

Mouse grab for all widgets (clipplanes/crops/paths/.....) is switched off when project is first loaded and when playing keyframes. Toggle mouse grab with g or toggle via Toggle menu.

## Clip planes

Primary role of clip planes is for clipping volumes against a plane. Clipping by individual clip planes can be turned off via the bricks editor. Users can also use these for displaying captions in 3D or paste images and animated-gifs. Pasting image onto clip plane may help users when registering data from different modalities. Pasted images may also be used for conveying more information about the data. For example, users will be able to include photographs of real object into animations. Clip planes can be animated via keyframe editor.

Mouse grab for crop/dissect/blend/displace/networks/paths/clipplanes is switched off when project is first loaded and when playing keyframes. Toggle mouse grab with g or toggle via Toggle menu.

Add a clip plane by pressing "c" (or from Functions->3D Widgets menu). Clip plane is always added in the center of the volume.

Clip plane can also be added when 3 points are specified. Press spacebar to bring up command dialog and enter "clip" to add a clip plane passing through those 3 points. The points will be removed when the clip plane is added.

When the mouse is on either of the red/green/blue axis, left mouse drag can be used for rotation and right for translation. When mouse is on one of red/green axis, then ctrl+right mouse drag can be used for scaling the clip plane in the respective direction.

Users can issue single key commands while hovering over a clip plane.

Clip planes can also be manipulated using keyboard shortcuts.

Clip planes can be textured with transfer functions using "tfset" option. This facility allows for viewing of slices along any orientation.

Users can undo/redon changes made to the clip planes.

Viewport functionality adds a camera at clipplane position. Viewing direction is along the clip normal. Near and far cutting planes is controlled by the thickness parameter. Users can press spacebar while in viewport window to bring up the clip plane dialog.

### Keyboard Interaction

<b>DEL</b>	Delete currently active clipplane.
<b>Spacebar</b>	Opens dialog for the widget.
<b>v</b>	Hide widget
<b>x/y/z</b>	Restrict translation/rotation for clip plane along/about red/green/blue-axis respectively.

<b>f</b>	Toggle image flipping on the clip plane. Might be useful when using image on the clip plane for registration purposes.
<b>o</b>	Toggle application of opacity parameter. Works only when pasting captions or images on the clipplane.
<b>Up/Down</b>	Move widget in the currently selected axis direction.
<b>Shift + Up/Down</b>	Move in larger steps.
<b>Left/Right</b>	Rotate widget 1 degree about the currently selected axis.
<b>Shift + Left/Right</b>	Rotate widget 10 degrees about the currently selected axis.

Description of some options in the Property Pane -

<b>thickness</b>	Specify the slab thickness when displaying volume rendered image in the viewport
<b>tfset</b>	Texture the clip plane with the transfer functions from the specified transfer function set. Value of -1 will switch off the texturing on the clip plane.
<b>color</b>	Change the color of the clip plane. User will be shown color selection dialog.
<b>viewport</b>	<p>Viewport places a camera at clip plane position. The view direction of the camera is along the clip normal. When the transfer function is set for clip plane using "tfset" parameter, the viewport will be visible. Viewport is specified by three parameters - x,y,wd and ht. x,y specify the lower left corner of the viewport; wd and ht specify the width and height of viewport. The x,y,wd and ht all are normalized values and should be between 0.0 and 1.0. This is done so that viewport scales with the size of rendering window.</p> <p>When only 3 values are provided height is set to equal width. When only 2 values are provided width and height are set to 0.5. When less than 2 values are supplied the viewport is disabled.</p> <p>Viewport is active only when clip planes are textured (i.e. tfset parameter is between 0 and max TFsets). Viewport renders view from the camera placed at the clip plane position - based on thickness parameter you either get a single slice or a volume rendered slab.</p> <p>Viewport is switched off by removing all the viewport parameters</p> <p>The viewport is aligned with the red-green axes of the clip plane. Rotating these axes rotates the image in the viewport.</p>

