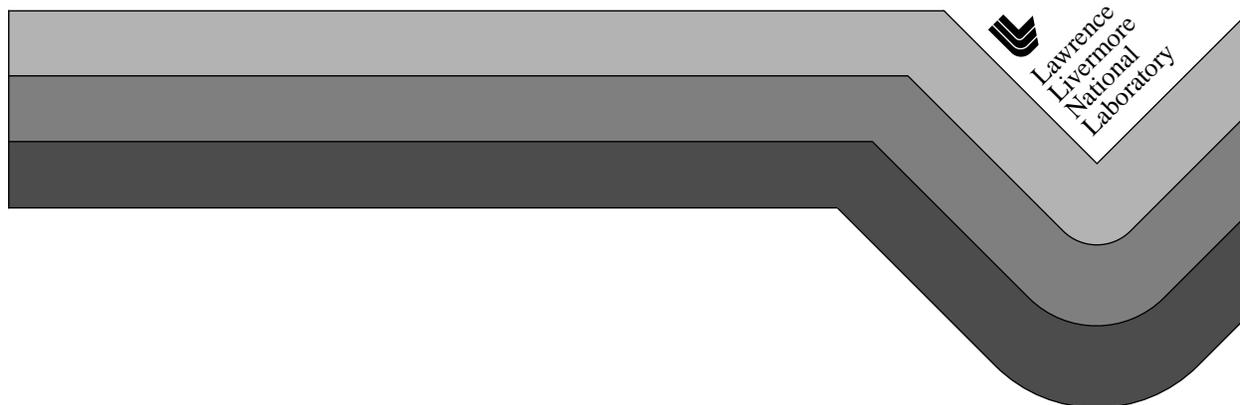


MeshTV Getting Started Manual

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Table of Contents

Table of Contents	iii
1.0 Introduction.....	1
1.1 Overview.....	1
1.2 Conventions Used in this Document.....	1
1.3 What You Need to Know to Use MeshTV.....	1
2.0 Understanding How MeshTV Works.....	2
3.0 Starting MeshTV.....	2
3.1 Using Menus.....	5
3.2 Using Scrolling Lists	5
3.3 Using Text Fields	7
3.4 Using the Mouse in the Vis window.....	8
3.5 Using the popup Menu	9
3.6 Using the toolbar.....	10
3.7 Manipulating 3D images with Navigate Mode.....	11
3.8 Using the Space Mouse in the Vis window	12
3.9 Manipulating 2D images with Navigate Mode.....	12
3.10 Manipulating images with Zoom Mode	13
3.11 Making Reference Lines and Curves from 2D images via the Line-out Mode.....	13
3.12 Picking Data from Images with the Pick and Query Mode	14
3.13 Using Slice Pick	14
3.14 Choosing the center of rotation for 3d images	15
4.0 Tutorial 1: The Basics.....	15
4.1 Changing the Selected File List	15
4.2 Opening a File.....	17
4.3 The Output Window	18
4.4 Error Messages	18
4.5 Selecting a Plot.....	19
4.6 Replace plots.....	21
4.7 Changing the Variable	21

4.8	Setting the Plot Attributes.....	21
4.9	Using the Data Operators	23
4.10	Setting the Data Operator Attributes.....	23
4.11	Using the Notepad.....	25
4.12	Saving a Window	25
4.13	Printing a Window	27
4.14	Exiting.....	29
5.0	Tutorial 2: Using Multiple Windows	29
5.1	Starting the Tutorial	29
5.2	Opening Three Windows	29
5.3	Changing the Current Window.....	30
5.4	Performing the Line-out Operation.....	30
5.5	Using Pick and Query.....	32
5.6	Using the Command Line Interface	33
5.7	Using the Expressions window.....	34
5.8	Exiting the Tutorial.....	35

MeshTV Getting Started Manual

1.0 Introduction

1.1 Overview

This document introduces you to the MeshTV Graphical User Interface (GUI). You will be given a brief overview on how MeshTV works and then be shown how to start MeshTV and use the various controls in the *MeshTV Main* and popup windows.

1.2 Conventions Used in this Document

- References to other documents and sections are in “quotation marks.”
- Names of windows, buttons, labels, text fields, scrolling lists, etc. are in *italics*.
- Names of menu options are in “quotation marks.”
- Keyboard keys are in `<courier bold>`.
- User input is in `courier bold`.

1.3 What You Need to Know to Use MeshTV

Before starting to use MeshTV, you should be familiar with your windowing system and the basics of traversing a UNIXTM directory structure.

If you are familiar with using MOTIFTM, you can skip Section 3.1 "Using Menus" through Section 3.3 "Using Text Fields". These sections mention many MOTIF features that the casual user might be unfamiliar with; so even if you are familiar with MOTIF, you might want to read these sections.

2.0 Understanding How MeshTV Works

MeshTV supports up to 16 visualization windows, also called vis windows. Each vis window is independent of the other vis windows. MeshTV uses an active window concept; all changes made in the *MeshTV Main* window or one of its popup windows apply to the currently active window.

MeshTV can be manipulated through the graphical user interface (GUI) or through the command line interface, which can be accessed from the *MeshTV Main* window. All changes made through the GUI cause commands to be generated that are interpreted by the command line interface. Commands that are sent directly to the command line interface are not interpreted by the GUI. *Because of this, the GUI will not reflect changes made through the command line interface.*

The *MeshTV Main* window has a *Busy* indicator, in the shape of a clock, in the upper right hand corner. The *Busy* indicator appears when data files are being opened, plots are being generated, and at other times when MeshTV is busy. You can continue to manipulate the *MeshTV Main* window and all of its associated popup windows while the *Busy* indicator is present. However, actions that result from the changes will not occur immediately. You will not be able to manipulate the vis windows while the *Busy* indicator is present.

3.0 Starting MeshTV

You can invoke MeshTV from the command line by typing:

```
meshtv
```

When you first start MeshTV, it will generally open two windows that fill as much of the screen as possible. Figure 1 contains the most common layout. If you have ever flipped the *MeshTV Main* window and then saved your settings, the *MeshTV Main* window will lay out 2 visualization windows. However, for purposes of this tutorial, we will assume you are using a vertical layout.

