Plant Leaf Disease Detection Using Image Processing Techniques

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Abstract- *The Agricultural segment assumes an indispensable job in support capable monetary development and food security. Be that as it may, crop diseases frequently cause an extraordinary danger in accomplishing this objective. Thusly, a fruitful result relies totally upon legitimate detection and arrangement of plant diseases. This has made numerous chances of additional opportunities for scientists. These days, a great deal of work is being done to perceive and arrange plant diseases all the more correctly utilizing PC vision. The goal of this examination is to make a strategy that will give a superior answer for arrange plant diseases utilizing android application. This work basically centers around actualizing an improved division strategy utilizing a blend of thresholding and morphological activities. For arrangement, we have utilized the profound neural system. Our proposed technique has accomplished 99.25% precision in Plant Village database.*

Keywords- Plant leaf disease, Image Processing, segmentation, disease detection

I. INTRODUCTION

In creating nations, cultivating area can be a lot bigger and ranchers can't watch every single plant. Ranchers are likewise ignorant of non local diseases. Getting discussion may be tedious and expensive. Additionally utilizing of pointless petisides may make harm the plants. There are two fundamental attributes of plant disease detection AI techniques that must be accomplished, they are: speed and exactness [1]. There is requirement for creating strategy [6], for example, programmed plant disease detection and grouping utilizing leaf picture handling strategies.

This will demonstrate valuable procedure for ranchers and will caution them at the opportune time before spreading of the disease over huge zone. Arrangement is made out of four primary stages; in the principal stage we make a shading change structure for the RGB leaf picture and afterward [8], we apply shading space change for the shading change structure [7]. At that point picture is segmented utilizing the K-implies bunching method. In the subsequent stage, superfluous part (green zone) inside leaf region is evacuated. In third stage we compute the surface highlights for the segmented tainted item. At long last, in the fourth stage the removed highlights are gone through a pre-prepared neural network.

a. TYPES OF PLANT DISEASE:

Most plant diseases are brought about by growths, microbes, and infections. Growths are recognized principally from their morphology, with accentuation put on their conceptive structures. Microbes are viewed as more crude than organisms and for the most part have more straightforward life cycles.

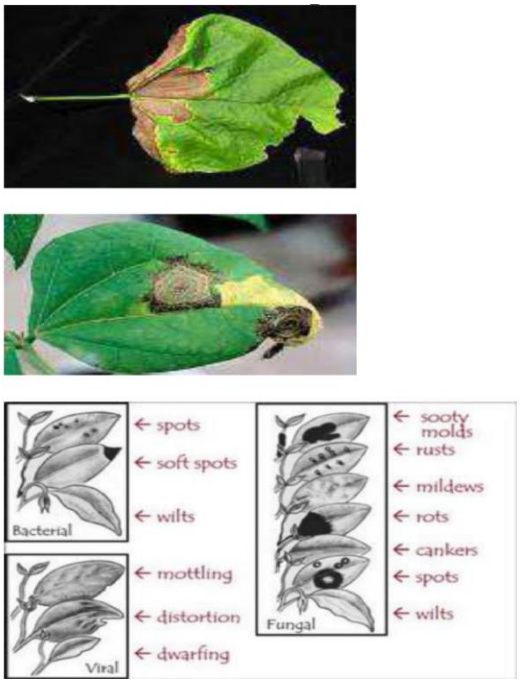

Figure 1: Sample Plant leaf disease detection

With not many special cases, microbes exist as single cells and increment in numbersby isolating into two cells during a procedure called parallel splitting Viruses are very minuscule particles comprising of protein and hereditary material with no related protein. The term disease is normally utilized distinctly for the devastation of live plants [5].

b. TYPES OF IMAGES:

i)Black and white(0,1)
ii)grey scale
iii)color image(RGB)

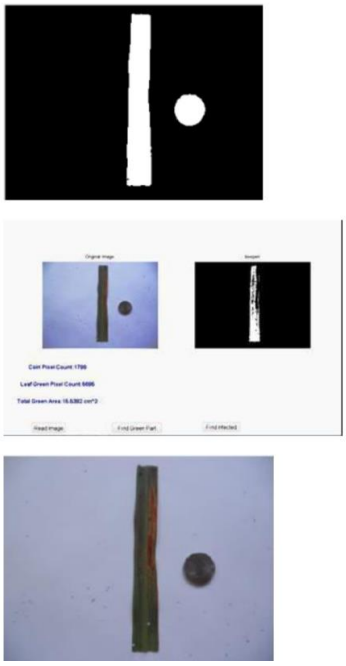

Figure 2: Image Types

II. RELATED WORK

C. G. Dhaware et al. [2], represent techniques for detecting infected parts of plant leaves. Images are pre-processed with the help of RGB to HSV conversion technique. Cluster based method background subtraction is used for segmentation. Cor- relation, energy, homogeneity etc. features are also used. For image classification, support vector machine (SVM) technique is used.

U. Mokhtar et al. [3], describe a method of detecting tomato leaf diseases detection based on support vector machines. In image pre-processing phase they had used three techniques such as leaf image isolation and extraction, image resizing and background subtraction technique with some morphological operations. Color and texture have been considered as features. For extracting texture Gabor filter is used. For the classification phase, support vector machine technique is used.

