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Pattern Matching based on Extracted Features of Leaves

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Abstract— In this paper, the main focus is to classify and authenticate the medicinal plant materials widely used for Indian herbal medicinal preparation. Plants are the backbone of all real life on Earth not only for the human being as well as other species also. The image of the leaf is taken using a digital camera, under a white background for detecting the sharp features of the leaf and also for better clarity. Software implementation was the captured features are extracted and also it is related to the data base and shows the result. By using tool the snapshot are stored in the database, so that the leaf can be recognized by matching the captured image from the database. The proposed method concludes the features of different leaf and shows matching percentage based on the features of different leaves using matlab.

Keywords- *Image Pre-processing, Feature Extraction, Pattern Matching*

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I. INTRODUCTION

Plants are the backbone of all real life on Earth not only for the human being as well as other species also. Leaves of different plants have different features which can be used to classify them. Plants lose their leaves annually in the Knowing the leaf of a tree is the best way to determine the species. The aim of the work is to classify and authenticate the medicinal plant materials widely used for Indian herbal medicinal preparation. In this paper, it shows efficient methods for plant identification using digital image processing.

Image processing is the recent growing technique in the real world. It refers to the processing of digital images by capturing the images from digital computer. So by applying advanced techniques of image processing and exploiting the capabilities of the latest advanced computing facilities and the use of computer techniques for identifying the shape, ,size, aspect ratio, area, perimeter, edge, centroid, convex area, texture, color and so on. Image analysis is done in between digital image processing and computer vision. There are lots of plant organs like leaves, flowers, fruits, seeds and many more which can be used for identification of plants. Some of the features which include shape, texture, color, compactness and shape of the leaf for analyzing the leaf recognition which faces lots of problems of adulteration and nomenclatural to misuse of this plant for specific disease [1].

In this paper leaves are selected to get the features of plant because database of leaf can be easily gathered and scanned and also it consist of many other information which are helpful for plant classification. Digital plant identification systems differentiate the leaf of plant species without requiring the expertise of botanists [2]. Nowadays, whole world is facing lots of problems like global warming, loss of biodiversity, fast urban development effects, and lots of environmental damages and many more problems. Here image processing techniques are used for medicinal purpose by extraction of feature, preprocessing, noise removal etc. The proposed approach consists of some stages: Pre-processing, Noise Removal, Feature extraction, Pattern Recognition, Edge Detection, and Classification. This paper describes the approaches for the plant identification by using digital images of leaves. The main aim is, it should give the better accuracy [3].

II. IMAGE PRE-PROCESSING

A. Conversion of RGB to GRAY

The image of the leaf is captured by scanners or digital cameras. Since we have not found any digitizing tool to save the image in a lossless compression design, here the image format is JPEG. An RGB image is firstly converted into a grayscale image. Eq. 1 is the desired formula for converting RGB value of a pixel into its grayscale value.

Gray = 0.2989 * R + 0.5870 * G + 0.1140 * B (1) where R, G, B known as the color of the pixel respectively.

Figure 1. RGB to Gray converted image

B. Conversion of GRAY to Binary

The thresholding methods is replaced by each pixel in an figure with a black pixel if the image concentration $I_{i,i}$ is less than the fixed constant T (that is, $I_{i,j} < T$), or a white pixel if the image intensity is greater than that invariable. BW = im2bw (I, level) convert the grayscale image I to a binary image.

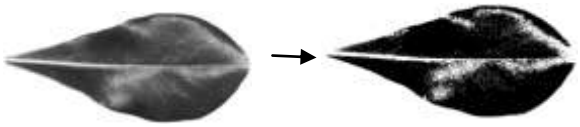

Figure 2. Binary converted image

C. Noise removal

Noise is a random difference of image Intensity and visibility as grains in the image. At the time of capturing the images by the help digital camera a noise is also captured in the images. The images are blur it means the noise is also captured. Noise

is eliminated by different techniques. In this paper I am taking median filter for eliminating noise.

