Detection of Plant Leaf Diseases

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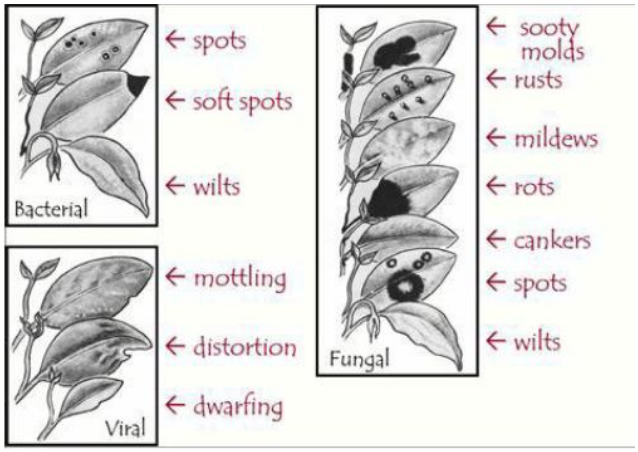
Abstract- *Images form important data and information in biological sciences. Automatic detection of plant diseases is an essential research topic as it may prove benefits in monitoring large fields of crops, and thus automatically detect the symptoms of diseases as soon as they appear on plant leaves. The project system is a software solution for automatic detection and computation of texture statistics for plant leaf diseases. The developed processing scheme consists of four main steps, first a color transformation structure for the input RGB image is created, then the green pixels are masked and removed using specific threshold value, then the image is segmented and the useful segments are extracted, finally the texture statistics is computed. From the texture statistics, the presence of diseases on the plant leaf is evaluated. Experimental results on a database of about 500 plant leaves of 30 different plants confirm the robustness of the proposed approach.*

Keywords- HSI, Color Co-occurrence Matrix, Texture, Plant Leaf Diseases.

I. INTRODUCTION

Digital image processing and image analysis technology based on the advances in Micro electronics and computers has many applications in biology and it circumvents the problems that are associated with traditional photography. This new tool helps to improve the images from microscopic to telescopic range and also offers a s cope for their analysis. It, therefore, has many applications in biology [1 It is estimated that 2007 plant disease losses in Georgia (USA) is approximately $653.06 million [2]. The naked eye observation of experts is the main approach adopted in practice for detection and identification of plant diseases. But, this requires continuous monitoring of experts which might be prohibitively expensive in large farms. This enables machine vision that is to provide image based automatic inspection, process control and robot guidance. Comparatively, visual identification is labor intensive, less accurate. Kimet.al, have classified the grape fruit peel diseases using color texture features analysis. The texture features are calculated from the SGDM and the classification is done using squared distance technique. Grape fruit peel might be infected by several diseases like canker, copper burn, greasy spot, melanose and wind scar [4]. The classification accuracy achieved is 96.7 Helly et.al developed a new method in which HSI transformation is applied to the input image, and then it is segmented using Fuzzy C- mean algorithm. Feature extraction stage deals with the color, size and shape of the spot and finally classification is done using neural networks [5].



In this paper, detection and classification of leaf diseases has been proposed, this method is based on masking and removing of green pixels, applying a specific threshold to extract the infected region and computing the texture statistics to evaluate the diseases. Plant diseases may be broadly classified into three types. They are bacterial, fungal and viral diseases. Some of the diseases are shown in Figure 1.

II. MOTIVATIONS

Detection of plant leaves diseases is one of the simplest and efficient method to detect diseases in plants. It can be implemented in very low cost. It widely efficient and useful for today's farmers in especially in the country like India. This can play an important role in life for the development of their life and the country as well. This project overcome all the methods used in early life for prevention of food crops and their maintainence.

III. PROBLEM STATEMENT

The step-by -step procedure of t he proposed system:

1. RGB image acquisition
2. Convert the input image from RGB to HSI format.
3. Masking the green-pixels
4. Removal of masked green pixels
5. Segment the components
6. Obtain the useful segments
7. Computing the features using color-co -occurrence

methodology
8. Evaluation of texture statistics.

Color Transformation Structure:

First, the RGB images of leaves are converted into Hue Saturation Intensity (HSI) color space representation. The purpose of the color space is to facilitate the specification of colors in some standard, generally accepted way. HSI (hue, saturation, intensity) color model is a popular color model because it is based on human perception [10]. Hue is a color attribute that refers to the dominant color as perceived by an observer. Saturation refers to the relative purity or the amount of white light added to hue and intensity refers to the amplitude of the light. Color spaces can be converted from one space to another easily. After the transformation process, the H component is taken into account for further analysis. S and I are dropped since it does not give extra information. Figure 3 shows the H, S and I components.