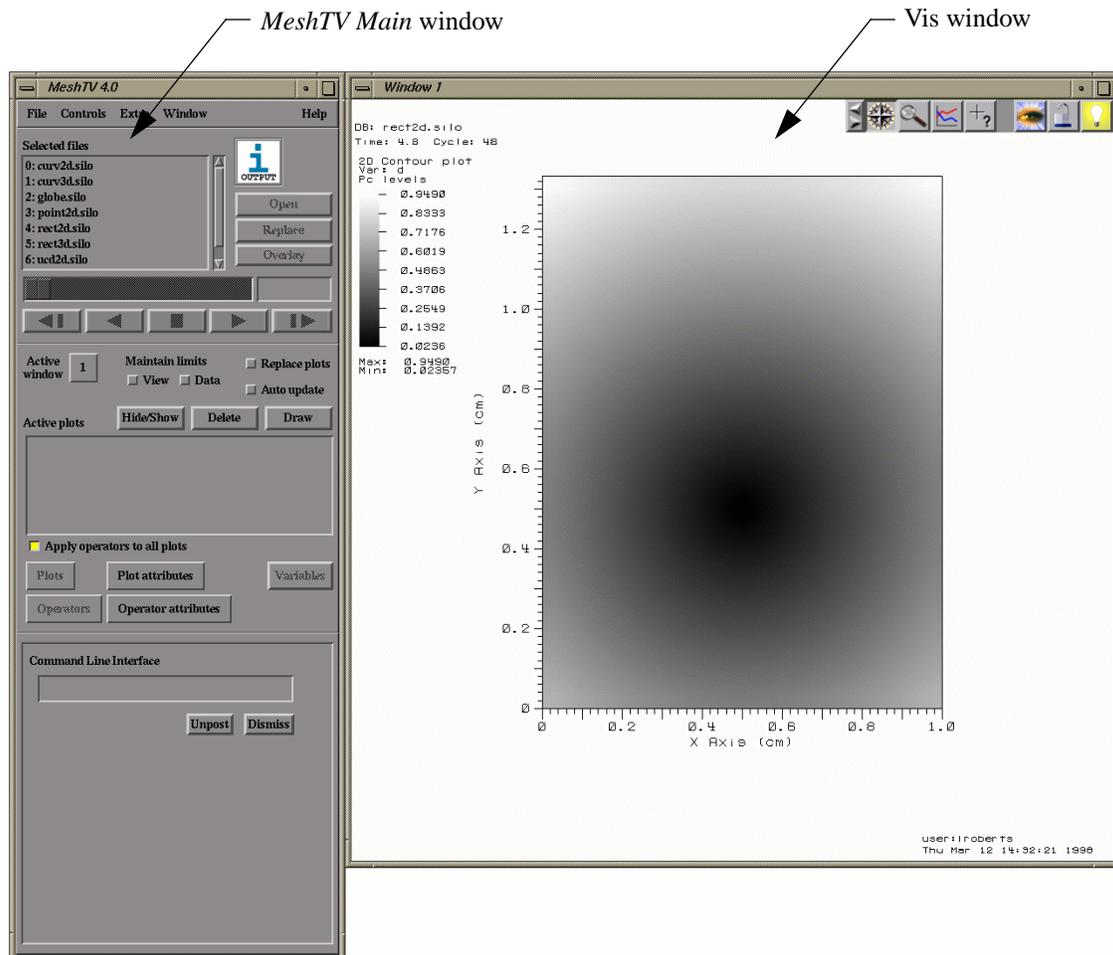


Figure 1: MeshTV Main window and visualization window

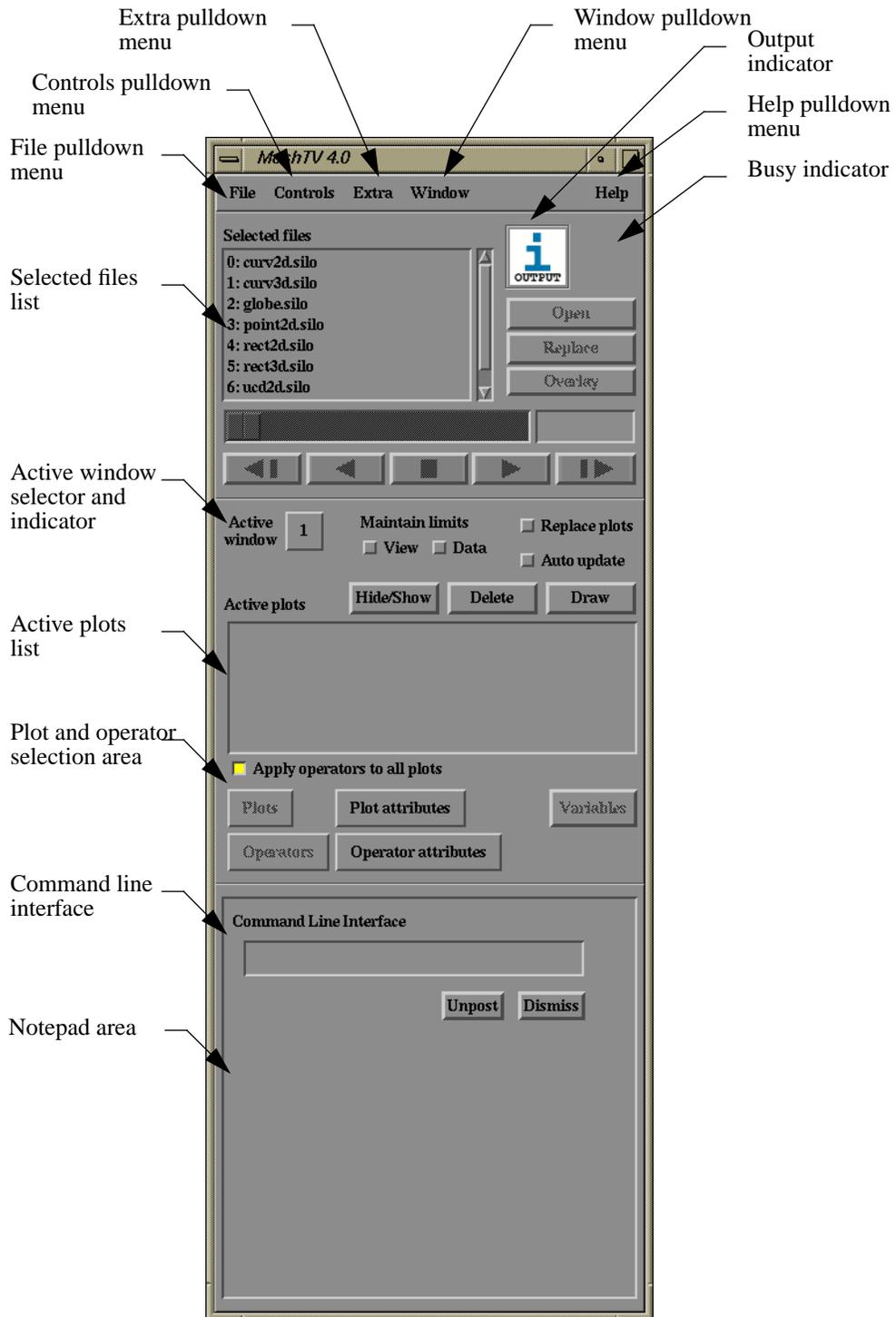


Figure 2: MeshTV Main window

3.1 Using Menus

At the top of the main control window, you will see the main menu bar which contains several pulldown menus. These give you access to many popup menus used to control MeshTV. To access a menu:

- Press the left mouse button over the pulldown menu. You will see a list of the menu entries.
- While holding down the mouse button, move the cursor down the list of entries to the desired choice. As you move the cursor, you will highlight individual entries.
- To make a selection, release the mouse button while the desired choice is highlighted.
- If you decide not to make a selection, simply move the cursor out of the menu area and release the mouse button.

