DETECTION OF PLANT LEAF DISEASES USING IMAGE PROCESSING AND ANDROID O.S.

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Abstract:

In this paper we present an automatic detection of plant diseases using image processing techniques.The presented system is a software solution for automatic detection and computation of texture statistics for plant leaf diseases. The processing system 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 diseases, if present on the plant leaf are evaluated.

Keywords

HSI, Texture,Co-occurrence matrix, Masking of pixels, Plant Disease Detection.

I. INTRODUCTION

Digital image processing and image analysis technology based on the advances in microelectronics and computers have many applications in biology and they find a way to the problems that are associated with traditional photography. This new tool helps in improving the images from microscopic to telescopic range and also analyzing them.Plant diseases cause periodic outbreak of diseases which leads to a number of disasters. Because of the devastating effects of plant diseases, some of the crop cultivation has been abandoned.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 prove to be quite expensive in case of large farms. Further, in some developing countries, farmers may have to go long distances to contact experts, this makes the process time consuming and moreover farmers are unaware of non-native diseases.Automatic detection of plant diseases is an important research topic as it may be quite beneficial in monitoring large fields, and it canhelp in automatically detecting the corresponding diseases from the symptoms appearing on the plant leaves. This enables machine vision that is to provide image based automatic inspection, process control and robot guidance.

The classification accuracy is achieved with the help of HSI transformation. It is applied to the input image, and then, 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.

Fig.1 Affected leaves withvarious Diseases

The fast and accurate method for detection of leaf diseasesis by usingthe k-means which is based on segmentation.Automatic classification of leaf diseases is done based on high resolution multispectral and stereo images. This approach uses sugar beet leaves. Here the diseased region is extracted using segmentation and the plant diseases are graded by calculating the quotient of disease spot and leaf areas. An optimal threshold value for segmentation is obtained using weighted Par-Zen window. This reduces the computational burden and storage requirements without degrading the final segmentation results.Detection and classification of leaf diseases 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.

II. LITERATURE REVIEW

Thresholding: This is one of the first methods to use digital image processing, proposed by Lindow and Webb (1983). An analog video camera was used to capture the images, under a red light illumination to highlight the necrotic areas. These images were then digitized and stored in the computers.Vegetable pathologies may manifest in different partsof the plant. There are methods exploring visual cues present in almost all of those parts, like roots (Smith and Dickson 1991), kernels (Ahmad et al. 1999), fruits(Aleixos et al. 2002; Corkidi et al. 2005; López-García et al.2010), stems and leaves.The method proposed by Skaloudova et al. (2006) is used for measuring the damage caused in leaves by spider mites. The algorithm is based on a two-stage thresholding. The first stage discriminates the leaf from the background, and the second stage separates damaged regions from healthy surface.Weizheng et al. (2008) presented a strategyto quantify lesions in soybean leaves. The algorithm isbasically composed by a two-step thresholding. The first threshold aims to separate leaf from background. After that, the image containing only the leaf is converted to the HSI color space, and the Sobel operator is applied to identify the lesion edges. A second threshold is applied to the resulting Sobel gradient image.Contreras-Medina et al. (2012) proposed a system toquantify five different types of symptoms in plant leaves.Their system is actually composed of five independentmodules: 1) chlorosis algorithm, which combines the red and green components of the image in order to determine the yellowness of the leaf, which indicates the severity of the chlorosis; 2) necrosis algorithm, which uses the blue component to discriminate leaves from background, and the green component to identify and quantify the necrotic regions; 3) leaf deformation algorithm, which uses the blue component to segment the leaf and calculates the sphericity of the leaf as a measure for its deformation; 4) white spots algorithm, which applies a thresholding to the blue component of the image to estimate the area occupied by those spots; 5) mosaic algorithm, which uses the blue channel, a number of morphological operations and the Canny edge detector to identify and quantify thevenations present in the leaf.

III. PROCEDURE OF THE 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 using color-co-occurrence method.

Working Overview:

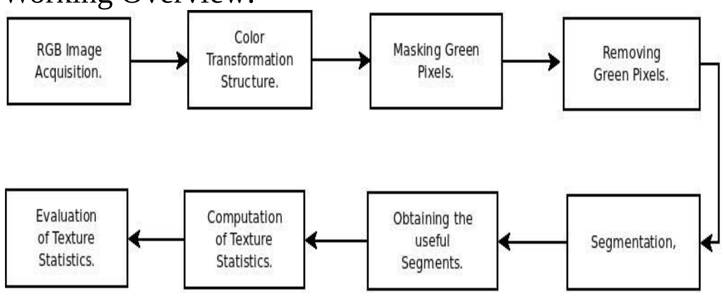

Fig 2: Working steps of system

A. *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.

B. *Hue Color Attribute*

It refers to the dominant color as viewed by a person. 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.

C. Masking Green Pixels

Here, we identify mainlythe green colored pixels. After this, based on specified threshold value computed for these pixels, the mostly green pixels are masked as 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 zero value.

