Diagnosis of Groundnut Plant Leaf Disease using Threshold Based Color Segmentation and Artificial Neural Network

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***ABSTRACT*: The plants are very essential for animal and human life. The plants also suffer from disease caused by fungus, parasites, viruses and pests. Various techniques are developed and applied for identifying type of disease and percentage affected. Image segmentation is used widely in many applications.This paper gives a study of the threshold technique in color image segmentation and Artificial Neural Network. Image segmentation is fundamental approaches of image processing . Several general purpose algorithms and techniques have been developed for image segmentation. Segmentation applications are involving detection, recognition and measurement of features. The purpose of image segmentation is to partition an image into meaningful regions with respect to a particular application. Segmentation techniques can be classified as either contextual or non-contextual. Thresholding is a Non-Contextual Approach. This paper enumerates performance of threshold technique in color image segmentation for groundnut images and classified by using Artificial Neural Network**

Key words: Image Segmentation, Threshold, Image Processing, Artificial Neural Network.

I INTRODUCTION

Image segmentation may be a mechanism wont to divide a picture into multiple segments. It will make image smooth and straightforward to gauge. Segmentation process also helps to find a region of interest in a particular image[1]. One of the foremost important problems in colour image analysis is that of segmentation. The fundamental idea in colour image segmentation is to think about colour uniformity as a relevant criterion to partition a picture into significant regions. People are only curious about certain parts of the image. These parts are frequently referred to as foreground or target and other is called background. Image segmentation may be a technique and process which divide the image into a different feature of the region and extract out the interested target. It divides an image into a number of discrete regions such that the pixels have high similarity in each region and high contrast between regions. Properties like intensity, texture, depth, grey-level, colour help to acknowledge similar regions, such properties are wont to form groups of regions having an identical meaning. Segmentation is a valuable tool in many fields including health care, industry, remote sensing, image processing, content-based image, pattern recognition, traffic image, video and computer vision. Many pieces of research have focused on grey-level image segmentation, whereas the colour images carry most of the information. Segmentation techniques can be classified into the following categories: Edge-based, Cluster-based, Threshold-based, Neural Network-based, Region-based and Hybrid. Image segmentation based on thresholding is one of the oldest and powerful technique since the threshold value divides the pixels in such a way that pixels having intensity value less than threshold belongs to at least one class while pixels whose intensity value is bigger than threshold belongs to a different class.Region-based methods divide an image into different regions that are similar according to a set of some predefined conditions.[2].

The simplest method of image segmentation is named the thresholding method. This method is predicated on a clip-level (or a threshold value) to show a grey-scale image into a binary image. There is also balanced histogram thresholding. The key of this method is to pick the edge value (or values when multiple-levels are selected). Several popular methods are utilized in the industry including the utmost entropy method, Otsu's method (maximum variance), and k-means clustering[2].

Recently, methods are developed for thresholding computerized tomography (CT) images. The key idea is that, unlike Otsu's method, the thresholds are derived from the radiographs instead of the (reconstructed) image.[9][10] The Neural Network-based image segmentation techniques reported in the literature can mainly be classified into two categories: supervised and unsupervised methods. Supervised methods require expert human input for segmentation. Usually, this suggests that human experts are carefully selecting the training data that are then wont to segment the pictures. Unsupervised methods are semi or fully automatic. User intervention could be necessary at some point within the process to enhance the performance of the methods, but the results should be more or less human independent[2].

II RELATED WORKS

The segmentation process makes the images into parts and it gives a special representation on the parts of the image. There are several methods in that intend to perform such task that can adapt to different types of images that are very complex and specific. The goal of segmentation is to simplify and change the representation of an image into something that is easier to analyze and more meaningful. In the computer vision field to understanding images the

information extracted from them can be used for other tasks for example identification of an airport from remote sensing data detection of cancerous cells. Many segmentation methods have been proposed in this literature survey. Segmentation technique are chooses over the level of segmentation are decided by the particular type of image and characteristics of the problem being considered.

