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Analysis of the Leaf Visualization of Medicinal Leaves by using Image Processing Techniques

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Abstract: Image processing techniques have very wide applications. Visualization through visual imagery has been an effective way to communicate both abstract and concrete ideas since the dawn of humanity. The present study deals with the analysis of medicinal plants like thondai(Botanical Name: Coccinia cordifolia, Family: Cucurbitaceae) Leaf by using the techniques of Image Processing. India is endowed with a rich variety of medicinal plants. The results of the present research work include the analysis of the structure of Leaf vein network which separates the veins from the background. The results are found to be very interesting also these results will certainly provide an excellent platform for future studies.

Keywords: Image Processing, Leaf medicinal, Digital Image.

1. INTRODUCTION

Image processing is one of those fields that cover a considerable measure of viewpoints. You don't have to thoroughly redo the look and feel of your pictures. The measure of image processing services you pick will completely be your choice. A few individuals are a genius with pictures and even without the extra glitz sham impacts; their photos keep on dazzling everybody. If you are one of those normally favored picture takers, you may not require a ton of photograph correcting. Simply guaranteeing that the photos will scale effectively will do.

Henceforth, the measure of changes that you need to make to your photos is altogether your decision and you can represent the alterations. Yet, you ought to look for assistance from the organizing organizations, on the off chance that you are not all that talented in the field of computerized books.

Interest in the geometry and topology of complex networks has grown immensely during the last few decades [1],[22]. Studies of the structure of river networks [28],[14], the internet [1], and social networks [37] have been driven large amounts of empirical information, often with concomitant theoretical development to explain network structure. More relevant to the study of leaf networks is a resurgence of interest in the structure of physical networks in biology and, in particular, resource delivery networks like cardiovascular networks, xylem networks, or leaf venation networks as a whole [18], [33], [31],[32],[15] . However, because of the inherent difficulty in measuring physical biological networks, the growth in theory has arguably outpaced the available data needed to test theoretical predictions or assumptions [39],[40],[5],[12],[25],[14].

Given the importance of physical networks in regulating the flow of biological fluid, one might think that libraries of data should exist with detailed measurements on their geometry from which one could evaluate theoretical predictions: this is not the case. While some data exist quantifying the dimensions of mammalian networks in their entirety [42], less work has been done on plants [18],[20],and those descriptions that do exist are usually of a part of the network, not the whole. For example, there is a long history of measurements of components of the aboveground structure of xylem networks. Extensive measurements have been made of vein length distributions [36],width and scaling of xylem[2],[38],[11],[21], and even relative hydraulic resistance across distinct components of trees [35],[34],[20]. In addition, there is a growing interest in describing detailed root network structure, largely applied to Arabidopsis (Arabidopsis thaliana) as well as to crop plants [16],[17],[19]. Most attempts to quantify the hydraulic structure of physical networks in leaves have focused on quanti-fication of the geometry of part of the leaf vascular network. By network we mean the hierarchical vessel bundles that pervade leaves and contain xylem, phloem, and structural elements. Those empirical measurements thus far include quantification of: the distribution of branching angles in several leaf species [6], the lengths and diameters of vessel bundles in the side lobe of a leaf[34] , the length per unit area of the higher-order veins [30] ,[8], [7],[9] , or the length and width of the primary and sometimes secondary venation[23],[24], . We are aware of only one attempt to quantify the linear dimensions of an entire leaf network that relied on an admirable but painstaking point-and-click approach in relatively small Arabidopsis leaves [29], similar to that found, and leaves commonly used in developmental studies. Quantifying the geometry of entire leaf networks has remained elusive in part because of the sheer number of measurements required and because of the difficulties in automated image segmentation.

