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DETECTION OF DISEASED LEAF USING IMAGE PROCESSING TECHNIQUE

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Abstract: *Nowadays crops are damaged due to many types of diseases. Plant diseases have turned into a dilemma as it can cause significant reduction in both quality and quantity of agricultural products. The developed scheme consists of four steps likely, to create a colour transformation structure for the input RGB image followed by masking of green pixels and its removal using threshold value which is then followed by segmentation process. The segmentation process is achieved by Mumford shah algorithm. The feature extraction is achieved by (scale invariant feature transform) SIFT algorithm. Finally the extracted features are passed to the classifier using (Artificial neural network) ANN algorithm. Classifier using ANN algorithm is developed to classify the leaf according to their growth and colour change. Thus the classifier is used for classifying the disease. This technique is a solution for automatic detection of leaf diseases using growth, size and colour change.*

Keywords- *SIFT(scale invariant feature transform), ANN (Artificial neural network)*

I.INTRODUCTION

The study of detection of plant diseases using image processing was done in [1]-[3]. The detection of plant disease and its treatment is explained is [1]. In [1] the segmentation is done using different algorithms like Otsu strategy, k-means bunching. [2] And [3] are focussed in image enhancement, image segmentation, and colour conversion. In [3] an artificial intelligence technique has been implemented using k-means clustering (segmentation). This proposed techniques is a solution for automatic detection of leaf diseases using growth, size and colour change.

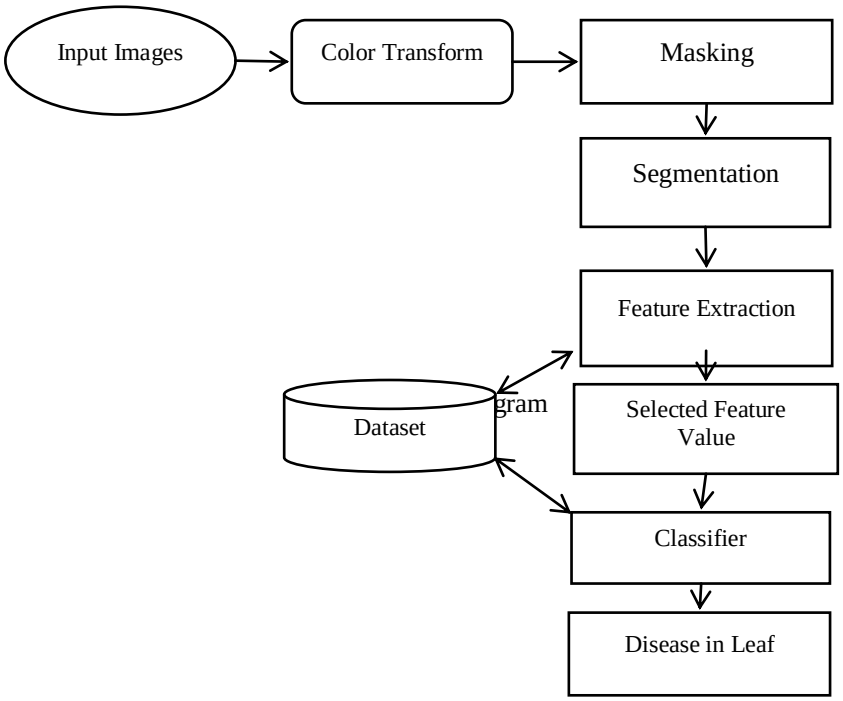
II.TABULATION REPRESENTING THE IMAGE SAMPLES AND DISEASES

NAME OF THE SAMPLE	IMAGE OF THE SAMPLE	DISEASE
1.**TOMATO LEAF** **2.SUGAR MAPLE LEAF**	 	Alternaria is a fungal plant pathogen that causes black dots in leaves.This disease is susceptible under the ideal environment condition such as dry, warm, cool, and moist winter.

MINT LEAF		Anthracnose is a fungal disease. It causes dark, sunken lesions on leaves, stems, fruits and flowers. It also attacks developing shoots and expanding leaves.
1.RED MAPLE LEAF **2.BEECH LEAF**	 	Kirramyces leaf disease are a group of fungal leaf pathogens that infect the mature and immature foliage. They can cause severe defoliation in young trees and become a significant problem in hardwood trees.
ROSE LEAF	 	Black spot is a fungus that manifests itself on rose bushes. As black spot on leaves are processed, these spots are fringed with yellow rings on both sides of leaf.

III.BLOCK DIAGRAM

The block diagram of the module is shown as per the fig.1



IV. BLOCK DIAGRAM DESCRIPTION

4.1. Modules

The proposed system has four modules
1. Colour transform
2. Segmentation
3. Feature Extraction
4. Classification

4.2 Module description

4.2.1 Colour transform

Colour can be described by its red(R), green (G), and blue(B) coordinates as well-known RGB system or by some of its linear transformation such as XYZ, CMY, YUV, IQ .If the RGB coordinates are in the interval from 0 to 1, then each colour can be shown in cube of the RGB space. Matlab creates the colour transformation structure in C that defines the colour space conversion specified by a type. To perform transformation, pass the colour transformation structure as argument to the "applycform" function. In colour transform, the input images of leaf are transformed into colour images.

