Drishti Paint

Drishti Paint allows users to manually segment and generate surface mesh for regions from the volume. To facilitate the segmentation process, Drishti Paint currently provides 2 sets of 2D tools – Curves, Graph Cut – along with direct painting in 3D. The **?** button brings up help for the currently selected 2D toolset - Curves/Graph Cut.

The label information is stored to the .mask.sc file in a compressed format (using blosc compression).

Surface meshes generated from Drishti Paint are watertight, suitable for further analysis as well as 3D printing. Mesh smoothing and hole filling facility is also available.

To start segmenting volume, load the processed volume in the program. Drag-and-drop processed volume files (.pvl.nc) to load them in Drishti Paint. Users can also use "Load" option to do that. Then using the segmentation tools start segmenting/labelling the data.

In both the 2D modes - Curves/Graph Cut - Axial/Sagittal/Coronal views are shown in the three panels along with the 3D view of the data.

Navigation between different slices
Use arrow keys/mouse wheel or the slider bar on the left to move between slices.
Up/Down arrows to move to next/previous slice.
Mouse wheel to move to next/previous slice.

Label number selection and label colour change
Select label number from the "Label" box in the left panel.
Select label number by clicking on label color patch in the "Label Color Editor" accessed via the "View" menu at the top.
Double click the tag color patch in the "Label Color Editor" to change the label color.

Image Size

Use the O, Fit, + and - buttons for change the image size.
O : Original image size.
Fit : Fit image size to the window size.
+ : Increase image size.
- : Decrease image size.

File Menu

Export Mask to Raw

The mask(tags/labels) information is stored in .mask.sc file in compressed format. This information can be exported to .raw file using Export Mask to Raw option. The label volume is exported to raw format. The file has a 13-byte header (first byte specifies voxel type- 0 in this

case, next 3 integers specify grid size). This exported file can be imported via Drishti Import as RAW file.

Import Mask from Raw

The label information can be imported from a .raw file using Import Mask from Raw option. The label volume to be imported should be in raw format. The file must have a 13-byte header (first byte specifies voxel type- 0 in this case, next 3 integers specify grid size). Existing label volume is overwritten with this option. Use checkpointing if one doesn't want to lose the existing label information.

Extract Tagged Region

Extract regions from the original processed volume (from .pvl.nc file) that are labelled.

User will be asked to specify the label numbers to extract - (-1 for all labelled region, 0 for non-labelled region and other positive numbers separated by space to extract region labelled with that specific number; for e.g. 1 3 6 will extract regions labelled with 1, 2 and 6 respectively.).

Once the labels are decided, users will asked further options to narrow down the regions to be saved to file. The options are as follows:

Tag Only – Extract for the labelled regions specified by the label values in the earlier dialog. Voxel values outside this region are set to the user specified value which will be asked for.

Tag + Transfer Function - Use the opacity of the transfer function within the labelled regions specified by the label values in the earlier dialog and save only the non-zero voxels. Thus, the labelled region and transfer function together limit what voxels are extracted. Voxel values outside this region are set to the user specified value which will be asked for.

Mesh Tagged Region

Generate surface mesh for labelled as well as unlabelled regions.

The surface mesh can be smoothed and holes filled - respective dialog options will pop up before mesh generation starts.

User will be asked to specify the label numbers to extract:
-2 to ignore all labels and mesh region only based on visibility (transfer functions and visible labels) into a single mesh
-1 to mesh for all labelled region into a single mesh.
0 to mesh only non-labelled region. Observe that mesh generated from 0 and -2 will be different.
Positive numbers separated by space to extract region labelled with that specific number; for e.g. 1 2 6 will extract regions labelled with 1, 2 and 6 respectively. Each label will be saved to a different mesh.

When -2 is selected, users will be asked about the coloring of the resulting mesh. The options are as follows:
Transfer Function - Color the mesh using colors from the transfer functions.

User Color - Apply user defined color - a color selection dialog will pop up.

When the selected labels are not -2, users will be asked further options to narrow down and color the regions to be meshed. The options are as follows:

Tag Color - Mesh the labelled regions specified by the label values in the earlier dialog. The color of the mesh is governed by the label colors.

