Detecting Plant Leaves Diseases using Image Processing Techniques

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***Abstract*—** *The plant disease drastically reduces both, growth and yield of the plant. It is necessary to combat plant diseases effectively to maintaining sufficient food produce globally. Detection of plant disease and its severity has always been challenging. Image processing techniques are proven to be one of the accurate and economic practices for measuring the parameters related to various plant diseases. In this research study, leaves of fruit, namely apple have been considered and Image processing techniques had been used for disease detection.*

I. INTRODUCTION

1.1 Diseases that affect apple leaves

The decrease in the yield of apple production is mainly because of existence of viruses on crops specifically on leaves. Apple is also called as *malusdomestica.* India is the sixth major apple manufacturer in the world. Apple is the most significant source of energy and hence identifying the disease in apple in right time with sufficient accuracy is of utmost importance. Apple leaves are mainly affected by *apple scab, marsonina coronaria, black rot canker, powdery mildew, apple mosaic* and other virus diseases, *alternaria leaf spot.*

FIGURE 1: Apple Leaf Affected with *scab*

FIGURE 2: Apple leaf affected with *marsonina coronaria* disease

FIGURE 3: Apple fruit and leaf affected with *black rot canker* diseases

FIGURE 4: Apple leaf affected with powdery mildew disease

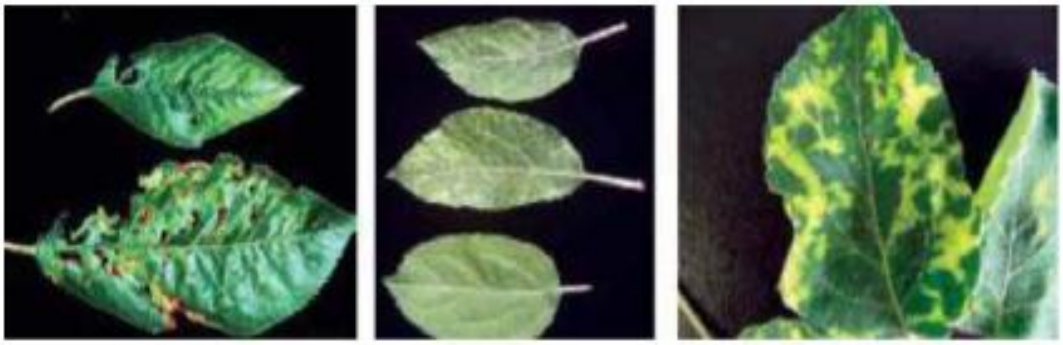


FIGURE 5: Apple leaf affected with apple *mosaic* disease

FIGURE 6: Apple leaf affected with *alternaria* disease

II. PROPOSED METHODOLOGY

To improve the accuracy of the disease detection in plant leaves, a methodology as shown in Fig. 7 has been proposed in this research work. Dataset have been prepared with apple leaf images from benchmark data collection. The input data is pre-processed for colour transformation, removal of noise, edge detection and histogram equalization. The pre-processed images segmented using FCM and KFCM algorithms into order to separate the image into background and foreground images. Then the foreground portion of the image is taken for Discrete Wavelet Transformation (DWT) which divides the images into 4 sub bands. Then the textural features have been extracted sub band images using Gray Level Cooccurrence Matrix method. The extracted textual features are used for classifying the images into healthy and diseased leaves using SVM and deep autoencoder technique.

2.1 Preparation of dataset

Dataset have been prepared in the proposed research work from apple benchmark dataset consists of 101 leaves collected from plant village dataset. It consists of 51 leaf images affected with Scab disease and 50 images of healthy leaves. The dimensions of apple leaf images are 256x256 pixels.

2.2 Pre-processing

The datasets contain colour images and the images are converted into grayscale images and which then are pre-processed with the help of Laplacian of Gaussian (LOG) filters. Basically, Laplacian of Gaussian is a popular edge detection algorithm. Edge detection is an important step in disease detection as edges help to recognize objects, locate boundaries, and extract features. Edge detection is about identifying sudden, local changes in the intensity values of the pixels in a plant leaf image. Edge detection algorithms like the Sobel Operator work on the first derivative of a plant leaf image. In other words, if we have a graph of the intensity values for each pixel in an image, the Sobel Operator takes a look at where the slope of the intensity graph reaches a peak, and that peak is marked as an edge.

