



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

Pallavi Shetty¹, Dr. Balasubramani R.²

¹Associate Professor, Dept, of MCA, NMAM.I.T., Nitte.

²Professor, Dept. of ISE., NMAM.I.T., Nitte.

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 automate 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 complicated background 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.[1]

Jyotismita Chaki et. al discusses 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, slimmness 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 SamreenI 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 oncluded 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 and 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

- [1] James S. Cope, David Corney, Jonathan Y. Clark, Paola Remagnino, Paul Wilkin, "Plant species identification using digital morphometrics: A review", *Expert Systems with Applications* 39 (2012) 7562-7573, , www.elsevier.com/locate/eswa
- [2] X.-F. Wang et al., "Classification of plant leaf image with complicated background", *Applied Mathematics and Computation* 205 (2008) 916–926 www.elsevier.com/locate/amc
- [3] Jyotismita Chaki, Ranjan Parekh, Samar Bhattacharya, "Plant Leaf Recognition using Texture and Shape Features with Neural Classifiers", *Pattern Recognition Letters* 58 (2015) 61-68 www.elsevier.com/locate/patrec
- [4] Jyotismita Chaki, Ranjan Parekh, "Plant Leaf Recognition using Shape based Features and Neural Network classifiers", *International Journal of Advanced Computer Science and Applications*, Vol. 2, No. 10, 2011
- [5] B.S.Harish, Aditi Hedge, OmPriya Venkatesh, D.G.Spoorthy, D.Sushma, "Classification of Plant leaves using Morphological features and Zernike Moments", 978-1-4673-6217-7/13/\$31.00 ©2013 IEEE
- [6] Abdul Kadir, Lukito Edi Nugroho, Adhi Susanto and Paulus Insap Santosa, "Performance Improvement of Leaf Identification System Using Principal Component Analysis", *International Journal of Advanced Science and Technology* Vol. 44, July, 2012
- [7] Sapna Sharma, Dr. Chitvan Gupta, "Recognition of Plant Species based on leaf images using Multilayer Feed Forward Neural Network", *International Journal of Innovative Research in Advanced Engineering (IJIRAE)*ISSN: 2349-2163 Issue 6, Volume 2 (June 2015)
- [8] ArunPriya C., Balasaravanan T., Antony Selvadoss Thanamani, "An Efficient Leaf Recognition Algorithm for Plant Classification Using Support Vector Machine", 978-1-4673-1039-0/12/\$31.00 ©2012 IEEE
- [9] Abdul Kadir, Lukito Edi Nugroho, AdhiSusanto, Paulus InsapSantosa, "Leaf Classification Using Shape, Color, and Texture Features", *International Journal of Computer Trends and Technology*- July to Aug Issue 2011, ISSN: 2231-2803.
- [10] Miss. NedaSamreenI.Khan, Prof. Rajesh B.Pandhare, A Review on Off-line Leaf

Recognition Using Neural Network,
International Journal of Computer Science
and Mobile Computing, Vol.4 Issue.1,
January- 2015, pg. 478-482

- [11] ArunPriya C., Balasaravanan T., Antony SelvadossThanamani, An Efficient Leaf Recognition Algorithm for Plant Classification Using Support Vector Machine, Proceedings of the International Conference on Pattern Recognition, Informatics and Medical Engineering, March 21-23, 2012
- [12] Raman Maini & Dr. Himanshu Aggarwal, "Study and Comparison of Various Image Edge Detection Techniques", International Journal of Image Processing (IJIP), Volume (3) : Issue(1)
- [13] Prof. Meeta Kumar, MrunaliKamble, ShubhadaPawar, PrajaktaPatil, Neha Bonde, "Survey on Techniques for Plant Leaf Classification", International Journal of Modern Engineering Research (IJMER), Vol.1, Issue.2, pp-538-544.
- [14] Sethulekshmi A V, Sreekumar K, Ayurvedic leaf recognition for Plant Classification, International Journal of Computer Science and Information Technologies, Vol. 5 (6), 2014, 8061-806