Masking green pixels:

In this step, we identify the mostly green colored pixels. After that, based on specified threshold value that is computed for these pixels, the mostly green pixels are masked as follows: if the green component of the pixel intensity is less than the pre- computed threshold value, the red, green and blue components of the this pixel is assigned to a value of zero. This is done in sense that the green colored pixels mostly represent the healthy areas of the leaf and they do not add any valuable weight to disease identification and furthermore this s ignificantly reduces the processing time.

Removing the masked cells:

he pixels with zeros red, green, blue components were completely removed. This is helpful as it gives more accurate disease classification and significantly reduces the processing time.

Segmentation:

From the above steps, the infected portion of the leaf is extracted. The infected region is then segmented into a number of patches of equal size. The size of the patch is chosen in such a way that the significant information is not lost. I n this approach patch size of 32 32 is taken. The next step is to extract the useful segments. Not all segments contain significant amount of information. So the patches which are having more than fifty percent of the information are taken into account for the further analysis.

Color co-occurrence Method:

The color co- occurrence texture analysis method is developed through the Spatial Gray- level Dependence M atrices (S GDM). The gray level co- occurrence methodology is a statistical way to describe shape by statistically sampling the way certain gray- levels occur in relation to other gr ay levels [11]. These matrices measure the probability that a pixel at one particular gray level will occur at a distinct distance and orientation from any pixel given that pixel has a second particular gray level. The S GDM's are represented by the function where I represent the gray level of the location , and j represents the gray level of the pixel at a dis tance d from location at an orientation angle of . SGDM's are generated for H image.

Texture Features:

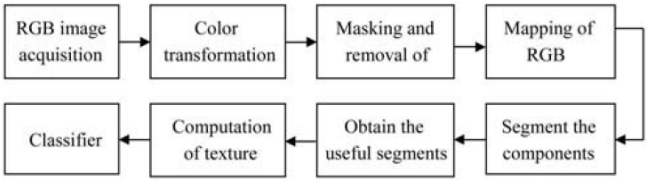
Texture features like Contrast, Energy, Local homogeneity, Cluster shade and Cluster prominence are computed for the Hue content of the image as given in Eqns.4 -8.

Contrast (4)
Energy (5)
Local Homogeneity (6)
Cluster Shade = (7)
Cluster Prominence = (8)

From the texture features, the plant diseases are classified into various types

IV. PROPOSED SYSTEM

First, the images of various leaves are acquired using a digital camera. Then image- Processing techniques are applied to the acquired images to extract useful features that are necessary for further analysis. Figure 2 depicts the bas ic procedure of the proposed vision- based detection algorithm in this paper.



V. RESULTS & DISCUSSION:

The acquired leaf images are converted into HSI format. From the hue content, the co-occurrence features like contrast, energy, local homogeneity, shade and prominence are derived. The feature sets are used for analysis of disease

type of particular species. Samples of leaves with various diseases like early scorch, yellow spots, brown spots, late scorch, bacterial and fungal diseases are shown in Figure 4.

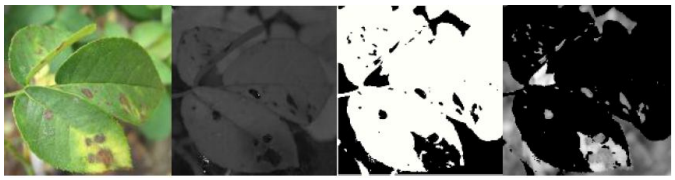
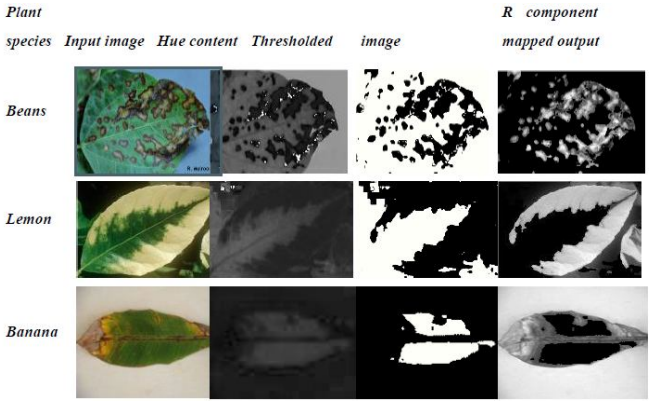