Transfer Function - Mesh the labelled regions specified by the label values in the earlier dialog. The color of the mesh is governed by the transfer functions.

Tag + Transfer Function - Mesh the labelled regions specified by the label values in the earlier dialog. The color of the mesh is a mix of label color and transfer functions.

The above three options generate the same mesh, the only difference is color.

Tag Mask + Transfer Function - Use the opacity of the transfer function within the labelled regions specified by the label values in the earlier dialog and mesh only the non-zero voxels. Thus, the labelled region and transfer function together limit the region to mesh. The color of the mesh will be user defined color - a color selection dialog will pop up.

Save Work

Save the label information to .mask.sc and .curves files. All the work that the user does stays in memory. This option is to prevent loss of work in the case program crashes in midst of a process.

Saving the work (or checkpointing) frequently is recommended.

Checkpoints

Users can also checkpoint their work using checkpoint functionality available under Functions menu. Checkpoints can be saved, loaded and deleted as needed. Checkpoints save label(tag) volume.

Checkpoint option saves the label volume to .checkpoint file in compressed format (blosc compression). Each checkpoint has a name associated with it, that is supplied by the user.

Load Checkpoint restores the selected label volume. User selects the name of the checkpoint to restore. The restored checkpoint tags are not automatically stored to .mask file. The user can choose to **Save Work** to commit to .mask.sc file.

Delete Checkpoint deletes the selected checkpointed volume.

3D Viewer

The 3D viewer gives an overview of what the user has labelled.

3D Preview panel

Update	Update the view with label/tag information. This might be needed when the label information does not update automatically after labelling operations in GraphCut mode.
Near Neighbour	Switch for interpolation used during 3D rendering of the volume. When switched off, a linear interpolation of voxel data is performed before rendering. This results in better looking image, but due to interpolation may not give accurate result.
Paint Radius **Paint Depth**	Size of the influence volume during 3D paint operations.
Connected Only	When switched on, influence only the region connected to the voxel under the mouse cursor. When switched off, all the region inside the Paint Radius and Depth is affected – even those that are not connected to the voxel under the mouse cursor.
Edges **Shadows**	Affects the look of the 3D rendered image.
Remove Top Layers **Voxels**	Skip the given number of layers or voxels during 3D rendering of the volume. This may be useful to reach inner layers of the data.
Stepsize	Used for 3D rendering of the volume.
Sketch Pad	Use the sketch pad to draw a closed curve and apply tagging operation. Press ESC to erase a drawn curve. Press **t** to tag the region enclosed by the drawn curve. Everything inside the closed curve that is visible is labelled with the currently selected tag value.
Box	Show enclosing box for the volume data.
Position	Show the current position of the cursor in 3D and 2D slices.
Snapshot	Save image from the 3D display.

Commands that can be issued in 3D viewer (Press spacebar to bring up the command panel).

tagsused	List the tags that are in use.
crop	Adds a crop tool to 3D scene. The effects of the crop tool can be seen in 3D viewer window as well as the 2D slice panels.
reload	Reload tags from the mask file.
reset	reset <tag> Set all voxels in the region to tag1. Default value for tag is 0. Crop/Clipping planes are obeyed - clipped region is not considered.
merge	merge <tag1> <tag2> Merge tag2 into tag1 when two parameters are specified. Replace tag2 with tag1 in the selected subvolume. If tag2 value is -1, then all the tags (even 0) are replaced with tag1 within the selected subvolume. Crop/Clipping planes are obeyed - clipped region is not considered.
mergetf	mergetf <tag1> <tag2> Similar to merge, except the operation is carried out only within the visible portion of the selected subvolume. Visible portion is that region where opacity is greater than 0 as defined by transfer functions and visible tags. Crop/Clipping planes are obeyed - clipped region is not considered.
tubes	tubes <tag> Tag tube-like and sheet-like structures in visible region. Visible portion is that region where opacity is greater than 0 as defined by transfer functions and visible tags. If <tag> is not specified then current tag value is used. Crop/Clipping planes are obeyed - clipped region is not considered.
dilate	dilate <tag> <size> Dilate the visible region with specified <tag> value into unlabelled region. The size of morphological dilation is given by <size > parameter. Note that this is different from **d/Shift+d** keypress operation, where only connected region under mouse is considered.

