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Agriculture plant leaf Disease detection using Spatial Gray-level Dependence Matrices

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Abstract— Agriculture is one of the main central divisions of Indian Providence. Indian agriculture segments more than 18 per cent of India's household product further it helps to provide employment opportunities to 50% of the countries workforce. Fungus, viruses and germs are the main causes that affect the plant leaves. Currently crops face many types of diseases. Damage by the pest is main trait. If good concern is not done in the plants it may lead to grave outcome on vegetation. Discovery of plant illness along with the other routine method in monitoring the plants reduces the drudgery as it ascertains the injection of plants at early stage. Image processing provides better techniques about disease identification. The process has four major processes, initially the color image is transformed to RGB, and then the RGB image is then transferred to HSV for shade generation. After that the green pixels are obtained from the color generation process. The image is analyzed, segmented meaningfully and the texture features are extracted and evaluated from the SGDM matrices.

Keywords— HSI, RGB, Texture, SGDM, Texture, Image

I. INTRODUCTION

Agriculture work plays a legendary role in India. Most of the Individuals focus on the agriculture trade. The agriculture trade plays a vital role in the economic growth. Mostly, the leaves are affected by microorganism diseases. The explosion of population and also the environmental conditions are the main cause for the plant diseases. The most important challenge in the agriculture is to decrease the application of pesticide.

Generally image processing techniques are applied to,

1. Identify the leaf, stem, and fruit.
2. They can also be used to measure the affected space by malady.
3. Find out the texture of affected regions.
4. The size and shape of fruits can also be determined by various Image Processing Techniques.

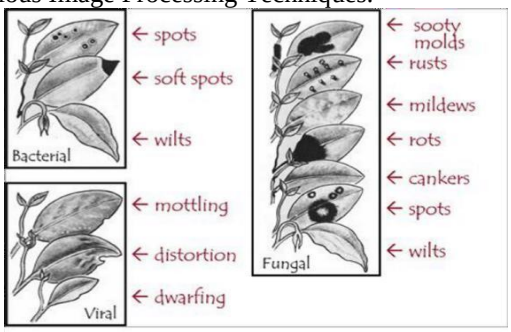

Figure 1. Types of Disease

Basically crop leaf diseases area unit primarily divided into microorganism, viral, fungal. These area unit additionally classified are shown I Figure one. A number of them are early scorch, soft mildew, little achromatic color, late scorch etc.

II. LITERATURE SURVEY

Savita N. Ghaiwat et al. [1] research work is a work on a number of methods that are used to classify plant disease. K-nearest neighbor techniques is used to cluster the preprocessed image. Finally SVM classifier is used and it also has some drawbacks.

Sanjay and nithin [2] proposed a paper and it has four steps. First, the input image is given as RGB image, and then the RGB image is converted to HIS format. In second step, inexperienced pixels are converted and removed if the threshold value is low. In third, by victimization precompiled intensity are removed and masked. As the last step segmentation is done.

Mrunalini and prasanth [3] proposed a work that affects the plant leaves. Machine learning is mainly used to recognize the diseases in earlier stage and it also reduces the time. The Co-occurrence technique is used to extract the features. To detect the disease correctly neural networks is used. In computation process the detection of leaf diseases are captured.

Anand H. Kulkarni et al. [4] did a work on strategy for plant diseases recognition victimization artificial neural network (ANN) with image processing techniques. In this the classification is one by ANN and Feature is extracted using Dennis Gabor Filter. Using the color and texture features the disease are identified.

Smita Naikwadi [7] proposed a bar chart matching that helps to locate the disease. In plants, illness seems on plant leafs and the matching is carried out by edge detection technique and color feature. A layer of the image is separated into Red, Green and blue that help to identify the edges clearly. Spatial Gray-level Dependence Matrices (SGDM) is used to increase the color co-occurrence texture analysis technique.

Sanjay B. Patil et al. [8] presented a work on threshold values of two types. In this the region space and the affected leaf space are accurately identified. As a final step, categorization of illness is done by the calculated leaf space and lesion space with the threshold segmentation as a fast and accurate process.

III. PROPOSED APPROACH

The procedure of the proposed work is shown in Figure 2. First, the images of the leaves are captured using a digital camera. Finally the image processing techniques are applied to the preprocessed images to extract the diseased portions and it is also be used for additional analysis.

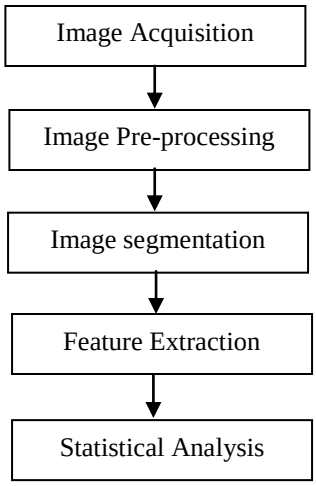

Figure 2. The basic procedure of the proposed approach

The procedure followed in the proposed system:
1. Acquire the input color image in RGB format.
2. RGB to HSV conversion is performed on the input image.
3. The green pixels are masked and removed.
4. Segment the meaningful components in the image.
5. Extract the features using color-co-occurrence matrix.
6. The texture statistics are found out.

