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Segmentation Base Advance Approach for Detect and Classify Leaf Diseases

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Abstract – The most challenging process in agricultural application is id identification of leaf individually. In this paper, the classification of leaf diseases is proposed along with the leaf identification of leaf identification, initially, the leaf skeletons are identified based on grapes image. Since, the leaf skeletons are used for estimating the positions and directions of the leaves. Using advance segmentation algorithm is proposed for retrieval of skeletons and identify diseases. If diseases will detected that using machine learning approach for classify types of diseases work on other result analysis parameters for classify type.

Keywords: Leaf Diseases, SVM Classifier, Thresolding Segmentation

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1. INTRODUCTION

Image processing is a process of taking an image as an input, perform some operation it, in order to manipulated the image which include enhancing reducing rotating etc. or extracting some useful information from it and producing the desired output.

The purpose of agriculture is not to feed ever growing population but it is an important sources of energy and a solution to solve the problem of global warming. Plant diseases are extremely significant, as that can adversely affect both quality and quantity of crops in agriculture production. Plant diseases diagnosis is very essential in earrlier stage in order to cure and control them. Most leaf diseases are caused by fungi, bacteria and viruses Fungi are identified primarily from their morphology, with emphasis placed on their reproductive structures. Bacteria are considered more primitive than fungi and generally have simpler life cycles. With few exceptions, bacteria exist as single cells and increase in numbers by dividing into two cells during a process called binary fission viruses are extremely tiny particles consisting of protein and genetic material with no associated protein.

There are many types of leaf diseases.

Rusts:-Rusts are plant diseases caused by pathogenic fungi of the order pucciniales.

Rots:-Rot is a name used for various diseases of cultivated plants caused by fungi or bacteria, producing dark brown discoloration and decay in the leaves of fruit and vegetables: A diseases of the apple, pear and quinces caused by a fungus (Physalosapora cydoniae)

Blight**:-**Blight is a rapid and complete chlorosis, browning, and the death of plant tissues such as leaves, branches, twings, or floral organs. Fire blight of pome fruits, caused by the bacterium Erwinia amylovora (Burrill) winslow et al., is the most severe diseases of pear and also is found in apple and raspberry, among others.

Leaf spot:-leaf spot is a common descriptive term applied toa number of diseases affecting the foliage of ornamentals and shade by fungi, but some are caused by bacteria. Some insects also causes damage that appears like a leaf spot diseases.

Downy mildews **:-**Downy mildew is a micro-biotic fungal infection that occurs in cool moist weather and affectes many different plants. It is most often recognized by a yellow or faded spotting that appears on the leaves and is a particular problem in the northeast United States.

Powdery mildew:-Powdery mildew is a common fungal diseases that affects many different plants. It is caused by a wide array of fungi of the Erysiphales order. Pososphaera xanthi is the most common reported cause. Powdery mildew is easy

to spot by the white, powdery residue that covers leaves and stems on the infected plant.

Fig 1.1 Rust

Fig 1.2 Rots

Fig 1.3 Blight

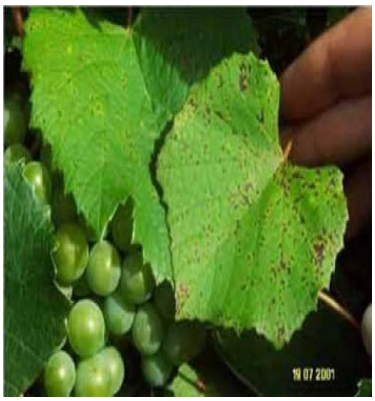


Fig 1.4 Leaf Spot

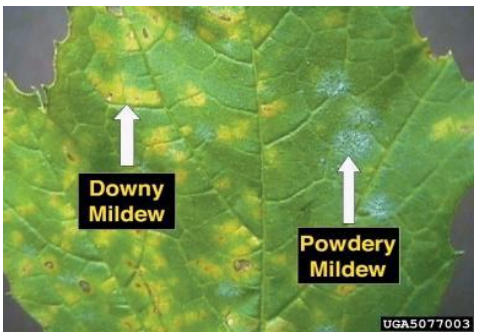


Fig 1.5. Downy Mildew & Powdery Mildew

2. HOW TO DETECT LEAF DISEASE

Now a days, there are different types of detect leaf diseases are available. And we can classify them into several categories as follows:-

- Support vector machine (SVM)
- Gray level co –occurrence matrix (GLCM)
- K-means clustering

In this section we briefly explain the concepts, advantages, drawbacks of the detect leaf diseases.

