iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VI **Month of publication:** June 2020

DOI: http://doi.org/10.22214/ijraset.2020.6139

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VI June 2020- Available at www.ijraset.com

Leaf Recognition using Multilayer Perceptron

A. Arockia Selvaraj[1], S. Mythili1[2], B. Tamilarasan[3], C. Preethi[4], G. M. Manthra[5]
[1]*Assistant Professor, Department of Computer Science and Engineering, Info Institute of Engineering, Coimbatore, TamilNadu, India*
[2, 3, 4, 5]*Department of Information Technology, Info Institute of Engineering, Coimbatore, TamilNadu, India*

Abstract: Plants are the backbone of all life on earth and essential resources for human wellbeing Plant recognition is very important in agriculture for the management of plant species and application for medicinal purposes. Plant species detection aims at the automatic identification of plants. Although a lot of aspects Like leaf, flowers, fruits, seeds could contribute to the decision, but leaf features are the most leaf is always more accessible as compared to other parts of the plants .This present paper introduced a novel plant species classifier based on the extraction of Morphological features using a Multilayer Perceptron with Adaboosting .Initially, some pre-processing techniques are used to set up a leaf image for the feature extraction process. Leaves is an application designed to classify different plant species based on the leaf's shape and venation. The number of known and unknown plant species increases as time. A database is created with 127 herbal leaves. Different classifiers, k-NN, Decision Tree and MultiLayer Perceptron are employed to test the accuracy of the algorithm.

I. INTRODUCTION

Leaves are the main part of a plant. These plants have a very good medicinal feature from root to leaf. Many plants have herbal qualities. Leaf recognition for plant species detection is a significant research zone in the field of image processing and computer vision. Although a lot of methods have been developed so far, the existing computational models for leaf recognition. Certain leaf has its own medicinal properties like skin ailment, cold, blood purifier, indigestion, for increasing the memory level and so on. Image processing algorithm is used for the identification of leaf through the MATLAB algorithm. Using MATLAB software image processing toolbox coding are done for database and test sample. Leaves is an application designed to classify different plant species based on the leaf's shape and venation. This system uses different image processing and machine learning techniques including centroid-radii, moment invariance, canny edge detection, morphological operations, image difference and artificial neural networks. Development of an automated system for identifying and classifying different leafs of the contaminated plants is an emerging research area in precision agriculture.

II. EXSITING SYSTEM

In existing techniques, there are several algorithms were developed for leaf recognition .In this context a detailed overview of the literature is presented with papers by Vijaykumar V who presented a filtering algorithm for Median filter noise removal [1]. First estimating the amount of noise from the noisy image, then replace the centre pixel by the mean of the sum of the surrounding pixels based on a threshold value.

Compared to other filtering algorithms such as mean, alpha-trimmed mean. [2] used shape and texture features for leaf classification using neural networks and achieved 83.00% accuracy. Kulkarni et al. [3] proposed technique based on color, texture, vein and shape features combined with Zernike moments. Radial Basis Probabilistic Neural Network (RBPNN) classifier was used for classification. Prasvita and Herdiyeni [4] used shape features and neural network classifier and acquired a classification accuracy of 90.00%. Ekshinge and Andore. [5] achieved 85% accuracy by elliptic Fourier analysis using shape feature. who proposed the GLCM based method is proposed to segment the leaf image of the leaf regions from the soft tissue regions [6]. Authors start with pre-processing techniques such as binary conversion and edge detection techniques. In this work, it is tried to automatic classification of leaf detection using image processing methods based on information gained from leaf images with good accuracy and first time tried to all the types of leaf .

