International Journal of Computational Intelligence Research
ISSN 0973-1873 Volume 13, Number 7 (2017), pp. 1821-1828

http://www.ripublication.com

# Plant Disease Classification Using Image Segmentation and SVM Techniques

**K. Elangovan**
*Student, Department of Computer Applications,*
*University college of Engineering, BIT Campus, Anna University,*
*Trichy-620 024, Tamilnadu, India.*

**S. Nalini**
*Assistant Professor, Department of Computer Applications,*
*University college of Engineering, BIT Campus, Anna University,*
*Trichy-620 024, Tamilnadu, India.*

**Abstract**

For preventing the losses in the yield and quantity of the agricultural product, Classification is performed, if proper analysis is not taken in this approach or classification, then it produce serious effects on plants and due to which respective product quality or productivity is affected. Disease classification on plant is very critical for supportable agriculture. It is very difficult to monitor or treat the plant diseases manually. It requires huge amount of work, and also need the excessive processing time, therefore image processing is used for the detection of plant diseases. Plant disease classification involves the steps like Load image, pre-processing, segmentation, feature extraction, svmClassifer

**Keywords:** RGB Image, Segmentation, Pre-processing, SVM classifier.

## I. INTRODUCTION

India is a cultivated country and about 80% of the population depends upon on agriculture. Farmers have large range of difference for selecting various acceptable crops and finding the suitable herbicides and pesticides for plant. Disease on plant leads to the convincing reduction in both the quality and productivity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants.

Support Vector Machines (SVM) classification approach are proposed and used in this paper. Health of plant leaf and disease on plant leaf plays an important role in successful cultivate of crops in the farm.

In early Days, analysis of plant diseases were done manually by the expertise person in that field only. This requires huge amount of work and also requires excessive processing time. The image processing techniques can be used in that paper. In most of the cases disease symptoms are seen on the leaves, stem and fruit.

Mostly image processing includes regarding images as signals while applying signal processing methods, it is among very quickly growing technologies today, its applications in various aspects of a business.

Image Processing is cast core research area within engineering and computer science regulation too.

Image processing basically contains the following three steps:

a) Importing the image with ocular scanner or by digital photography.

b) Analyzing and handling the image which includes data condensation and image enhancement and spotting patterns that are not to human eyes like satellite photographs.

c) Output is the last stage in which result can be changed image or report that is based on image analysis

## II. LITERATURE REVIEW

**[1]**This paper describes an image processing technique that identifies the visual symptoms of chili plant diseases using an analysis of colored images, Work of software program that recognizes the color and shape of the chili leaf image, LABVIEW software was used to captured the image of chili plant in RGB color model and MATLAB software was used to enable a recognition process to determine the chili plant disease through the leaf images, the input image was enhanced to preserve information of the affected pixels before extracting chili leaf image from the background.

The color model respectively was used to reduce effect of illumination and distinguish between chili and non-chili leaf color efficiently and the resulting color pixels are clustered to obtain groups of colors in the image is shown below