YEAR	AUTHOR	METHODOLOGY	APPLICATION USED
2018	Vijayalakshmi et al	K. Nearest neighbor technique	Recognition of diseased leaf
2018	Kumari et al	Fuzzy c Means clustering	Recognition of affected region in a plant
2017	Jayamoorthy et al	Kernal Fuzzy C Means Technique	Recognition of disease and suggest Pesticides in leaves
2017	Devaraj et al	Support Vector Machine	Spotting diseases in Bean crops
2017	Megha et al	Support Vector Machine	Recognition & classification of bacterial infection in plants
2016	Rupali patil et al	Hue Saturation Value Machine(HSV)	Spotting diseases in grapes leaf
2016	Abrham Debasu Mengistu et al	Radial basis function and self organizing map	Recognition of disease in coffee plant
2015	Prakash Mankar et al	Neural Network Pattern recognition	Spotting diseases found in tomato plant
2015	Shreya Bharsar et al	Artificial Neural Network	Spotting diseases in plant leaves

Liju Dong et al (2008) proposed an iterative algorithm for finding optimal thresholds that minimize a weighted sum of squared error objective function. This method is mathematically equivalent to the well known Otsu's method. K-Means method is compared to that of classical Otsu's method in multilevel thresholding by Dongji Liu et al (2009). This both method are based on a same criterion that minimizes within class variance.

III THRESHOLDING TECHNIQUE FOR COLOR IMAGE SEGMENTATION

Thresholding is the simplest method of image segmentation. From a gray scale image, thresholding are often wont to create binary images. In image processing, thresholding is employed to separate a picture into smaller segments, or junks, using a minimum of one color or gray value to define their boundary. The advantage of obtaining first a binary image is that it reduces the complexityof the info and simplifies the method of recognition and classification[2].

The most common way to convert a gray level image to a binary image is to select a single threshold value (T)[2] .

The input to a thresholding operation is usually a gray scale or color image. In the simplest implementation, the output may be a binary image representing the segmentation. The white tone implies the foreground and the Black tones implies to background (or vice versa). This method of segmentation applies a single fixed criterion to all pixels in the image simultaneously [8].

the segmented image is a divided image of continuous regions or sets of pixels. The pixels are partitioned counting on their intensity value. Segment image into foreground and background.

g(x, y) = 1 if f(x,y) is foreground pixel = 0 if f(x, y) is background pixel In real applications histograms are more complex with many peaks and not clear valleys and it is not always easy to select the value of T.

$$g(x,y) = \begin{cases} 0 & f(x,y) < T \\ 1 & f(x,y) => T \end{cases} \quad (1)$$

This technique can be expressed as:

T=T[x, y, p(x, y), f(x, y]

Where *f(x, y)* metioned that the grey level and

p (x, *y)* is metioned the local property.

Where F(x, y) is greater than T then it is called an object point otherwise the point is not an object point because it is a relative to background of the object.

Global thresholding:

The most of the technique global threshold suitable when the intensity distribution of objects and background pixels are sufficiently distinct. In the global threshold, one threshold value is employed within the whole image. The global threshold has been a well-liked technique in a few years [6][7][8]. The background of the image having the some pixel values have been separated from the foreground with their respective values of the image, global thresholding might be used.

Global Thresholding implies that foreground separates from the background by choosing threshold T. If g(x, y) may be a threshold version of f(x, y) at some global threshold T,

$$g(x,y) = \begin{cases} = 1 & if \quad f(x,y) \geq T \\ = 0 & otherwise \end{cases} \quad (2)$$

The various techniques of global thresholding such as: Otsu, optimal thresholding, histogram analysis, iterative thresholding, maximum correlation thresholding, clustering, Multispectral and Multithresholding.