	Crop/Clipping planes are obeyed - clipped region is not considered.
erode	erode <tag> <size> Erode the visible region with specified <tag> value. The size of morphological erosion is given by <size > parameter. Note that this is different from **e** keypress operation, where only connected region under mouse is considered. Crop/Clipping planes are obeyed - clipped region is not considered.
smooth	Smooth <tag> <filterWidth> Gaussian smoothing of the visible region with specified <tag> value and <filterWidth>. This will result in smoothing of the edges in the tagged region. Crop/Clipping planes are obeyed - clipped region is not considered.
shrinkwrap	shrinkwrap <tag> Shrinkwrap and label the visible region with <tag>. Visible portion is that region where opacity is greater than 0 as defined by transfer functions and visible tags. If <tag> is not specified, then current tag value is used to label the region. Note that this operation is slightly different from **Shift+f** keypress operation, where only connected region under mouse is considered. Crop/Clipping planes are obeyed - clipped region is not considered.
shell	shell <tag> <thickness> Tag the boundary of shrinkwrapped visible region. The visible region is first identified by shrinkwrap and boundary of this region is tagged. The width of boundary is decided by the thickness value. Visible portion is that region where opacity is greater than 0 as defined by transfer functions and visible tags. If <tag> is not specified, then current tag value is used. If <width> is not specified, then default value of 1 is used. Crop/Clipping planes are obeyed - clipped region is not considered.
getvolume	getvolume <tag> Calculate the volume occupied by visible voxels marked with tag1. Default value for tag is -1 : consider all visible voxels.

	Crop/Clipping planes are obeyed - clipped region is not considered.
setvisible	setvisible <tag> Set visible region to tag. Visible portion is that region where opacity is greater than 0 as defined by transfer functions and visible tags. Crop/Clipping planes are obeyed - clipped region is not considered.
setinvisible	setinvisible <tag> Set invisible region to tag. Invisible portion is that region where opacity is equal to 0 as defined by transfer functions and hidden tags. Crop/Clipping planes are obeyed - clipped region is not considered.
modifyoriginalvolume	**THIS FUNCTION MODIFIES THE ORIGINAL VOXEL VALUES** **YOU MAY WANT TO KEEP A COPY OF THE ORIGINAL DATA** Modify original voxel values in the transparent region. Values for the voxels in the transparent region are set to the value specified by the user. A dialog box will pop up to ask for the substiture voxel value. Crop/Clipping planes are obeyed - clipped region is treated as transparent and will be modified.

Keyboard Interaction

Spacebar	Bring up command input dialog.
b	Toggle bounding box.
a	Toggle visibility of axes.
o	Switch camera to orthographic projection.
p	Switch camera to perspective projection.
c	Add clip plane.
v	Toggle visibility of clip planes and crop.
DEL	Hover over a clip plane to remove it.
?	Show/hide information text.

Esc	When in Sketch Pad mode - erase the any curve drawn on screen. When saving image sequence or a movie - stop the process.
f	Region growing with current tag value. Move the mouse over to the region you want to fill/region grow before pressing "f". Region that is connected to the voxel under the mouse cursor and that has either tag value 0 or current tag value will be filled. Clipping planes are obeyed - clipped region is not considered.
Shift+f	Shrinkwrap/create shell around the connected region under the mouse cursor with current tag value. Move the mouse over to the region you want to shrinkwrap/shell before pressing "Shift+f". You will be asked whether to shrinkwrap or shell the connected region. Next you will be asked the label of the connected region - meaning only the connected voxels having that specified label value will be considered for shrinkwrap/shell operation. Value of -1 means select all connected visible voxels. Any other value means only the voxels that are visible, connected and having specified label value will be considered. If you have chosen to create shell surrounding the connected region, a dialog box will pop up to ask for the thickness of the shell. Clipping planes are obeyed - clipped region is not considered.
h	Hatch (generate cross bars, useful for 3d printing) the connected region with current tag value. Move the mouse over to the region you want to hatch before pressing "f". Region that is connected to the voxel under the mouse cursor and that has either tag value 0 or current tag value will be hatched. You will be asked for interval and thickness values. Both the values are in terms of number of voxels and should be greater than 0. Also, thickness must be less than interval value. Clipping planes are obeyed - clipped region is not considered.
d	Dilate the current tag by "Dilate/Erode" parameter value (3D parameter panel) into connected unlabelled (i.e. 0 label) region. Move the mouse over to the region you want to dilate before pressing "d". Clipping planes are obeyed - clipped region is not considered.