Some menu choices have a triangle pointing to the right. The triangle indicates a pullright menu. To access a pullright menu:

- Press the left mouse button over a pulldown menu.
- Slide the cursor to the right while a pullright menu entry is highlighted. This will bring up a pullright menu.
- Slide the cursor down the pullright menu and make a selection just as you would with a pulldown menu.

If you press and release the left mouse on a pulldown menu, the pulldown will stay visible. To make a selection, simply click the left mouse button over the desired entry. To hide the pulldown menu without making a selection, click the left mouse button outside the menu area.

3.2 Using Scrolling Lists

In the *MeshTV Main* window and several of the popup windows, you will see scrolling lists. These allow you to make selections from a list where the number of elements may change in time. To scroll a scrolling list:

- To scroll down a scrolling list, move the cursor over the down facing triangle in the scroll bar. The scrolling list will scroll down as long as the left mouse button is depressed.
- To scroll up a scrolling list, move the cursor over the up facing triangle in the scroll bar. The scrolling list will scroll up as long as the left mouse button is depressed.
- To scroll to an absolute position in the scrolling list, move the cursor over the center area of the slider. Press the left mouse button, as you move the slider the

list will scroll to the position of the slider. Once you have reached the desired location release the mouse button.

- To scroll up a page in the scrolling list, move the cursor into the scroll bar above the slider and press and release the left mouse button.
- To scroll down a page in the scrolling list, move the cursor into the scroll bar below the slider and press and release the left mouse button.
- To scroll to the top of the list, press and hold the **<Shift>** key and press the left mouse button with the mouse over the up-facing triangle in the scroll bar.
- To scroll to the bottom of the list, press and hold the **<Shift>** key and press the left mouse button with the mouse over the down-facing triangle in the scroll bar.

There are two types of scrolling lists within MeshTV — one allows you to make a single selection from a list and another allows you to make multiple selections from a list. To use single selection in the scrolling list:

- Position the mouse over the desired entry and press and release the left mouse button. If another entry has already been selected, it will become unselected.

To use multiple selection in the scrolling list:

- To select a single entry, move the mouse over the desired entry and press and release the left mouse button. Any previous selections will become unselected.
- To select a continuous range of entries, position the mouse over the first entry in the range. Any previous selections will become unselected. Press the left mouse button and drag the mouse over the remaining entries in the desired range. Once the last entry in the desired range is selected, release the mouse button.
- To select all the entries in the list, position the mouse over the first entry and then press the left mouse button and drag the mouse down the list past the bottom. Keep holding the mouse, with the button down, until the list has scrolled to the bottom. (This will occur after a short pause.) Once the list is selected, release the mouse button.
- To modify an existing selection, press and hold the **<Shift>** key while moving the mouse to a new end point, then press the left mouse button. The items between the initial start point and the current entry will now be selected. The selection proceeds as above.
- If you have already selected files, and you want to add more to your selection, move the mouse over the entry you want to add. Press and hold the **<Ctrl>** key, and then press the left mouse button. The new item will be added, and any previously selected items will be unaffected. You can add a continuous range of entries by pressing and holding the **<Ctrl>** key, selecting the first entry by pressing the left mouse button, and dragging the mouse over the remaining entries. Once the last entry in the desired range is selected, release the mouse button.

- To delete an item or multiple items from an existing selection, move the mouse over the first entry to be deselected, press and hold the **<Ctrl>** key, then press the left mouse button. The entry under the mouse will become deselected. Additional entries may be deselected by dragging the mouse over a range of entries. Releasing the mouse button ends the deselection.

3.3 Using Text Fields

Several of the popup windows contain text fields. These allow you to enter information from the keyboard.

To insert text into a text field:

- Move the cursor to the position in the text where you want to insert text.
- Press the left mouse button. An insertion cursor should appear in the text field — this is the insertion point.
- Text typed from the keyboard will be inserted after the insertion point.

To delete text from a text field:

- Move the cursor to the end of the text that you want to delete.
- Press the left mouse button. An insertion cursor should appear in the text field — this is the insertion point.
- Press the **<Back Space>** key to remove characters immediately in front of the insertion point.

To replace text in a text field:

- Highlight the section of text that you want to replace.
- Type the replacement text.

To highlight text:

- Position the cursor over a character and click the left mouse button once to highlight a single character.
- Position the cursor over a word and click the left mouse button twice to highlight a single word.
- Position the cursor over a line of text and click the left mouse button three times to highlight the entire line.
- Move the cursor to the beginning of the text that you want to highlight. Press the left mouse button. Move the cursor across the text to the end of the text to be highlighted. Release the mouse button. The text will now be highlighted.

You do not always have to press the **<Return>** key to get the a popup window to recognize the changes you have made in the text field. Pressing the *Apply* or *Make default* buttons in an attribute window will cause all the text lines in the window to be read.

3.4 Using the Mouse in the Vis window

Visualization windows support several modes that determine how mouse actions are interpreted.

If the vis window contains a 2D image, then the available modes are:

- Zoom
- Navigate
- Line-out
- Pick

If the vis window contains a 3D image, then the available modes are:

- Zoom
- Navigate
- Pick
- Slice Pick

The mode can be set using the popup menu in the visualization window, or by pressing the appropriate button in the toolbar.

3.5 Using the popup Menu

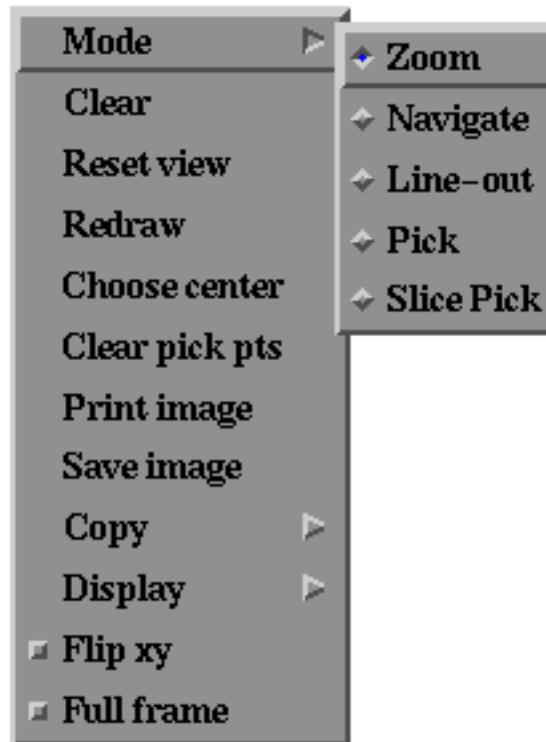


Figure 3: The popup menu in the vis window

The popup menu can be used to set the mouse mode (via the “Mode” entry), clear the window, reset the view, redraw the window, choose the center of rotation, print the image in the window, save the image in the window, flip the X and Y axes, and produce the largest picture possible. Options in the “Copy” entry allow you to copy various attributes from other windows. Options in the “Display” entry allow you to invert the background and foreground colors, place a bounding box around an image when rotating to increase speed, switch to perspective view, keep an image spinning on rotation, and set the stereo mode. To use the popup menu:

- Press the right mouse button in the vis window. You will see a list of menu entries.
- Using the popup menu is now equivalent to using a pulldown menu.