4.2.2 Segmentation

Segmentation is the most important part in image processing, which is more meaningful and easier for further process. Segmentation may also depend on various features that are contained in the image. It is also useful in image analysis and image compression.

Mumford shah

The Mumford shah functional is a function which is used to establish an optimality criterion for segmenting an image into sub regions. The Mumford shah function is a tool for image segmentation. Let J be a bounded open subset of Rn and g be a bounded measurable function. The functional concerns pairs (u, K) where K is a closed subset and u is a function.

$$J(u,K) = H^{n-1(k)} + \int_{\Omega\setminus k} |\nabla_u|^2 + \int_{\Omega\setminus k} |u-g|^2$$

Where Hn-1(k) is the Hausdorff measure of co-dimension 1 of K.

The purpose of this exercise is to segment an image by minimizing a Mumford shah funtional,

$$G^{MS}(u) = \int_{\Omega} (\alpha |\nabla_u|^2 + \beta |u-u_0|^2) dxdy + H^1(S_u)$$

Where $\Omega \subset IR^2$ is open and bounded, H^1 is the Hausdorff 1-dimensional measure in IR^2, S varies in the class of closed subsets of Ω, u varies in $C^1(\Omega - S)$ and $\alpha, \beta > 0$ are fixed positive parameters.

4.2.3. Feature Extraction

Feature extraction is a type of dimensionality reduction that efficiently represents the interesting parts of an image as a compact feature vector. This technique is used for larger images and for completing task such as image matching and retrieval. A reduced feature representation is used in Featuredetection, feature extraction, and feature matching are combined to solve common computer vision problems such as object detection and object recognition, content-based image retrieval, face detection and recognition, and texture classification.

SIFT

Scale-invariant feature transform is an algorithm used in computer vision to detect and to describe local features in images. Scale invariant feature transform is an image descriptor used for image-based matching and recognition which is developed by David Lowe. This descriptor as well as related image descriptor are used for large number of purposes in computer vision related to point matching between different views of 3-D scene and view based object recognition. Experimentally, the SIFT descriptor has been proven to be more useful in practice for image matching and object recognition under real-world conditions.

The scale normalized Laplacian is normalized with respect to the scale level in scale space and defined as.

$$\nabla 2normL(x,y,s) = s(L_{xx} + L_{yy}) = s(\partial 2L\partial x2 + \partial 2L\partial y2) = s\nabla 2(G(x,y,s)^{*} f)x,y)$$

Thedifference of Gaussians operator constitutes an approximation of the laplacian operator,

$$DOG(x,y,s) = L(x,y,s+\Delta s) - L(x,y,s) \approx \Delta s2\nabla 2L(x,y,s)$$

EXTRACTED FEATURES

- Orientation
- Texture
- Keypoints
- Shape
- Color
- Gradient

4.2.4. CLASSIFICATION

Classification of the images is used to categorizs the detected objects into predefined classes by using suituable methods that compares image patterns with the target patterns. All classification algorithms are based on the assumption that the image in question depicts one or more features and each of these features belongs to one of several distinct and exclusive classes

ARTIFICIAL NEURAL NETWORK(ANN) CLASSIFIER

ANN Classification is the process to separate samples into different classes by sorting common features between samples of known classes. Artificial neural networks are electronic networks of neurons based on the neural structure of the brain. This process records one at the time, by comparing their classification with the known actual claasification of the records. These neural networks are organised in layers. Layers are made up of a number of "nodes" which contains an activation function. The main process of ANN is to compare the extracted features with the database which classify the leaf according to their growth and colour change. Thus this technique is a solution for automatic detection of leaf diseases using growth, size and colour change.

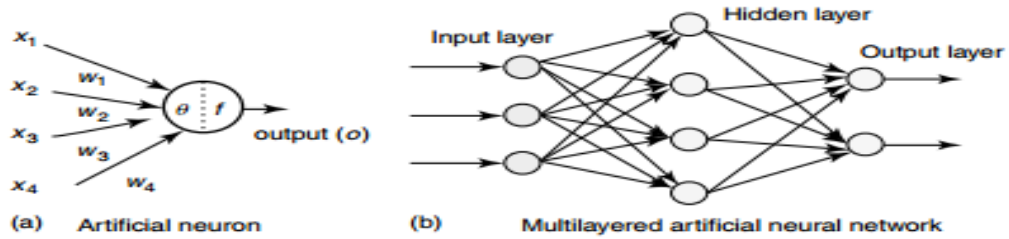


Fig 2. Architecture of artificial neuron and multi-layered artificial neural network

V. WORKING CONCEPTS

The working concept of "**DETECTION OF DISEASED LEAF USING IMAGE PROCESSING TECHNIQUE"**isto get the input image in RGB format. The colour transformation takes place. The RGB image is converted into grey level image in masking. Then, the pixel range of diseased portion is automatically segmented using the segmentation process and it is achieved by "Mumford shah algorithm". Followed by segmentation process, the feature extraction process using SIFT algorithm takes place. SIFT feature extraction method is carried out in order to extract colour and shape features. Then, it will generate the featured value for the input image and it will compare it with the dataset. Finally, the extracted features are passed to the classifier using ANN algorithm. The classifier using ANN is developed to classify the leaf according to their growth and colour change.