IV PROPOSED METHOD FOR COLOR IMAGE SEGMENTATION

The basic steps for methodology of thresholding color images.The images were taken Groundnut farm by high resolution camera. Each image containing a rush of number of leaves and dissoved with infected leaves and healthy leaves. Here the basic steps for color image thresholding is given below.

Step 1: The color image is taken as an input I.

Step 2: Find the global threshold or determine the optimal threshold.
Step 3: Based on the input image intensity levels similarities between the intensities are grouped.
Step 4: Using the excitatory and inhibitory functions, the input I produces the output vectors J which construct from the global threshold value.

Algorithm

The algorithm contains the methodology for color image segmentation
Step1: Intialize value for T
Step2: Separate RGB, Planes. μ_1, μ_2, μ_3.
Step 3: Separate high intensity pixels from original image $\mu_{(i,j)}$.

Using, $\mu_s = \mu_1,- \mu_1,\geq T$

Step 4: Reconstruct segmented image $\mu_T = (\mu_i, \mu_j)$
Step 5: Repeat steps for all Pixels $\mu_{s(i,j)}$ i=rows, j=columns

V. RESULTS AND DISCUSSION

The following images contains original images and segmented images


a)Segmented image b)Original image

Fig. 1: 001.jpg


a)Segmented image b)Original image

Fig.2: 002.jpg

Fig.3: 003.jpg

A number of color image segmentation experiments are performed on rush images. The images are collected from a groundnut farm Using high resolution camera, containing 6 set of color images each one represented with real world pictures. Figure 1 and 2 contains the different threshold values obtained using various segmentation methods for complex, real and low intensity images.Where (a) represents the segmented image and (b) represents the original images (001.jpg - 002.jpg).fig.3 represents the grey scale. where the segmented images are clearly shown the defected area from rush image of ground nut leaves it shown in fig.(1,2)a.

Artificial Neural Network plays a important role in classification.The feature extracted from the segmented image. The highly challeging task is finding the best classification method. The previous researchers metioned that the Artificial Neural Network makes a best role for the classification

Intial stage: The relevant weight and the bias setup with a appropiate value

Training stage: The feeding to the ANN, ie., input and gives the source location

Testing ANN: The diseased plant leaf samples are tested with number of iterations for the best results. The normal plant and abnormal plant leafs are undergoes the above test to diagnosis the disease affected plant

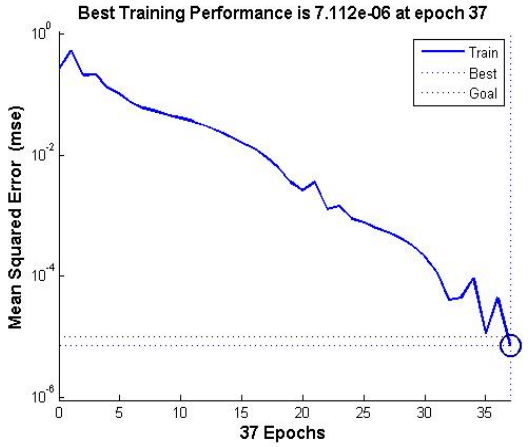

Fig 4. The Mean Square Error value at 37th epoch

The Mean Square Error(MSE) Fig (4). Shows the Mean Square Error value can be reduced by further iterations. At the 37th epoch reaches the goal with the best performance of training iterations.The classified images by the Artificial Neural Network gives result as 51.98% of leaf is affected by the fungal diseseas.

VI. FUTURE WORK

Supervised methods require expert human input for segmentation. The human experts gives suggests as to selecting training data carefully and for segment the images. The future method has to be faster and achieve a better results in all kind of rush image for color segmentation.

VII. CONCLUSION

In this color image segmentation a new approach has been presented that is based on the R, G, and B channels, these channels will produce some kind of noise and to remove this kind of noise a median filtering process was proposed. It shows the fast to reach satisfactory results. In order to decrease the computation time the threshold values are initialized. The threshold values are calculated based on the type of image used.

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