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PLANT LEAF CLASSIFICATION USING SUPERVISED CLASSIFICATION ALGORITHM

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Abstract— Some of the world's plants are already at the edge of becoming extinct. So to saving earth's biodiversity for future generations is an important global task. To identify Plant Leaf type is an important task for the reproduction procedure. This involves mapping plants distribution by collecting plant leaves and then identifying them in a laboratory environment. But it takes long time consuming process to identify them so for that computer system is developed the model to identify plant leaf and classify them. Our proposed system identifies plant leaf images and classifies them into different families. Leaf surface parameters like color, texture, shape etc are used to extract the features. In our proposed system we used color and texture feature. In order to extract the color feature we used HSV color model and for texture feature used GLCM (Gray level co-occurrence matrix) and for shape feature we used Geometric features. We have used NN feed forward algorithm to classify our plant leaf images and also compare NN with SVM algorithm. NN achieved accuracy better than SVM. NN achieved classification accuracy of (74.66%) when SVM that achieved accuracy of (48.00 %).Accuracy of classification is checked using color feature and texture features standalone and also with combined features. Instead of using single features combined features gives better result. In our proposed system we have taken dataset of 285 images, 210 images are trained with NN feed forward algorithm and 75 images used for testing set. Our system gives approximate 83.33% accuracy with NN.

Keywords— Feature extraction, color feature, shape feature, texture feature, HSV, Canny edge detection, GLCM, classification, neural network, svm.

I. INTRODUCTION

Now a day's there are many plants which are already at the end of becoming extinct. So to saving earth's biodiversity for future generations is an important global task. Reproduction of plants is important to save extinct plants. So to identify plant type is an important task for the reproduction procedure. Plant leaves are collected and identify them manually in a laboratory. But it takes long time consuming process to identify the plant leaf so for that computer system is developed the model to identify plant leaf type and classify them using classification algorithms.

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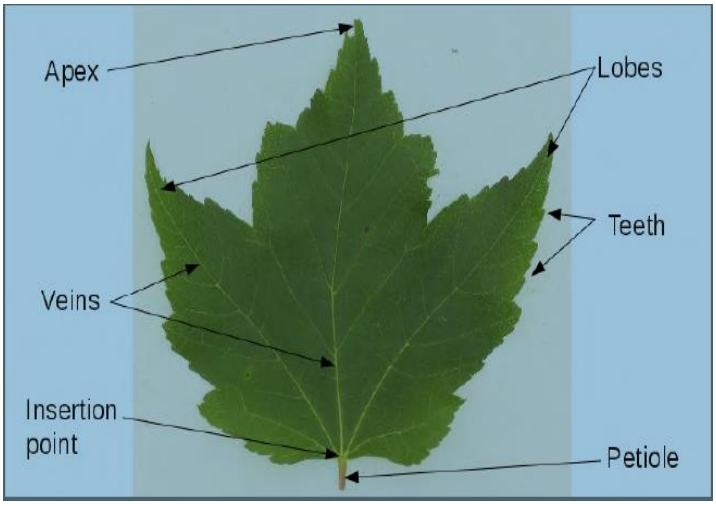

Fig.1 Diagram of leaf part

Digital image processing is a rapidly growing area of computer science since it was introduced and developed in the 1960's [1]. Digital image processing deals with manipulation of digital images through a digital computer. It is focuses on developing a computer system that is able to perform processing on an image [1]. Digital image processing allows one to enhance image features of interest and extract useful information from it.

Classification techniques are widely used to classify data among various classes. Classification techniques are being used in different system to easily identify the type and group to which it is belongs to. There are many algorithm used for classification. There is mainly two types of classification algorithms Supervised classification algorithms and Unsupervised classification algorithms. In Supervised learning the computer is presented with example inputs and their desired outputs, given by a "teacher", and the goal is to learn a general rule that maps inputs to outputs [3]. While in Unsupervised learning, no labels are given to the learning algorithm, leaving it on its own to find structure in its input. Unsupervised learning can be a goal in itself (discovering hidden patterns in data) or a means towards an end [3].