3.6 Using the toolbar

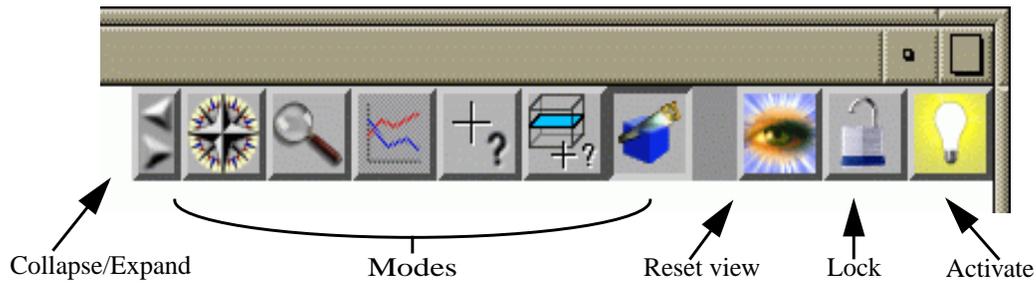


Figure 4: The toolbar in the visualization window

The toolbar appears at the top of all visualization windows. It shows window state as well as provides buttons for common actions. It can be used to set the mouse mode, reset the view, lock windows, and set the active window. The toolbar can also be collapsed into a tiny space in the window or completely removed.

The leftmost button, the one depicting two arrows, collapses the toolbar. Pressing it again expands the toolbar.

The next five buttons control the mouse mode of the window. The compass rose signifies “Navigate mode.” The magnifying glass signifies “Zoom mode.” The line chart signifies “Lineout mode.” The crosshair with the question mark signifies “Pick mode,” and the crosshair and question mark with the slice plane signifies “Slice pick mode.” These modes correspond directly to the modes in the popup menu. Pressing any one of the five buttons switches the window to that mode. In addition, the button that appears “pressed-in” reflects the window’s current mode.

The button with the eye performs a “reset view” operation, resetting the viewpoint to what it was when you first loaded the dataset.

The lock button allows windows to be “locked together”. This is a more advanced topic. See the User’s Manual for more information.

The button with the light bulb is the “Activate” button. Only one window may be active at any time. That window is signified by having a lit light bulb. All other windows have unlit light bulbs. To make a window the active window, press its unlit light bulb.

3.7 Manipulating 3D images with Navigate Mode

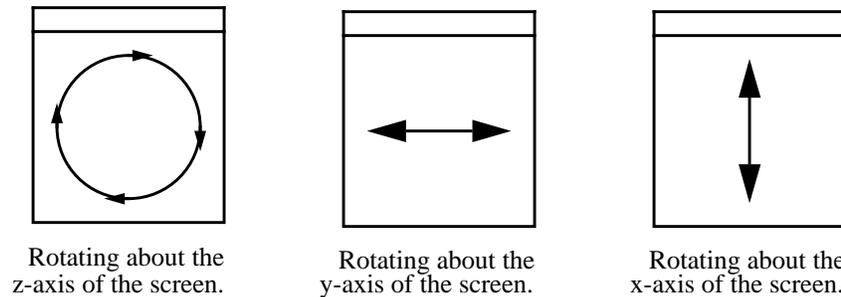


Figure 5: Mouse motions to perform rotations about various axes in Navigate mode

You can manipulate 3D images in Navigate mode as follows:

- Enter the Navigate mode by selecting “Navigate” from the “Mode” pullright menu from the popup menu in the vis window. The shape of the cursor will be an S.
- To rotate the image about the center of the 3D data limits, press the left mouse button. The cursor will change shape from an S to two arrows in a circle. The image will rotate by moving the mouse as shown in Figure 5.
- To pan the image, press and hold the **<Alt>** key. Press the left mouse button. The cursor will change shape from an S to an up and down arrow and left and right arrow joined like a plus sign. The image will now follow the cursor.
- To zoom the image, press and hold the middle mouse button. The image will zoom as long as you hold down the middle mouse button. The cursor will change shape from an S to a Z in a circle.
- To de-zoom the image, press and hold the **<Alt>** key. Press the middle mouse button. The image will de-zoom as long as you hold down both keys. If you release the **<Alt>** key, the image will start zooming. To stop zooming and de-zooming, release the middle mouse button. When de-zooming, the cursor will change shape from an S to a Z in a circle.
- The visualization window will stay in Navigate mode until it is changed.

These rules apply when using a standard mouse. MeshTV also supports a 3D mouse known as the Magellan Space Mouse, and the rules are different for this pointing device.

3.8 Using the Space Mouse in the Vis window

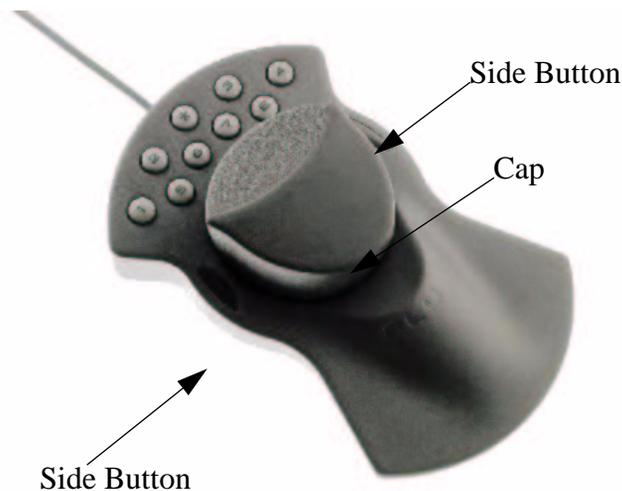


Figure 6: The Magellan Space Mouse

The Magellan Space Mouse is a six degree of freedom input device that allows for translation and rotation in three dimensions. In MeshTV, the Space Mouse can be used to navigate and zoom on three dimensional images. There are two modes of interaction in bounding box mode. The first mode moves the bounding box as soon as the cap starts moving. When the cap stops moving, the image is redrawn. The second mode is started by pressing one of the side buttons. When the cap moves, the bounding box also moves, but the image is not redrawn if the cap stops moving. Pressing the side button a second time causes the image to redraw. Both modes of interaction are always enabled.

