

# International Journal of Innovative Research in Science, Engineering and Technology

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## A Survey on Leaf Identification through Leaf Features Using Image Processing

Rahul Yadav<sup>[1]</sup>, Upasana Dugal<sup>[2]</sup>

M.Tech. Scholar, Dept. of CSE, BBDU, Lucknow, India<sup>[1]</sup>

Asst. Professor, Dept. of CSE, BBDU, Lucknow, India<sup>[2]</sup>

**ABSTRACT:** Earth is a only living planet exist in the solar system, which consist of ecosystem. Plants plays a vital role in ecosystem, which helps living being (like, human, animal etc.) to survive on the earth. Leaf is the important part of the plant which helps in the survival of the plant itself. Plants provide food for living beings. Leaf identification and classification helps to recognize the species of plants as well as different types of diseases, Which helps plants to survive in the nature. Leaf shape and size is major feature to identify the species of plant. The huge amount of database is present about the leaves, still number of leaves are unaware by human beings. Identification and classification of leaves is done with several methodologies.

**KEYWORDS:** leaf recognition, leaf segmentation, leaf venation, leaf shape, leaf size, image processing, morphological features, canny edge detection.

### I. INTRODUCTION

On earth there are number of plant species, which provides food and shelter for living beings. Without plants there will be no existence of environment on earth. There are number of plant species present worldwide, which makes balance to the nature. Now a days, earth faces various vital ecological problems like – global warming, lose of biodiversity and various environmental damages [2]. At very first step plants leaf are identified and classified on the basis of there shape, size, colour and texture etc. on other hand number of ways to recognize the plant like fruit, flower, root, leaf, etc. leaf recognition is very useful step in biodiversity. Recognition of plant species has many advantages like identification of medical plants as ayurveda and poisonous plants causes health issues. This technique is based on different features present on leaf surface. Features will determine the particular species of the following plants[4]. It has limited results because of the climate change and disease will cause the change in colour of leaves.

Therefore, at the different climate conditions there are different types of plants which will survive in the environment. Disease management is the different task to manage, more number of disease are detected on leafs or stems of the plant[1]. In present time, researcher used different computer vision, methodologies and pattern recognition technique have been applied towards automated procedure of the plant recognition[2].

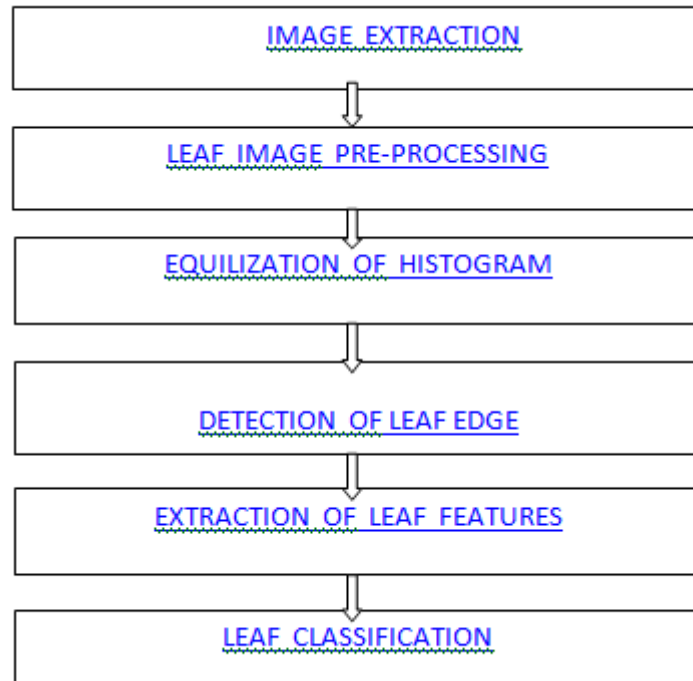
In the figure given below the steps are given by which the detection of leaf image is done step by step it consist of six steps. Each and every step is important for the process of image detection.

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There are several papers proposed before from which some related work is described below. As time progressed the database size is increased. The increase in information will result in increase of knowledge regarding plant species. The more medical plants are detected will help in cure of human beings and animals.

[9] Image processing is a very profound key that can change outlook of any designs. Edge detection is a fundamental tool in IP and computer vision in the area of feature detection and feature extraction. These optical sensors, AI and tracking are three independently existing dynamic fields through which we can achieve in different areas, it shows handshake relationship between them and we extend applications of these various fields to make benefitted to the mankind.

[4] A new approach is to extract the feature from leaf using Canny edge detector and classify 22 different kinds of plant with SVM classifier. The most important feature of any object is its shape. The two demanding and important parts of shape identification approach are shape matching and shape representation. Several extraction features are given like – area, filled area, perimeter, eccentricity, solidity, circularity, rectangularity, complexity, compactness etc.

[6] It reports the result of experiments in improving performance of leaf identification system using principal component analysis (PCA), it converts feature into orthogonal features and then inputs to the classifier that uses probabilistic neural network (PNN). Tested in two databases Foliage and Flavia, PCA will increase the accuracy of the leaf identification system on both databases.

[7] It deals with various classification techniques, plant leaf classification is done on its different morphological features. There are no. of methods given as it is difficult to decide the method for classification because the quality of result can be different for different input data. It has wide applications in various fields such as botany, ayurveda, agriculture etc. This gives the overview of different classification techniques for leaf classification.