Shift+d	Dilate the current tag by "Dilate/Erode" parameter value into all connected visible region (even if it is already labelled i.e. has non-zero label). Move the mouse over to the region you want to dilate before pressing "Shift+d". Clipping planes are obeyed - clipped region is not considered.
e	Erode the current tag by "Extent" parameter value. Move the mouse over to the region you want to erode before pressing "e".
t	When in Sketch Pad Mode - tag with current tag value all visible region under by the curve drawn in sketch pad.
m	Repeat last merge/mergetf operation using previously used tag parameters.

Mouse Interaction

Shift+Left Mouse	Paint current label value.
Shift+Right Mouse	Reset label value to 0.
Ctrl+Left Mouse	3D view only. Change position cross marker. Image slices in the respective orthogonal slice widget are updated.
Ctrl+Right Mouse	Change (pivot) center of rotation. When a visible point is found under the mouse position, the center of rotation is set to that point. When no visible point is found under the mouse position, the center of rotation is reset to the centre of the data box.

Curves Mode

The curves option allow users to mark regions using semi-automatic livewire method and hand drawn curves.

The livewire segmentation tool is based on Dijkstra's lowest cost path algorithm. The curve tries to follow high gradient ridges. The users set the starting point, clicking on the slice image pixel, known as an anchor. Then, as they starts to move the mouse over other points, the smallest cost path is drawn from the anchor to the pixel where the mouse is over, changing itself if the user moves the mouse. If they want to choose the path that is being displayed, they simply click the image again to set next anchor. The user can follow this process till the required region is selected. The anchor points can be added and removed from the livewire curve.

Users can also manually draw the curves, using the New Curve button (or pressing c).

Intermediate curves can be generated by interpolating from the user added set of curves. Two options for interpolation are given – (DT) using signed distance transform and (WM) using weighted means of strings method.

Bake Curves	Bake (write) the label information to mask volume. The 3D view is automatically updated to reflect the changes. Only the visible region inside the curves will be tagged with the selected label – a dialog will ask the user to specify the tag value. Use transfer functions, Min/Max Grad as well as visibility of untagged (i.e. 0) and tagged(labelled) regions to allow for a better control over what regions are getting affected during the baking process.
New Curve	Start a new curve. User can also press "c" to start a new curve on the slice in focus.
End Curve	End the curve. This button is shown only when drawing a curve.
RemoveAll	Remove all curves for the slice type (axial/sagital/coronal) in focus.

Curve Interpolation (Morphing)

Interpolate (DT)	Curve morphing using signed distance field. Works even when there are multiple curves in a slice. A signed distance field is generated for the successive pairs of start and end slices using the curves on those slices. This field is then interpolated using spline interpolation method and the curves at 0-boundary are returned as the interpolated curves for intermediate slices.

	This method does not work well when the curves are farther apart. In this case try the weighted means method - **Interpolate (WM)** method. If the interpolated curves are not to the user's satisfaction, these interpolated curves can be deleted by hovering over one of the curves and pressing Delete. User can choose to draw a new curves for inbetween slices to generate a better set of interpolated curves.
Interpolate (WM)	Curve morphing using weighted mean of strings. Works will for single curve per a slice. Curves are represented as sequence of symbols, and curve morphing is computed as a weighted mean of two strings. This method works well when start and end curves are farther apart (where the distance transform mehod fails). If the interpolated curves are not to the user's satisfaction, these interpolated curves can be deleted by hovering over one of the curves and pressing Delete. User can choose to draw a new curves for inbetween slices to generate a better set of interpolated curves.