Disadvantages in existing system:

1) Difficult to get accurate results.
2) They are not applicable for multiple images for leaf images in a short time.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VI June 2020- Available at www.ijraset.com

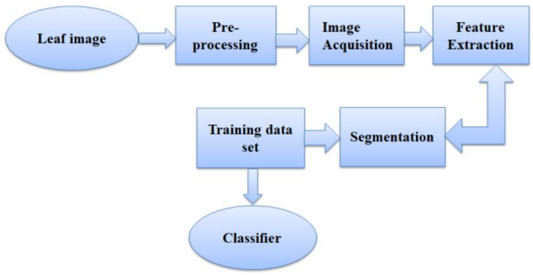
III. PROPOSED SYSTEM:

The research is based on Leaf shape, Vein, color, and texture features are used to classify leaf using PNN classifier after applying feature extraction. The methodology is based on two phases, first segmentation of leaves and then classification. These extracted features will be further processed to be used for classification. The shape features are mainly related to geometry of leaf and they are also referred to as morphological features.Image Acquisition helps to analyse the features such as texture, compositions and so on. Feature Extraction allow us to know existence and location of plant leaf with leaf images. This research can be applied Gray Level Co-Occurrence Matrix (GLCM) and Multi Layer Perceptron(MLP) Algorithm for analyzing the texture of leaf images. The GLCM feature extraction process results an image characteristic with four parameters, such as Contrast, Correlation, Energy, and Homogeneity. In image pre-processing the first step is color conversion. The color image is converted into gray image for making the pixel values equal. This process is done in order to reduce the complexity. The second step of image pre-processing is edge detection. Edge detection is done for getting the exact curve of the leaf. On comparing perwitt detection, sobel edge detection has given the better result which will be shown in later topics. The next step after edge detection is feature extraction.

A. Advantages

1) MultiLayer Perceptron are much faster than SVM.
2) Leaf image will be detected in an early stage.
3) It responsible for extracting structural features.
4) It also establishes textural features.

IV. SYSTEM ARCHITECTURE



The system architecture consists of six entities they are leaf images, Pre-processing, Image Acquisition, Feature Extraction ,Segmentation, Classification and Output Images. First, leaf images are given as input and then pre-processed using IDM. The feature will be differentiated and chosen. And then features will be extracted using GLCM. Also, MultiLayer Perceptron(MLP) classifiers are used along with the K-Means Clustering algorithm. Later, the results will be normal or abnormal.

V. ALGORITHM/TECHNIQUE USED

1) Enhancement and Compression Techniques.
2) Inverse Difference Moment (IDM).
3) Gray Level Cooccurrence Matrix (GLCM).
4) Multi Layer Perceptron (MLP).
5) K-Means Clustering Algorithm.

Algorithm Description

A. Enhancement and Compression Techniques

In Pre-Processing step, there are two techniques are used such as Enhancement and Compression Techniques. Enhancement technique are used to boost up the pixel value in the image. Compression technique are used to decrease the pixel value in the image. Here, mostly the noised image will be processed into denoised image.

B. IDM (Inverse Difference Moment)

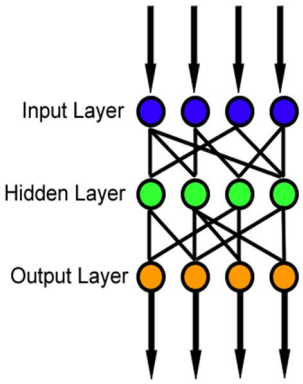
In this Feature Selection step, (IDM) Inverse Difference Moment algorithm is used that is mainly used to convert spatial domain into frequency domain. Inverse Difference Moment (IDM) is a spectral evaluation approach used for studying non-desk bound information, and affords time-frequency representation of these information This is another feature influenced by the homogeneity of the image. It contains a weighting factor resulting in smaller contributions from inhomogeneous areas. So lack of homogeneity in images causes a low value of Inverse Difference Moment.