Support vector machines (SVMs) are supervised learning models with associated learning algorithm that analyze data used for classification and regression analysis. Support vector machine is based on maximizing the minimum distance from the separating hyper plane to the nearest sample. Only binary classification is supported in basic SVM, but for multiclass classification case extension can be possible[8]. In these extensions, additional constraints and parameters are added to optimization problems for handling the separation of the different classes. SVM is a binary classifier that means the class labels can only take two values ±1. To get M-class classifiers, set of binary classifiers are constructed in this way $f^1 f^2 \ldots\ldots f^M$ and each is trained for separating one class from the rest.

$$\underset{j=1\ldots M}{\operatorname{argmax}}\, g^j(x) \text{ , where } g^j(x) = \sum_{i=1}^{m} y_i \alpha_i^j k(x, x_i) + b^j$$

The function returns the signed real value that can be interpreted as distance from separation of hyper plane to point x.. The larger the value the more confident one is that the point x belong to the positive class. Hence, assign point x to the class whose confidence value is largest for this point.

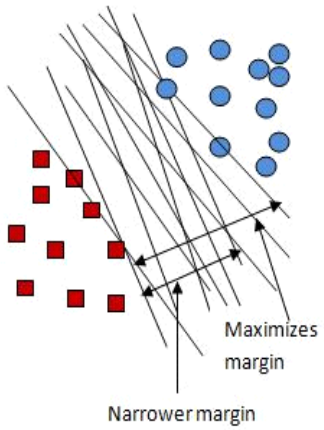


Fig 2.1 Support Vector Machine (SVM)

Main advantages of SVM are:

- Its prediction accuracy is high.
- Its working is robust when training examples contain errors.
- Its simple geometric interpretation and a sparse solution.
- Like neural networks the computational complexity of SVMs does not depend on the dimensionality of the input space.

Drawbacks of SVM are:

- This classifier involves long training time.
- In SVM it is difficult to understand the learned function (weights).
- The large number of support vectors used from the training set to perform classification task.

2.1 Gray level co –occurrence matrix (GLCM)

The GLCM features are extracted from the image. Gray-Level Co-Occurrence Matrix (GLCM) is the statistical method of investigating texture which considers the spatial relationship of pixels [2]. The GLCM functions characterize the texture of images by computing the spatial relationship among the pixels in the images. The statistical measures are extracted from this matrix. In the creation of GLCMs, an array of offsets which describe pixel relationships of varying direction and distance have to be specified. In the proposed method, four features are extracted which include contrast, energy, homogeneity and correlation. Let Pij represents the (i,j)th entry in the normalized Gray-Level Co-Occurrence Matrix. N represents the number of distinct gray levels in the quantized image. The different features extracted are defined [4]

2.2 K-Means Clustering

This is working on the partition clustering principle. The algorithm for K-Means clustering is: i. Initialize the center for each cluster. ii. Notify the nearest cluster to every data value. iii. Set the location of each cluster to the mean of all data points fitting in to that cluster iv. Repeat steps ii and iii until all data elements are converged to one of the cluster center. The performance of the clustering technique is measured using precision, recall and F1 values

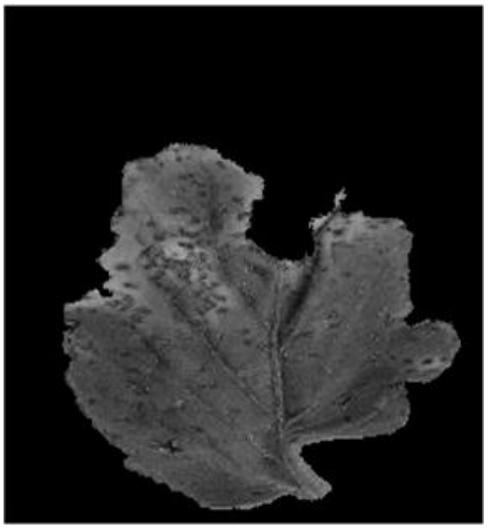
3. IMPLEMENTATION DETAILS

The process of image segmentation base advance approach for detect and classify leaf diseases could be stated as follows:

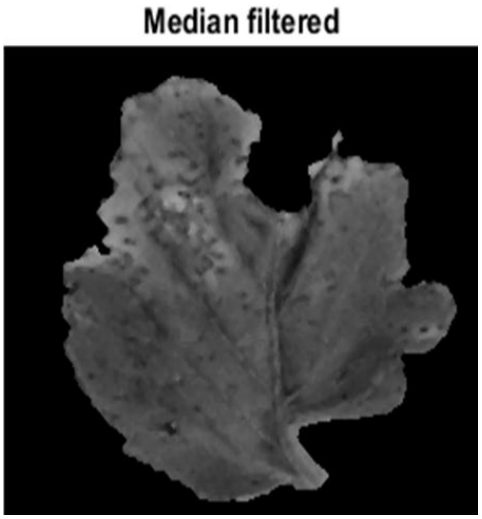
Step 1: Load input image.

