SURVEY ON CLASSIFICATION METHODS IN IMAGE PROCESSING OF MEDICINAL PLANTS USING LEAVES

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Abstract
Plants play an important role in human life and provide required information for the development of human society. Due to environmental degradation and lack of awareness, many rare medicinal plant species are at the risk of extinction so it is necessary to keep record for plant protection. In this survey paper, we discussed various methods to classify the plants using leaves.

Keywords: Plant leaf classification, Artificial neural network, PCA, SVM, k-NN, PNN

1. Introduction:
Plants are the most important forms of life on our planet. Plants maintain the balance of O2 and CO2 of earth’s atmosphere. In addition, plants are important means of livelihood and production of human beings. Computerized plant identification system can be very helpful in botanical garden or natural reserve park management, new plant species discovery, plant taxonomy, exotic plant detection and so on. A computer based plant identification or classification system can use different characteristics of the flora, starting at very simple level such as: shape and color of the leaf, flower and fruit type, branching style, root type, seasonality, outlook to very complex such as cell and tissue structure, genetic structure. A substantial amount of work has been done on leaf shape based plant classification and recognition[7]. So the first step is to build up a database for protecting plants. Here the need arises to train a computer how to classify plants. Despite the great advances made in Botany, there are many plants which are still unknown.

Using digital image processing for the purpose of automatic classification and recognition of plants based on the images of the leaves. A computer based plant classification system can use different characteristics of the flora, starting at very simple level such as: shape and color of the leaf, flower and fruit type, branching style, root type, seasonality, outlook to very complex such as cell and tissue structure, genetic structure.

2. Proposed work
In this paper, we have included the survey details of various classifiers to classify the plants of different species using leaves.

3. Survey on Classification Techniques:
X.-F. Wang et al proposed an efficient classification frameworks for leaf images with complicated background. First, automatic marker-controlled watershed method combined with pre-segmentation and morphological operation is applied to segment leaf images with prior shape information. Then some shape features including seven geometric moments and sixteen Zernike moment features will be extracted from segment binary images. In addition, an efficient moving center hypersphere(MCH) classifier with data compression function is introduced to address extracted features.[2]

J.S.Cope et. al discussed a number of species identification system that rely on both domain knowledge and on a wide range of morphometric methods. Plants are extremely diverse in shape, size and colour. A method that works very well on one group may rely on
features that are absent in another taxon. The use of computational, morphometric and image processing methods to analyze leaf images is particularly timely.

Jyotismita Chaki et al discuss a method characterizing plant leaves based on the leaf texture modeled using Gabor filter and GLCM features, together with the leaf shape, modeled using curvelet features and invariant moments[3].

Jyotismita Chaki et al proposed an automated system for plant identification using shape modeling approaches based on invariant-moments model and centroid-radii model, and the two are compared with regard to classification accuracies. Such automated classification systems can prove extremely useful for quick and efficient classification of plant species [4].

Abdul Kadir et al reports the results of experiments in improving performance of leaf identification system using Principal Component Analysis (PCA)[6].

The system involved combination of features derived from shape, vein, color, and texture of leaf. PCA was incorporated to the identification system to convert the features into orthogonal features and then the results were inputted to the classifier that used Probabilistic Neural Network (PNN). This approach has been tested on two datasets, Foliage and Flavia, that contain various color leaves (foliage plants) and green leaves respectively. The results showed that PCA can increase the accuracy of the leaf identification system on both datasets.[6]

Abdul Kadir et al developed a method for leaf classification, which incorporates shape and vein, color, and texture features and uses PNN as a classifier. Fourier descriptors, slimness ratio, roundness ratio, and dispersion are used to represent shape features. Color moments that consist of mean, standard deviation, and skewness are used to represent color. Twelve textures features are extracted from lacunarity. The result gives 93.75% of accuracy, which is slightly better than the original work that gives 90.312% of accuracy. Although performance of the system is good enough, we believe that the performance still can be improved. Hence, other features will be researched in the future [9].

Miss. Needa Samreen Khan et al discussed the different leaf recognition techniques, which enables the user to recognize the type of leaf using an approach that depends on neural network. Scanned images are being introduced into the computer initially, image enhancement and reduction of noise modifies their quality, further followed by feature extraction. Selection of feature points from the geometric centre of the leaf image and compares them with the already trained feature points of database leaf image is the basis for leaf recognition system. Different stages like image pre-processing, feature extraction and leaf through neural network are being discussed in this paper[10].

Raman Maini et al compare the various Edge Detection techniques and they concluded that Canny’s edge detection algorithm performs better than Sobel, Prewitt and Robert’s operators under all the scenarios[12].

ArunPriya C et al proposed an approach, consists of three phases such as preprocessing, feature extraction and classification. The preprocessing phase involves a typical image processing steps such as transforming to gray scale and boundary enhancement. The feature extraction phase derives the common DMF from five fundamental features. The main contribution of this approach is the Support Vector Machine (SVM) classification for efficient leaf recognition. 12 leaf features which are extracted and orthogonalized into 5 principal variables are given as input vector to the SVM. Classifier tested with flavia dataset and a real dataset and compared with k-NN approach, the proposed approach produces very high accuracy and takes very less execution time [8].

Prof. Meeta Kumar et al surveyed different leaf classification techniques and concluded that the Nearest Neighbor method is perhaps the simplest of all algorithms for predicting the class of a test example. An obvious disadvantage of the kNN method is the time complexity of making predictions [13].
Sapna Sharma et al. present an automated recognition system for the plants leaf image using the multilayer feed forward neural network and back propagation algorithm. Experimental result indicates that the technique is workable with accuracy greater than 90% for the 10000 no. of epochs required for training the neural network. This technique is fast in execution, efficient in classification and easy in implementation.[7]

B.S. Harish et al. experimented as, ten different morphological and Zernike moments are extracted and fed as input to four different classifiers, namely, Naïve Bayes, k-NN, SVM and PNN. They observed that Naïve Bayes and k-NN give less accuracy and SVM ad PNN have comparatively high accuracy[5].

Sethulekshmi A V et al. presents a comparative study of global and local feature descriptors and classifiers used in leaf recognition algorithm. The comparative study considers both theoretical and experimental aspects, and checking for efficiency and effectiveness. The main feature descriptor for leaf recognition is texture and shape identification, because leaf shape and texture are promising identifier in a leaf [14].

4. Conclusion
This paper presents a comparative study of classifiers used in leaf recognition algorithm. The comparative study considers both theoretical and experimental aspects, and checking for efficiency and effectiveness. A big challenge for leaf images feature descriptors, especially in the context of similar leaf images.

References