D. 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 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.

E. 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. Inthis approach patch size of 32*32 is taken. The next step is to extract the useful segments. Not all segments contains significant amount of that information. So the patches which are having more than fifty percent of the information are taken into account for the further analysis.

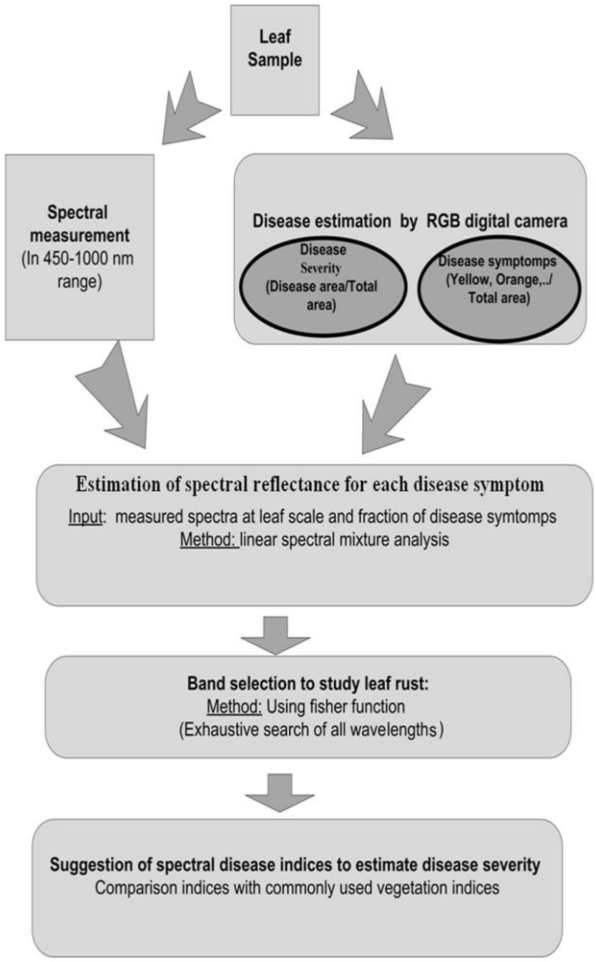

Fig.2 StepBy Step Execution Of Procedure

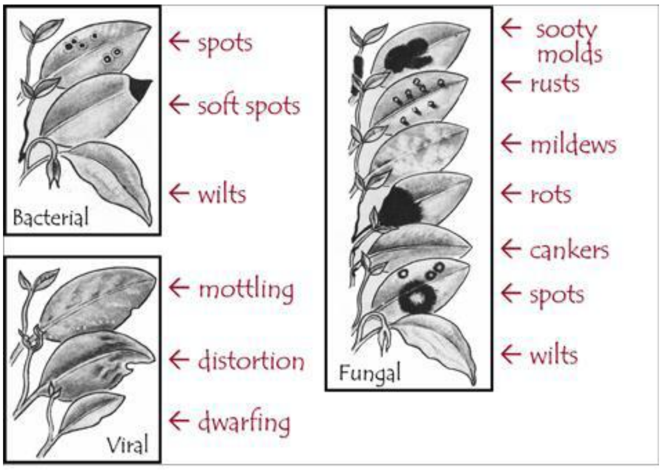

Fig.3 Types Of Disease

F. Color Co-Occurrence Method

The color co-occurrence texture analysis method is developed through the Spatial Gray- level

Dependence Matrices (SGDM). 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 gray levels. 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.

G.Texture Features

Contrast, Energy, Local homogeneity, Cluster shade and Cluster prominence are the texture features which are calculated for the Hue content of the image.

IV. MATHEMATICAL MODEL

Step1:User Registration

U=Register(Uid,Username,Upassword)

Step2:Data Validation

V=Validation(Uid,Username,Upassword)

Step 3: User Login

[V/N]=login(Username,Upassword)

Step 4: Manipulation of Data

A] User can see or download the data

B]User can enter the data

C]D-- Enter data

1]I1-Select the Image (memory)

2] I2- Draw Image (Digitization)

Step 5: Apply algorithms on Image

1] Ics =Gray Scaling (I)

2] Ith=Thresholding

3] Im=Masking of green pixels

4] S= Image Segmentation

inoatches(Ics,Ith,Im)

5] C= Method of color occurrence for TextureAnalysis

6] M= Texture analysis using SGDM Matric

Step 6: Values of the Image properties of leaves are compared to the database value of leaves.

Step 7: Display the result

V.EXPECTED OUTCOMEOF THE PROPOSED SYSTEM

The image processing can be used in agricultural application for following purposes:
1. To detect leaves with disease.
2. To quantify areathat is affected.
3. To find shape of affected area.
4. To determine color of the affected area.
5. Texture analysis by determining size and shape of leaf.

V. CONCLUSION

The main approach of this approach is to recognize the diseases. Speed and accuracy are the main characteristics of disease detection. Hence,the extension of this work will focus on developing the advanced algorithms for fast and accurate detection of leaves with disease. This paper explains an application of texture analysis in detecting the plant diseases. The results of this approach can recognize the leaf diseases with little computational effort.

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