly and their dimensions are equal to data vectors.

4 Feature extraction

Interesting part of an image from where the required information's are extracted is called as feature extraction. The element of the region of interest (ROI) will be littler than the original picture. Gray level cooccurrence matrix (GLCM) is one of the best methods for texture analysis. It uses second order statistics methods for estimating the image properties. GLCM calculates the pixel with a specific intensity or gray value occurs in the image. Resultant will be the sum of occurrence of the pixel with specific intensity in the spatial domain. Size of the GLCM will be based on the number of gray levels.

5 Classification

Finally, classifiers are used for the training and testing of the datasets. These classifiers may be support vector machine (SVM), k-nearest neighbour, neural network, fuzzy logic based etc. These methods are used to classify and detect the leaf diseases.

IV. RESULTS AND DISCUSSION

ALTERNARIA ALTERNATA:

It is a fungus that impact the leaf spots over 380 has family of plant. It will too impact leaf spots, rots, blight and alternative plant elements shows in Fig. 9

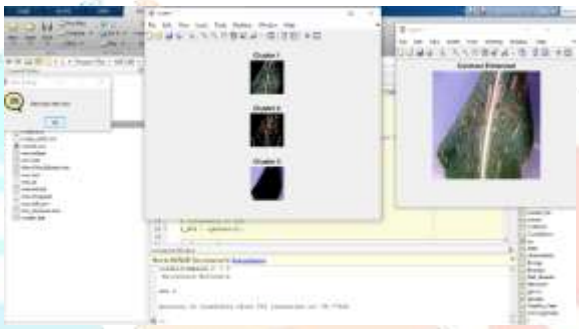

Fig. 9. Alternaria Alternata Diseased leaf and Output

ANTHRACNOSE:

Anthracnose shows in Fig. 10 a bunch of fungal illness that have an effect on a spread of plants in heat, humid areas. Shade trees like sycamore, ash, oak, and maple are particularly inclined, though the illness is found during a variety of plants, as well as grasses and annuals.

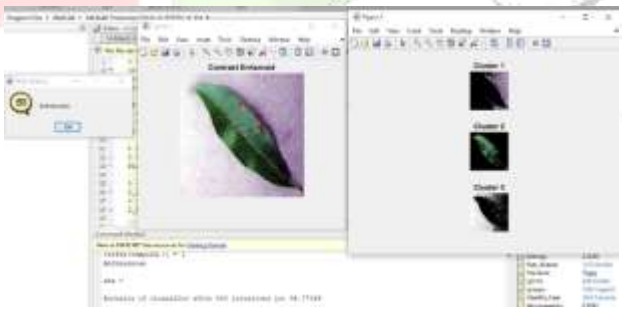

Fig. 10. Anthracnose Diseased leaf and Output

BACTERIAL BLIGHT:

Bacterial Blight shows in Fig. 11 is characterized by tiny, pale inexperienced spots or streaks appeared as water-soaked. The lesions can expand then seem as dry dead spots. it's going to extend till the complete length of the leaf.

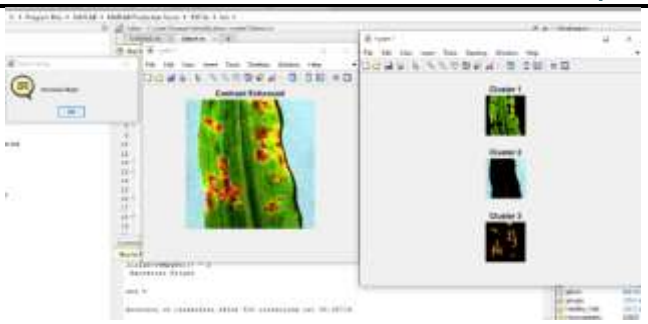

Fig. 11. Bacterial Blight Diseased leaf and Output

CERCOSPORA LEAF SPOT:

Infested leaf has tan to darker spots with twisted leaf edge 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. 12 defoliation might occur.

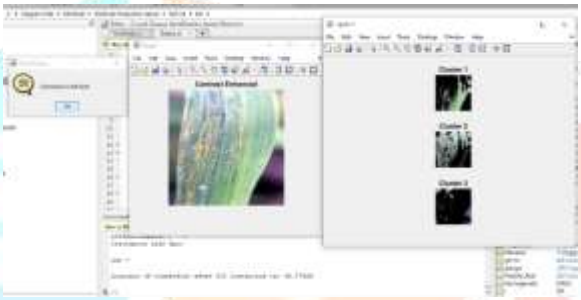

Fig. 12. Cercospora Leaf Spot Diseased leaf and Output

HEALTHY LEAVES:

Leaves create cream-white hued stripes corresponding to the midrib, which in the end spread the entire leaf. Infected leaves are narrower than healthy leaves. Plants tiller profusely, have short internode length and look bushy. Poor ratooning after gather, which brings about sketchy yields.

Fig. 13. Healthy Leaves Diseased leaf and Output

V. CONCLUSION

The present study deals with Alternaria Alternata, Anthracnose, Bacterial Blight and Cercospora Leaf Spot these automatic illness detections 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. In this project the leaf diseases for all kinds of plants is identified using K-mean algorithm and SVM. In this we can identified effected area and the problem can be rectified very easily with less cost.

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