VI. RESULTS

Finally, the results are obtained by executing the simulation byshowing various types of diseases and the steps carried out for detecting the diseased leaf are displayed below,

DISEASED LEAF

Fig 3. Importing the diseased leaf

MASKING

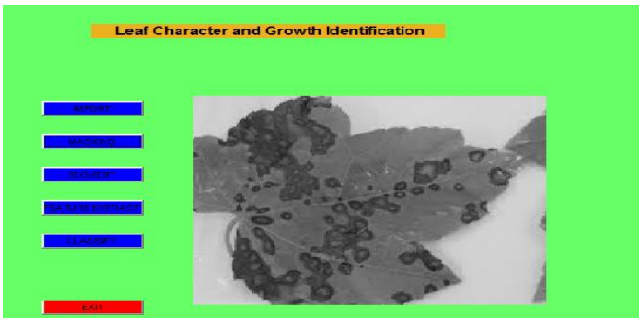


Fig 4. Masking of diseased leaf

SEGMENTATION

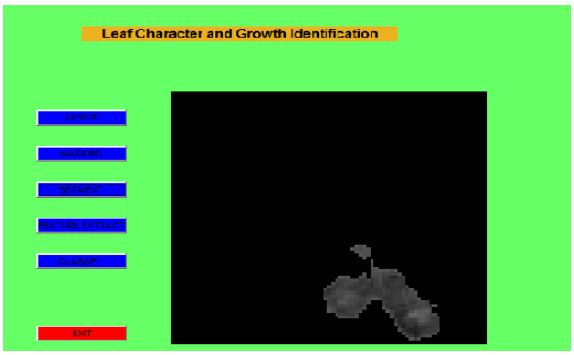


Fig 5. Segmented output

FEATURE EXTRACTION USING SIFT

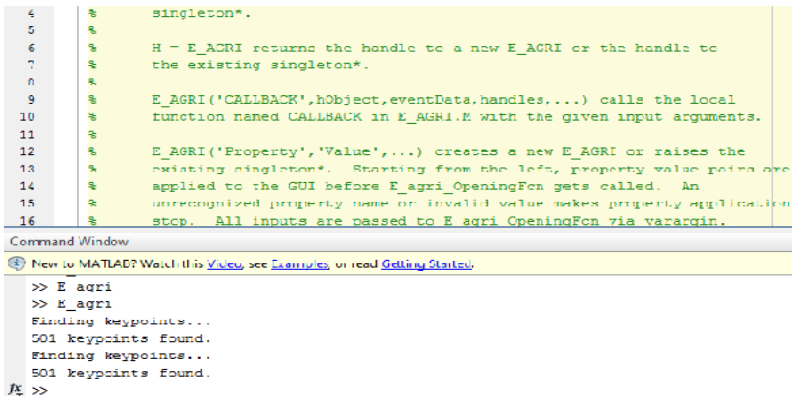


Fig 6. Finding key point value using feature extraction

CLASSIFICATION USING ANN

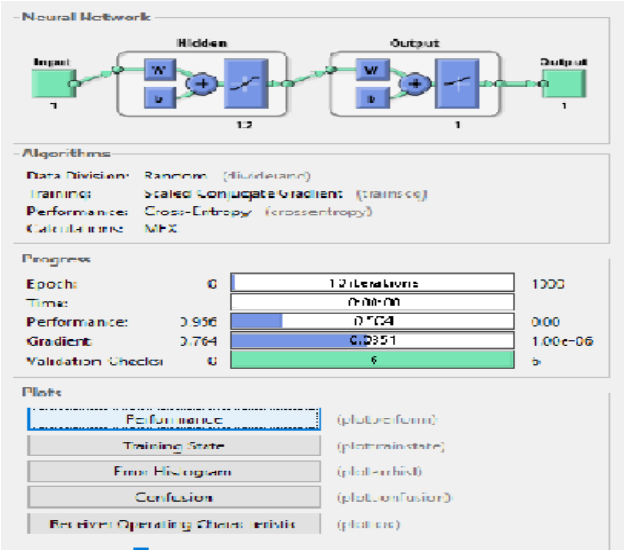


Fig 7. Artificial neural classification output

VII. REFERENCE

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