	<p>Users can interact with a clipplane from its viewport. Left mouse click and keypress commands can be issued to clipplane via its viewport. Following is the mouse and keystrokes that are recognized from viewport :</p> <p>-----</p> <p>Mouse</p> <p>-----</p> <p>Left Mouse click - add point.  Left Mouse drag - rotate about red/green axis.  Ctrl/(Command for Mac) + Left Mouse drag - rotate about blue axis.</p> <p>Middle Mouse drag - scale image in viewport.  Right Mouse drag - translate along red/green axis.  Ctrl/Command + Right Mouse drag - translate along blue axis.</p> <p>Mouse wheel - move plane up/down along the plane normal.  Ctrl/Command + Mouse wheel - move plane up/down in a large step along the plane normal.</p> <p>Shift + Mouse wheel - increase/decrease thickness of slab in viewport.</p> <p>-----</p> <p>-----</p> <p>KeyPress</p> <p>-----</p> <p>DEL - delete viewport - set viewport parameters to (-1,-1,-1)</p> <p>Up/Down key - move plane up/down along the plane normal.  Shift + Up/Down key - move plane up/down in a large step along the plane normal.</p> <p>Left/Right key - rotate plane 1 degree about the normal.  Shift + Left/Right key - rotate plane 10 degrees about the normal.</p> <p>X/Ctrl+X key - rotate plane 1 degree about the Red(X) axis.  Shift + X/Ctrl+X key - rotate plane 10 degrees about the Red(X) axis.</p> <p>Y/Ctrl+Y key - rotate plane 1 degree about the Green(X) axis.  Shift + Y/Ctrl+Y key - rotate plane 10 degrees about the Green(X) axis.</p> <p>-----</p> <p>Example :</p> <p>viewport 0 0 0.5 : show the textured plane in the lower left corner at half the width and height of the rendering window.</p> <p>viewport 0 0.5 0.5 : viewport is set in the upper left corner at half width and height of the rendering window.</p>
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Description of commands that can be issued for clipping planes.

<b>mop clip</b>	<p>Apply clipping operations to the mask buffer. This will set the clipped voxels in the mask to 0. The clip plane can now be removed.</p> <p><b>**</b> The clipped voxels are restored with next mask buffer update (which is triggered among others by transfer function changes).</p>
<b>reorientcamera</b>	<p>Reorient camera with respect to the clip plane. The camera will reorient such that the viewer is looking down the normal to clip plane and the green and orange axes of the clip plane align with the vertical and horizontal axes of the screen plane.</p>
<b>grid</b>	<p>grid no grid [nx] [ny] Draw grid on the clip plane. Default value of nx and ny is 10 - i.e. draw a 10x10 grid on the clip plane.</p> <p>"grid no" will remove display of grid from the clip plane.</p>
<b>savesliceimage</b>	<p>savesliceimage savesliceimage step</p> <p>Save grayscale image for the cutface defined by the clip plane. The dimensions for the clipplane are given by the scale parameter. step parameter can be used to reduce the dimensions of the slice image, while still covering the same area.</p> <p>Example : savesliceimage 2 : save a quarter sized image.</p>
<b>reslice</b>	<p>reslice reslice [subsample] [tag]</p> <p><b>**</b> When thickness is 0, this option gives cross sectional area of visible region in viewport. Users can also save the cross sectional image used for calculating the area.</p> <p>Save resliced volume as defined by the clip plane. The selected subvolume is resliced along the normal direction. The extent and thickness parameter of the clip plane defines the extend of the volume saved. The viewport needs to be active in order to save the volume using this option. The transfer function set used for viewport governs the voxels saved. Users can save value or opacity using this option.</p> <p>The amount of subsampling is governed by the parameter subsample. Default value is 1 - i.e. take every voxel.</p> <p>The tag parameter controls the tagged voxels that are saved. Default value is -1 - i.e. save all voxels whether they are tagged or not.</p> <p><b>***</b></p>