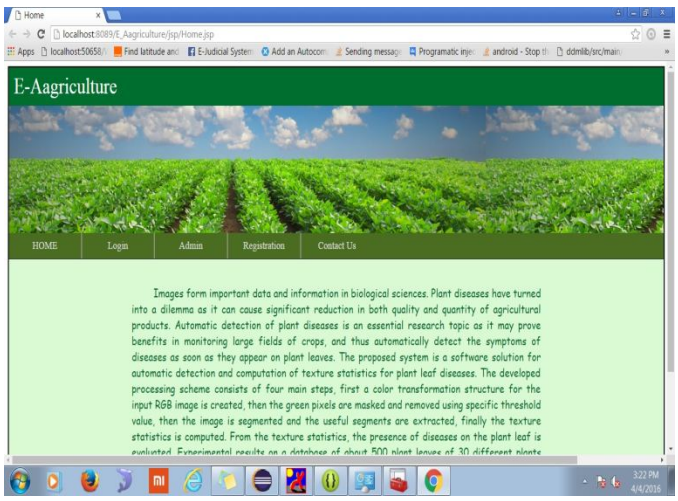
Fig 3:(a) Input I mage (b) Hue Content. (c) Thresholded Image. (d) R Component Mapped Output



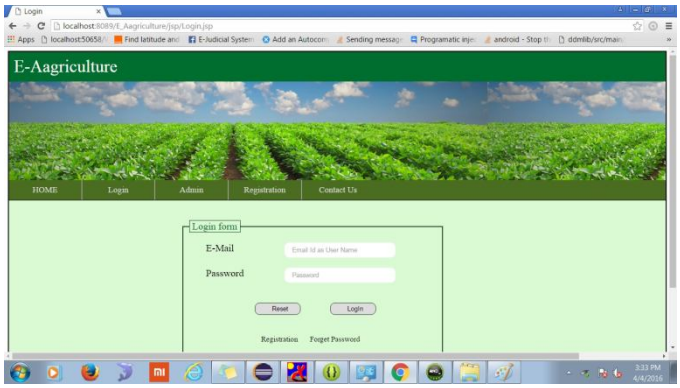
After mapping the R, G, B components of the input image to the thresholded image, the co- occurrence features are calculated. The co- occurrence features such as contrast, energy, local homogeneity, cluster s hade and cluster prominence are derived from the Co- occurrence matr ix using the Eqns 4- 8. The co- occur rence features for the H component of the leaf infected by various diseases are listed below.

VI.IMPLEMENTATIONS OF PROJECT ON WINDOWS:

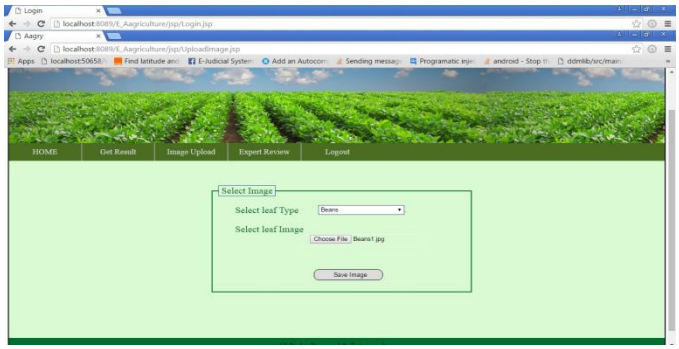
1. Screenshot: homepage



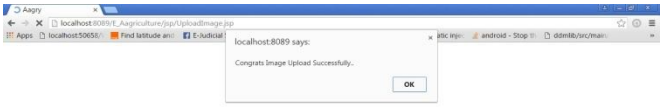
2. Screenshot: Regisrtration for new users



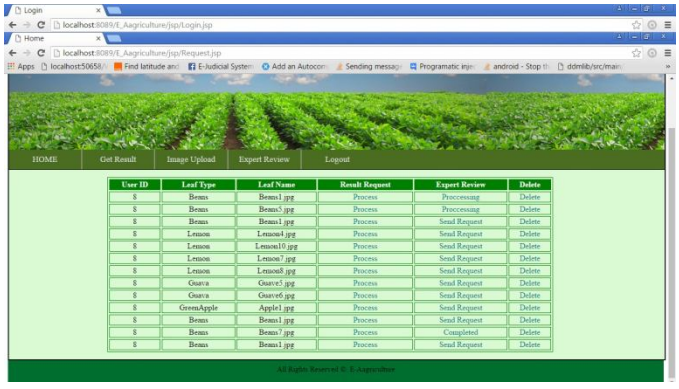
3. Screenshot: Upload the image of defected leaf