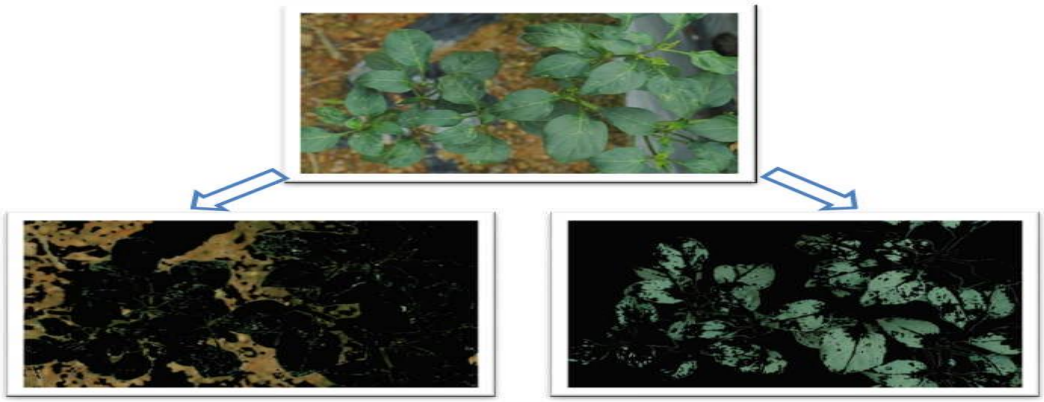

**Figure 1.** Result of color cluster

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**[2]**In this paper introduce an innovative approach to automatically detect and grade the diseases on pomegranate fruit Module identification of this paper is Bacterial Blight, Cercospora fruit spot, Fruit Rot, Alternaria fruit Spot diseases on pomegranate fruit. Molecular techniques and profiling of plant volatile organic compounds were used for diseases detection its vital functions such as photosynthesis, transpiration, pollination, fertilization, germination, and some pomegranate fruit disease:

Cercospora (Cercospora sp): The affected fruits showed small random black spots, which later on coalesce into big spots.Fruit Rot (Aspergillums foetidus): The symptoms were in the form of round black spots on the fruit and petiole. The disease starts from calyx end and gradually the entire fruit shows black spots, the fruit further rots emitting a foul odor.Bacterial Blight (Colletotrichum gloesporioidesl): The disease was characterized by appearance of small, random and water-soaked spots on fruit. If cracks are passing through the spots then the disease identified would be Bacterial blight.Alternaria Fruit Spot (Alternaria alternata): Small reddish brown circular spots appeared on the fruits, as the disease advances these spots, blend to form larger patches and the fruits start crumbling, the arils get affected which become and become not suited for consumption.

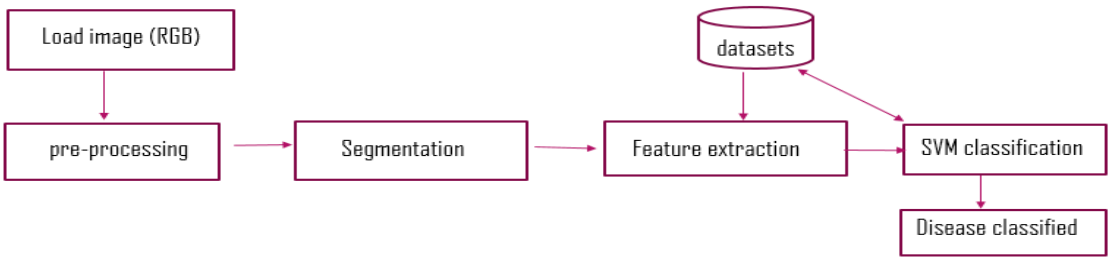
**[3]**This paper connected to spectroscopic and imaging based, and volatile profiling-based plant disease detection methods, Segmentation of leaf image is important while extracting the feature from that image, Methods of this spectroscopic and imaging techniques are: fluorescence imaging, multispectral or hyper spectral imaging, and infrared spectroscopy.The fluorescence steady at certain frequencies such as 450, 550, 690, and 740 nm and provide difference between the fluorescence at 550 and 690nm were higher in the diseased portion of the leaves, while it was very low for healthy regions of the leaves. Quadratic discriminant analysis (QDA) used for analysis, QDA classified healthy and diseased plants with an accuracy of 71% and 96%, respectively.

**[4]**Image processing and disease detection is general term of this paper and color space, color histogram, grey level co-occurrence matrix (CCM), Gabor filter, Canny and Sobel edge detector are feature extraction techniques of this paper.

Artificial Neural Network (ANN), Back propagation (BP) Network, Probabilistic Neural Network (PNN), Radial Basis Function (RBF) Neural Network are classification techniques of this paper, support vector regression (SVR) technic to classify apple leaf diseases also described in this paper.

## III. RELATED WORK

### A. Architecture:




### B. Algorithm:

Step 1: Load leaf image as RGB format

Step 2: Contrast image gives accuracy of affected image

Step 3: pre-processing

Step 4: segmentation of Otsu is considered as binary image from grey image

Otsu process:

Separate pixels into two clusters

i) Then find the mean of each cluster.

ii) Square the difference between the means.

iii) Multiply the number of pixels in one cluster times the number in the other

Step 5: Feature extraction is identify the disease and morphological method provide better result

Step 6: svmclassify is built in method that can provide classified result

The svmtrain function uses an optimization method to identify support vectors si, weights αi, and bias b that are used to classify vectors x according to the following equation

c=sumiαik (si, x) +b, where k is a kernel function. In the case of a linear kernel, k is the dot product