## II. IMAGE PROCESSING AND TECHNIQUES

Leaf recognition process involves capturing images. Images are captured by using a 2D camera or a scanner. These equipments should be good enough to capture external surface of leaves crisp and clear, high identification cameras are used for image processing. After image capturing is done then it is forwarded to computer system for future processing

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of image. 2D image is more suitable than 3D image because it will reduce the time complexity and space complexity to great extent[3].

First step in image processing is the conversion of RGB images to the GRAY images. We convert the RGB values by forming a weighted sum of the B(blue), G(green), R(red) components.

[ GRAY = 0.1140\*B + 0.5870\*G + 0.2989\*R ]

After obtaining the gray image it is converted to binary image and separate image from background based on threshold values. Values which are less than threshold values are given as white and values are more than threshold are given as black. After binary image is extracted the canny edge detector designed by Jhon F. canny in 1986, is used for detection of edges and thinning of edges.

Image processing can be characterized in several parts as follows – imaging, image denoising, image restoration, image coding, image segmentation, image transformation, object representation and recognition and content based image retrieval. The leaf of plants have useful information for the classification of various species of plants.

### III. FEATURE EXTRACTION

The features based on shape have been extracted by the following terms [4] –

1. **AREA** – The number of white pixels in the leaf region in binary image representation is called area. It is denoted by “A”.
2. **FILLED AREA** – A filled image is an image with no holes. Filled area of an image returns a scalar that specifies the number of on pixels in filled image. It is denoted by “FA”.
3. **DIAMETER** – The longest distance between two points on the margin of leaf, it is denoted by “D”.
4. **PERIMETER** – The value of distance around the boundary of leaf region, it is denoted by “P”.
5. **ECCENTRICITY** – It is the ratio of distance between the foci of the ellipse and its major axis length. It is denoted by “E”.
6. **RECTANGULARITY** – It gives similarity between the leaf and rectangle. It is defined as  $L_p * W_p / A$ , where  $L_p$  means physiological length,  $W_p$  means physiological width and  $A$  means area of leaf.
7. **CIRCULARITY** – It defines the difference between the leaf and circle, it is denoted by “C”, and derives as  $(4 * A / P)$ .
8. **NARROW FACTOR** – It is the ratio of diameter (D) and physiological length ( $L_p$ ), it is derived as  $D / L_p$ .
9. **MAJOR AXIS** – The line segment connecting the base and the tip of leaf is called as major axis.
10. **MINOR AXIS** – The maximum width, which is perpendicular to the major axis, is called as minor axis of the leaf.
11. **COMPLEXITY** – It is given as the ratio of the square root of the perimeter and the area of leaf. It is derived as  $\sqrt{P / A}$ .
12. **COMPACTNESS** – It is given as the ratio of area of leaf to the square root of the perimeter. It is derived as  $A / \sqrt{P}$ .

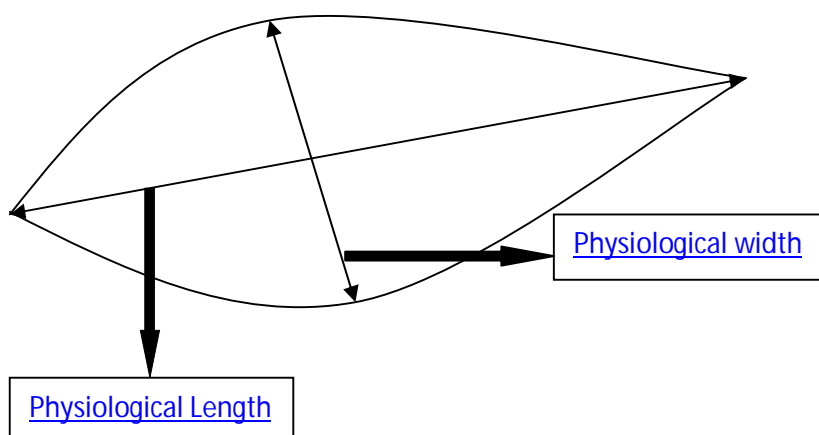
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13. **ASPECT RATIO** – It is defined as the ratio of the physiological width ( $W_p$ ) to the physiological length ( $L_p$ ). It is derived as  $L_p/W_p$ .



The above figure is the representation of a leaf which show the edges and describe the physiological length and physiological width. It will help in the calculation of aspect ratio, one of the feature of leaf edge detection process.

#### IV. CONCLUSION

Plants play an important role in ecosystem, without plants there will be no existence of ecology of the earth. This work proposed a comparison of supervised classification of plants leaves. Where we use different representation using feature extracted from binary masks of these leaves “The fine scale margin feature histogram, by a centroid counter distance curved shape, signature and by an interior texture feature histogram.”

We make difference to the leaves by its margin better than its shape or texture. The more we combine features of the leaves the more optimized difference will be obtained between the sample of leaves. It is also discovered that margin representation can affect the result more than the shape and size of leaves. There are wide varieties of medical herbs and plants are found in our country, which are been vanishing from the nature day by day. So by this these species of plants are identified and also be preserved by the creation of leaf databases for leaf present in the ecology of nature.

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