T. N. Tete et al. [4], describe a method of detecting plant disease based on a clustering method. This process is divided into four parts- pre-processing, segmentation, feature extraction and classification. Infected parts are segmented with the help of thresholding and k-mean clustering method. For classification, artificial neural network algorithm is used.

III. PLANT LEAF DISEASE DETECTION

Images are collected from publicly available Plant Village [5] database. It contains about 54306 images of diseased as well as healthy leaves of 14 different types of crops. Fig 1 shows some sample images of tomato leaf from the dataset.

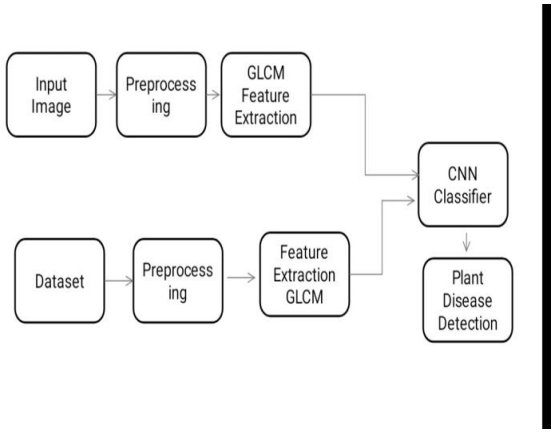

Figure 3: Flow diagram

STEPS INVOLVED IN PLANT LEAF DISEASE DETECTION

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 mainly the 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. 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. In this 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.

E. 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.

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

IV. IMPLEMENTATION OF THIS PROJECT IN REAL TIME

System Overview

The system consists of a mobile application, which will enable the farmers to take images of plants using their mobile phones and send it to a central server where the central system in the server will analyze the pictures based on visual symptoms using image processing algorithms in order to measure the disease type. An expert group will be available to check the status of the image analysis data and provide suggestions based on the report and their knowledge, which will be sent to the farmer as a notification in the application.

Mobile Application Development The mobile application consists of 5 basic functionalities. They are

1) Image capture,
2) Image selection,
3) Image zoom and crop,
4) Share image with expert group,
5) Receive notification from central server.

Image capture: At the very first page of the application, the application bar shows the icon for capturing image using the application. On navigation of the menu, the user gets to take image on shutter click event using the phone.

Image selection: In case of previously taken pictures of paddy, the application navigation menu also contains the option of selecting an image from the existing photo library of the phone.

Image zoom and crop: The leaf of paddy is a very thin one, and it is important that the targeted area of the leaf gets focus in the image. The mobile application lets the farmer to zoom the affected region of paddy using pinch with twofingers. The test images were taken with a phone which has a camera in it. The application allows to zoom 4x times the original image. In addition, once the targeted region has been selected, the crop button of the crops the image in a 170x400 pixel frame, which in the targeted resolution for processing images in the server image processing application. Selecting target regions of paddy leaf in mobile application.

Share image with expert group: This functionality of the application enables the farmer to send the captured/ selected image to be uploaded in the remote server using HTTP Web Services in Windows phone. The client mobile application uploads two basic types of data in the server for every request, the image that the farmer selects for seeking suggestion and a unique URL created through windows live services which is created for communicating with the mobile phone from a remote application. The URL created using Windows Live service is used for sending notification from the \server application of sent by the expert groups with their feedback.

Receive notification from central server: Once the image has been uploaded in the remote server, the expert sends feedback to the client mobile application via notification. This notification is sent through a URL generated by Windows Live Services which is unique for every device. Once the notification is received, it is displayed in the application which the user will be able to view for taking appropriate steps suggested by the experts.

Figure 4: Mobile App for Plant leaf disease detection

Server Script for Storing Data: The image and the data uploaded from Windows Phone application is received in the

server using a script. The images are stored within the assigned directory and the device URL is mapped in the database against every uploaded image in the database

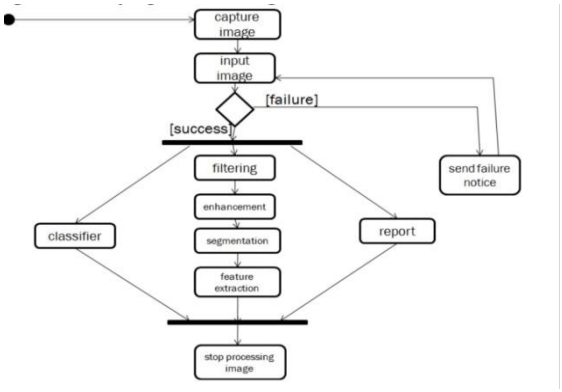

Figure 5: Flow chart

V. RESULTS AND DISCUSSION

RECEIVER NOTIFICATION:

Figure 6: Result display for Mobile application

The image processing can be used in agricultural application for following purposes:

1. Detecting leaves with disease.
2. Quantify area that is affected.
3. Finding the shape of affected area.
4. Determine color of the affected area.
5. Texture analysis by determining size and shape of leaf.

VI. CONCLUSION

` The fundamental methodology of this methodology is to perceive the diseases. Speed and exactness are the principle qualities of disease detection. Thus, the augmentation of this work will concentrate on building up the propelled calculations for quick and exact detection of leaves with disease. This paper clarifies an application of surface examination in identifying the plant diseases. The results of this methodology can perceive the leaf diseases with minimal computational exertion.

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