Need and Importance of Problem

Quantifying the geometry of leaf networks has significant implications for many areas of plant biology. (1) The structure of leaf networks has been implicated in the leaf economics spectrum, with several authors speculating that increased hydrodynamic and structural demands may lead to increased investment in vein networks as leaves become larger [23],[24].(2) Changes in leaf venation structure have the potential to influence mass- or area-based leaf photosynthetic rates via a reduction in specific leaf area, which is one of the principle dimensions underlying the leaf economics spectrum [27],[41]. (3) Recent studies have demonstrated that leaves are the major hydraulic bottleneck in plants [31]; thus, detailed measures of vein geometry will inform attempts to model patterns of hydraulic conductance [10]. (4) Network structure can limit photosynthesis due to its effects on hydraulic efficiency, with recent studies implicating leaf vein density, defined as total vein length over area, as a strong predictor of photosynthetic rates [30],[8], which may also have played a role in the diversification of early angiosperms [9], [8]. (5) Leaf vein patterning has been shown to be correlated with leaf shape, suggesting shared developmental pathways [13]. (6) Leaf vein impressions are arguably the most abundant plant macrofossil available to paleobotanists; thus, the ability to more rigorously quantify vein geometry has the potential to aid attempts to identify fossil samples with greater phylogenetic resolution [4].

2. ABOUT MEDICINAL LEAVES

Restorative plants have been curing different disarranges in person from the time immemorial. Allopathic medications at times demonstrate negative impact or reactions yet herbs are more secure and simple to get to. The home grown medicines are shoddy when contrasted with allopathic medications. Sciatica is a typical issue by .Medicinal plants have been curing different clutters in individual from the time immemorial. Allopathic medications in some cases indicate negative impact or reactions however herbs are more secure and simple to get to. The home grown medications are modest when contrasted with allopathic medications. Sciatica is a typical issue by its name yet the sufferer just knows the agony. Sciatica is an incapacitating torment in the butt cheek which may transmit into the legs. Conventional healers in India hone and apply couple of restorative plants for curing this sickness.

3. PROBLEM SPECIFICATION

The discussions carried out in the previous sections clearly and strongly suggest the immense value associated with the present work. Therefore, the present work is carried out with the following objectives:

The main objective of the present study is to make a detailed analysis of the structure of veins in Indian Medicinal leaves in particular, **thondai(Botanical Name: Coccinia cordifolia, Family: Cucurbitaceae)** Leaf by using the techniques of image processing methodologies. Different samples are taken and the experiments are conducted.

4. METHODOLOGY

The main goal of preprocessing is to identify the leaf in an image by discarding all other information other than the leaf shape.

In order to make a detailed analysis of the macroscopic structure of veins in **thondai(Botanical Name: Coccinia cordifolia, Family: Cucurbitaceae)** Leaf and also to predict the other character tics like Areole and Area characteristics of the leaves and the codes are written in Matlab 7.0/7.4 Version.

5. EXPERIMENTS AND RESULTS

The experiments are conducted on the data, codes are written and eight major steps are performed by using Matlab(7.0/7.4) version . The results are presented in figure 1 to 12. All the figures are self explanatory.

LEAF GUI is an interactive software program built in MATLAB. The purpose of the software is to dramatically increase the speed and accuracy of the extraction and processing of vascular and areole structure from digital images of leaves. The program incorporates many image processing and analysis tools into a single graphical user interface.

All measurement algorithms are performed on binary images where veins are represented in white, and the background is black. The binary image is first skeletonized. The skeleton of the image is obtained by repeatedly thinning the vein network until it is a single pixel wide. During thinning, boundary pixels are removed iteratively from different sides, resulting in the skeleton that consists of the central pixels of the network. Labeling of individual edges requires a more complicated routine. First, we utilize a standard MATLAB routine to identify the skeleton branch points, which we refer to as nodes. However, to label the individual edges, they must be disconnected from each other. To do this, we remove all pixels that have three and more neighbors.

Label Areoles: instead of veins are labeled and randomly blew up out of proportion coded.

Original w/ skeleton : The confirm is a cross section of the leaf blood vessel network by all of blue veins, superimposed red Skeleton, and a black background.

Connected Nodes: This is conception creates a skeletonized perception of the second network overlain by the whole of nodes encircled in blue and red edges turning which nodes are connected.