	<p>When thickness parameter is 0, cross sectional area will be calculated for the region visible in viewport. For cross sectional area, only opacity is considered, not value - all non-zero opacity voxel lying in the clip plane will be added up to give cross sectional area.</p> <p>Users can save the cross sectional image that was used to calculate the cross sectional area. ***</p> <p>Example : reslice 2 : save with factor of 2 reduction, save all voxels. reslice 2 0 : save with factor of 2 reduction, save only voxels that are tagged 0. reslice 2 1 : save with factor of 2 reduction, save only voxels that are tagged 1.</p>
<b>solidcolor</b>	<p>solidcolor [no]</p> <p>Set solidcolor option - shows the clip plane as a solid plane, instead of outline.</p>
<b>image</b>	<p>image [no]</p> <p>Load image to be pasted on the clip plane. A file dialog will pop-up for image file name. Animated-gifs can be loaded and animated via keyframe editor by changing imageframe number. Users can change images on the clip plane at keyframes.</p> <p>Users can show either images or captions on a clipplane, but not both at the same time.</p> <p>Toggling visibility has not effect on images. Images will always be displayed.</p> <p>"image no" will remove image (if any) pasted on the clip plane.</p>
<b>caption</b>	<p>caption [no]</p> <p>Used for displaying text captions on the clip plane. Captions dialog will pop-up where users can enter text and select color for the caption. The text or colour can be changed for different keyframes.</p> <p>Opacity parameter of the clip plane will affect the opacity of the captions.</p> <p>Users can show either images or captions on a clipplane, but not both at the same time.</p> <p>Toggling visibility has no effect on captions. Captions will always be displayed.</p> <p>"caption no" will remove caption (if any) pasted on the clip plane.</p>
<b>imageframe</b>	<p>imageframe n</p> <p>Specify imageframe number n for animated-gifs. First image frame number is 0. Specify different frame numbers at different keyframes using keyframe editor for animations.</p>
<b>scale</b>	<p>scale s</p>

	<p>scale sx sy Apply scaling parameter s or individually sx and sy to the clip plane. This specifies absolute size for the clip plane.</p> <p>Example : scale 200 250</p> <p>This proves useful when saving slice image or pasting image on a clip plane for registration purposes. Only one of scale or vscale is active at a time.</p>
<b>vscale</b>	<p>vscale s vscale sx sy</p> <p>Apply scaling parameter s or individually sx and sy to the clip plane.</p> <p>Normally clipplanes are shown such that they do not appear too large or too small. The clipplane size changes relative to the volumetric data size.</p> <p>Only one of scale or vscale is active at a time.</p>
<b>opacity</b>	<p>opacity op</p> <p>Apply opacity "op" to the clip plane. The opacity parameter must be between 0 (transparent) and 1 (opaque).</p>
<b>translate</b>	<p>translate x y z Translate to the x,y,z position.</p> <p>Example : translate 200 250 200</p>
<b>translatex</b>	<p>translatex x Translate to the x,0,0 position.</p> <p>Example : translutex 200</p>
<b>translatey</b>	<p>translatey y Translate to the 0,y,0 position.</p>
<b>translatez</b>	<p>translatez z Translate to the 0,0,z position.</p>
<b>move</b>	<p>move x y z Move from the current position by x,y,z units.</p> <p>Example : move 50 20 20</p>
<b>movex</b>	<p>movex x Move from the current position by x,0,0 units.</p>

