

## Microscopic Image Analysis for Plant Tissue Using Image Processing Technique

Prof. Satange D. N. \*, Ms. Pasarkar Anagha A , Ms. Chauhan Priyanka D,

\* Asstt. Professor, Dept of Computer Sci,  
Arts Commerce & Science College, Amravati  
[dineshnsatange@rediffmail.com](mailto:dineshnsatange@rediffmail.com)

Post Graduate Student, Dept of Computer Sci,  
Arts, Commerce & Science College, Amravati.  
[anaghapas@gmail.com](mailto:anaghapas@gmail.com)

*Abstract-In this paper we analyze some microscopic images of plant tissue (xylem) using image processing technique. We capture the image with the help of Compound Laboratory Microscope. A compound laboratory microscope (CLM) is an advanced piece of lab equipment that utilizes light to create magnified images of specimens that are then projected onto an imaging mechanism. The deformation of plant tissue obtained at the scale of the two principal failure mechanisms: Cell breakage & cell separation. Different fundamental algorithm of image processing is implemented like edge linking and boundary detection of plant cells, image enhancement ,segmentation ,noise removal, morphological operation. A segmentation based problem to count number of white & black nano particles approximately in microscopic image*

**Keywords:** Compound Laboratory Microscope, Image Enhancement, Noise Removal, Image Segmentation.

### I. INTRODUCTION

In this we analyze some microscopic images of plant tissue (xylem vessels) using image processing technique. We capture the image with the help of Compound Laboratory Microscope. A compound laboratory microscope (CLM) is an advanced piece of lab equipment that utilizes light to create magnified images of specimens that are then projected onto an imaging mechanism. The term "compound" refers to the combination of lenses on the microscope that cause the magnification of objects. The digital camera is attached to compound laboratory microscope to store the image in to the computer. The environment scanning electron microscope provides a relevant & controllable environment. The deformation of plant tissue obtained at the scale of the two

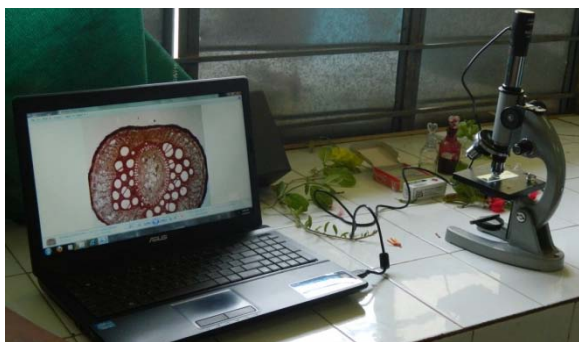
principal failure mechanisms: Cell breakage and cell separation.

In this paper we use some image processing techniques for enhancing and identify the each tissue accurately Image enhancement is one of the basic requirements for making image useful for statistical analysis. Different fundamental algorithm of image segmentation is implemented like edge linking and boundary detection of plant cells. A segmentation based problem to count number of white & black nano particles approximately in a microscopic image. [2]

### II. IMAGE SENSING & ACQUISITION

We capture some microscopic images of plant tissue (xylem vessels) using Compound laboratory microscope. A compound laboratory microscope (CLM) is an advanced piece of lab

equipment that utilizes light to create magnified images of specimens that are then projected onto an imaging mechanism. The term "compound" refers to the combination of lenses on the microscope that cause the magnification of objects. The digital eyepiece camera MDCE -5c USB 2.0 is attached to compound laboratory microscope to store the image into the computer.



**Figure 1: Plant tissue image capture using camera eyepiece microscope**

### III. IMAGE ENHANCEMENT

The principal objective of image enhancement is to process a given image so that the result is more suitable than the original image for a specific application. It accentuates or sharpens image features such as edges, boundaries, or contrast to make a graphic display more helpful for display and analysis. [1]

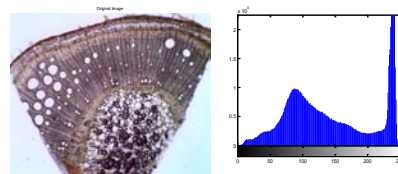
#### a) Types of Transformation Functions

There are three basic types of functions (transformations) that are used frequently image enhancement. They are

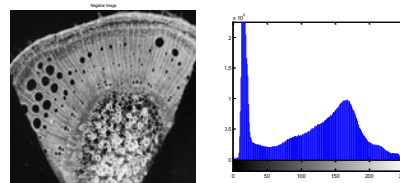
- photographic negative
- logarithmic transformations  $c * \log ( 1 + f )$
- Gamma transformation.

