

## Counting and Measuring Branch Points on Tree Like Structures

### Abstract

The following procedure can be used to count the number of branch points on tree like structures using the Discovery-1 software.

### Instructions

1. Start with the best image possible.
2. Binarize the image using the Threshold or Binarize commands (Process menu).
3. Skeletonize the binary image (Binary dialog, Process menu).
4. Get rid of single pixels using Remove Single Pixels (Binary dialog, Process menu).
5. Get rid of uninteresting objects by setting object classification in Integrated Morphometry Analysis (Measure menu), measure objects, then binarize the "measured image" using the journal function to create object mask.
6. If you have many short branches that you do not want to count, erode the image enough times to remove the branches (Binary dialog, Process menu).
7. Convert the image to an 8 bit image with a maximum gray value of 28 using Arithmetic and dividing by 9 (Note: Binary images have a gray value of 255 when converted into 8 bit) (Process menu).
8. Process the image using the Sharpen function with Medium filter (Process menu).
9. Pixels at the end points of branches will now have a gray value of 224.
10. Set the minimum gray value threshold for the image to 224 so that only the end points are red.
11. Count the number of end points by counting the number of pixels within the thresholded area (Show Region Statistics, Measure menu).

**Document ID**  
D10198

**Product**  
Discovery-1 software  
version 5.0

**Created**  
16-Jun-1998

**Last Reviewed**  
14-Jul-2003

**Keywords:** discovery-1 software techniques v5  
**Issue Type:** analysistools