C. GLCM (Gray Level Co occurrence Matrix)

In this Feature Extraction step, GLCM (Gray Level Co occurrence Matrix) algorithm is used. Feature extraction is the main step in various image processing applications. Gray Level Co-occurrence Matrix is used for feature extraction and selection. GLCM was defined by Haralick in 1973.GLCM is main tool used in image texture analysis. Textures of an image are complex visual patterns that are composed of entities or regions with sub patterns with the characteristics of brightness, colour, shape,size, etc. GLCM is a statistical way to indicate image texture structure by statistically sampling the pattern of the grey levels occurs in relation to other grey levels. We use the Gray Level Co-occurrence Matrix (GLCM) method to extract textural features such as entropy, contrast, correlation, homogeneity. The Gray Level Co-occurrence Matrix (GLCM) method is a way of extracting second order statistical texture features [6]. A GLCM is a matrix where the number of rows and columns is equal to the number of gray levels, G, in the image. The matrix element P (i, j | Δx, Δy) is the relative frequency with which two pixels, separated by a pixel distance (Δx, Δy), occur within a given neighbourhood, one with intensity 'i' and the other with intensity 'j'. The matrix element P (i, j | d, ɵ) contains the second order statistical probability values for changes between gray levels 'i' and 'j' at a particular displacement distance d and at a particular angle (ɵ). Using a large number of intensity levels G implies storing a lot of temporary data, i.e. a G × G matrix for each combination of (Δx, Δy) or (d, ɵ). Due to their large dimensionality, the GLCM's are very sensitive to the size of the texture samples on which they are estimated. The results can be displayed on the screen.

D. MLP (Multi Layer Perceptron)

In this work, we empoly multi-layer feed forward network algorithm for leaf recognition using its shape, color and vein features. The leaf images are pre-processed and segmented. The shape features like area, convex area, diameter, length, width, perimeter, eccentricity, solidity, major axis length and Minor axis length are extracted by taking the features from the segmented leaf image. The mean, standard deviation, skewness and kurtosis for red, green and blue color features are extracted. Wiener filtering and canny edge detection are used to identify the vein features v1, v2, v3, v4 at different thresholds by calculating gray level value from the gray level histogram. MLP belongs to a feed forward artificial neural network model that maps a set of input data onto a set of its appropriate outputs. MLP includes multiple layers of nodes in a directed graph, and each layer is fully connected to the next one. Except the input nodes, each node is considered as a processing element or a neuron with a nonlinear activation function. MLP generally make use of back propagation for training the network . Learning occurs in the perceptron by changing the connection weights once every piece of data gets processed based on the amount of error occurred in the output when compared to the expected result. This example of supervised learning can be carried out through the back propagation, i.e., a generalization of the least mean squares algorithm in the liner perceptron.

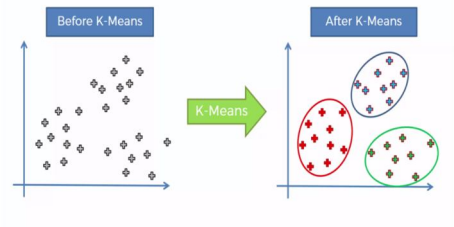


E. K-MEANS Clustering

The K-means clustering algorithm uses iterative refinement to produce a final result. The algorithm inputs are the number of clusters K and the data set. The data set is a collection of features for each data point. The algorithms starts with initial estimates for the K centroids, which can either be randomly generated or randomly selected from the data set. The algorithm then iterates between two steps:

1) *Data Assignment Step:* Each centroid defines one of the clusters. In this step, each data point is assigned to its nearest centroid, based on the squared Euclidean distance. More formally, the collection of centroids in a set, then each data point is assigned to a cluster based on the standard Euclidean distance. Let the set of data point assignments for each cluster centroid.
2) *Centroid Update Step:* In this step, the centroids are recomputed. This is done by taking the mean of all data points assigned to that centroid cluster. The algorithm iterates between steps one and two until a stopping criteria is met (i.e., no data points change clusters, the sum of the distances is minimized, or some maximum number of iterations is reached).This algorithm is guaranteed to converge to a result. The result may be a local optimum (i.e. not necessarily the best possible outcome), meaning that assessing more than one run of the algorithm with randomized starting centroids may give a better outcome.

a) *Choosing K:* The algorithm described above finds the clusters and data set labels for a particular pre-chosen K. To find the number of clusters in the data, the user needs to run the K-means clustering algorithm for a range of K values and compare the results. In general, there is no method for determining exact value of K.



.