#### 1. Negative Transformation

Negatives of digital images are useful in numerous applications, such as displaying medical images and photographing a screen. The negative of an image with intensity levels in the range  $[0, L-1]$  is obtained by using the negative transformation.



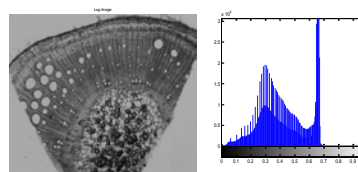
**Figure 2: Original image and its histogram**



**Figure 3: Negative image and its histogram**

#### 2. Log Transformations

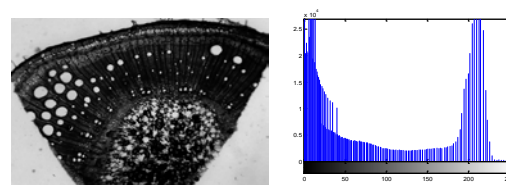
We use a transformation of this type to expand the values of dark pixels while compressing the higher-level values. The opposite is true of the inverse log transformation. It compresses the dynamic range of images with large variations in pixel values.



**Figure 4: Log image and its histogram**

#### 3. Gamma Transformations

This transformation function is also called as gamma correction. For various values of different levels of enhancements can be obtained. This technique is quite commonly called as Gamma Correction. , every monitor has built-in gamma correction in it with certain gamma ranges and so a good monitor automatically corrects all the images displayed on it for the best contrast to give user the best experience.



**Figure 5: Gamma=3 and its histogram**

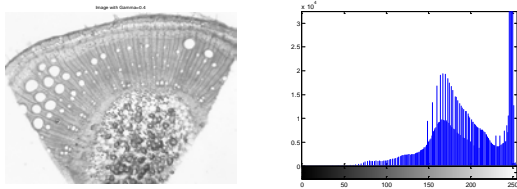


Figure 6: Gamma =0.4 and its histogram

#### IV. NOISE REMOVAL

The exact definition of noise is to remove unwanted disturbances. Noise is the result of errors in the image acquisition process that result in pixel values that do not reflect the true intensities of the real scene. Gaussian noise is statistical noise that has its probability density function equal to that of the normal distribution, which is also known as the Gaussian distribution. A special case is white Gaussian noise, in which the values at any pair of times are identically distributed and independent.

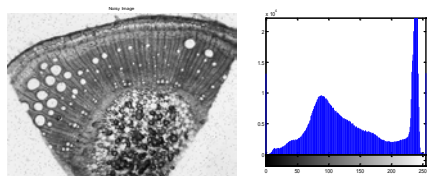


Figure 7: Noisy image and its histogram

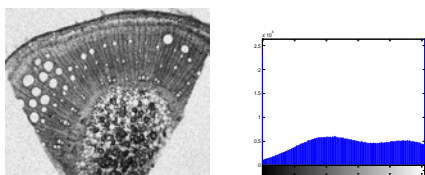


Figure 8: Gaussian image and its histogram

#### V. SEGMENTATION

Segmentation subdivides an image into constituent regions or objects. Most of the segmentation algorithms are based on the basic property of intensity values: discontinuity & similarity. In the first category, the approach is to be partition an image based on abrupt changes in intensity such as edges. The principal approaches in second category are based on partitioning an image in to regions that are similar according to set of predefined criteria.

##### A.Marker Controller Watershed Segmentation.

The watershed transform finds "catchment basins" and "watershed ridge lines" in an image by treating it as a surface where light pixels are high and dark pixels are low. Segmentation using the watershed transform works better if you can identify, or "mark," foreground objects and background locations.[1]

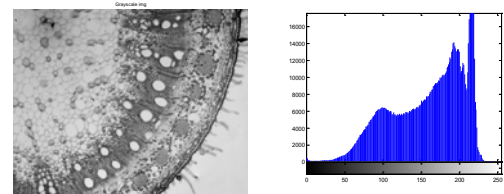


Figure 9: Grayscale image and its histogram

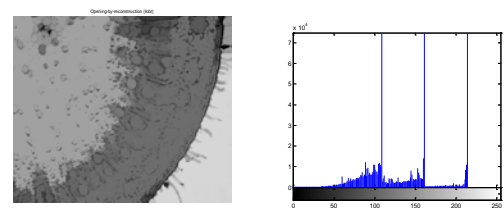


Figure 10: Opening by reconstruction and its histogram

One visualization technique is to superimpose the foreground markers, background markers, and segmented object boundaries on the original image. You can use dilation as needed to make certain aspects, such as the object boundaries, more visible. Object boundaries are located where  $L == 0$ .

