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Plant Leaf Disease Identification System for Android

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Abstract: The leaves of a plant provides the most important information or data which provides us to know which type of plant it is and which type of disease is infected on that leaf. The plants play an important role in the biological field. In this project we have describe the development of an Android application that gives users or farmers the capability to identify the plant leaf diseases based on the photographs of plant leaves taken from an android application. Detecting diseases on leaf of plant at early stages gives strength to overcome it and treat it appropriately by providing the details to the farmer that which prevention action should be taken.

Keywords: Image processing, Android**,** Texture, Plant Leaf Diseases.

I. INTRODUCTION

India is an agricultural country and the position of any country in the world depends on its agricultural production. In India the farmers have wide variety to select their plant for cultivation to produce maximum yield depending on environment available. Then also the production gets affected by diseases of the crop. The diseases of the plant are caused by pathogens, insufficiency of nutrients, fungus etc. Detecting diseases at early stages enables to overcome it and treat it appropriately. For this an expert is required for identifying the disease, describe the method of treatment and protection. Identifying the plant disease is not easy task. It requires experience and knowledge of plants and their diseases. It also requires correct result in describing the symptoms of plant diseases. A person can depend on a system which has experience and knowledge, called an Expert System. An expert system can be:

- Agricultural advisor
- An excellent farmers
- Electronic or Computerized expert system

An excellent farmer precisely catches the change of the crops in the growing process and they manage the cultivation in proportion to the change in order to cultivate the agricultural products of high quality. Since sensing the delicate change of crops is obtained through the observation by the visual sense in their long cultivation experience, it is difficult for them to transmit the understood technique to future generations as a general cultivation one. If farmers decide to take advice from agricultural expert regarding the treatment of incidence of pest /disease/trait to their crop/plant in order to increase the crop productivity then he may face following situations:

- Sometimes they have to go long distances for approaching the expert.
- Expert may not be present at that time even though they go long distances.
- Sometimes, the expert whom a farmer contacts, may not be present in that location to give opinion to the farmer with the information and knowledge.

In this quest the expert advice is very costly and time consuming. Electronic expert systems enable farmers in identifying type of diseases; making the right decision and selecting the proper treatment. The expert systems are smart computer programs that are capable of serving solutions or suggestion related to specific problems in given area. One of the advantages of using Electronic expert systems is its capability to reduce the information that users need to process, reduce personnel costs and increase throughput. Expert system performs work more consistently than human experts.

II. EXISTING SYSTEM

Images form necessary data and information in biological field. Plant diseases have turned into a problem as it can cause significant reduction in both quantity and quality of agricultural products. Automatically detection of plant leaf diseases is a necessary topic as it helps to improve benefits in observing large fields of crops, and thus automatically detect the diseases as they appear on plant leaf. The proposed system is a software solution for automatic computation and detection of texture statistics for plant leaf diseases. From the texture statistics, the presence of diseases on the plant leaf is assess.

III. PROPOSED SYSTEM

Therefore looking for exact, fast and low price method to automatically detect the diseases from the symptoms that come on the plant leaf is of great importance. This enables machine vision that is to provide image based automatic inspection, process control. The objective of this paper is to concentrate on the plant leaf disease detection for android based on the texture of the leaf.

First, the images of various leaves are acquired using a android camera. Then image- processing techniques are applied to the acquired images to extract useful features that are necessary for the analysis. Fig 1 represents the basic procedure of the proposed plant leaf disease identification based detection algorithm in this paper.

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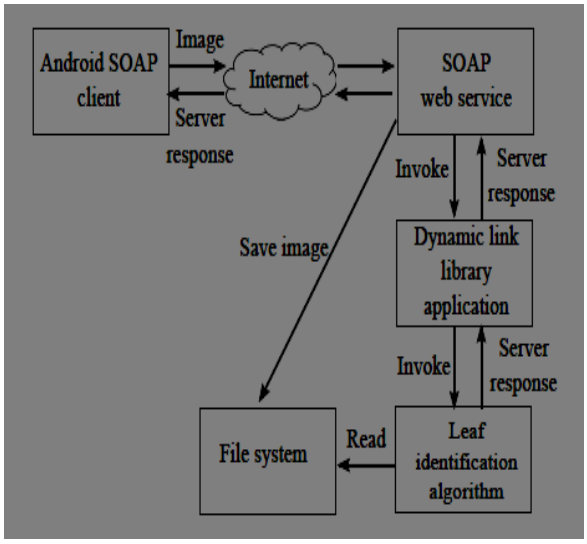

Fig. 1 System Architecture

The steps of the proposed system:
1. Acquisition of RGB image
2. Convert the input image from RGB to HSI form
3. Masking the green-pixels
4. Removal of masked green pixels
5. Segment the components
6. Gain the beneficial segments
7. Calculating the main features using color co-occurrence procedure
8. Evaluation of texture statistics

Color Transformation Structure: Firstly, the RGB images of leaves is converted into HSI (Hue Saturation Intensity) color space representation. The purpose of the color space is to make easy the specification of colors in some standard, generally accepted way. HSI color model is a famous color model because it is based on human perception. Hue is a color characteristic that refers to the dominant color. Saturation refers to the relative purity. The color spaces can be easily converted from one space to another. After the transformation process, the H component is taken for further analysis. S and I are dropped, it does not give extra information. Figure 2 shows the H, S and I components.