Color Transformation Structure
Initially, RGB image is taken as input. Then RGB images are converted to HSV (HUE, Saturation) color area illustration. For the enhancement of image RGB is perfect one. However HSV model is a perfect entity for color recognition [9]. Hue is a color quality that shows pure color by an observer. Saturation is a supplementary of hue. In the variation method, the Hue element is taken for further analysis. Saturation and Hue are mainly used to produce additional information.

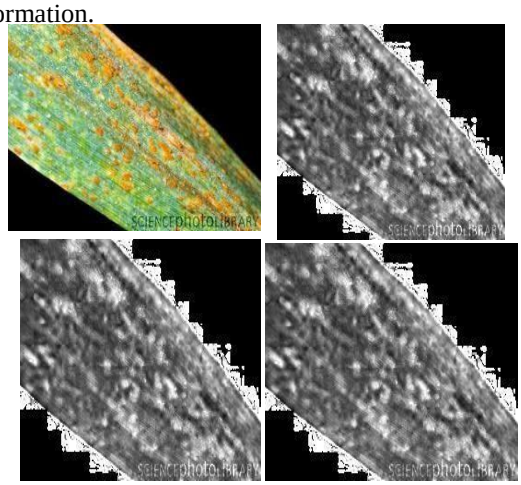

Figure 3: a) Input image tainted by fungus b) Hue Component C) Saturation component d) Value Component

Processing the green pixels
Masking is a process that is used to mask the background pixels in an image, that the threshold value is zero. By this step, the masked colored pixels are gained that has a lesser threshold value. The diseased parts of the pixel intensities are measured and set to zero by the figure intensities value. Then red and blue parts of the image are gained zero by mapping the RGB parts [10]. The inexpert RGB pixels principally signify the pure regions in the leaf and that it does not add any additional value for illness recognition.

Segmentation
Starting on top of steps, the contaminated area is extracted from the leaf image. The contaminated section is segmented into various patches of equal size. In this the patch size of 32*32 is taken [11].

Finding useful segments
At this step the segmented area in the leaf that are useful are gathered. The segments ware captured without the loss of any information. But all the segments of the leafs does not contained the useful segments. So, the segments that is useful for analysis is taken for further analysis.

Color co-occurrence method
In texture analysis process, texture selection is made by the calculated form of mixture intensity values that are inside the

image. Spatial Gray-Level Dependence Matrices (SGDM) method is used to extract functional math texture choice. GLCM is a matrix that the amount of rows and columns is capable with the amount of grey levels G, within the image. The matrix component is that the ratio with 2 pixels is taken as neighborhood at specific intervals, one with intensity i and other with j. The SGDM's area unit perform p(i,j,d,Θ) wherever i symbolize the grey stage of the placement, associate in nursing d, j is used to describe the grey level elements of the image from the starting angle. SGDM's area unit is obtained for Hue image.

Texture Features

Spatial Gray-level Dependence Matrices (SGDM) is calculated for the Hue color transformation by the distinction, power, native homogeneity and correlation.
The following equation represents the texture features.

Contrast: Gives intensity among a picture element and its neighbor more than the total image. Range = [0 [size(SGDM,1)-1)^2] Contrast is 0 for a constant image.

$$\text{Contrast} = \sum_{i=0}^{N-1} (i, j)^2 c(i, j)$$

Energy: Calculates the amount of squared fundamentals in the SGDM Range = [0,1] Energy is 1 for a constant image.

$$\text{Energy} = \sum_{i=0}^{N-1} c(i, j)^2$$

Homogeneity: Precedes a price that deals the nearness of the allocation of components within the SGDM to the SGDM diagonal. Range = [0,1] Homogeneity is 1 for a diagonal SGDM.

$$Homogeneity = \sum_{i=0}^{N-1} c(i, j)/(1 + (i - j)^2)$$

IV. RESULT AND DISCUSSION

Totally a hundred and twenty dataset of various leaf imges are taken for this experiment.

In observation, analysis will be done on 5 totally different models. These models are listed in Table I.

Table 1. Color Feature Models

Model	Color Features
M1	H
M2	S
M3	I
M4	HS
M5	HSI

Here we've got a thought about Model M! & their color features. The SGDM properties for Hue (H) & Saturation (S) pictures square measure tabulated in following Table II.

Table 2. Features set for Septoria spot on leaf images

SGDM	'H'	'S'
Contrast	0.1055	1.7140
Correlation	0.7264	0.7610
Energy	0.6915	0.6832
Homogeneity	0.9555	0.9255

Similarly we've tested for healthy leaf from our dataset and also the options area unit delineated in Table III.

Table 3. Features set for healthy leaf images

SGDM Properties	'H'	'S'
Contrast	0.0081	0.1833
Correlation	0.8141	0.8801
Energy	0.9702	0.9562
Homogeneity	0.9971	0.9946

V. Conclusion

Recognizing the texture statistics for plant disease is explained in this paper. Firstly, HSV color transformation process is done by transferring the RGB intensity values to HSV for color descriptor. With the pre-computed intensity levels the unwanted pixels are masked and removed. Then as a next step the segmentation process is done using victimization 32*32 patch size, as a result it gives helpful segments. Square measure is used for texture examination by color co-occurrence matrix. As a final phase, the texture parameters are computed to texture limit of original leaf. In future the work can specialize in rising algorithms like Deep learning techniques that mainly concentrate on classification method.

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