Median Filtering: Median filtering is a non linear method which is useful in reducing noise. It is widely used as it is effective at reducing noise while preserving edges. The median filter works on moving with the image pixel by pixel, replaces each values with the median value of nearby pixels which are located there. The median is evaluated by first sorting all the values of pixels from the windows into arithmetic order, and then replacing the pixel being measured with the middle (median) pixel value.RGB images will be transformed to the gray scale image were used in this method. For noise reduction, a median filter with dimension contains 3 x 3 is used like sampler. In this process, the gray level at each pixel is changed by the median gray level at the close pixels. The values of the median are obtained and set as the value in pixels. The gray level values are (64, 64, 64, 64, 255, 255, 64, 64, and 255). These values are then approved in ascending order (64, 64, 64, 64, 64, 64, 255,255, and 255). The value 64 is arranged in the median of the gray level.

D. Feature Extraction

In this paper, there are lots of knowingly used digital morphological features (DMFs), resulting from 5 basic features, are extracted so that a processor can obtain the feature values quickly. After completing preprocessing, feature extraction is easy to use.

1. **Area**: The value of leaf area is very easy to calculate, just by including the quantity of pixels of binary value 1 on smoothed image. It is denoted as A [4,7].

2. **Perimeter:** It is calculated by including the number of pixels consisting leaf boundary. It is denoted as P.

3. **Aspect Ratio:** It is identify as the ratio of length to the width of leaf. It is given as [5]

$$\text{Aspect Ratio} = \frac{\text{Length}}{\text{Width}}$$

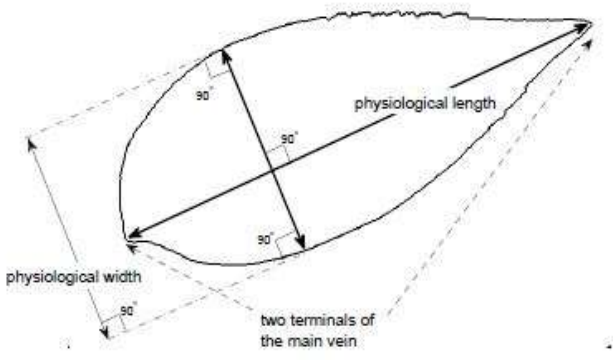

Figure 3. Relation between physiological length and physiological width

III. PROPOSED METHOD

Here, the proposed method is basically used to find out the percentage matching between two leaves.

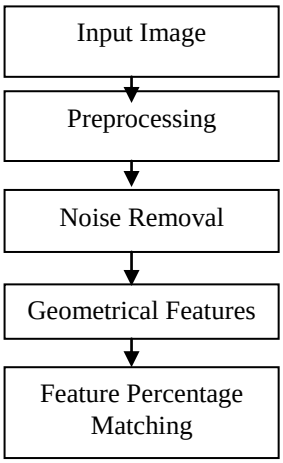

Figure 4. Flow diagram of proposed approach

The algorithm is basically explain geometrical features of the leaves and gives the features percentage matching. The algorithm comprises different steps:

1. Take two images as an input.
2. By applying pre-processing techniques on both the images.
3. Removal of noise on both the images.
4. Compute geometrical features of the leaf such as area, perimeter and aspect ratio.
5. On the basis of taking two leaves percentage matching is done in between both the leaf by using geometrical features.

IV. EXPERIMENT AND RESULT DISCUSSION

The easiest way is to identify a plant is by its leaves. In modern years the image processing and pattern recognition techniques both have been apply towards plant recognition [6]. To verify the efficiency and accuracy of the image, in this paper it is discussed to improve contrast quality of an image.

Figure 5. Leaf 1

Figure 6. Leaf 2

Figure 7. Leaf 3

Figure 8. Leaf 4

Figure 9. Leaf 5

Figure 10. Leaf 6

Table 1. Features and matching percentage of different leaves

	Area	Perimeter	Aspect Ratio	Total Matched Percentage
Leaf 1	5	4.962	0.4	6.662
Leaf 2	3	7.457	1.25	
Leaf 3	4	5.624	1.66	4.028
Leaf 4	11	13.026	0.57	
Leaf 5	6	55.676	0.28	3.340
Leaf 6	4	3.96	0.55	

V. CONCLUSION AND FUTURE WORK

This research paper introduce an approach for leaf of the plant, pattern matching. The result gives the matching percentage of leaves using different geometrical features on the basis of extracted features. With the help of percentage matching, we can find the leaves which are looking similar but on the basis of their features their results are different. In future we can include more features of the leaves by doing experiments on morphological feature also and we may classify the images by the classification techniques.

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