An Efficient Classification Model for Plant Disease Detection

Siri Sumana Kalavala, Sridevi Sakhamuri, B B V Satya Vara Prasad

***Abstract**: India is an Agriculture based country. Most of our exports and countries income is because of farming. so measures to be taken, which makes farming more easy and secure for the farmers. Plant diseases are emerging all the time. In olden days, experts used to monitor the farm continuously but now technology is changing, plant diseases are recognized automatically. we know that farming is a difficult task. In order to reduce this difficulty many young minds have come up with many techniques. one of those is image processing. Identification of disease involves steps like Image acquisition, pre-processing, segmentation, Feature extraction.*

***Index Terms**: feature extraction, Image acquisition, Image processing, Image pre-processing, Image Segmentation, Plant Diseases.*

I. INTRODUCTION

Farming is the most important factor in our country. More than 70 percent of people depend on agriculture. Plant Diseases have always been a challenge to plant growth and crop production in several parts of the world. Due to Environmental changes Plant diseases are emerging all the time which can spoil the entire farm. Proper care should be taken to protect the farm. Fungi, bacteria, and viruses are the main causes of different forms of biotic diseases.A biotic plant diseases are produced by non-living ecological circumstances such as weather conditions, burning of chemicals, etc. Many farmers choose to use chemicals like weeds and pests from annihilating their harvests and to add more nutrients to the soil. In olden days, experts used to monitor the farm manually. Now, technology is changing we can know the weather conditions and water level of crops through mobile apps by placing sensor in the field and also some automatic techniques are provided to reduce the amount of work. Image processing is a strategy to change over a image into digital form and perform a few tasks on it, in order to get an enhanced image and to improve its quality (or) to extricate some supportive data from it. Image Segmentation is the process of subdividing a computerized picture into the subsequent parts for further analysis. This process is normally used to distinguish objects or other essential information in digital images. Computers cannot perceive the items by their own. Numerous procedures have been made so as to segment images. In the Segmentation process, the regions ought to be homogeneous and uniform referring to some characteristics like texture, color and gray level. segmentation is based on different features like color information, boundaries or segment of an Image.In this paper, we have collected the information about unhealthy plants by using image processing technique. Through this technique, we have compared healthy leaves image with the plant images and tried to identify the differences through which we will detect whether the plant is infected or not. After detecting we have also detected what kind of disease the plant.

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II. LITERATURE SURVEY

In this area, different techniques for plant disease detection is examined.

G. Saradhambal [2] have proposed an upgraded k-means clustering algorithm to estimate the infected area of the leaves and to measure the time complexity . They have done experimental analysis by capturing the images of a plant and identified the disease through image segmentation process. They have shown the infected part of the leaf using image processing technique.

V. Pooja [3] mainly focused on identifying the infected region using SVM (Support Vector Machine) classifier. They have collected 250 images to train the network .These 250 images are based on diseases, Alternaria Alternata, Bacterial Blight, Anthracnose, Cercospora leaf spot and Mossaic. Also, calculated the overall recognition rate of the diseases.

A few analysts has propose that a quick and exact technique is created depending on image processing for evaluating of plant diseases. The outcome gives the procedure for detection of plant diseases. The utilization of K-means clustering and neural system has been formulated for the clustering and classification of disease that influence a plant leaves. This work has been accomplished for the five diseases.

III. RELATED WORKS

Image processing technique is used in various applications like Remote sensing, Medical Imaging, Forensic Studies, Textiles, Military, Printing Industry etc.

In the same way, in plant disease detection different techniques are used to identify the disease.

An Enhancement in SVM to Improve plant Disease Detection

SVM(support vector machine) is a classifier of neural network approach. This method uses many color representations throughout its execution. There are two datasets named train and training datasets. Initially images are taken as input and we need to convert the image into pyramid shape.

Then extreme detection is to be done in which each and every point or In training data set, one image is taken and its features are matched to images present in the training dataset by utilizing SIFT(scale-invariant feature transform) which is used for feature matching. Then Hue and saturation part of image is also separated. Through this process the area infected by the disease will be calculated in terms of percentage %. Finally, the disease is also detected.

Leaf Disease Detection and Classification by using Back Propagation

In this work, Load the image as an input and Identify the mostly green colored pixels. The value of the green color pixel is set to be zero, if it is less than pre-computed threshold value. At that point the RGB shading segment of the pixel is said to be zero. The green shading pixels areas are not influenced by some other infections and it won't include any significant load to disease identification. These technique will diminish the handling time.