Because the space mouse is sensitive, some movements are made easier by placing the space mouse in dominant mode. This is done by pressing the '*' and '3' buttons on the device at the same time. While in dominant mode, only the input of largest magnitude is processed. Dominant mode may be turned off by pressing the '*' and '3' buttons again.

3.9 Manipulating 2D images with Navigate Mode

You can use Navigate mode to manipulate 2D images in the following manner:

- Enter the Navigate mode by selecting "Navigate" from the "Mode" pullright menu from the popup menu in the vis window. The cursor shape will be a P.
- To pan the image, press the left mouse button. The cursor will change shape from a P to an up and down arrow and left and right arrow joined like a plus sign. The image will now follow the cursor.

- To zoom the image, press and hold the middle mouse button. The image will zoom as long as you hold down the middle mouse button. The cursor will change shape from a P to a Z in a circle.
- To de-zoom the image, press and hold the **<Alt>** key. Press the middle mouse button. The image will de-zoom as long as you hold down both keys. If you release the **<Alt>** key it will start zooming. To stop zooming and de-zooming, release the middle mouse button. When de-zooming, the cursor will change shape from a P to a Z in a circle.
- The visualization window will stay in Navigate mode until it is changed.

3.10 Manipulating images with Zoom Mode

You can use the Zoom mode to zoom in on a section of an image as follows:

- Enter the Zoom mode by selecting “Zoom” from the “Mode” pullright menu from the popup menu in the vis window. The shape of the cursor will be an arrow.
- Press the left mouse button in one corner of the rectangular region that you want to be the used as the new plot boundary. The shape of the cursor will change to an arrow pointing into a corner.
- As you move the cursor a rectangle will appear showing the region that will be used to define the new plot boundaries.
- Release the mouse button when the rectangle defines the new plot boundaries.
- The visualization window will stay in zoom mode until it is changed.

3.11 Making Reference Lines and Curves from 2D images via the Line-out Mode

The line-out mode is used to produce “value vs. distance” curve plots from a 2D image. These plots are referred to as curve plots, or sometimes reference curves. In actuality, two lines are drawn when you are in line-out mode. One is the line you draw (called the reference line plot) on the visualization window, and the other is the curve plot, which must appear in a separate visualization window. This requirement means that you must have at least two vis windows for line-outs to function properly. To make a reference line plot:

- If you already have two visualization windows, you can skip this part. Add a second vis window by selecting *Window* from the *MeshTV Main* window and then selecting “Add.”
- Enter the line-out mode by selecting “Line-out” from the “Mode” pullright menu from the popup menu in the vis window. The shape of the cursor will be an arrow.
- Press and hold the left mouse button at the first end point of the line.

- As you move the cursor a line will be displayed showing the line that will be drawn when you release the mouse. This is the reference line plot.
- Release the mouse button when the second end point is in the correct location.
- A curve plot, which represents the variable versus distance along the selected line, will appear in another visualization window. The default window for this output is vis window 2, but that window must exist before you use this mode.
- You may continue creating lines as long as you are in line-out mode. The vis window will stay in line-out mode until it is changed.

Section 4 "Tutorial 1: The Basics" and Section 5 "Tutorial 2: Using Multiple Windows" contain tutorials to help you learn how to use MeshTV. For more information about reference plots, please see Section 5.4 "Performing the Line-out Operation" in Tutorial 2.

3.12 Picking Data from Images with the Pick and Query Mode

The pick and query mode is used to get quantitative information from an image. To get information about a point in the image:

- Enter the pick and query mode by selecting "Pick" from the "Mode" pullright menu from the popup menu in the vis window. The cursor shape will be a plus sign.
- Press and release any mouse button over the position you want to query.
- The result of the query will appear in the *Output* window.
- You may continue querying points as long as you are in pick and query mode. The vis window will stay in pick and query mode until it is changed.

Section 4 "Tutorial 1: The Basics" and Section 5 "Tutorial 2: Using Multiple Windows" contain tutorials to help you learn how to use MeshTV. For more information about pick and query, please see Section 5.5 "Using Pick and Query" in Tutorial 2.

3.13 Using Slice Pick

The slice pick and query mode outputs the same kind of information as the normal pick mode. It is also used like the normal 3D pick to select a starting point for the Onion Peel (or segment) operator. To select a starting point using this mode:

- Enter the pick and query mode by selecting "Slice Pick" from the "Mode" pull-right menu from the popup menu in the vis window. The cursor shape will be a plus sign. You will see a slice of your data set. The slice will be parallel to the axis most facing you, and it will appear in the center of the data set.
- To move the slice plane, press and hold the left mouse button. Move the mouse up and down to move the plane forward and backward in the problem's bounding box. When you release the mouse, the plane will draw in its new location.
- Press and release any mouse button over the position you want to select.

- You will see a crosshairs appear, along with a label containing the zone number. You can use this picked point in later segment operations, which are not described in this tutorial. For more information about them, see the *MeshTV User's Manual*.
- You may continue selecting points as long as you are in pick mode. The vis window will stay in pick mode until it is changed. The last-selected point is the one that will be used by the segment operator.

3.14 Choosing the center of rotation for 3d images

Choose center is used to select the center of rotation for 3d images.

- You may choose the center of rotation by selecting “Choose center” from the popup menu in the vis window. The cursor shape will be a plus sign.
- Press and release any mouse button over the point you want for the new center of rotation. The new center of rotation will correspond to the x, y, and z position of the point on the front surface under the mouse.
- The new center of rotation will be displayed in the *Output* window.
- The visualization window will go into navigate mode.

4.0 Tutorial 1: The Basics

In this tutorial, you will learn how to: select files, generate different kinds of plots, modify plot properties, save an image, and print an image on a color printer.

4.1 Changing the Selected File List

One of the first things you must do after starting MeshTV is select the files you want work with. By default the files you can work with are all the files in the directory you were in when you started MeshTV that match the filter “*”. To change the selected file list, you must bring up the *File selection* window.

- Start MeshTV by typing **meshtv** at the prompt.
- Select “Select file” from the *File* pulldown menu on the *MeshTV Main* window.