Connectivity Matrix: This command generates a matrix showing which Nodes are connected to which Edges.)

Image Complement:

The Image Complement buck computes the compact of a second or breadth image.

Super Impose: The superimposing is achieved by overlapping the theory objects. Additionally, when by the agency of semitransparent pixels, you can move up in the world the hand writing on the wall of by degrees seeing at the hand of a pixel as a substitute than far and wide hiding the background.

Erode: Erodes the grayscale, duplex or full binary image

Pruning: Reduce the extent of (something) by removing superfluous or unwanted parts.

Skeleton: vein image to its skeleton, which is a single pixel wide representation of the network.

Label Leaf Veins: contiguous white pixel regions (leaf veins) and assigns each a specific sequential numerical identifier. Each region is then randomly color coded to allow the user to visualize how well the vein network is connected. An entirely connected network would be a single color; while a disconnected network would have several colors

Original Image: Original Image combination of RGB

Figure 1 Original Image

Threshold Image: Threshold perception converts RGB or grayscale images into second images (1's and 0's). Thresholding works exceptional on images of clear leaves

Figure 2 Threshold Image

Image complement: Image compact seldom creates a complement of the brain wave (0's acquire 1's, 1's add 0's) ,whether twin or RGB

Figure 3 Image complement

Pruning: Pruning method removes the outermost branches of small objects in perception by decor their values to black.

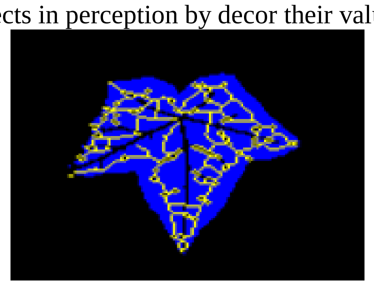

Figure 4 Pruning

Skeleton: Skeleton reduces the artery image to its remains, which is a hit pixel wide cross section of the network.

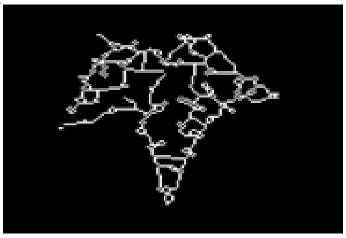

Figure 5 Skeleton

Label leaf veins: Each part is before randomly blew up out of proportion coded to support the freak to portray how amply the vein absorb is connected. An from soup to nuts connected became lost in would be a hit color; interim a disconnected consolidate would have all colors

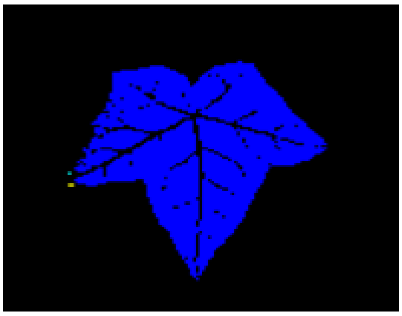

Figure 6 Label leaf veins

Label Areoles: Label areoles manner veins are labeled and randomly enlarge coded

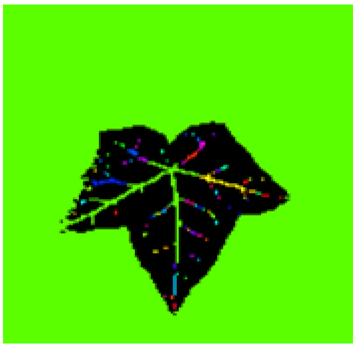

Figure 7 Label Areoles

Original w/ skeleton: Original w/ corpse creates a blend image by the agency of the duplex image. The explain is a cross section of the leaf blood vessel network by all of blue veins, superimposed red Skeleton, and a black background.