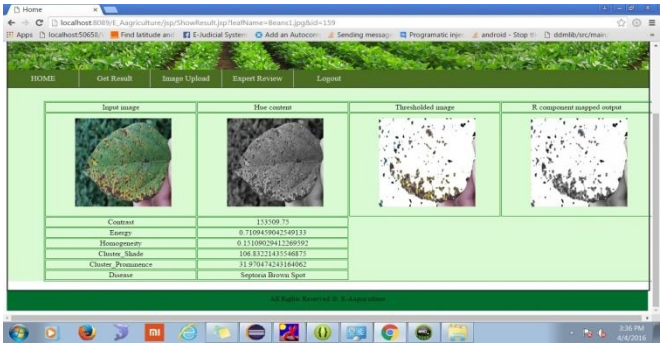
4. Screenshot: Connectivitity with the server



5. Screenshot: Data Base of different leaves

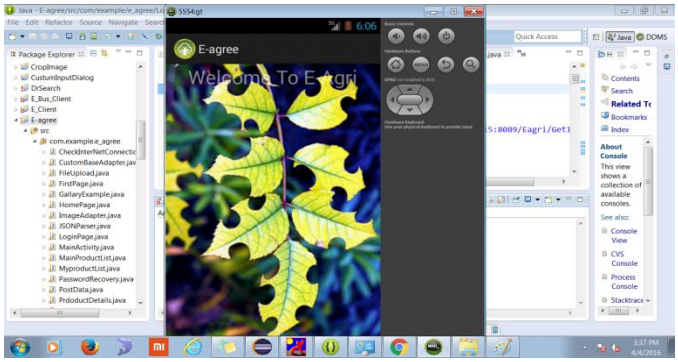


6. Screenshot: Result/Disease of the detected leaf

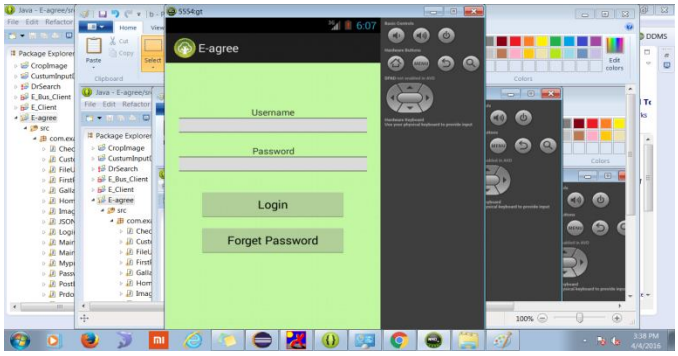


VII. IMPLEMENTATIONS OF PROJECT ON ANDROID

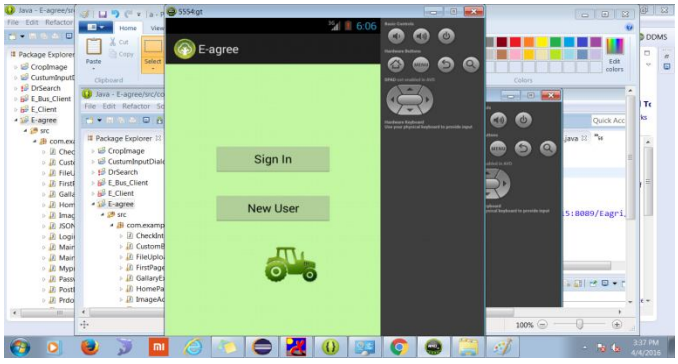
1. Screenshot: Virtual android on PC



2. Screenshot: Home page of E agree on android

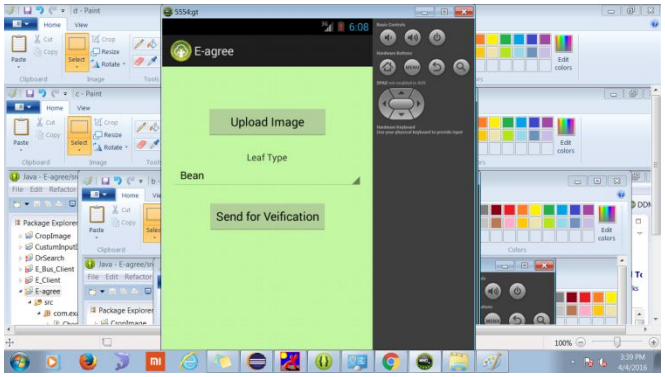


3. Screenshot: Registration for new user/Sign in



4. Screenshot: Choosing the opted Operation

5. Screenshot: Uploading the image of a leaf



VIII. CONCLUSION

From the analyzation, grayscale images are easy to process and implement for various applications because they have better clarity and suited for analysis than RGB images. Histogram equalization is used to enhance the contrast of the images and provides clear image to human eyes .Histogram equalization is used to achieve better quality images in gray scale which is used in various medical applications, biological applications such as digital X-rays, plant leaves disease, etc. So, these types of images will be used to analysis and diagnosis the plant leaves diseases and determines the diseases level of the plant leaves.

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