IV. PROPOSED SYSTEM

We have provided a solution for plant diseases. Plant diseases are emerging all the time. There are different types of plant diseases available. Plant diseases caused by Bacteria, Fungi and viruses are Biotic diseases. Abiotic plant diseases exist due to non-living environmental conditions like extreme climate conditions, burning of synthetic compounds etc. In our experimental analysis, we have collected 74 plant images that involved distinctive plant diseases like Bacterial Blight, Anthracnose , Cercospora leaf spot , Alternaria Alternata, and Healthy leaves. After extracting the features of plant image, we have also identified the classification of diseases and more accuracy was observed than before. Distinctive number of images is gathered for every disease are taken as input images.

Fundamentals of Plant Diseases:

Plant diseases are caused by Biotic(Fungi, Bacteria, Viruses, nematodes)and Abiotic plant diseases. Abiotic plant diseases are less harmful compared to Biotic plant diseases. The type of disease can be identified based on a variety of symptoms of diseased plant.

Fungi: Fungi are the most widely recognized irrestible life forms causing plant disease. Fungi normally produce spores .when it is transferred to a plant,it causes infection. These Spores can spread from plant to plant by water, wind, creepy crawlies, flying creatures and equipment.

Bacteria: Microorganisms are single-celled tiny living beings that can assault living plants cause plant diseases. Microscopic organisms can be transferred from plant to plant in beads of water by rainsplash, creepy crawlies, wind.

Viruses: Infections are the smallest parasites causing plant illness. In light of their amazingly little size, they can be seen just with an electron magnifying instrument. Most infections are spread by bug vectors. Viral infections of plants cause hindering, shading changes in leaves and development contortions.

V. PROPOSED SCHEME

Identification of disease will be done in 4 steps:

1. Image Acquisition
2. Preprocessing the image
3. Segmentation
4. Feature Extraction.

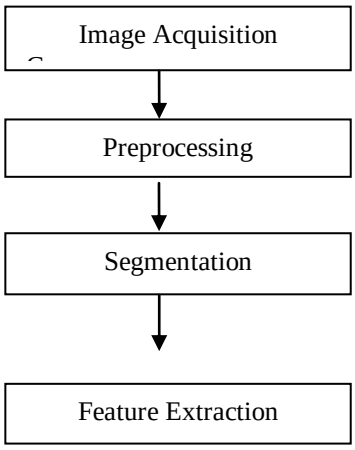

Image Acquisition: the initial step is to collect the data from a plant and load the image, which would be considered as an input to our process .This can be in any form of image like Jpeg, Bitmap, Tiff, PNG etc

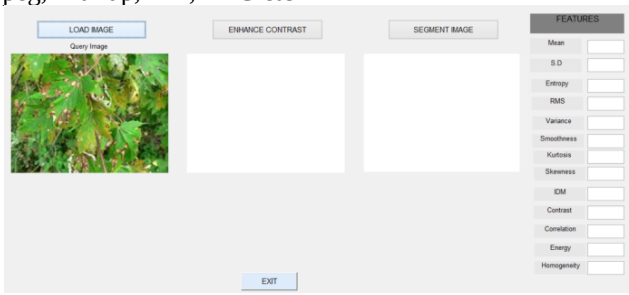

Image Preprocessing: This step includes enhancement of contrast. The aim of preprocessing is to enhance the image information that suppresses undesirable distortions and improves picture highlights which are important for further preparing.

Segmentation: In image processing, it is one of the most troublesome errands and also an essential step, which decides the nature of the last consequence of analysis by separating the infected part from leaves. It means representing the image in increasingly significant and easier approach to analyse.

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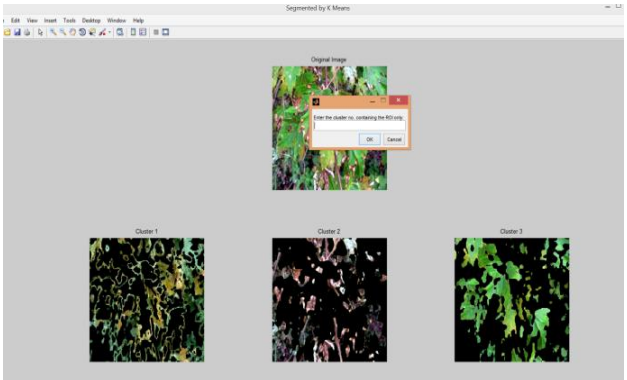
In this segmentation process, digital image is divided into numerous segments. K-means clustering technique is used for the segmentation purpose.

