Analysis Of Input Plant Images For Detection Of Leaf Diseases Using Image Processing

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Abstract- Image Processing discovers applications in different territories and latest progressions have demonstrated value for the agribusiness area. Digital Image Processing enables various types of procedures to be applied on the acquired image. It has the ability to adequately oppose issues such as unwanted noise and distortion during processing. This paper advances novel understanding of plant leaf ailment recognition utilizing picture segmentation by applying edge detection and after that k-mean calculation. Image segmentation is the way toward isolating an acquired image into a few fragments to improve an image. This renders the image to be more important and simpler to dissect. Image segmentation is ordinarily used to find the outskirts of the information leaf image. It is basic to expel certain undesirable components like noise, dullness and brightness that distort the image quality of the acquired images. Edge detection technique is utilized as an underlying calculation to expel the undesirable fragments to separate the exact piece of the leaf shape. k- means clustering is connected at the following level of division to decide the structure of the plant leaf. This approach streamlines the system and estimations to remove shape related highlights of the leaf for higher exactness.

Keywords: Image Processing, Edge Detection, k- means clustering.

I. INTRODUCTION

Progressions in the field of science and innovation have achieved radical changes in the farming division. In the current past, picture preparing has lined up with rural area to create applications that aid basic leadership while going about as a specialist framework. Pictures taken continuously are handled and changed into helpful data to help basic leadership for the farmer. Hence early plant malady identification and analysis is basic in the field of farming. Infection discovery procedures that consequently identify plant ailment in the underlying stages demonstrate value for the agriculturist. There are a few illnesses amid development phases that influence plants with the possibility to cause enormous monetary misfortunes. On the off chance that the infections are not recognized at first stage then it might prove detrimental to the development of the plant. Cost of agrarian creation builds complexity if the plant sicknesses are identified at a beginning time and may stretch out to add up to monetary calamity of a maker if not cured fittingly at beginning periods.

II. LEAF INFECTIONS IN PLANTS

In farming, leaf disease is a noteworthy reason for trim misfortune, bringing about financial misfortunes. Leaf diseases are caused by different reasons , for example, microscopic organisms, infection, parasite and so on that attack the leaf tissues prompting weakening of the leaf and the plant. Dryness of leaves, change in shading and spots on the leaves and defoliation are the real depicters of leaf illnesses. Changes in atmosphere conditions for example, enormous rain fall, dry season and extreme changes in temperature or irritation assaults may cause leaf diseases. Once the illness causing living beings, for example, microbes, infection and so on, go into the leaf tissue, they begin duplicating and diminish the quality of the leaf and debasement begins. Different pursuits have been completed and calculations detailed for the identification and determination of leaf diseases. This work is an answer for the identification and order of plant leaf sicknesses utilizing MATLAB

III. WORKING PRINCIPLE

The fundamental standard is the utilization of image processing systems on the input image to give sensible and precise outcomes about the tainted leaf by a simple strategy. Image processing is utilized for estimating influenced territory of malady and to decide the distinction in the shade of the influenced zone [1,5].

The system of image processing for observing of harvest wellbeing is performed by securing the pictures of the yield indiscriminately interims to recognize the adjustments in the shape and structure that influences the product. The harvest/plant pictures are caught by JPEG Camera. These pictures experience picture preparing and are contrasted and the predefined photos of the plant in MATLAB programming. A histogram examination is consequently performed to identify the adjustments in the plant. The states of the leaf that are examined are strength of the leaf (great/contaminated), development (completely developed/fizzled), and dampness (dry/wet).

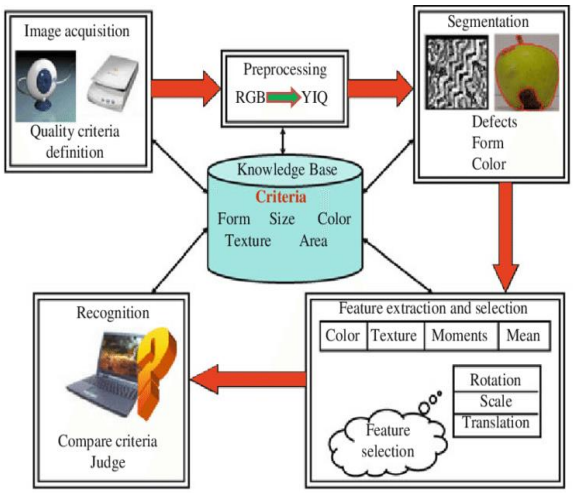

Fig.1: Working principle of leaf disease detection using image processing

A) Image Acquisition:

Image acquisition is an initial phase where the image of the diseases affected plant is captured through different image capturing devices like digital camera, sensors, hyper spectral imaging. It is then stored for further analysis and information interpretation. The image is processed in MATLAB via Graphical User Interface (GUI) which automates the calculation of plant properties.