A multilayer preceptor (MLP) is a feed forward artificial neural network model that maps sets of input data onto a set of appropriate outputs[4].A MLP consists of multiple layers of nodes in a directed graph, with each layer fully connected to the next one. Except for the input nodes, each node is a neuron (or processing element) with a nonlinear activation function.

II. LITERATURE REVIEW

ArunPriya C, Balasaravanan T., Antony Selvadoss Thanamani(2012): proposed An Efficient Leaf Recognition Algorithm for Plant Classification Using Support Vector Machine. The paper presents the application of SVM and on image processing particularly for understanding leaf image features Therefore two techniques have been combined namely; Support Vector Machine (SVM) and K-NN. The study shows that SVM obtains the higher percentage of accuracy among K-NN technique. Color extraction is used to extract the feature.

Hang zhang, Paul Yanne, Shangsong Liang(2012): proposed Plant Species Classification Using Leaf Shape And Texture which presents the new method to generate the feature space that combines local texture features using wavelet decomposition and co-occurrence matrix statistics and global shape features. They have used support vector machine is used to classify plant species.

Suhaili Beeran Kutty, Noor Ezan Abdullah(2013): proposed Classification of Watermelon Leaf Diseases Using Neural Network Analysis The present work deals with identification and classification of Anthracnose and Downey Mildew, watermelon leaf diseases using neural network analysis. In this paper the classification on the watermelon's leaf diseases is based on color feature extraction. RGB color model is used and Region of Interest (ROI) need to be identified from each infected leaf samples based on its RGB color component. Then crop out sampled images and resized all cropped data will be transferred to SPSS for further analysis. The analysis have been done by using error bar plot in SPSS software and the work develops a classification system for watermelon leaf diseases using Neural Network Pattern Recognition Toolbox (nprtool) in MATLAB. The obtained features are trained by Lavenberg-Marquardtbackpropagation algorithm (trainlm).

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R.janani, A.Gopal (2013):proposed Identification of selected medicinal plant leaves using image features and ANN.In this paper, it is proposed to have a method for classification of medicinal plant leaves using Artificial Neural Network (ANN) classifier. Then extracted Features are geometric, shape and texture.

Esraa Elhariri, NashwaEl-Bendary, Aboul Ella Hassanien(2014): proposed Plant Classification System based on Leaf Features system used two algorithm Random Forests (RF) and Linear Discriminant Analysis (LDA). HSV color extraction and GLCM Texture Extraction also shape features and vein features are extracted used to extract the plant leaf features. LDA system and RF system usinglO-fold cross-validation and LDA achieved accuracy better than RF.

SRNO	AUTHOR	YEAR	METHOD
1	ArunPriya C, Balasaravanan T., Antony Selvadoss Thanamani	2012	RGB color extraction, SVM compared with K-NN
2	Hang zhang, Paul Yanne, Shangsong Liang	2012	Wavelet decomposition and GLCM texture feature extraction, shape feature extraction, SVM
3	Suhaili Beeran Kutty, Noor Ezan Abdullah	2013	RGB color extraction, NNPR
4	R.janani, A.Gopal	2013	shape ,color and texture features extraction, ANN
5	Esraa Elhariri, NashwaEl-Bendary , Aboul Ella Hassanien	2014	RGB,HSV color extraction ,GLCM texture extraction, shape and vein extraction, Random Forests (RF) and Linear Discriminant Analysis (LDA),

III. FEATURE EXTRACTION

In order to extract the relevant information from raw data, they need to be further processed by the feature extractors.

Feature Extraction using Color Model:

Hue, Saturation, Value or HSV is a color model that describes colors (hue or tint) in terms of their shade (saturation or amount of gray) and their brightness or value. The HSV color wheel may be depicted as a cone or cylinder[4].Hue is expressed as a number from 0 to 360 degrees representing hues of red (starts at 0), yellow (starts at 60), green (starts at 120), cyan (starts at 180), blue (starts at 240), and magenta (starts at 300). Saturation is the amount of gray (0% to 100%) in the color. Value (or Brightness) works in conjunction with saturation and describes the brightness or intensity of the color from 0% to 100%.

Feature Extraction using shape analysis:

Some basic geometric features, which have been used in leaf recognition systems.

Area: The number of pixels in the interior.