The following steps involved in k means clustering are:

1. Enter the value of a cluster
2. Every pixel of image assigns minimum distance between cluster.
3. The cluster value is recomputed by taking the average of pixel value.
4. Repeat second and third step until there is no change in cluster value.



Feature Extraction: After performing the segmentation process features are extracted. These features include mean, standard deviation, skewness, contrast, correlation, entropy, homogeneity, kurtosis, energy, RMS, Smoothness are computed for the image .Leaf image is captured to identify the health of each plant.

Mean: It is a measure of the average value of the element in the segmented image.

Mean=(sum of pixel value)/(total number of pixel).

Skewness: to find the skewness of the infected leaf of segmented part

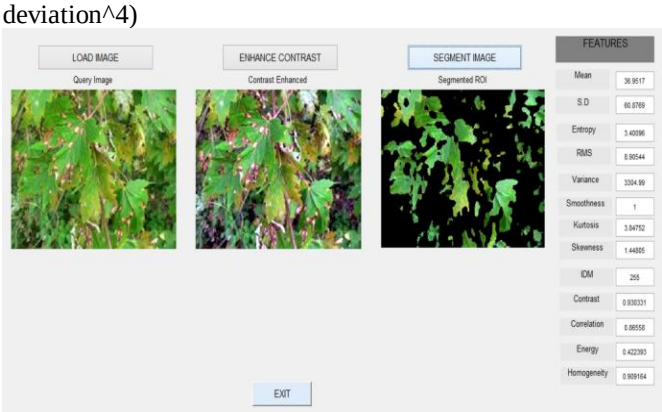
Skewness=(third moment of mean)/(standard deviation^3)

Contract: it measures the difference between a pixel and its neighbor pixel over the whole image.

Entropy: to calculate the average value of all pixel value in the image.

Homogeneity: it measures the closeness distribution in image diagonal to image diagonal.

Kurtosis: Kurtosis = (fourth central moment)/(standard deviation^4)



VI. EXPERIMENTAL WORK

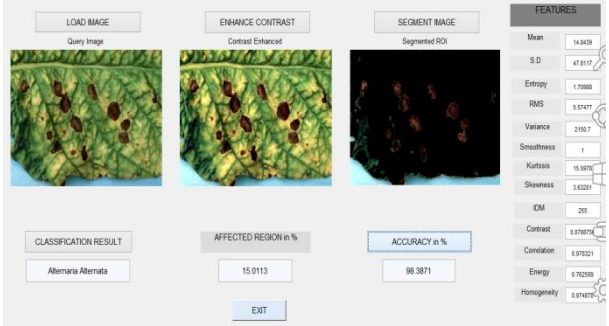


Fig.9. If Unhealthy Image is taken as Input

The above results clearly states that ,the accuracy has increased in detecting the unhealthy plant leaves. Through segmentation process, features are calculated ,classification result and affected region was found for an unhealthy image.

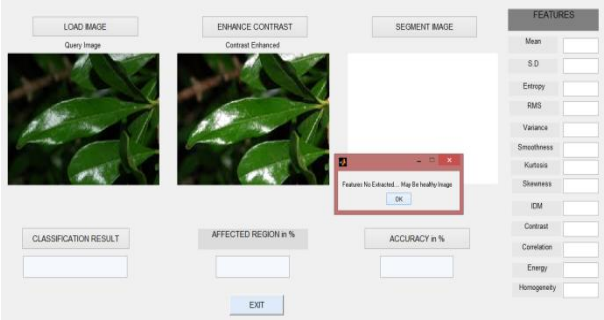


Fig.10. If Healthy Image is taken as Input

Considering healthy image as an input will not extract any features ,as it doesn't contain any disease .when we load a healthy image ,it enhances the contrast and image will not be segmented.

VII. CONCLUSION AND RECOMMENDATIONS

In this paper, We have implemented the plant disease detection using image processing. Based on the analysis and observation, it is clear that the results are more accurate. this project has improved the process of image segmentation and disease detection with much better accuracy and precision. Through this image processing technique the cost will be reduced and the affected area of the plant can be identified easily. The efficiency of identifying the disease is increased through this process. This can also be implemented in different areas of technology like medical, Industrial applications, Finger print, Remote sensing with great precision.

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