	Example : movex 50
<b>movey</b>	movey y Move from the current position by 0,y,0 units.
<b>movez</b>	movez z Move from the current position by 0,0,z units.
<b>rotate</b>	rotate x y z a Rotate by a degrees about the axis defined by vector x,y,z. The vector x,y,z is internally normalized.  Example : rotate 0.1 1.0 0.5 40
<b>rotatex</b>	rotatex a Rotate by a degrees about X-axis.  Example : rotatex 30
<b>rotatey</b>	rotatey a Rotate by a degrees about Y-axis.
<b>rotatez</b>	rotatez a Rotate by a degrees about Z-axis
<b>addrotation</b>	addrotation x y z a Rotate by a degrees about the axis defined by vector x,y,z from its current orientation. The vector x,y,z is internally normalized.  Example : addrotation 0.1 1.0 0.5 40
<b>addrotationx</b>	addrotationx a Rotate by a degrees about X-axis from its current orientation.  Example : addrotationx 30
<b>addrotationy</b>	addrotationy a Rotate by a degrees about Y-axis from its current orientation.
<b>addrotationz</b>	addrotationz a Rotate by a degrees about Z-axis from its current orientation.
<b>rotatescreenx</b>	rotatescreenx a Rotate by a degrees about horizontal screen axis from its current orientation.  Example : rotatescreenx 30
<b>rotatescreeny</b>	rotatescreeny a

	Rotate by a degrees about vertical screen axis from its current orientation.
<b>rotatescreenz</b>	rotatescreenz a Rotate by a degrees about axis perpendicular to screen from its current orientation.
<b>movea</b>	movea val Move along orange axis.
<b>moveb</b>	moveb val Move along green axis.
<b>movec</b>	movec val Move along blue axis.
<b>rotate[a b c]</b>	rotate[a b c] angle Rotate about orange/green/blue axis by "angle" degrees.  Example : rotatea 90 - rotate about orange axis by 90 degrees



## Crops/Blend/Glow/Dissect

Specify two points and use Command Dialog (press spacebar) (or from Functions->3D Widgets) menu) to add crop/blend/glow/dissect widget.

### Keyboard Interaction

<b>Spacebar</b>	Open dialog for the widget.
<b>x</b>	Red handle selected.
<b>y</b>	Green handle selected.
<b>z</b>	Blue handle selected.
<b>f</b>	Flip endpoints
<b>v</b>	Hide widget.
<b>DEL</b>	Delete the widget
<b>Up/Down</b>	Move widget in the currently selected handle direction.
<b>Shift + Up/Down</b>	Move in larger steps.
<b>Left/Right</b>	Rotate widget about the currently selected handle.
<b>Shift + Left/Right</b>	Rotate with larger angles.

### Mouse Interaction

Mouse right/middle button drag	Translate whole widget or either point depending upon where the drag started.
Mouse Ctrl + right/middle button drag	Change the size of the widget.
Mouse left drag	Rotate widget about selected axis.

Description of commands that can be issued.

<b>mop crop</b>	Apply crop operations to the mask buffer. This will set the crop voxels in the mask to 0. The crop widget can now be removed.
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	<p>** The cropped voxels are restored with next mask buffer update (which is triggered among others by transfer function changes)</p>
<b>point</b>	<p>point num x y z</p> <p>num can either be 0 or 1</p> <p>Example : point 0 220 320 100</p>
<b>radius</b>	<p>radius num rad radius rad</p> <p>If num is specified then s and t radius for that point is set to rad. If num is not specified then s and t radius for both the points is set to rad.</p>
<b>lift</b>	<p>lift num val lift val</p> <p>If num is specified then lift-value for that point is set to val. If num is not specified then lift-value for both the points is set to val.</p> <p>Lift is used to distort the selected region. "val" can be both positive as well as negative.</p> <p>Examples : lift 0 -20 lift 1 50 lift 30</p>
<b>normalize</b>	<p>Point coordinates are normalize i.e. coordinates are truncated.</p>
<b>rads</b>	<p>rads num rad rads rad</p> <p>Specify the size for red handle</p> <p>If num is specified then s (red-axis) radius for that point is set to rad. If num is not specified then s radius for both the points is set to rad.</p>
<b>radt</b>	<p>radt num rad radt rad</p> <p>Specify the size for green handle</p> <p>If num is specified then t (green-axis) radius for that point is set to rad. If num is not specified then t radius for both the points is set to rad.</p>
<b>angle</b>	<p>angle degrees</p> <p>Set angle of rotation about blue axis.</p>
<b>save</b>	<p>Save two end points to a text file.</p>

