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Disease Detection in Leaves using Image Processing Techniques

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Abstract—*Agricultural products are prone to diseases as they come into the attack of fungi, bacteria and are also affected by bad environmental conditions. The symptoms are first visible on leaves, stems etc. this paper proposes methodology for detecting diseases in leaves. The objective is to detect and classify diseases. Leaf images are captured and some are used for training purpose and some are used as test images. Proposed method first enhances the image and then converts the RGB image into HSV color space then segments the diseased portion from the healthy portion using K-mean clustering. Feature extraction is done using GLCM and classification is done using SVM.*

Keywords: *co-occurrence matrix; SVM; texture feature; k-mean clustering.*

1. INTRODUCTION

India is an agricultural country. The economy mainly depends on agricultural products. The main aim is to increase the economy by increasing the production as well as improving the quality of the fruits and vegetables. Now a day due to environmental conditions the quality of agricultural products is degrading as they become susceptible to several diseases. So it is necessary to detect diseases as early as possible. The initial symptoms are first observed in the leaves. So by detecting the diseases at the early stage the treatment can be provided early and hence increasing the yield and also improving the quality of the fruits.

Manual inspection of diseases in very large field is very long process and it is not possible for the farmers handling more than one farms so there should be a system that automatically detects the diseases and then only treatment is to be provided. The easiest way is to use image processing techniques.

This paper is organized into the following sections. Section 1 gives an introduction part and importance of leaf disease detection. Section 2 describes various types of strawberry leaf diseases. Section 3 presents a literature review. Section 4 includes proposed methodology for leaf disease detection and classification. Section 5 shows experimental result. Finally, Section 6 consists of conclusion.

2. PLANT DISEASES ANALYSIS

Proposed work focusing on strawberry leaves .

Leaf Spot

It is caused by Mycosphaerella fragariae. There are small round purple to reddish spots on upper leaf surfaces. Centers of these spots are of grey to white color.

Leaf Spot

Leaf Scorch

Leaf scorch is caused Diplocarpon earliana. In this disease spots are of 2 shapes; small pinpoint spots in large or small numbers and/or ¼ to ½" diameter blotchy spots. Scorch spots are typically reddish brown.

Leaf Scorch

Leaf Blight

Leaf blight is caused by Phomopsis obscurans. There are reddish purple spots with brown centers.

Leaf Blight

3. LITERATURE REVIEW

The methodology proposed in [1] shows that image pre-processing is done to remove noise like Gaussian noise, salt and pepper noise. Then segmentation is done using k-mean clustering. Then features extracted using GLCM and classification done using ANN.
In [2] color, morphology and texture features are extracted instead of only texture feature. Classification is done using ANN.
In [3] color and texture features are extracted using histogram and comparing pixel values with the neighboring pixels respectively. Classification is done using ANN.
In [4] color and texture features are combined and then classification is done using the random forest classifier.

4. PROPOSED METHODOLOGY

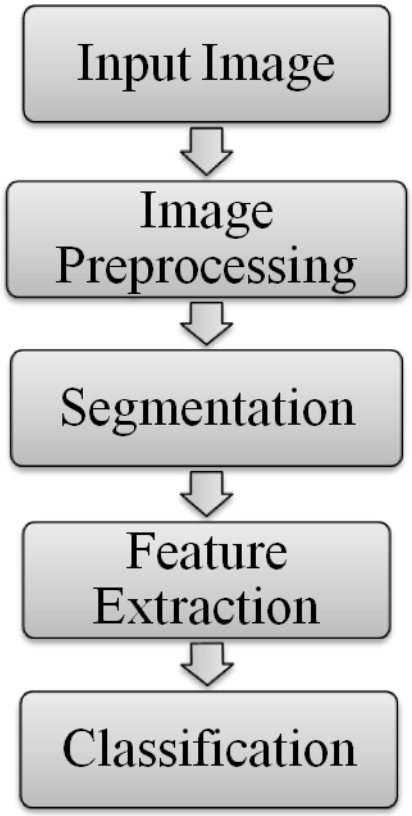
There are five main steps used for the detection of plant leaf diseases as shown in fig.2. The proposed method includes following steps input image, image preprocessing, segmentation, feature extraction and classification.

A. Image Acquisition:

It is the basic and fundamental step as the processing is done on the images.

B. Image Pre-processing:

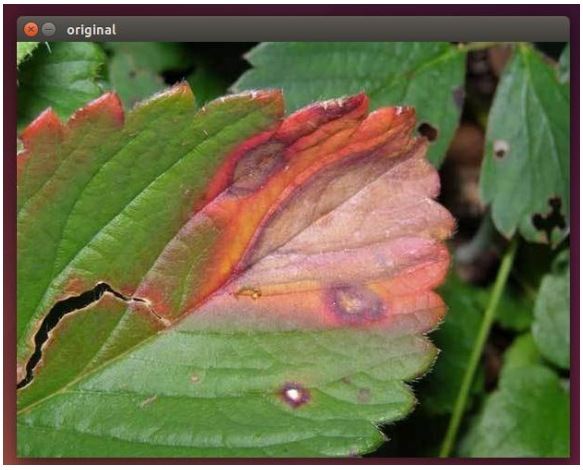
Image pre-processing includes two things to be done one is image enhancement and color space conversion. The RGB image is converted into HSV image.



Proposed Methodology

Image enhancement:

Image enhancement is done using histogram equalization. It is done to enhance the contrast of the image. Histogram equalization is done on grayscale image. Then image is converted into RGB format and then it is converted into YCbCr format.



Original Image

Histogram equalized image

Enhanced image

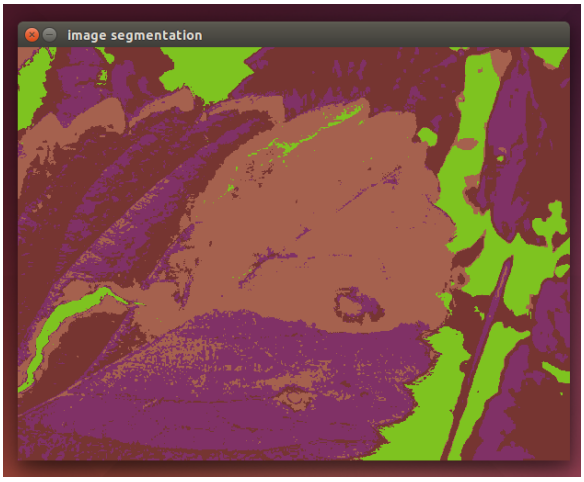
Color space conversion:

This plays an important role in detection of diseases in leaves. The RGB images of strawberry leaf are converted into HSV. Hue describes purity of color as perceived by an observer. Saturation refers the proportion of white color.

HSV Image

Image Segmentation:

Image segmentation is used for separating the diseased portion from the healthy portion. Here K-mean clustering is used with value K = 4.



Segmented Image

5. Conclusion

The classification using SVM is more accurate when there are less number of training images. ANN is complex compared to SVM. Once ANN is trained it becomes difficult to make modifications as it behaves like a black box. ANN is the network of neurons where neurons are the features extracted. There are hidden layers in ANN which makes it

complex to make modifications. In SVM making modifications is easier compared to ANN. ANN and Random Forest Classifier requires large number of training images compared to SVM. SVM is robust to distortions present in the training images.

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