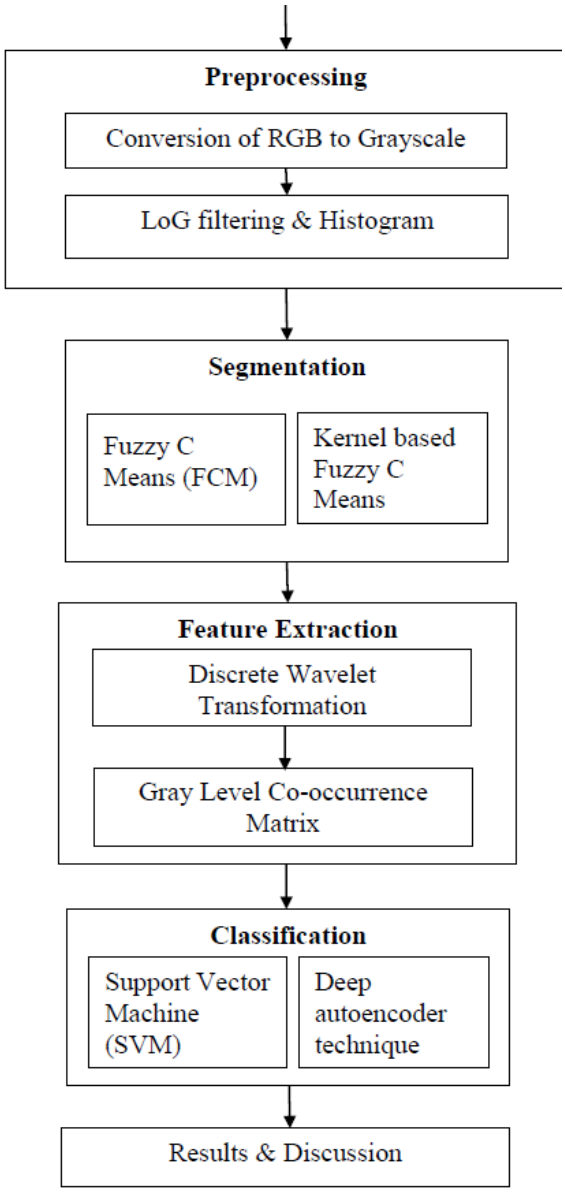
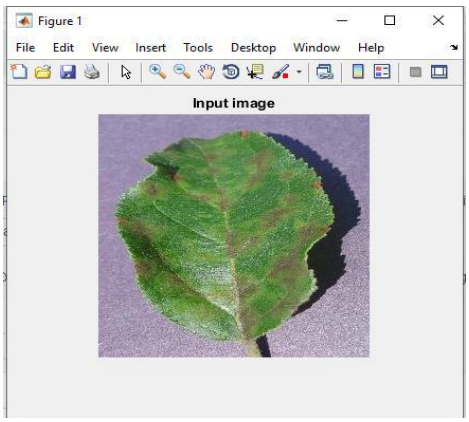
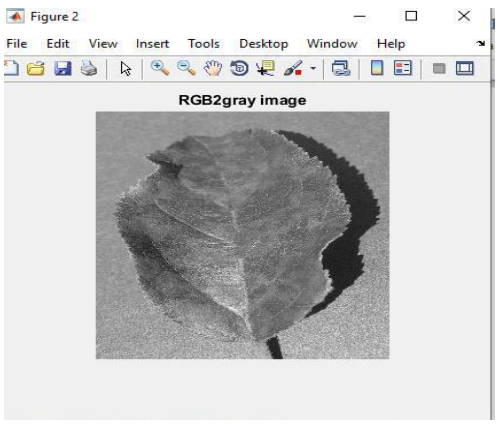


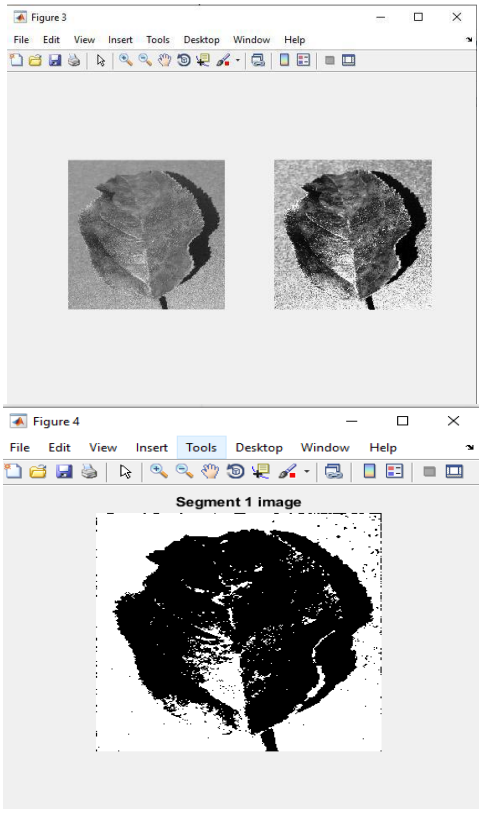
FIGURE 7: Workflow of proposed methodology for disease detection in plant leaf images

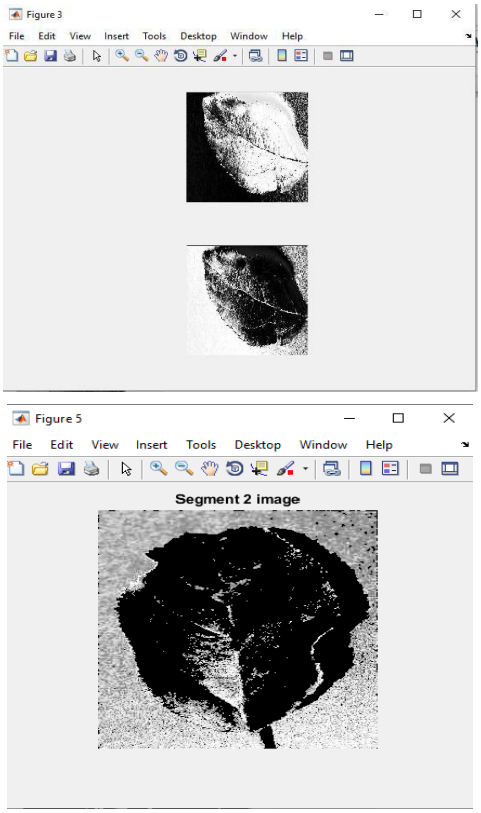
III. EXPERIMENTATION

The segmentation methods have been tested for their performance by applying the methods to each leaf image of the datasets. Experiment has been carried out in MATLAB.









IV. CONCLUSION

In this paper, the overall methodology for detecting enhanced diseases detection in plant leaves has been described. Apple benchmark dataset have been used. The input images have been pre-processed and segmented using FCM and KFCM algorithms.

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