<b>moves</b>	<p>moves [-]</p> <p>Move the widget in the direction of S-axis (red).</p> <p>"moves -" will move the widget in the opposite direction of S-axis (red).</p>
<b>movet</b>	<p>movet [-]</p> <p>Move the widget in the direction of T-axis (green).</p> <p>"movet -" will move the widget in the opposite direction of T-axis (green).</p>

## Paths

Paths are created using path command from the points (or from Functions->3D Widgets menu). Paths can be created using all the points or the selected set of points. Path consists of atleast 2 points. Once a path is created points used for creating the path are removed. The path can be modified after it has been created - points can be added, moved and removed from the path.

Paths can be employed for cropping and blending transfer functions. Volumes can be cropped along a given path. Thick slices can also be viewed along a given path.

Users can add, load and save path data via command dialog.

Left click on the path curve will add a point and right click on a point will remove the point. Left mouse drag will move the selected point. Middle mouse drag will move the entire path.

Users can undo/redo changes made to the paths.

Viewport functionality adds a multiperspective camera. Viewing direction for the multiperspective camera is along the green axis. The up-vector for the camera is the red axis. Snapshot are taken along the path and are joined together to form a single cohesive image. Near and far cutting planes is controlled by the green axis length. Users can press spacebar while in viewport window to bring up the path dialog.

### Keyboard Interaction

<b>DEL</b>	Delete path. If the DEL is pressed when cursor is within the viewport then the viewport will be switched off.
<b>Spacebar</b>	Opens dialog for the widget.
<b>c</b>	Toggle connection of the two ends of path - making a closed or open path.
<b>Shift + t</b>	When no point on path is selected, bring up caption dialog. Caption is enabled. When caption is enabled, pressing t will render caption text instead of tube.  When a point of the path is pressed, change radius T of cross-sectional ellipse for tube.
<b>f</b>	Flip two ends of path. Useful when showing caption or image
<b>p</b>	Toggle display of path points as big dots on the path.
<b>n</b>	Toggle display of path points numbers.
<b>l</b> <b>Shift+l</b>	Toggle display of path length. Toggle display of caption beside the path or on the path.

	<p>When displaying caption beside the path, the caption text is always displayed at one end of the path. This end can be changed by changing the arrow direction (forward/backward).</p> <p>When displaying caption on the path, the caption text is displayed all along the path. The text is displayed only while in tube mode. The height of the text can be changed by "height" command. The angle of the text can be changed by "angle" command. The direction of the text can be changed by changing the arrow direction (forward/backward).</p>
<b>s</b> <b>s/Shift + s</b>	Only when a point of the path is pressed, change radius S of cross-sectional ellipse for tube.
<b>a</b> <b>a/Shift + a</b>	<p>If no point on the path is pressed, toggle display of angle between first 3 points.</p> <p>Only when a point of the path is pressed, change rotation angle (twist) of cross-sectional ellipse for tube.</p>
<b>x/y/z/w</b>	<p>Constrain movement of point in red/green/tangent directions.</p> <p>When moving the entire path with middle mouse button, x/y/z constrain movement along global x/y/z directions.</p> <p>Make it free in all directions with w.</p>
<b>Ctrl+z</b>	<p>Undo last position change.</p> <p>Users can perform unlimited undo.</p>
<b>Ctrl+y</b>	<p>Redo the last undone position change.</p> <p>Users can perform unlimited redo.</p>

Description of some options in the Property Pane –

<b>Color</b>	Path color.
<b>Opacity</b>	Transparency of the path.
<b>Smoothness</b>	<p>Controls spline interpolation for intermediate points.</p> <p>Value of 1 implies linear interpolation.</p>
<b>Sections</b>	Controls the number of facets when rendered as tube.
<b>Cap Style</b>	flat/round/arrow
<b>Arrow Direction</b>	forward/backward - when cap style is arrow.
<b>Arrows For All</b>	Applicable only when cap style is arrow.
<b>Arrow Length</b>	Controls length of arrows - when cap style is arrow.
<b>Display Angle</b>	Show angle between first 3 points of the path.