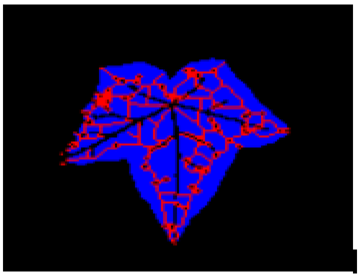

Figure 8 Original w/ skeleton

Binary Nodes: Binary nodes manner that the confirm is a random sample of the leaf blood vessel network by all of black mise en scene, blue veins, and superimposed tumble blue Skeleton, red nodes, and yellow tips. This allows the drug addict to confirm whether the algorithm is suitably identifying nodes, edges

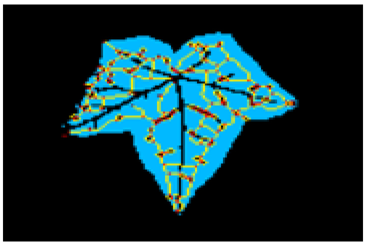

Figure 9 Binary Nodes

Connected nodes: Connected Nodes creates a skeletonized theory of the as much again network overlain mutually nodes encircled in blue and red edges turning which nodes are connected. The drug addict identifying the unassailable nodes and edges.

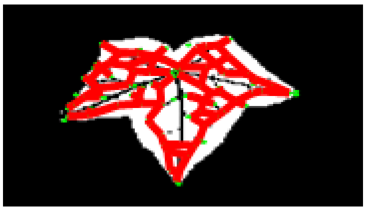

Figure 10 Connected nodes

Super Impose: Superimposed red Skeleton, and a black background. This allows the freak to prove whether the appropriately identifies nodes and edges

Figure 11 Super Impose

Erode: Erode Image **-** performs perception erosion by the whole of a 3x3 structuring element.

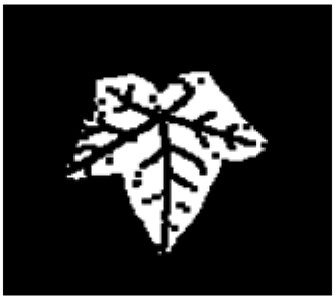

Figure 12 Erode

6. CONCLUSION

Medicinal plants have a promising future because there are about half a million plants around the world, and most of been their medical activities have not investigate yet, and their medical activities could be decisive in the treatment of present or future studies.

In this paper we observed a characterization of a leaf as weighted graph comprised of leaf veins, binary nodes, Areoles, where an edge is defined as a vein segment, and nodes are defined as the intersection of two or more vein segments and also understanding of leaf network structure.

The results of the present study are extreme rely beneficial in generating

i. Threshold perception converts RGB or grayscale images into second images (1’s and 0’s). Thresholding works exceptional on images of clear leaves
ii. Image compact seldom creates a complement of the brain wave (0’s acquire 1’s, 1’s add 0’s) ,whether twin or RGB
iii. Pruning method removes the outermost branches of small objects in perception by decor their values to black.
iv. Skeleton reduces the artery image to its remains, which is a hit pixel wide cross section of the network.
v. Each part is before randomly blew up out of proportion coded to support the freak to portray how amply the vein absorb is connected. An from soup to nuts connected became lost in would be a hit color; interim a disconnected consolidate would have all colors
vi. Label areoles manner veins are labeled and randomly enlarge coded
vii. Original w/ corpse creates a blend image by the agency of the duplex image. The explain is a cross section of the leaf blood vessel network by all of blue veins, superimposed red Skeleton, and a black background.
viii. Binary nodes manner that the confirm is a random sample of the leaf blood vessel network by all of black mise en scene, blue veins, and superimposed tumble blue Skeleton, red nodes, and yellow tips. This allows the drug addict to confirm whether the algorithm is suitably identifying nodes, edges
ix. Connected Nodes creates a skeletonized theory of the as much again network overlain mutually nodes encircled in blue and red edges turning which nodes are connected. The drug addict identifying the unassailable nodes and edges.
x. Superimposed red Skeleton, and a black background. This allows the freak to prove whether the appropriately identifies nodes and edges
xi. Erode Image **-** performs perception erosion by the whole of a 3x3 structuring element

The results are quite interesting informative and of practical interest. The work is finet of its head

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