Livewire

Livewire	Begin/end region selection using livewire tool. Livewire tool allows quick and accurate extraction of object/region using simple gesture motions with a mouse. The tool allows the user to interactively select an optimal boundary segment by immediately displaying the minimum cost path from the current cursor position to a previously specified anchor or seed point in the slice image. The transfer function and tag visibility is used to draw the slice image.
SliceLOD	This specifies the level of detail of the slice image used for livewire segmentation. Higher the value lower is the image quality - essentially the number is used as the stride through the data. So higher value results in lower resolution image. Sometimes when boundary of the region is too jagged, you might reduce the slice resolution and increase smoothing to get a smoother boundary. For large slice images too, one may choose a lower resolution slice.
Smoothing	This parameter specifies the smoothing to be applied to the slice image before livewire segmentation.
Gradient Type	There are two options - Central Difference and Sobel method. Sobel give smoother gradients compared to the central difference scheme.

Keyboard Interaction

c	Start a new curve.
ESC	Resets the livewire curve, when generating livewire curve.
d	Dilate curve under the cursor.
Shift+d	Dilate all the curves within the limits specified by the end markers for the current slice direction.
e	Erode curve under the cursor.
Shift+e	Erode all the curves within the limits specified by the end markers for the current slice direction.
Ctrl + c	Copy curve under the mouse cursor to the internal buffer. Interpolated curves cannot be coppied to the internal buffer.
Ctrl + v	Paste curve from the internal buffer.
s	Smooth curve under the mouse cursor.
Shift+s	Smooth all the curves within the limits specified by the end markers for the current slice direction.
g	Generate a shrinkwrapped curve. A shrinkwrap curve is a curve that wraps around the connected visible region of current slice. This current slice image (based on transfer function and visible tags) will determine the curve/s generated. If there are many isolated regions then multiple curves will be generated.
Shift+g	Generate shrinkwrap curves within the limits specified by the end markers for the current slice direction.
Del **Backspace**	When Del/Backspace is pressed while the cursor is over a curve, the curve is removed. If the curve is an interpolated curve, then all the interpolated curves are removed.

Mouse Interaction

Mouse Move	When generating livewire in livewire mode, moving mouse without any button pressed will update the livewire from last seed point to the current mouse position. When the user is happy with the current livewire, they can press left mouse button to create a seed point from with the next part of livewire can be formed.
Left Mouse Click	When in livewire mode, create a seed point.
Ctrl+Mouse Move	Update other slices to reflect the current mouse position. If mouse position display option is active (Position checkbox under 3D Preview panel) then a cross hair is shown to reflect the cursor position.
Middle Mouse Mrag	Move the entire curve under the cursor.

GraphCut Mode

Graph Cut option allows the user to divide the image into "object" and "background" regions using a graph cut approach. A graph is formed by connecting all pairs of neighboring image pixels by weighted edges. Users identify certains pixels as object or background by tagging them. These seeds provide clues about the image content. A standard min-cut/max flow algorithm is then used to expand the object seeds to identify the object region.

To seed the object pixels user first selects a tag value using "Tag" parameter box and then paints using Left mouse drag. Background seeds are painted using Shift+Left mouse drag, this will paint the region red with value 255. Pure black/transparent region is automatically considered part of the background.

Users can change the tag colors via "Tag Color Editor". Selecting the tag in the editor also changes the tag value in the "Tag" parameter box.

Copy Tags	When applying repeat tagging operation, copy the tags/labels from previous slice and use it as a guess for the next slice. Only the current tag/label values are copied from the previous slice. The copied region will be eroded by **Shrink** parameter.
Smoothness	This parameter is used for smoothing, dilation and erosion operations.
Lambda	Lambda parameter controls the tightness of curvature object region as defined by the graph cut algorithm. It is used internally to increase/decrease the average gradient magnitude.
BoxSize	For the graph cut method, the average gradient magnitude is calculated over the region of size BoxSize.
Shrink	This parameter is used when copying tag/label from previous slice (region is eroded by Shrink value) to be used as seeds for tagging operation for the next slice.

Mouse Interaction

Left Mouse	Mark pixels with current tag for object selection.
Shift+Left Mouse	Mark pixels red with value 255 for background selection. Pure black/transparent region is automatically treated as background.
Shift+Right Mouse	Display voxel coordinate, voxel value and tag value.
Ctrl+Mouse move	Change slice positions in other slice windows. Image slices in the respective orthogonal slice widget are updated. Position cross marker if enabled in 3D view gets updated.

Alt+Left Mouse	Define bounding box.
Left Mouse Double Click	Reset bounding box.