<b>Display Path Length</b>	Show length of the path besides the path.
<b>Text Color</b>	Path length text color.
<b>Length Text Distance</b>	Display length of the path at a distance in screen pixels away from path.
<b>Same For All</b>	Set radii and angles to be the same for all points on the path
<b>TFset</b>	Choose transfer function set when applying blending option.
<b>Use For</b>	Switch on crop/blend options
<b>KeepInside</b>	Flip the direction of crop/blend.
<b>Interpolate</b>	Interpolate this path between keyframes. Path points, radii and angle are interpolated only if the two paths at the keyframes have identical number of points.
<b>Viewport</b>	<p>Viewport functionality adds a multiperspective camera. Viewing direction for the multiperspective camera is along the green axis. The up-vector for the camera is the red axis. Snapshot are taken along the path and are joined together to form a single cohesive image. Near and far cutting planes is controlled by the green axis length. Users can press spacebar while in viewport window to bring up the path dialog.</p> <p>When the transfer function is set for the path using "viewport tfset" parameter, the viewport will be visible. Viewport is specified by three parameters - x,y,wd and ht. x,y specify the lower left corner of the viewport; wd and ht specify the width and height of viewport. The x,y,wd and ht all are normalized values and should be between 0.0 and 1.0. This is done so that viewport scales with the size of rendering window.</p> <p>When only 3 values are provided height is set to equal width.  When only 2 values are provided width is set to 1.0 and height is set to 0.5.  When less than 2 values are supplied the viewport is disabled.  For example –  0 0 0.5 0.5 – will show the viewport at lower left corner covering 1/4<sup>th</sup> of the display window.  0 0.5 1 0.5 – will cover the top half of the display window.</p> <p>Viewport is active only when "viewport tfset" parameter is between 0 and max TFsets. Viewport renders view from the camera placed at the multiple positions along the path - based on length of red axis you either get a single slice or a volume rendered slab.</p> <p>Viewport is switched off by removing all the viewport parameters</p>

	<p>Users can interact with a path from its viewport. Mouse and keypress commands can be issued to a path via its viewport. Following is the mouse and keystrokes that are recognized from viewport :</p> <p>-----</p> <p>Mouse</p> <p>-----</p> <p>Mouse click - show points at the top of the viewport.</p> <p>Left Mouse drag - When not under any point in viewport, the entire path is affected. When under a point only the point is affected. Left mouse horizontal drag - translate along path spine. Left mouse vertical drag - translate along green axis - i.e. depth.</p> <p>Shift+Left Mouse drag When not under any point in viewport, the entire path is affected. When under a point only the point is affected. This operation results in increasing/decreasing the length of red axis - i.e. height.</p> <p>Ctrl+Left Mouse drag - Same as Shift+Left Mouse drag (i.e. increasing/decreasing the height) but exaggerated.</p> <p>Alt+Left Mouse drag When not under any point in viewport, the entire path is affected. When under a point only the point is affected. This operation results in rotation about the path spine.</p> <p>Mouse wheel - When not under any point in viewport, the entire path is affected. When under a point only the point is affected. This operation results in translation along red axis - i.e. move along vertical direction.</p> <p>Ctrl + Mouse wheel - Same as Ctrl+Mouse wheel but exaggerated.</p> <p>Shift + Mouse wheel - When not under any point in viewport, the entire path is affected. When under a point only the point is affected. This operation results in increasing/decreasing thickness of slab in viewport.</p> <p>-----</p> <p>KeyPress</p> <p>DEL - delete viewport - set viewport parameters to (-1,-1,-1,-1)</p>
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Description of commands that can be issued.