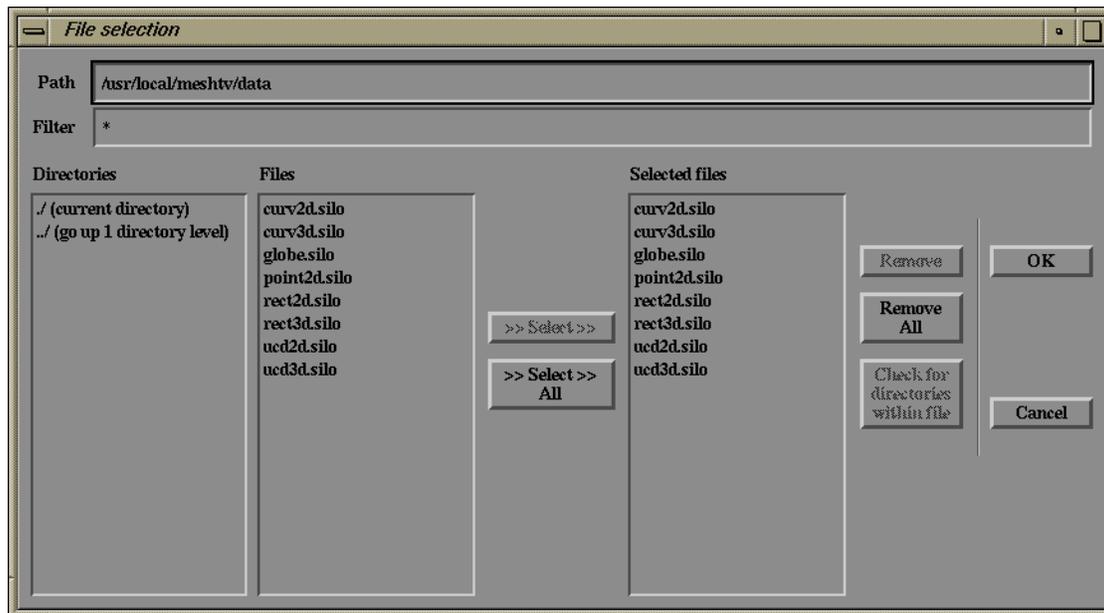


Figure 7: File selection window

The *File selection* window is used to define the list of files you want to use. Once the *Selected files* list contains the files you want to work with, press the *OK* button to transfer the contents of the *Selected files* list in the *File selection* window to the *Selected files* list on the *MeshTV Main* window.

To add entries to the *Selected files* list:

- Highlight the entries to be added from the *Files* list. The *Select* button will become active.
- Press the *Select* button. The highlighted entries will be added to the *Selected files* list.

To delete entries from the *Selected files* list:

- Highlight the entries to be deleted from the *Selected files* list. The *Remove* button will become active.
- Press the *Remove* button. The highlighted entries will be deleted from the *Selected files* list.

If your SILO files have directories within them, you may open the directories from within the *File selection* window.

- Highlight all the entries in the *Selected files* list that contain directories.
- Press the *Check for directories within file* button. An entry will appear for each directory within the file.

The *Files* list contains all the files in the directory specified in the *Path* text field that match the filter specified in the *Filter* text field. The *Path* text field contains the current location within your directory structure. To change the *Path* text field:

- Edit the *Path* text field and press the **<Return>** key.

or

- Double click on an entry in the *Directories* list. The *Path* text field will be concatenated with the double clicked entry to form a new *Path* text field.

The *Filter* text field recognizes the wildcard characters * and ?. The * character matches zero or more characters. The ? character matches exactly one character. To change the *Filter* text field:

- Edit the *Filter* text field and press the **<Return>** key.

Changing the *Path* or *Filter* text fields will cause the *Directories* and *Files* lists to be updated.

- Position yourself in the MeshTV's data directory. For most people, this directory will be **/usr/local/meshtv/data**. Others might need to check **/usr/local/apps/meshtv/data**. If neither of those locations exists, go to a shell window and type **which meshtv**, which should return a path. That path might look like **/usr/local/meshtv/bin/meshtv**, but in any event, the last part of the path will be **/bin/meshtv**. If you take the full path and replace **/bin/meshtv** with **/data**, you have MeshTV's data directory. In the example given above, that would be **/usr/local/meshtv/data**.
- Highlight all the entries in the *Files* list. The *Select* button will now become active.
- Press the *Select* button to transfer the highlighted files from the *Files* list to the *Selected files* list.
- Highlight the entry *ucd3d.silo* in the *Selected files* list. The *Remove* button and *Check for directories within file* button will now become active.
- Press the *Remove* button to delete the *ucd3d.silo* entry from the *Selected files* list.
- Press the *Done* button.

You can change the selected files at any time while you are using MeshTV.

4.2 Opening a File

A file can be opened in either of the two following manners:

- Double click on the desired file in the *Selected files* list on the *MeshTV Main* window.

or

- Highlight the desired file in the *Selected files* list on the *MeshTV Main* window.
- Press the *Open* button next to the *Selected files* list on the *MeshTV Main* window.

When a file is highlighted in the *Selected files* list, the *Open* and *Replace* buttons next to the list become active. This indicates that one of the two buttons should be pressed. As was previously mentioned, if the *Open* button is pressed the file will be opened. If the *Replace* button is pressed, then in addition to opening the file, all the plots in the *Active plots* list will have the file associated with them changed so they are associated with the newly opened file. The association with the original file is lost. Once either of the buttons is pressed, they will both become inactive.

- Double click on the entry **rect2d.silo** in the *Selected files* list.

4.3 The Output Window

The *Output* window contains all the messages generated by MeshTV. The types of messages that are sent include information about opened files, error messages, pick and query information, and information about images saved and printed. When a new message is added to the *Output* window a red border will appear around the output indicator. The border will remain until you display the *Output* window. To bring up the *Output* window press on the output indicator on the *MeshTV Main* window.

- Press on the output indicator on the *MeshTV Main* window. The *Output* window should contain the copyright message and some information about the file you opened.
- Press the *Dismiss* button. The red border on the output indicator will have disappeared.

4.4 Error Messages

All error messages will be displayed in the *Error message* window that automatically pops up when an error occurs. You can either dismiss the window via the *Dismiss* button, or leave it up for future reference. All errors are also logged to the *Output* window. If an action results in more than one error, only the first one will be displayed along with a count of the remaining errors. If you wish to see the remaining errors, you will need to look in the *Output* window.

- Press the *Delete* button on the *MeshTV Main* window. The *Error message* window will be brought up.
- Press the *Dismiss* button.
- Bring up the *Output* window. You should see the error message from the *Error message* window at the bottom of the output.
- Press the *Dismiss* button.

4.5 Selecting a Plot

To select plots to be plotted in the vis window, use the *Plots* pulldown menu in the *MeshTV Main* window. Pulling right from an entry in the *Plots* pulldown menu will bring up a list of all the variables in the current file appropriate for the given plot type.

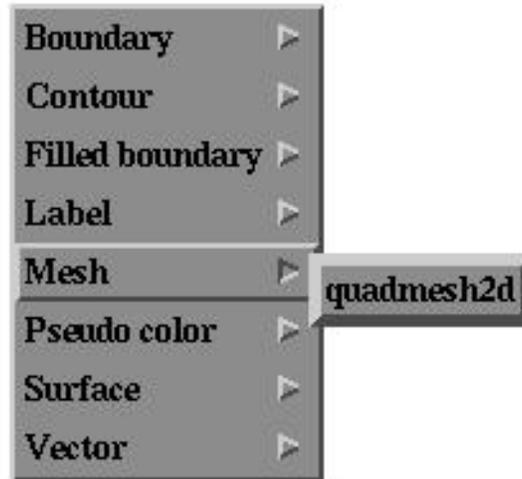


Figure 8: The Plots pulldown

- Select “quadmash2d” from the pullright menu from the “Mesh” entry from the *Plots* pulldown menu.
- Select “d” from the pullright menu from the “Pseudocolor” entry from the *Plots* pulldown menu.