First of all we load the input image from the leaf snap database

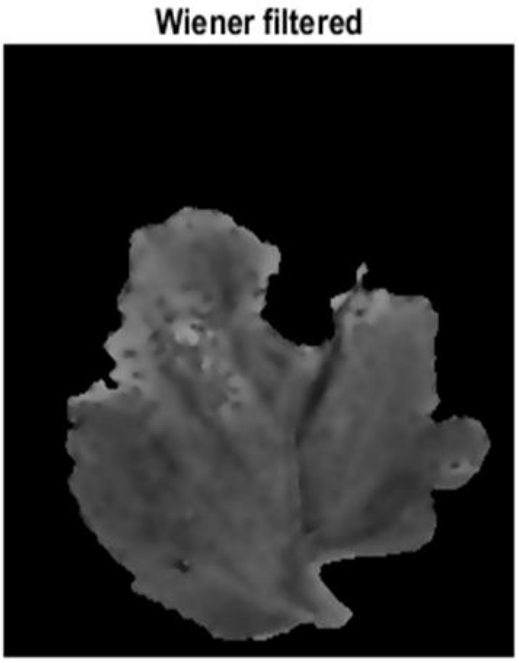
Step 2: Read and display an RGB image, and then convert it to grayscale.



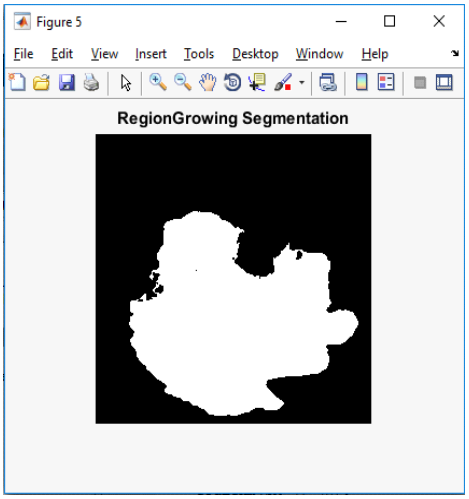
Step 3: Appiled a median filter.



Step 4: Applied a wiener filter.

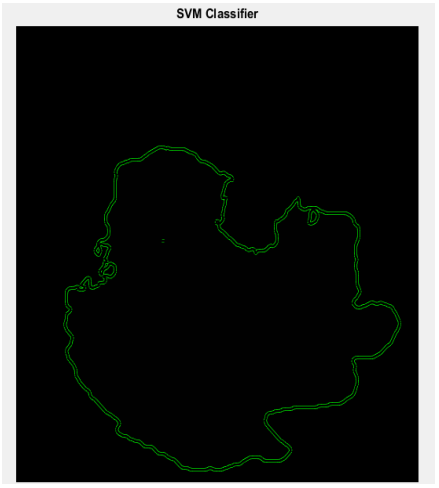


Step 5: Using a region growing segmentation.

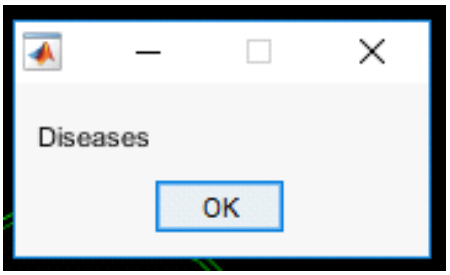


Step 6: Applied SVM classifier.

Applied parameter SVM classifier show a curve on image.



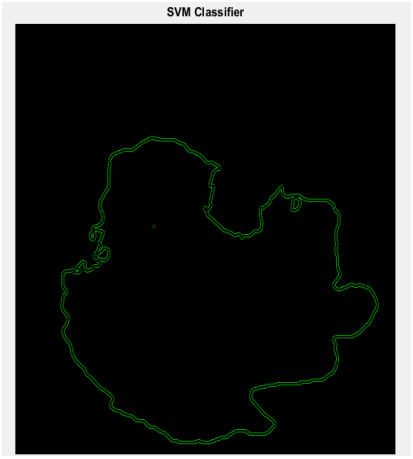
Step 7: Dispaly Dilouge Box in Message of Diseases



Finally using parameters detect leaf diseases and output is here.