<b>reslice</b>	reslice [subsample] [tag]
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	<p>Save resliced volume as defined by the path. The selected subvolume is resliced along the view direction as seen in the path viewport. The length of green axis defines depth, the length of path defines width and height of the volume saved is twice the length of red axis.</p> <p>The viewport needs to be active in order to save the volume using this option. The transfer function set used for viewport governs the voxels saved. Users can save value or opacity using this option.</p> <p>The amount of subsampling is governed by the parameter subsample. Default value is 1 - i.e. take every voxel.</p> <p>The tag parameter controls the tagged voxels that are saved. Default value is -1 - i.e. save all voxels whether they are tagged or not.</p> <p>Example :  reslice 2 : save with factor of 2 reduction, save all voxels.  reslice 2 0 : save with factor of 2 reduction, save only voxels that are tagged 0.  reslice 2 1 : save with factor of 2 reduction, save only voxels that are tagged 1.</p>
<b>reslicefull</b>	<p>reslicefull [subsample] [tag]</p> <p>Save resliced volume as defined by the path. The only difference between reslice and reslicefull is that in the case of reslicefull, the depth of the volume saved is twice the length of green axis. The depth and width are same as with reslice option.</p> <p>Example :  reslicefull 2 : save with factor of 2 reduction, save all voxels.  reslicefull 2 0 : save with factor of 2 reduction, save only voxels that are tagged 0.  reslicefull 2 1 : save with factor of 2 reduction, save only voxels that are tagged 1.</p>
<b>addcamerapath</b>	<p>Add a new animation keyframe for each point on path. Each keyframe will have camera pointing in the direction along the path. The keyframes are added 10 frames apart, these can then be moved in order to speedup or slow the animation.</p> <p>An example where this option of adding keyframes could be used is when one wants to follow a tubular structure. In this case rather than actually repositioning the camera at each point of interest, user can just create a path and make the camera follow this path by using "addcamerapath" command.</p>
<b>save</b>	Save path coordinates to file.
<b>normalize</b>	Convert coordinates for all points into integers.
<b>radius</b>	setradius/radius r



	Set radius for the cross-sectional circle to the given value r for all the points in the path - i.e. set radius S (red axis) and T (green axis) to be same.
<b>circle</b>	Rearrange points on the path so that they lie on a circle. Centroid of the original path will be taken as the center of the circle. Average distance of the points on the original path from the center will be the radius of the circle.
<b>resample</b>	resample [npoints] Path points are resampled so that they lie equidistant from their neighbours. npoints specify the number of resampled points. When not specified, the number of points of the path remain unchanged.
<b>planar</b>	Rearrange points on the path so that they lie on a plane.
<b>height</b>	height h Set height for the caption text or image texture.
<b>rads</b>	rads s rads pt s  rads s : Set radius S (red axis) for the cross-sectional ellipse to the given value s for all the points in the path. rads pt s : Set radius s for the point pt in the path.
<b>radt</b>	rad t rad pt t  rad t : Set radius T (green axis) for the cross-sectional ellipse to the given value t for all the points in the path. rad pt t : Set radius t for the point pt in the path.
<b>angle</b>	angle a angle pt a  angle a : Set rotation angle for the cross-sectional ellipse to the given value a for all the points in the path. This also affects the angle for caption and image. angle pt a : Set angle a for the point pt in the path.
<b>showprofile</b>	showprofile [v]  Get raw data values along the path. When raw file is not available data from .pvl.nc. files would be used. User is asked for a text file name to store these coordinates and values. User can choose not to save the values in a text file by pressing Cancel for the dialog for save file.  The values are shown as a profile curve. When only showprofile is used, raw data values are extracted for voxels on the path. When showprofile is used with an integer value v, this value is used for placing a cube of size