B) Image pre-processing:

The acquired images are subject to certain unwanted elements like noise, dullness and brightness that distort the image quality. It is essential to eliminate these to have a good quality image to obtain accurate results. Image enhancement is used for this purpose. The idea behind various enhancement techniques is to bring out detail that is obscured, or to highlight certain features of interest in an image. It uses different filtering techniques to remove unwanted information in an image. The RGB images are converted to grey images using the equation:

$$f(x)=0.2989*R+0.5870*G+0.114*B$$

C) Image Segmentation:

Differentiating and extracting region of interest from the background is a significant step in image analysis and is termed as image segmentation module. Area, perimeter and surface continuity are found by segmenting the image different parts.

D) Feature Extraction:

Feature extraction is method for restraining the number of resources required to describe a large set of data accurately. When the input data to be processed is too bulky and with abundant redundancy then it needs to be transformed into a reduced set of features. Transforming the input data set into reduced set of features is called feature extraction. This reduced data set can then be used to perform the requisite task instead of using the whole bulk of input data. In feature extraction desired feature vectors such as color, texture, morphology and structure are extracted. If the feature extraction is done wisely then it is expected that the resultant features set will be able to extract the relevant information from the input data.

IV. METHODOLOGY

A) Plant Leaf Disease identification Using MATLAB

Detection of plant disease through some automatic technique is beneficial as it reduces a large work of monitoring in large farm areas. Plant diseases can be detected as a soon as the symptoms appear during an early stage itself. Plant disease identification by visual way is more tedious task as also less accurate. However use of automatic detection techniques will take fewer efforts, time and be more accurate. Different types of image processing techniques can be applied on them, to process those images and get different, useful features needed for the purpose of later analysis. In plants, some general diseases seen are brown and yellow spots. Digital camera or similar devices are used to take images of leafs of different types, and then these are subjective to color processing identifying the affected area in leafs.

B) Edge Detection

Edge detection is the most familiar approach for detecting significant discontinuities in intensity values. It is a basic tool used for image segmentation. In image processing the edge detection treats the localization of important variations of a gray level image and the detection of the physical properties of leafs. Edge detection methods transform acquired images into edge images which results into grey tone image and is helpful for the detection of the diseases in the leafs . Here Canny edge detection algorithm is used to extract this information.

The various steps involved are:

Algorithm:

Step 1: start
Step 2: acquisition of the leaf image
Step 3: convert acquired image to grayscale
Step 4: apply canny edge detection algorithm
Step 5: convert grey scale image into edge histogram
Step 6: compare edge histogram image with database image
Step 7: stop

C) Color Histogram

Different leafs have different colors like green, yellow, red etc with varying intensity. Even though we consider green colored

leaf its intensity will be different. Hence this part of algorithm extracts this information from an input leaf [12].

Algorithm:

Step 1: start

Step 2: acquire the leaf image

Step 3: convert the leaf image into green histogram, blue histogram and red histogram separately.

Step 4: stop.

D) k- means Clustering

k-means Clustering algorithm has been widely used in image segmentation and database organization. Clustering algorithms can be grouped into two i.e) hierarchical and partitioned. Hierarchical clustering algorithms recursively find nested clusters which starts with the data point that merges the most related pairs of cluster data successively Compared to hierarchical clustering, partional clustering differs by portioning the data which are not composed of hierarchical structure. The hierarchical algorithm is an n*n similarity matrix, which is derived from the pattern matrix that supports the Multi-Dimensional Scaling (MDS). The main steps are

(1) Noise Removal

(2) Data Normalization

(3) K means Cluster

E) k-means clustering algorithm:

This algorithm is used to cluster/divide the object based on the feature of the leaf in to k number of groups. This is done by using the Euclidean distance metric. The algorithm of k means

- Initialization: User should select the value of k. k means the number of clusters/groups, i.e. the image is divided in to k number of clusters.
- Every pixel is assigned to its nearest centroid (k).
- The position of centroid is changed by means of data values assigned to the group. The centroid moves to the centre of its assigned points.