**C. Modules***:*

a) Image (RGB) load:

The images of the plant leaf are captured through the camera, this image is in RGB (Red, Green and Blue) form, color transformation structure for the leaf image is created, and then an independent color space transformation for the color transformation structure is applied.

b) Pre-processing:

To remove noise in image or other object removal, pre-processing techniques is considered. Image clipping i.e. cropping of the leaf image to get the interested image region. Image smoothing is done using the smoothing filter. Image enhancement is carried out for increasing the contrast. The RGB images into the grey images using color conversion using equation(x) =0.2989*R + 0.5870*G + 0.114*B

Then the histogram equalization which distributes the intensities of the images is applied on the image to enhance the plant disease images. The cumulative distribution function is used to distribute intensity values

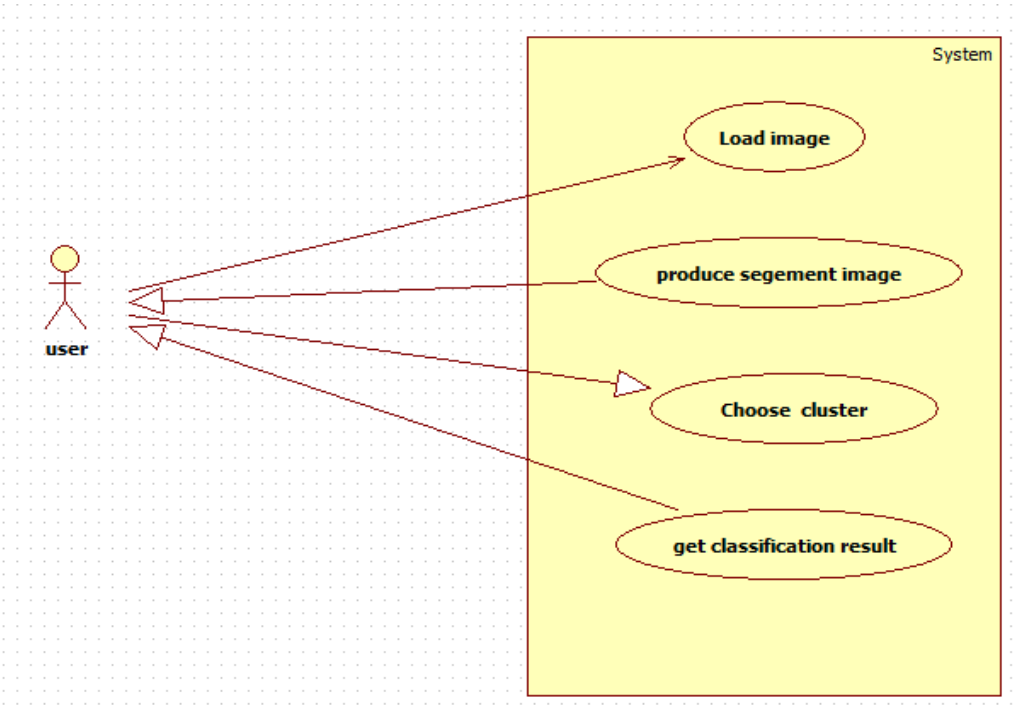
c) Segmentation:

Segmentation of leaf image is important while processing image from that Segmentation means partitioning of image into various part of same features or having some similarity. The segmentation can be done using various methods like Otsu' method, k-means clustering.

d) Feature extraction*:*

Feature extraction plays an important role for classification of an image. In many application feature extraction of image is used. Color, texture, morphology, edges etc. are the features which can be used in plant disease classification, texture means how the color is distributed in the image, the roughness, hardness of the image. In this paper considers color, texture and morphology as a feature for disease detection. They have found that morphological result gives better result than the other features. It can use for identify the infected plant leaf of classification plant image

## IV. UML DIAGRAM




## V. EXPERIMENTAL RESULTS

### A. Performance Evaluation:

a) User can load jpeg/png/gif image as rgb format,

b) Then system produce segment process image (rgbtogrey then greytobinary process)

c) Then user select appropriate image segmented part (using k-means cluster algorithm)

d) Then the classified result should be appeared and simply and easily to detect leaf disease.