	<p>2*v+1 centered on each voxel on the path. Raw values are extracted for all voxels in the cube. The average, minimum and maximum values are found at each point on the path. Three profile curves are drawn - one for each average value, minimum value and maximum value.</p>
<b>showthicknessprofile</b>	<p>showthicknessprofile [0 1]</p> <p>Get thickness profile for a surface.</p> <p>The thickness is calculated for surface below the spine of the path. The thickness calculation starts at the nodal points on the path spine. Search starts from the nodal point in the direction of red axis of the path crosssection. See image on the left. The first point to have non-zero opacity is saved.</p> <p>If "showthicknessprofile" or "showthicknessprofile 0" is given then the search continues along the red axis to find the first point with zero opacity. The search terminates either when such a point is found or if the search reaches the end of red axis. The thickness of the surface is then given by distance between these two points. See image in the middle.</p> <p>If "showthicknessprofile 1" is specified then the search to find the second point start from the end of the red inwards - in the opposite direction. First point with non-zero opacity is located. The surface thickness is given by distance between these two points. See image on the right.</p> <p>Users can choose to save these points to a .path file. This text file lists the points at either end of the surface used for calculating the thickness. The file can be loaded or drag-and-dropped as pathgroup to display the thickness information. The parameters for pathgroup can be changed - they are a subset of path parameters.</p> <p>Users can use the smoothness parameter to include additional inbetween points for thickness calculation.</p> <p>The thickness values can be saved in a text file.</p>
<b>caption</b>	<p>caption [no] nocaption</p> <p>Bring up caption dialog. Caption is enabled. When caption is enabled, pressing "t" will render caption text instead of tube.</p> <p>"caption no"/nocaption will turn off caption for this path.</p>
<b>image</b>	<p>image [no] noimage</p> <p>Image texturing is enabled. User is asked for the image file name. When image is enabled, pressing "t" will render image texture instead of tube.</p> <p>"image no"/noimage will turn off image for this path.</p>

<b>moves</b>	<p>moves [-]</p> <p>Move the path in the direction of S-axis (red).</p> <p>"moves -" will move the path in the opposite direction of S-axis (red).</p>
<b>movet</b>	<p>movet [-]</p> <p>Move the path in the direction of T-axis (green).</p> <p>"movet -" will move the path in the opposite direction of T-axis (green).</p>
<b>mop patch</b>	<p>mop patch [thick] [val]</p> <p>patch will patchup the region encircled by the closed path - if the path is not closed it will be treated as closed path of this operation. The patch will be of thickness "thick" and filled with value "val".</p> <p>Default values for thick and val are 1 and 255 respectively.</p> <p>For example</p> <p>mop patch : fill 1 voxel thick patch with value 255</p> <p>mop patch 5 120 : fill 5 voxel thick patch with value 120</p> <p>These patches can be removed using "mop removepatch" via main command dialog.</p>
<b>mop paint</b>	<p>mop paint [tag]</p> <p>Apply paint operation using nodal points of the path.</p> <p>tag value is painted within the spherical region defined by radius of the first node.</p> <p>If no tag value is specified, 0 is assumed.</p>
<b>mop paintpatch</b>	<p>mop paintpatch [thick] [tag]</p> <p>patch will paint the region encircled by the closed path - if the path is not closed it will be treated as closed path of this operation. The patch will be of thickness "thick" and tagged with value "tag".</p> <p>Default values for thick and tag are 1 and 0 respectively.</p> <p>For example</p> <p>mop paintpatch : fill 1 voxel thick patch with value 0</p> <p>mop paintpatch 5 1 : fill 5 voxel thick patch with value 1</p>
<b>mop carve</b> <b>mop restore</b> <b>mop set</b>	<p>mop [carve restore set] [radius] [decay]</p> <p>Apply carving/restore/set operation using nodal points of the path.</p> <p>carve/restore/set operations are applied within the spherical region defined by radius parameter.</p> <p>carve sets the mask buffer values within the target zone to 0 smoothstepping to original values near the edge of sphere based on decay parameter. When the value of decay is 0, there is a sharp cut. Value of decay lies between 0 and radius.</p> <p>restore will restore mask buffer values within the target zone to original. Decay parameter need not be specified for this operation.</p>

	set will replace the mask buffer values within the target zone to 255. One of the uses of this operation could be to fillup large holes and then apply say shrinkwrap. Decay parameter need not be specified for this operation.
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