  Out of the three clusters classification is done for only one cluster which has affected area.

V. RESULTS

A)Edge Detection Algorithm is an effective and precise method for distinguishing edges of solid and contaminated plants In preparing process isolate the layers of testing image into Red, Green and Blue layers histogram which is one of the parameter for testing the image with database image. Edge detection assumes an imperative part in preprocessing step especially, in protest order and acknowledgment frameworks. The qualification between two areas based on variety in grey level properties decides an edge .The leaf forms are distinguished by extricating relative data about the edges in view of the varieties in the dark levels.

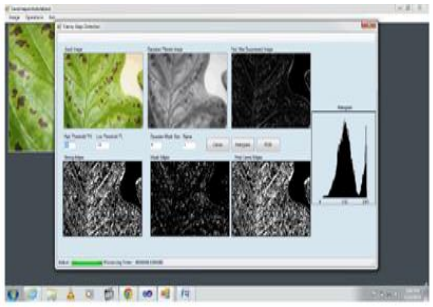

Fig.2: Edge Detection of Infected Image

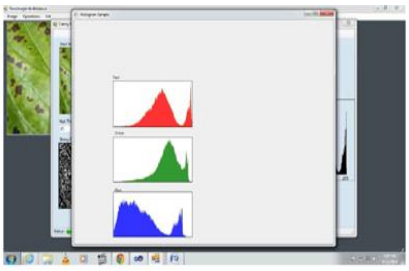

Fig.3: Color Histogram of Infected Image

B) k means clustering is used to optimize the cluster center and to detect the exact part of the plant leaf shape. The determination of plant leaf can sometimes be missed in certain situation. Generally, the accuracy of detection test depends on the quality of the plant leaf samples. Thus, the botanist may have difficulty in extracting the shape of the plant leaf due to these problems.

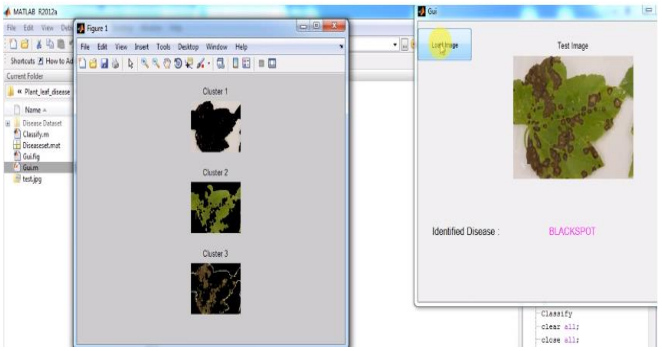

Fig.4: Clustered image using K-means clustering

Edge detection and K means algorithm combination has been used to detect the edges of leaf images. In the current study, the detected plant leaf will have 0 and 255 of grey level value respectively. This has resulted in clearer segmented plant leaf images which will assist botanists for better detection and classification ratio extraction.

Few challenges posed in this approach are optimization of the technique for an individual plant, effect of the background noise in the acquired image. Another challenge is the adoption

of technique for a continuous automatic monitoring of plant leaf diseases in actual field and environment.

VI. CONCLUSION:

This paper presents a novel approach for the identification of sick plant leaf. Picture segmentation is utilized as a procedure of isolating a procured picture into different portions to disentangle it .Thus the subsequent image turns out to be more useful and less demanding to break down. This enhances the exactness and decreases the handling time for breaking down the image. In the underlying stage edge detection is utilized to oust the undesirable portions to separate the exact leaf shape. Next, the utilization of K means clustering approach streamlines the way toward extricating shape related highlights and assurance of the leaf attributes for higher exactness and expanded productivity to analyze the tainted plant leaf. The consequence of K-Means clustering is preferred and more precise over edge detection. The processing time of edge detection technique is speedier than K-Means clustering strategy. The mix of the two calculations gives more precise and significant outcomes.

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