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Identification of Medicinal Plant Using Machine Learning Approach

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Abstract - *From Vedic times plants have been used as a source of medicine in ayurveda. In the preparation of ayurvedic medicine, identification of correct plant is the most important step, which have been done manually. Due to demand of mass production, Identification of these plants automatically is important. In this paper we have been implement a technique for medicinal plant identification using random forest algorithm, an ensemble supervise machine learning algorithm based on color ,texture and geometrical features*

Key Words: Medicinal Plant, Supervise learning, Image Processing, Identification, Automatic, Ayurveda.

1. INTRODUCTION

Ayurveda is an ancient system of medicine practiced in India and has its roots in the Vedic times, approximately 5000 years ago. The main constituents of ayurvedic medicines are plant leaves and other parts of plants like root, bark etc. More than 8000 plants of Indian origin have been found to be of medicinal value. Combinations of a small subset amounting to 1500 of these plants are used in Herbal medicines of different systems of India. Specifically, commercial Ayurvedic preparations use 500 of these plants. Over 80% of plants used in ayurvedic formulations are collected from the forests and wastelands whereas the remaining are cultivated in agricultural lands

In the ancient past, the Ayurvedic physicians themselves picked the medicinal plants and prepared the medicines for their patients. Most of the plants are identified using their leafs the common steps to classify the leaf of a plants are Capturing image, noise removal and resizing ,Extracting features, use proposed methodology and finally identify or recognized the plant.

2. Prior Work

A.Gopal et.al [1] implement a system using image processing with images of the plant leaves as a basis of classification. The software returns the closest match to the query. The proposed algorithm is implemented and the efficiency of the system is found by testing it on 10 different plant species. The software is trained with100 (10 number of each plant species) leaves and tested with 50 (tested with different plant species) leaves. The efficiency of the implementation of the proposed algorithms is found to be 92%.

Umme Habiba et.al [2] In this paper, for automatically classifying medicinal plants, they present a Multichannel Modified Local Gradient Pattern (MCMLGP), a new texture-based feature descriptor that uses different channels of color images for extracting more significant features to improve the performance of classification. Auther have trained their proposed approach using SVM classifier with arious kernels such as linear, polynomial and HI. In addition, used different feature descriptors for comparative experimental analysis with MCMLGP by conducting the rigorous experiment on our own medicinal plants dataset. The proposed approach gain higher accuracy (96.11%) than other techniques, and significantly valuable for exploration and evolution of medicinal plants classification.

R.Janani et.al[3] have proposed a method for the extraction of shape, color and texture features from leaf images and training an artificial neural network (ANN) classifier to identify the exact leaf class. The key issue lies in the selection of proper image input feature to attend high efficiency with less computational complexity. they tested the accuracy of network with different combination of input feature. the test result on 63 leaf images reviles that this method gives 94.4% accuracy with a minimum of 8 input features. this approach is more prominent for leaf identification system that have minimum input and demand less computational time.

Vijayashree.T et.al [4] has created database with 127 herbal leaves. For creating a database 11 texture parameters are taken into account. The parameters are Sum of Variance, Inverse Difference Moment, Aspect ratio, Correlation, Sum Entropy, Mean, and Sum Average. Gray level co-occurrence matrix (GLCM) is used for determining the parameters like entropy, homogeneity, contrast and energy. A test image is taken and compared with the database; the dissimilarity is calculated with the extracted parameters. The one with least dissimilarity is identified as the leaf and the output is displayed.

Venkataraman et.al [5] a system is developed which would provide a solution for identifying the plant and providing it's medicinal values, thereby helping in the cure of many ailments in a natural way. This paper discusses about the dataset collection, feature extraction using texture and HOG and thereby classifying based on Support Vector Machine algorithm.

Shitala Prasad et.al [6] These paper presents a new and efficient technique for leaf acquisition.The image is transformed to device independent lαβ color space that is further used to compute VGG-16 feature map. This feature map is re-projected to PCA subspace to optimize the performance for species recognition. To prove the robustness, the paper uses two different types of plant leaf datasets.

Dileep M.R et.al [7] This work proposes AyurLeaf, a Deep Learning based Convolutional Neural Network (CNN) model, to classify medicinal plants using leaf features such as shape, size, color, texture etc. This research work also proposes a standard dataset for medicinal plants, commonly seen in various regions of Kerala, the state on southwestern coast of India. The proposed dataset contains leaf samples from 40 medicinal plants. A deep neural network inspired from Alexnet is utilised for the efficient feature extraction from the dataset. Finally, the classification is performed using Softmax and SVM classifiers. Our model, upon 5-cross validation, achieved a classification accuracy of 96.76% on AyurLeaf dataset. AyurLeaf helps us to preserve the traditional medicinal knowledge carried by our ancestors and provides an easy way to identify and classify medicinal plants.

C.Amuthalingeswaran et.al [8] had built a model (Deep Neural Networks) for the identification of medicinal plants. To train the model auther used around 8,000 images belonging to four different classes. Finally, arrived with good accuracy of 85% when testing with images taken from the open field landareas.