**B. Parameter attributes:** Detect_data.mat and Accuracy_data.mat files are used for svmclassification.

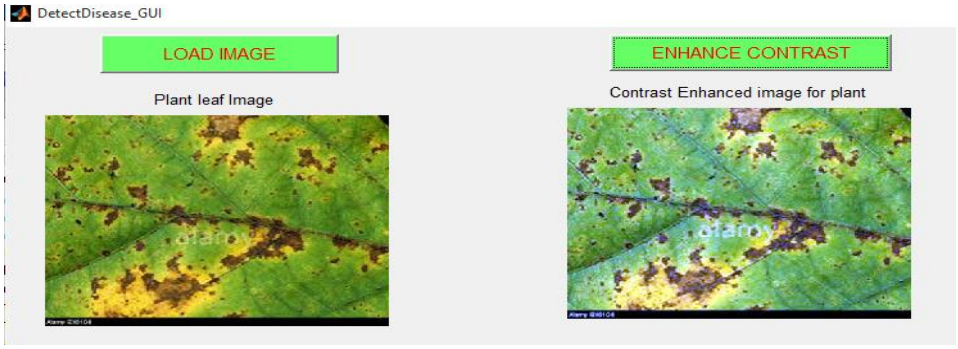



**Figure 1.** Enhancement of image

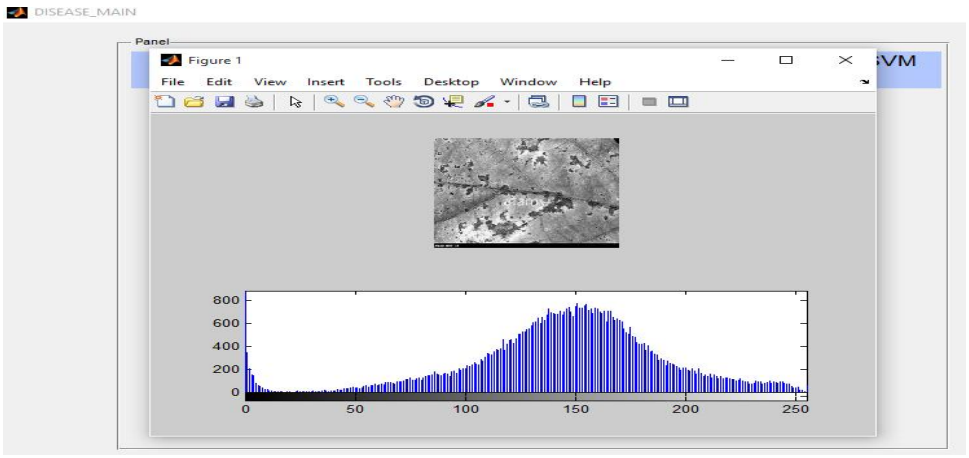



**Figure 2.** Histogram picture of enhanced image

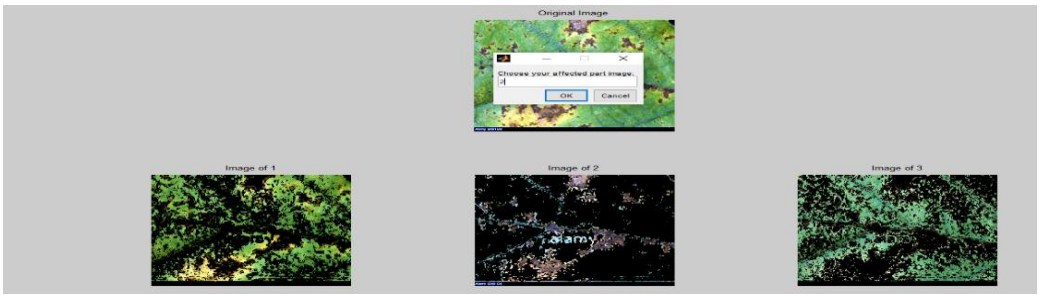



**Figure 6.** K-means cluster for segmenting disease

## VI. CONCLUSIONS

The accurate Disease detection and classification of the plant leaf image is very important for the successful cultivation of cropping and this can be done using image processing. This paper discussed various techniques to segment the disease part of the plant. This paper discussed classification techniques to extract the features of infected leaf and the classification of plant diseases throw svmclassifier

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