

Planar Filament Sholl Analysis XTension

Description: This XTension implements a Planar modification of typically spherical Sholl Analysis. It determines the Sholl intersections for a user-defined number of intervals and interval spacing.

This analysis is meant to qualitatively characterize the density of numerous neurons/dendrites/astrocytes as a function of user-defined depth/intervals.

This XTension generates a new Spots group for each interval and will place a spot object on the filament segments exactly at its intersection with the Sholl interval allowing for numerical (you can see the number of spots) and visual determination of dendrite/astrocyte density at each Sholl plane.

This analysis works for 2D and 3D (planar and volumetric) datasets. For optimum results, the datasets should have a distinguishable starting surface (similar to the figures below).

Analysis works for multiple filament objects, and will distinguish them by their own Filament ID.

The Imaris version used to develop this code is 9.3.1

NOTES: Actual Sholl planes are not visible in this XTension, only the intersections (But they should be easy to infer).

If the user does not define an oblique slicer beforehand the script will not work.

If the user does not create 3 measurement points on the oblique slicer surface the script will not work.

Creating less/more than 3 measurement points may cause the script to work improperly.

How it works: The User must first create an Oblique Slicer (available in the Surpass menu) and then create exactly 3 measurement points on that surface (ensure no other measurement points exist or the script may not function properly). The oblique slicer should be parallel (as possible, brains are not cubes) to the surface from which the measurements are desired to be taken from. The script creates a virtual plane from the 3 measurement points on the surface and calculates the intersections of each subsequent plane with the filaments. The number of planes, as well as the plane-plane spacing is defined by the user via a prompt. A Spot will be placed on each filament where there is a Sholl intersection.

How it compares to Sholl analysis in Imaris Filament: The results between the 2 methods is quite different and is meant for a single Filament with MANY dendrites/astrocytes which may not always be distinguishable. The rules in the XTension are not identical to those in Imaris itself.

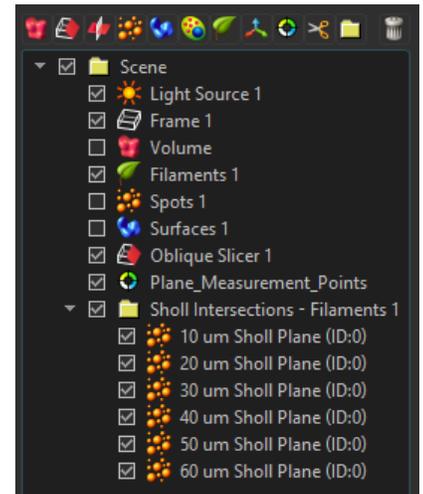


Figure 1: Suprass Screen snapshot after implementing the XTension Analysis.

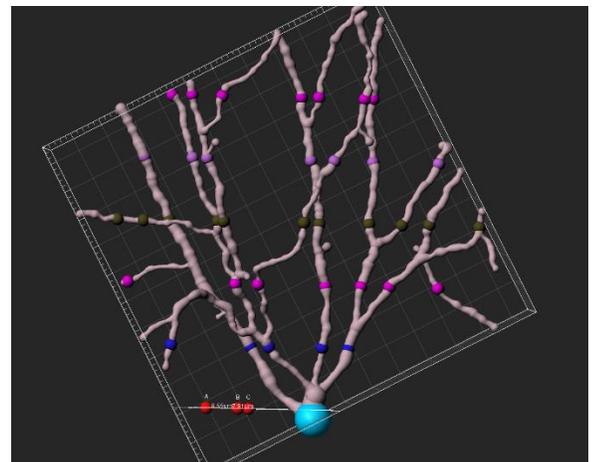


Figure 2: XTension Analysis on the Imaris sample pyramid file. Defined Oblique Slicer is at the bottom with the 3 Measurement Points on the surface of the slicer.