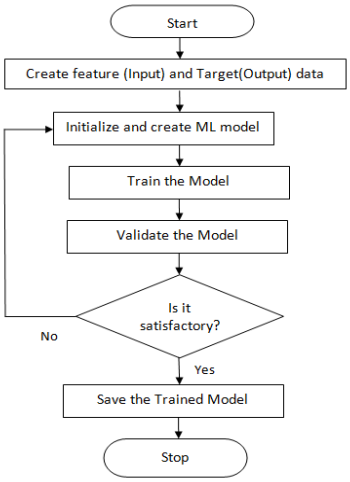
Manojkumar P. et.al [9]This paper explores feature vectors from both the front and back side of a green leaf along with morphological features to arrive at a unique optimum combination of features that maximizes the identification rate. A database of medicinal plant leaves is created from scanned images of front and back side of leaves of commonly used ayurvedic medicinal plants. The leaves are classified based on the unique feature combination. Identification rates up to 99% have been obtained when tested over a wide spectrum of classifiers. The above work has been extended to include identification by dry leaves and a combination of feature vectors is obtained, using which, identification rates exceeding 94% have been achieved.

Amala Sabu et.al [11] The proposed system uses a combination of SURF and HOG features extracted from leaf images and a classification using k-NN classifier. Our experiments show results which seem to be sufficient for building apps for real life use.

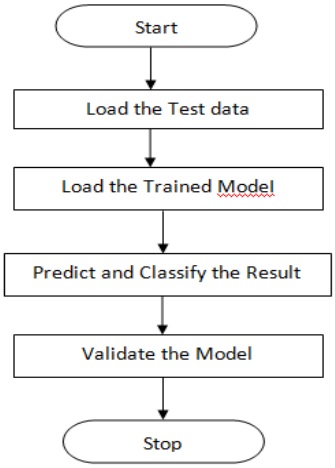
3. PROPOSED METHODOLOGY

Fig -1: Medicinal plants a-Alovera,b-Coriander,c-Drumstick,d-Hibiscus,e-Mint,f-Neem,g-Papaya,h-Peepal,i-Rui,i-Tulsi_Basil

Training Model Flowchart:



Testing Model Flowchart:



4. Result

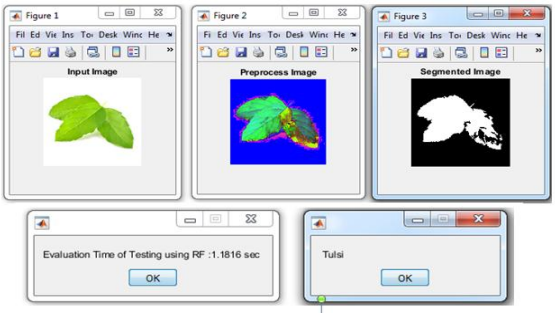


Fig -2: Identifying unknown image as Tulsi

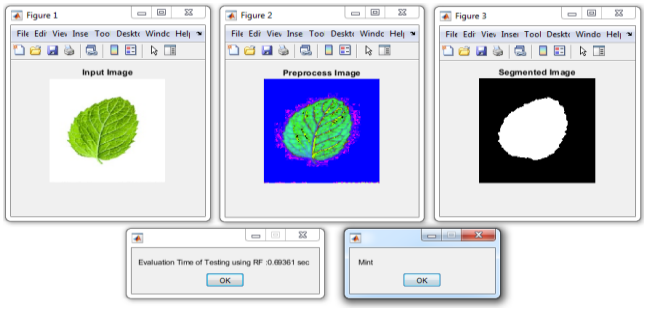


Fig -3: Identifying unknown image as Mint

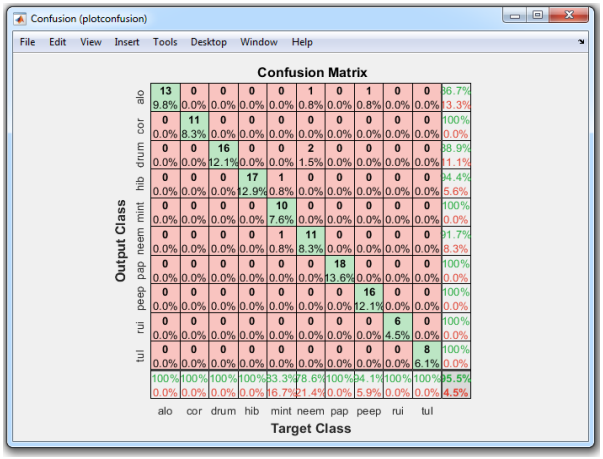


Fig -4: Confusion Matrix for System Performance

Table -1: Testing Performance

Parameters	Testing Performance (Percentage)
Accuracy	94.54
Sensitivity	96.23
Specificity	50.00
F-score	97.70

5. CONCLUSION

In this paper we have implemented a technique for medicinal plant identification using random forest algorithm, an ensemble supervise machine learning algorithm based on color, texture and geometrical features to identify the correct species of medicinal plant. The combination of shape, color and texture features result in correct leaf identification accuracy of 94.54 %.The results shown in this technique are very promising and thus indicate the aptness of this algorithm for medicinal plant identification systems. this work can be extended to a larger number of Plants species with improved accuracy in future.

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