VI. IMPLEMENTATION

1) *Image Acquisition:* Image Acquisition is a process of getting an input image for the process of automatic detection of leaf using digital image processing. A leaf image can be easily acquired using scanner or digital camera. The image can be of any size.The image should have preferably single color background with no petiole.Then the images will be trained in the system. After that these images can be ready for the further processing.
2) *Pre-processing:* After the images are trained, the second step will be the pre-processing. Here, the noise removal process is done by using the enhancement and compression techniques. As the result of this process, we will get the denoised images.
3) *Feature Extraction:* Feature extraction process, the above processed images will be given as the input of this step. And by using the GLCM algorithm, the features will be extracted by changing the gray scale images in this process. The results are entropy, contrast, correlation, homogeneity. These outputs will be given to the classification step.
4) *Segmentation:* Image segmentation is the process of partitioning a digital image into multiple segments.It is a set of pixels ,also known as super-pixels .Image segmentation is typically used to locate objects and boundaries (lines, curves, etc) in images.
5) *Classification:* In the classification process, the MLP (Multi Layer Perceptron)algorithm is used and also K-Means clustering is also used. MLP classifier is used for differentiating the features of the image. And the K-Means clustering process is used for grouping up the similar features together to find the better results of the image. By using these processes, it is able to obtain the results whether it is normal or abnormal, it also provides the percent of 90.

VII.CONCLUSION

A computer based analysis techniques for the detection of plant leaf using leaf images has been presented in this work. It starts from the preprocessing to remove the noise by using enhancement and compression techniques. After the pre-process, the area of the leaf is calculated. The method has been tested on a set of images and results have been evaluated based on GLCM features. And by using the MLP classifier along with the K-Means clustering algorithm, the results can be displayed and accuracy of this method was 90%. It is fully implemented to leaf images and also classify the type of plant leaf is occurs in the future works.

REFERENCES

[1] J. Chaki and R. Parekh, "Plant leaf recognition using shape based features and neural network classifiers," International Journal of Advanced Computer Science and Applications, vol. 2, no. 10, p. 7, 2011.
[2] H. Hajjdiab and I. A. Maskari, "Plant species recognition using leaf contours," IEEE, 2011.
[3] L. Gao, X. Lin, M. Zhong, and J. Zeng, "A neural network classifier based on prior evolution and iterative approximation used for leaf recognition," Sixth International Conference on Natural Computation, 2010.
[4] J.-X. Du, X.-F. Wang, and G.-J. Zhang, "Leaf shape based plant species recognition," Elsevier - Applied Mathematics and Computation, 2007.
[5] C.-Y. Gwo, C.-H. Wei, and Y. Li, "Rotary matching of edge features for leaf recognition," Elsevier - Computers and Electronics in Agriculture, 2013.
[6] Hossain J, Amin MA (2010) Leaf shape identification based plant biometrics. Proceedings of 13th International Conference on Computer and Information Technology (ICCIT), 458-463.
[7] Kadir A, Nugroho LE, Susanto A, Santosa PI (2012) Performance improvement of leaf identification system using Principal Component Analysis. International Journal of Advanced Science and Technology, 44:113-124.
[8] Im C, Nishida H, Kunii TL (1998) A hierarchical method of recognizing plant species by leaf shapes. IAPR Workshop on Machine Vision Applications, 158-161.
[9] Pietikäinen M, Mäenpää T, Viertola J (2002) Color Texture Classification with Color Histograms and Local Binary Patterns. Proceedings of the Workshop on Texture Analysis in Machine Vision, 109-112.