Keyboard Interaction

ESC	When repeat operation is in progress, pressing ESC will stop the operation. When repeat operation is not in progress, pressing ESC will clear user painted region. This will not reset/clear the already assigned voxel tags. In order to clear voxel tags only in certain areas you will need to paint over the required region with tag 255.
t	Tag regions using graphcut method with currently selected tag.
Shift + t	Repeat tagging operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
p	Paint regions. In order to set voxel tag to 0, paint using Shift+Left mouse button
Shift + p	Repeat paint operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
r	Reset voxel tag to 0 only for selected region having current tag value.
Shift + r	Repeat reset operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + Shift + r	Reset voxel tag to 0 for selected region, no matter what the current tag value is. Repeat reset operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
d	Dilate boundary of region tagged with current tag. Amount of dilation is decided by the Smoothness parameter.
Shift + d	Repeat dilation operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + d	Apply dilation over selected subvolume.
o	Open boundary of region tagged with current tag. Erosion followed by Dilation.
Shift + o	Repeat open operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + o	Apply open over selected subvolume.

c	Close boundary of region tagged with current tag. Dilation followed by Erosion.
Shift + c	Repeat close operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + c	Apply close over selected subvolume.
e	Erode boundary of region tagged with current tag. Amount of erosion is decided by the Smoothness parameter.
Shift + e	Repeat erosion operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + e	Apply erosion over selected subvolume.
f	Fill interior of region tagged with current tag number. This only works when the tagged region is hollow.
Shift + f	Repeat interior fill operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + f	Shrinkwrap/shell the connected region for the voxel under the mouse cursor. A similar function is available within the 3D Viewer.
s	Smooth boundary of region tagged with current tag. Amount of smoothing is decided by the Smoothness parameter.
Shift + s	Repeat smoothing operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.
Ctrl + s	Apply smoothing over selected subvolume.
v	This function is slightly different from f/Shift+f operation. v/Shift+v operates on visible region, whereas f/Shift+f operate on tagged region. Fill interior of visible region with current tag number.
Shift + v	Repeat interior fill operation over multiple slices within the user specified slice limits. Press Escape to stop the repeat operation.

Meshing

Mesh Tagged Region available under **File** menu.

Generate adaptivity mesh from the labels/segmentation data.

Save surface mesh to PLY/OBJ/STL formats.

A colored mesh is saved when PLY option is chosen.

A binary visibility volume is first prepared using tag and voxel opacities, which then is used to generate the surface mesh. This visibility volume has 1 for those voxels that have non-zero opacity and 0 otherwise. Smoothing can be applied to this volume resulting is smoother surface mesh. An isosurface value of 0.5 is default, lower values result in dilated surface, whereas higher values result in eroded surface.

Users can generate water-tight surface mesh using voxel values.

Surfaces are suitable for 3D printing.

Morphological operators - dilate/erode/close/open can be applied.

isosurface value	In order to generate the surface mesh, first a binary visibility volume is created from given information about tag opacity/transfer function etc. Smoothing can be applied to this volume - smooth data parameter defines the degree of smoothing. An isosurface is then generated from this volume. Lower isosurface values - closer to 0.0 - result in dilated surface, whereas higher values in an eroded surface. Default value is 0.5
adaptivity	The adaptivity threshold determines how closely the isosurface is matched by the resulting mesh. Higher thresholds will allow more variation in polygon size, using fewer polygons to express the surface. Adaptivity values range between 0.0 and 1.0. Default value is 0.1
downsample	Downsample the volume before isosurface mesh generation. Default value is 1 - no downsampling.
mesh smoothing	Smooth mesh using Taubin smoothing after isosurface mesh has been generated. Default value is 0 - no smoothing is applied.
smooth data	Smooth the visibility volume before isosurface mesh generation.

	Default value is 0 - no smoothing is applied.
apply voxel size	Multiply mesh coordinates by voxel size.
morpho operator	From the dropdown list select the morphological operator to apply. **Close** is typically used for closing holes. **Open** is typically used to remove smaller objects.
morpho radius	Select the neighbourhood radius for applying morphological operator. When the radius is 0, morphological operator is not applied.