Original Image

Output image



4. PARAMETERS

Precision :-

The terms true positives, true negatives, false positives, and false negatives compare the results of the classifier under test with trusted external judgments. The terms positive and negative refer to the classifier's prediction and the terms true and false refer to whether that prediction corresponds to the external judgment.

$$\text{Precision} = \frac{True\ Positive}{True\ Positive + False\ Positive}$$

$$= \frac{True\ Positive}{Total\ Predicted\ Positive}$$

Recall :-

$$\text{Recall} = \frac{True\ Positive}{True\ Positive + False\ Negative}$$

$$= \frac{True\ Positive}{Total\ Actual\ Positive}$$

Accuracy :-

Accuracy=TP+TN/TP+TN+FP+FN

5. FLOWCHART

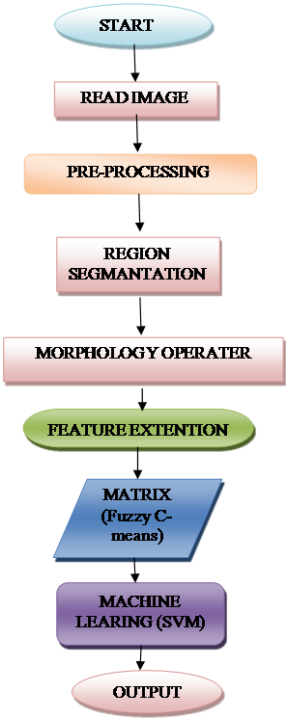


Fig 5.1: Proposed model for leaf diseases

Algorithm:-

Step 1: Read image.

Step 2: Applied pre processing step using median filter.

Step 3: Identify applied the region of interest (ROI) meaningful content.

Step 4: Erosion morphological operator to allow meaningful content. Step

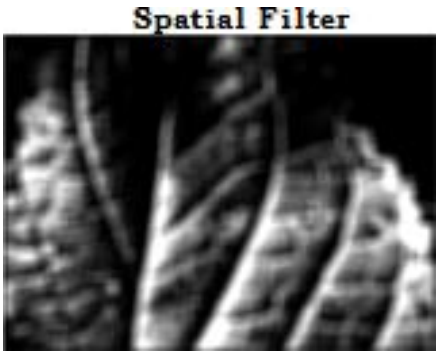
Step 5: Create a feature matrix.

Step 6: Applied the feature matrix.

Image:-

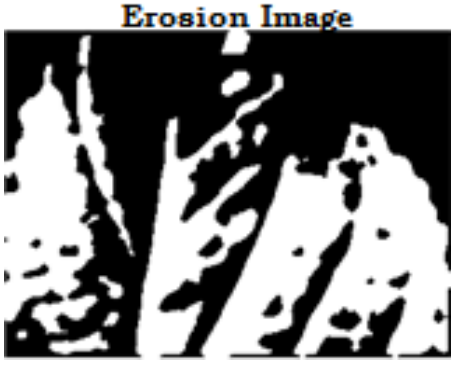
Step 1: Original Image

Step 2: RGB convert to gray level convert

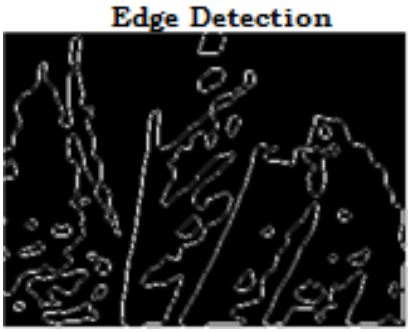


Step 3: Remove the unnecessary content we use special filter

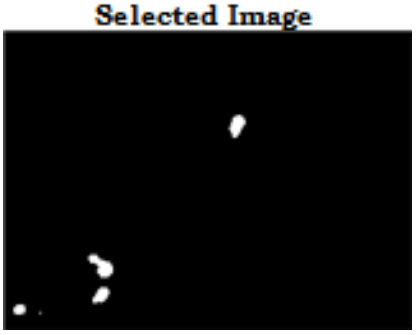
Step 4: Applied region based segmentation. We used automatic thresholding method to particular content.



Step 5:- Applied morphological operator. In morphological operator we used erosion



Step 6:- Applied edge detection.



Step 7:- Select image. In morphological operator we use erosion and opening or closing operator.

Step 8:- In this step identify the object.

6. CONCLUSION

The paper presents a comparative study regarding leaf diseases in order to evaluate different types of image segmentation method and SVM the advantages and disadvantages for each of the approached algorithms.

We have presented a new approach for leaf diseases or image segmentation (thresholding and morphological operators) SM classifier for allowing detect leaf and find diseases or solve diseases. It has been concluded that thresholding operator and SVM classifier is having a significant importance in digital image processing and also work on other parameters PRESION, RECALL & ACCURACY

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