As you make selections from the *Plots* pulldown menu you will see corresponding entries appear in the *Active plots* scrolling list. Each entry in the *Active plots* consists of a file number, a plot type, and a plot variable.

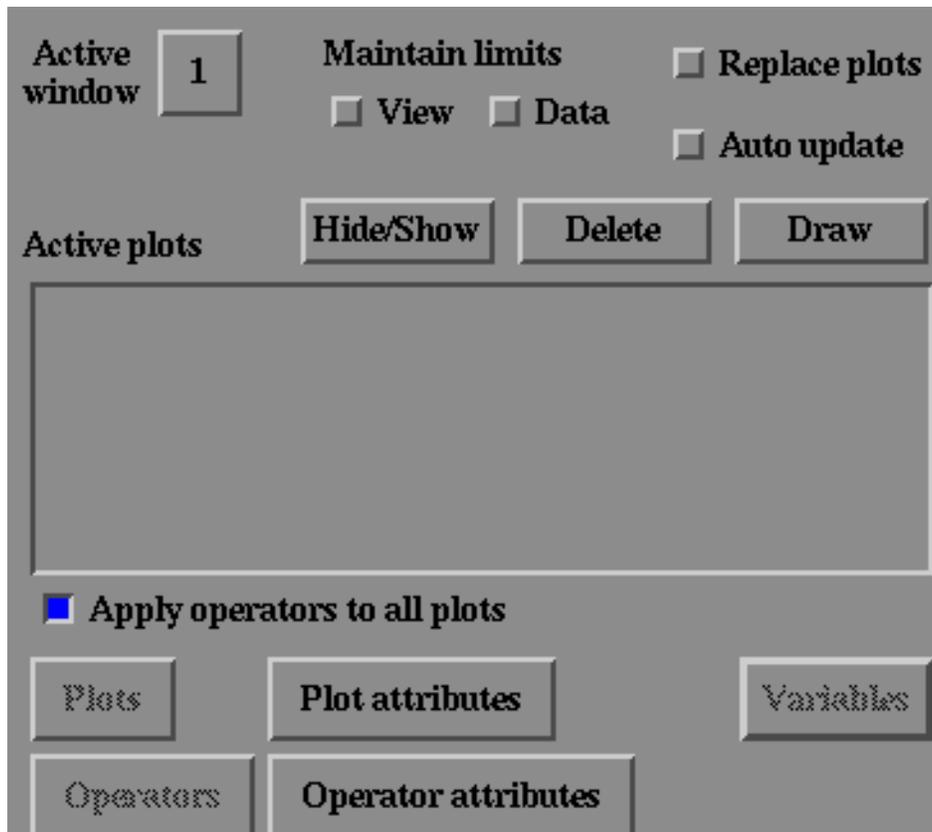


Figure 9: The Active plots list

Even though you have selected plots to draw, nothing appears in the vis window. To make plots appear, you must tell MeshTV that you want them drawn.

- Press the *Draw* button, which is located above the *Active plots* list.

The next thing you will do is add a material boundary plot on top of the current plots.

- Select “mat1” from the pullright menu from the “Boundary” entry from the *Plots* pulldown menu.
- Press the *Draw* button.

You will now hide the material boundary and then bring it back.

- First highlight the boundary plot from the *Active plots* list.
- Press the *Hide/Show* button.
- Unhide the hidden boundary plot by selecting it in the *Active plots* list and pressing the *Hide/Show* button again.

Finally, you will delete the mesh plot.

- Highlight the mesh plot from the *Active plots* list.

- Press the *Delete* button above the list.

When you delete a plot, hide a plot, or unhide a plot, the effect on the vis window is immediate (unlike adding a plot).

4.6 Replace plots

Up to this point, whenever you added a plot it was overlaid on top of any existing plots in the vis window. This was because *Replace plots* was turned off. When *Replace plots* is turned on, the currently active plots are replaced with the newly selected plot.

- Click on the box beside *Replace plots*. The box becomes “pushed in” and highlighted, indicating the Replace mode is on.
- Select “d” from the pullright menu from the “Pseudocolor” entry from the *Plots* pulldown menu. Notice that the boundary and pseudocolor plots were replaced with the new pseudocolor plot.
- Press the *Draw* button to make it visible.

This mode is useful if you want to look at one plot at a time and are frequently switching between plots. Let’s put things back the way they were.

- Click on the box beside *Replace plots*. The box becomes “pushed out,” indicating the Replace mode is turned off and plots will overlay each other.
- Select “mat1” from the pullright menu from the “Boundary” entry from the *Plots* pullright menu.
- Press the *Draw* button.

4.7 Changing the Variable

Every plot in MeshTV has a variable associated with it. The variable used by a plot or group of plots is changed by highlighting one or more plots from the *Active plots* list and selecting a new variable from the *Variable* pulldown menu on the *MeshTV Main* window.

- Highlight the pseudocolor plot from the *Active plots* list.
- Select the entry “p” from the *Variable* pulldown list.

Changing the plot variable takes effect immediately.

4.8 Setting the Plot Attributes

In this section, we will change the smoothing for the pseudocolor plot. Smoothing is based on the “centering” of the variable being plotted. Basically, a variable can be either “node-centered” (the data reside at the nodes), or “zone-centered” (the data reside at the zones.) In this section we will change the setting for the centering of the variable.

To change the attributes of the pseudocolor plot, you must bring up the *Pseudocolor plot attributes* window.

- Select “Pseudocolor” from the *Plot attributes* pulldown menu.