ABOUT AUTHORS

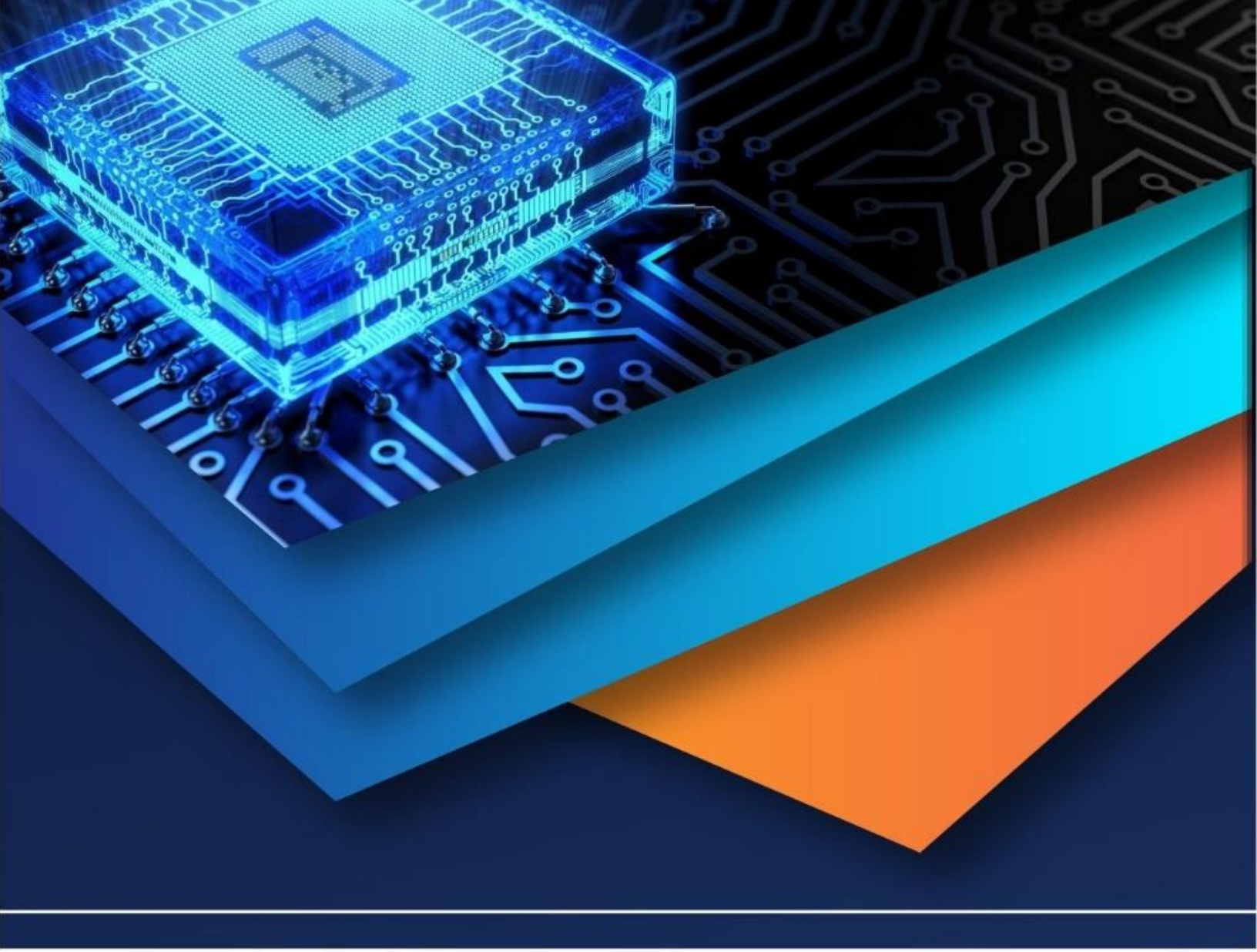
A. First Author Mr.A.Arockia Selvaraj
He is currently working as an Assistant Professor Department of Computer Science and Engineering at Info Institute of Engineering, Coimbatore Affiliated to Anna University. His research areas are Cloud Computing and Image Processing.

B. Second Author Ms. S.Mythili
She is currently a B.Tech student in Department of Information Technology at Info Institute of Engineering, Coimbatore Affiliated to Anna University. Her area of interest are Image Processing, multimedia.

C. Third Author Mr. B.Tamilarasan
He is currently a B.Tech student in Department of Information Technology at Info Institute of Engineering, Coimbatore Affiliated to Anna University. His area of interest are multimedia, Image Processing.

D. Fourth Author Ms. C.Preethi
She is currently a B.Tech student in Department of Information Technology at Info Institute of Engineering, Coimbatore Affiliated to Anna University. Her area of interest are Image Processing, mobile computing.

E. Fifth Author Ms. G.M.Manthra
She is currently a B.Tech student in Department of Information Technology at Info Institute of Engineering, Coimbatore Affiliated to Anna University. Her area of interest are Image Processing.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY