

Neem Leaf Aspect Ratio Measurement Using Image Processing Technique

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Abstract-In India, Neem is known as “the village pharmacy” because of its healing versatility, and it has been used in Ayurvedic medicine due to its medicinal properties. In Ayurveda, Neem leaves are used in various types of diseases like skin disease, neuromuscular pains etc. This paper presents simple and computationally good method to find the aspect ratio of the Neem leaf using image processing technique. Image is acquired using digital camera and stored in JPEG format. The leaf image and converts it into binary image. Then we do thresholding of the image. After thresholding we find out the length and width as well as the aspect ratio of the leaf.

Keywords-Image processing, digital photograph, Neem leaf, aspect ratio.

I. INTRODUCTION

The Neem tree (*Azadirachta indica* A.Juss.) is a tropical evergreen tree (deciduous in drier areas) native to Indian sub-continent . It has been used in Ayurvedic medicine for more than 4000 years due to its medicinal properties.

Neem is called ‘arista’ in Sanskrit a word that means ‘perfect, complete and imperishable’. Most of the plant parts such as fruits, seeds, leaves, bark and roots contain compounds with proven antiseptic, antiviral, antipyretic, anti-inflammatory, antiulcer and antifungal uses.[1]The people of India have long revered the neem tree; for centuries, millions have cleaned their teeth with neem twigs, smiered skin disorders with neem-leaf juice, taken neem tea as a tonic, and placed neem leaves in their beds, books, grainbins, cupboard and closets to keep away troublesome bugs.[2]

We extract basic geometric features as leaf length and leaf width. The leaf length is defined as the longest distance between the centroid and the two ends on the margin of the leaf on opposite sides of the centroid. The leaf width is defined as the distance between the intersection point with the centroid and its opposite side on the margin of the leaf. [3]

Canny edge detection algorithm is one of the most strictly defined methods that provide good and reliable detection of images. It is a fundamental step in image processing, it is necessary to point out the true edges to get the best results from the matching process. That is why it is important to choose edge detectors that fit best to the application. Here we used chose canny edge detector. Canny edge detection algorithm is also known as the optimal edge detector. The canny edge detector first smoothes the image to eliminate noise. It then finds the image gradient to highlight regions with high spatial derivatives.[7][8]

In grid counting method first the leaf is removed from plant and placed on a graph paper. Outlines of the leaf are drawn by pencil on graph paper. Finally leaf length and width is measured by counting the number grids covered by leaf. This method is accurate but laborious and time consuming when applied on large number of leaves.[6]

In the current research, image processing is used for extracting shape features from digital leaf image. Software has also been developed to find out leaf length and width and also to determine the aspect ratio.[4] The results were compared with the results obtained from grid counting method.

II. MATERIAL AND METHODOLOGY

A. Materials

Cannon make 16 Megapixel digital camera, PC, white paper sheet for background, Matlab, images of leaf arranged by numbers.

B. Methodology

Figure 1 shows the flowchart of the steps involved in the leaf aspect ratio measurement. Images of the plant leaf are acquired using digital camera. All the images are stored in JPEG format. Then select different images and calculate the aspect ratio.

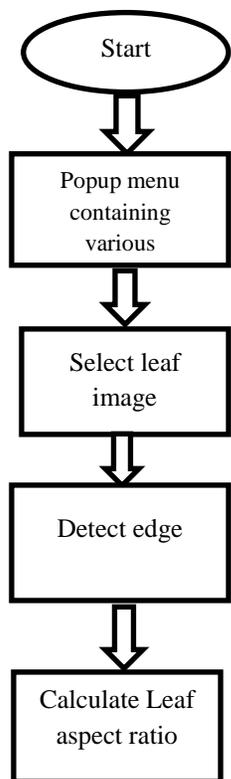


Figure 1 shows the flowchart of the steps involved in the leaf aspect ratio measurement using image processing.

1. Graphical Method

Leaf, whose Aspect ratio to be measured was placed on the graph paper; havingsmallest grid size of 1 mm. Leaf is outlined with a pencil accurately and carefully on the graphpaper. Calculate the length and width of the Out-Lined image. The no of grid count corresponds to the Actual length and width of the leaf.

2. Image Processing Method

The technique is based on Matlab image processing, it is a semi-automatic method to calculate the leaf aspect ratio and for more users this will be easy way to find out the aspect ratio of a leaf. The code is written in Matlab version 7.12.0.635

2.1 Photograph acquisition

The leaf, whose aspect ratio to be measured was placed on the white background. The camera was held horizontally to the planeof the leaf. The photograph distance is neither too close nor too far.The photograph is taken in such a way that the image is covered only the background that is white.

Images were 200 by 200 pixels so that it can take less processing time and clarity retention of input images. The RGB image of the Neem leaf is shown in fig.2



Figure 2 shows that the RGB image of the Neem leaf

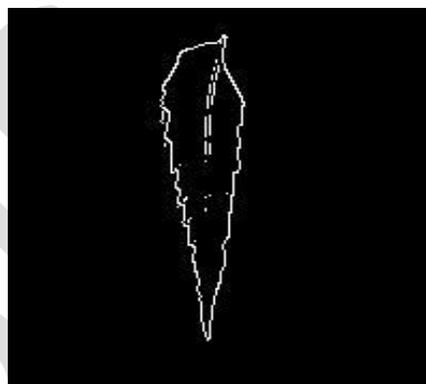


Figure 3 image of the leaf after Thresholding

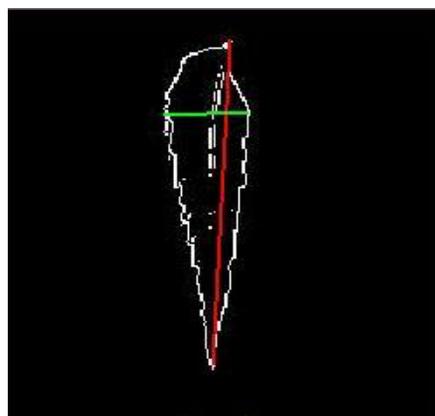


Figure 4 image after getting the leaf length and width

2.2 Aspect ratio calculation

Aspect ratio of the leaf is the ratio between the maximum length to its maximum width.First we count the number of

pixel present in the length and width of the leaf. It can be calculated from the following equation.

$$A_r = M_l / M_w$$

Where A_r is the aspect ratio, M_l is the maximum length, M_w is the maximum width.

2.3 Determination of relative error

Relative error can be calculated by the following equation.

$$E_r = (C_m - G_m) / G_m$$

Where E_r is the relative error C_m is the aspect ratio using computerized method, G_m is the aspect ratio using grid count method. Grid count method is accurate measurement to find the actual value.

III. RESULTS AND DISCUSSION

Mature leaves are collected from different Neem trees. To find the actual length and width of the leaf, placed the leaf in the graph paper calculate the length and width by counting the grid. After grid counting the image of the leaf is taken and using image Processing we can find out the pixel value of the leaf length and width. The experiment is carried out in eight different samples of Neem leaf and compare the results. The results are as given in table 1.

Table 1 show that Comparison of results measured by computerized method and grid count method.

Leaf sample	aspect ratio using computerized method (C_m)	aspect ratio using grid count method (G_m)	Error $E_r = (C_m - G_m) / G_m$
1	4.07	3.75	0.086
2	3.59	3.23	0.11
3	3.47	3.28	0.057
4	4.23	3.83	0.10
5	3.62	3.28	0.10
6	3.89	3.66	0.06
7	4.18	3.83	0.09
8	4.07	3.69	0.10

IV. CONCLUSIONS

Leaf aspect ratio is an important part for the identification of the leaf. Grid count methods are generally used to find the aspect ratio but these methods are time taking when we count large number of leaves.

Here we used image processing techniques to find the leaf aspect ratio. Images are collected in JPEG format. Image processing methods also have accuracy and also it takes less processing time. Images can be processed at any time, for that image are stored in PC.

After using image processing on the stored leaf image we can find the pixel value of length and width. This result is compared with the measurement of grid count method. Experiment is carried out in eight matured Neem leaf from different trees. In future this component will be necessary to calculate aspect ratio of the leaf to identify the different medicinal plant.

ACKNOWLEDGEMENT

The authors sincerely like to thanks and greatest gratitude and reverence to respected guide Dr. Prodipto Das for his excellence guidance, help, suggestions and encouragement.

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