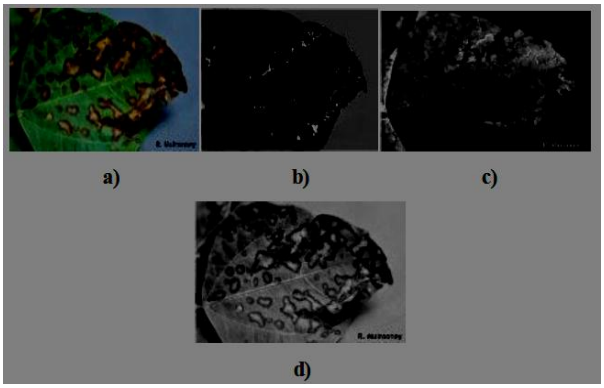

Fig. 2 a) Input image infected by Bacterial Brown Spot b) Hue Component c) Saturation Component d) Intensity Component

Masking green pixels: In this step, we identify mostly the green colored pixels and after that, based on specified threshold value that is computed for these pixels. Mostly the green pixels are masked as follows: if the green component of the pixel intensity is less than the pre-calculated threshold value, the red, green and blue components of the pixel is set to a value of zero. The green colored pixels mostly represent the healthful areas of the leaf and they do not add any valuable information to disease identification and furthermore.

Masked cells are removed: The pixels having zero values red, green, blue components were removed completely. This is helpful for more accurate disease classification and significantly decreasing the processing time.

Segmentation: From the above steps, the infected part of the leaf is extracted. The infected part is then segmented into a number of patches of equal size. The specific size of patch is chosen in such a way that the significant data is not lost. In this approach small size of 32×32 is taken. The next step is to draw the noteful segments. All segments do not contain significant amount of information. For further analysis the sizes which are having more than fifty percent of the information are taken into account.

Color co-occurrence process: The color co-occurrence structure analysis method is developed through the SGDM(Spatial Gray Level Dependence Matricess). The gray level co-occurrence procedure is a statistical way to describe shape by statistically processing the way certain gray levels occur in relation to other gray levels. These matrices measure the probability that a pixel at one part in gray level will occur at a distinct distance and orientation from any pixel given that pixel has a second part of gray level. The SGDM's is represented by the function $P(i,j,d,\theta)$ where I represent the gray level of the location(x,y) and j shows the gray level of the pixel at a distance d from location(x,y) at an inclination angle of θ. SGDM's are generated for H image.

Texture Features: Image texture features like Contrast, Energy, Local homogeneity, Cluster shade and Cluster prominence are calculated for the Hue content of the image.

Experimental Results and Discussion:
The acquired leaf images are converted into HSI form. From the hue content, the co-occurrence features like local homogeneity, energy, contrast, shade and prominence are derived. The main sets are used for the result of disease type of particular plant.

Samples of leaves with various diseases like brown spots, late scorch, yellow spots, bacterial and fungal diseases are shown in Fig 3

As a sample, a leaf that is infected by bacterial disease is taken as input to the algorithm. Fig 4(a) shows the input image. On the input image color transformation structure is performed. The hue content of the input image is shown in Fig 4(b). Then the green pixels are masked and removed using a specific threshold value. The thresholded image is

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shown in Fig4(c). Then the R, G, B components are mapped to the thresholded image. The R component mapped to the thresholded image is shown in Fig 4(d).

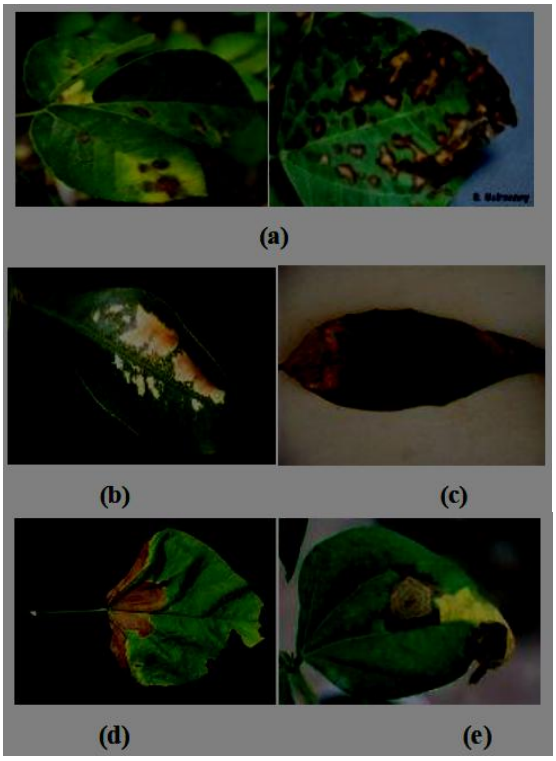

Fig. 3(a) Bacterial Disease in Rose and Phaseolus vulgaris Leaf (b) Sun Burn Disease in Citrus Leaf (c) Early Scorch Disease in Musa leaf (d) Late Scorch Disease in Phaseolus vulgaris Leaf (e) Fungal Disease in Phaseolus vulgaris Leaf

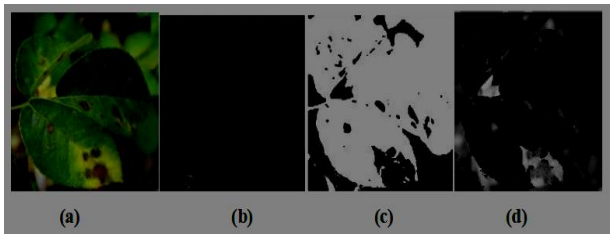

Fig. 4(a) Input Image (b) Hue Content. (c) Thresholded Image (d) R Component Mapped Output

IV. CONCLUSION

Based on the analysis, grayscale images are easy to process and implement. 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. So, these types of images will be used to analyse and diagnosis the plant leaves diseases and determines the diseases level of the plant leaves. Mobile phone has become available at the grass-root level providing different social and economic benefit. The aim of this proposal was to develop a user friendly automated system for the farmers that will help them in determining detection diseases of leaves without bringing an expert to the field.

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