Eccentricity: Eccentricity is the measure of aspect ratio. It's ratio of length of major axis to minor axis

Convex Hull: Returns a *p*-by-2 matrix that specifies the smallest convex polygon that can contain the region. Each row of the matrix contains the *x*- and *y*-coordinates of one vertex of the polygon.

EquivDiameter: Returns a scalar that specifies the diameter of a circle with the same area as the region. Computed as `sqrt(4*Area/pi)`.

MaxIntensity: Returns a scalar that specifies the value of the pixel with the greatest intensity in the region.

Mean Intensity: Returns a scalar that specifies the mean of all the intensity values in the region.

MinIntensity: Returns a scalar that specifies the value of the pixel with the lowest intensity in the region

Feature Extraction using Texture analysis:

Co-occurrence matrix captures numerical features of a texture using spatial relations of similar gray tones. Numerical features computed from the co-occurrence matrix can be used to represent, compare, and classify textures. The following are a subset of standard features derivable from a normalized co-occurrence matrix: Contrast: Measures the local variations in the gray-level co-occurrence matrix. Correlation: Measures the joint probability occurrence of the specified pixel pairs. Energy: Provides the sum of squared elements in the GLCM.

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Also known as uniformity or the angular Homogeneity: Measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal.

IV. EXPERIMENTAL RESULTS

We have taken Dataset of 285 images, 210 images are used for training set and 75 images are used for testing set. Taken 5 images from each class for testing. HSV color feature, Shape Geometric feature and GLCM texture features are extracted and feed this features to the neural network for classification.

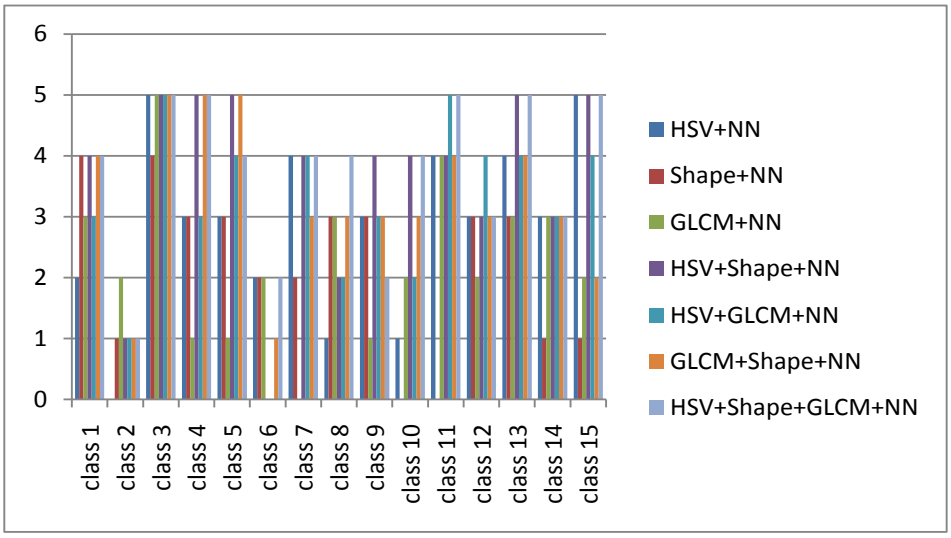

Fig.3 Comparison of results

V. CONCLUSIONS

Our proposed system is identified plant leaf type and classifies them into different classes. We have used color, shape and texture parameters to extract the features. NN feed forward classifier is used as the classification algorithm and also compare NN with SVM algorithm. NN achieve accuracy better than SVM. Dataset of 285 images are taken, 210 images are used for training set and 75 images are used for testing set. Taken 5 images from each class for testing. Color Features with NN Gives 57.33% average accuracy. Shape Features with NN Gives 44.00% average accuracy. Texture Features with NN Gives 45.33%average accuracy. Combine Color and shape Features with NN Gives 72.00% average accuracy. Combine Color and Texture Features with NN Gives 62.66% average accuracy. Combine Texture and shape Features with NN Gives 83.33% average accuracy. Combine Color, shape and Texture features with NN Gives 74.66% average accuracy.SVM Gives accuracy 48.00% with combined feature HSV, Shape and Texture. NN achieved accuracy better than SVM. So as compared to using single features combine feature gives better result.

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