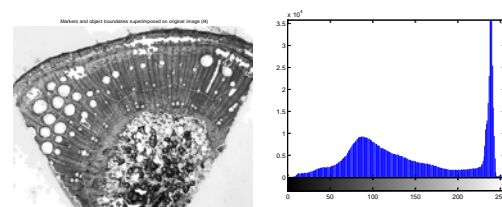


Figure 11: boundary image and its histogram

##### B. Texture Segmentation on Texture Filter

Texture segmentation is the identification of regions based on their texture. Your goal is to segment two kinds of fabric in an image using texture filters. The segmented objects in the binary image BW1 are white. If you compare BW1 to I, you notice the top texture is overly segmented (multiple white objects) and the bottom texture is segmented almost in its entirety.

You can extract the bottom texture using bwareaopen.

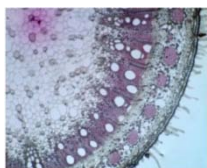


Figure 12: Original image

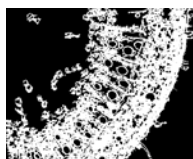


Figure 13: bwareopen image



Figure 14: rough mask image

## VI. MORPHOLOGICAL IMAGE PROCESSING

The word morphology commonly denotes a branch of biology that deals with the form and structure of animals and plants. We use the same word here in the context of mathematical morphology as a tool of extracting image components that are useful in the representation and description of region shape such as boundaries, skeletons etc. There are some morphological techniques such as filtering, thinning and pruning. In morphology there are two fundamental operations are dilation and erosion. Dilation allows object to expand, thus potentially filling small holes and connecting disjoint objects. Erosion shrinks object by etching away there boundary. Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries. In the morphological dilation and erosion operations, the state of any given pixel in the output image is determined by applying a rule to the corresponding pixel and its neighbors in the input image. Following Morphological Operation are

### 1) Top-hat transformation

You can use top-hat filtering to correct u even illumination when the background is dark.



Figure 15: Original image

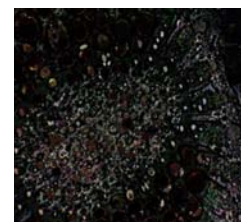


Figure 16: top-hat image

### 2) Erosion

Erosion operation performs binary dilation; otherwise it performs grayscale erosion. Imerode performs multiple erosions of the input image, using each structuring element in SE in succession.

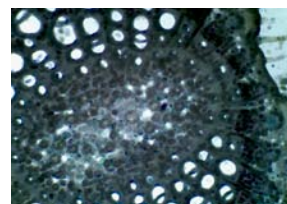


Figure 17: Erode image

### 3) Dilation

Dilation operation performs binary dilation, otherwise it perform grayscale.

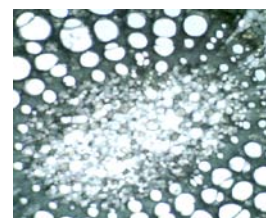


Figure18: Dilated image

### 4) Opening

Opening operation performs morphological opening on the grayscale or binary image IM with the structuring element (SE) . The morphological open operation is erosion followed by dilation, using the same structuring element for both operations.

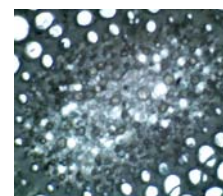


Figure 19: imopen image

### 5) Closing

The morphological close operation is a dilation followed by erosion, using the same structuring element for both operations.

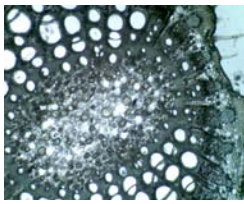


Figure 20: imclose image

### VIII. CONCLUSION

In this paper, three transformation functions are used i.e. negative, log, gamma transformation. In these log images zones of different tissues becomes conspicuous. In this grayscale image & negative image does not play any significant role in biological analysis because it removes the original stain absorb by tissue. It can also provide the original images which have clear edges the good segmentation results. We are able to count number of white nano particles. The total area covered by the white nano particles cannot be calculated exactly as we have distorted their boundaries to separate from each other.

### REFERENCES

- [1] Digital Image Processing Using Matlab Second Edition, Rafael C. Gonzalez.
- [2] Image Enhancement and Analysis of Microscopic Images Using various Processing Techniques \* Ms. Shivani Gupta \*\*Mr. Satyajit Sen Purkayastha M.Tech student Deptt. of Electronics and Comm., IET Bhaddal) ( Asstt. Professor, Deptt. of Electronics and Comm., IET Bhaddal).
- [3]<http://www.mathworks.com/access/helpdesk/help/toolbox>.