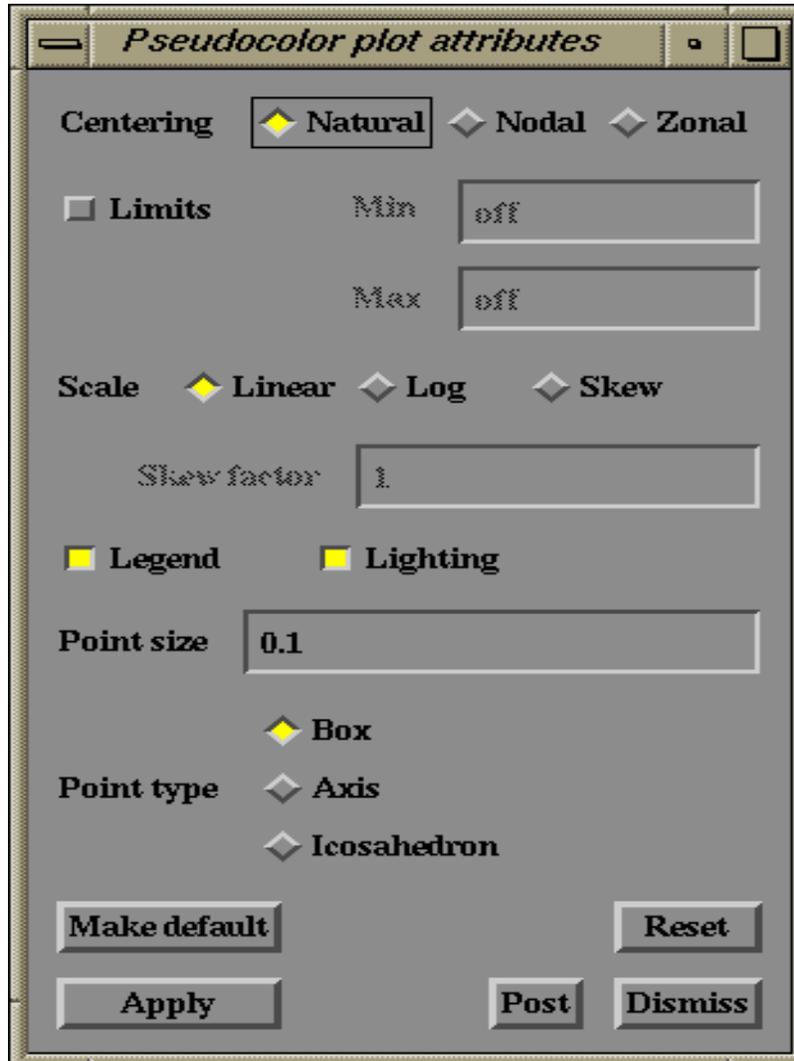


Figure 10: Pseudocolor plot attributes window

The *Pseudocolor plot attributes* window contains the *Centering* toggle buttons, a *Limits* on/off button, and two text fields for setting the minimum and maximum limits. There is also a *Log* on/off button that allows you to plot the scale in log and a *Legend* on/off button that specifies if you want to display a legend for this plot.

The default for *Centering* is *Natural*. *Natural* uses whatever centering the variable naturally has. If the variable is node-centered, the data are plotted at the nodes, and colors are interpolated between them, giving a smoothly-shaded plot. If the variable is zone-centered, one color is plotted for each zone, producing a “blocky” plot. If you select *Nodal*

or *Zonal*, you instruct MeshTV to interpolate your data (rather than just your colors) to the nodes or zones and to plot the data accordingly.

You will now switch from *Natural* to *Nodal*.

- Click the *Nodal* button so it is “popped out.”
- Press the *Apply* button.

The changes take effect as soon as the *Apply* button is pressed.

Pressing the *Make default* button makes the current setting in the window the default for any future pseudocolor plots. Pressing the *Reset* button changes the settings to match the current default attributes.

4.9 Using the Data Operators

The data operators are listed in the *Operators* pulldown menu on the *MeshTV Main* window. One or more operations can be applied to the data before it is plotted by successively choosing operators from the *Operators* pulldown menu. The operations being applied to the data can be seen in the variable name section of a plot entry in the *Active plots* list.

To reflect the data in the plots using the default reflection attributes:

- Select “Reflect plot” from the *Operators* pulldown menu.

The effects of applying a data operator will be immediate.

4.10 Setting the Data Operator Attributes

In this section we will change the reflect attributes to reflect the data into different quadrants.

To change the properties of the reflect operator you must bring up the *Reflect attributes* window.

- Select “Reflect plot” from the *Operator attributes* pulldown menu.

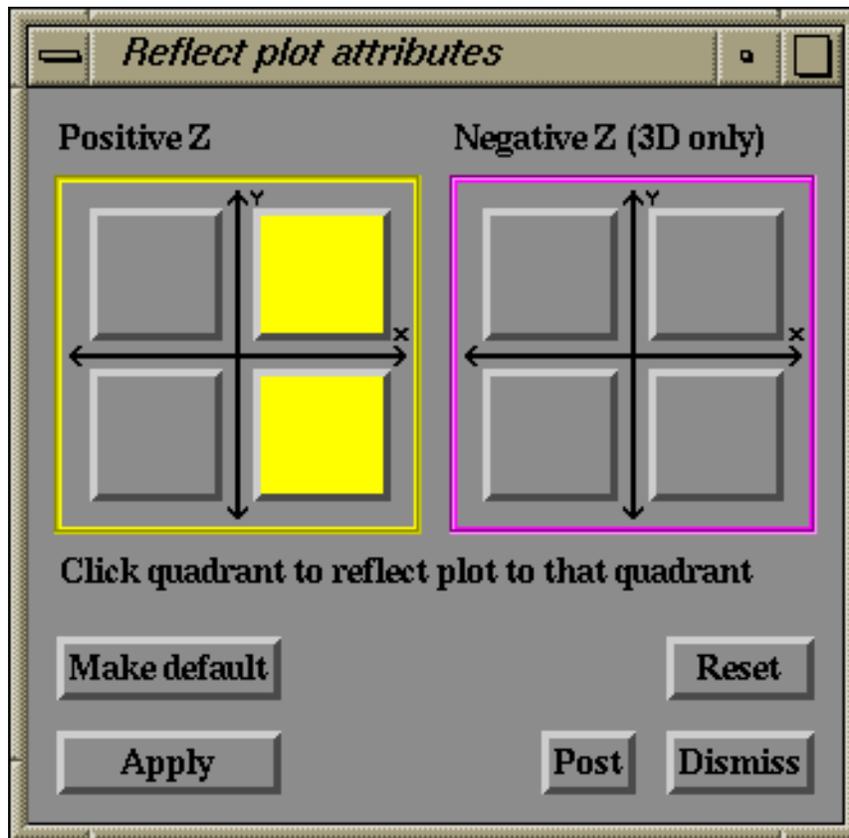


Figure 11: Reflect plot attributes window

The *Reflect plot attributes* window has two sections. The first section, titled *Positive Z*, works for both 2D and 3D problems, while the second section, titled *Negative Z (3D only)*, applies only for 3D problems. You can think of the section as representing the problem in the first quadrant. If you want to reflect the data into the negative Y section, you can select the quadrant below the one selected in the picture. If you want to reflect the data into the negative X section of the coordinate system, you can click on the quadrant to the left of the one selected in the picture.

You will now reflect the plot data.

- Select the squares to the left and bottom of the currently selected square.
- Press the *Apply* button.

You can only change the attributes of the last operator applied of a particular type. This means that if you are applying two index select operators to the data, then you can only change the attributes of the second index select operator applied. To change the attributes of the first one requires removing the second index select operator, changing the attributes of the first index select operator, and then reapplying the second index select operator. This restriction does not apply to operators of two different types. If you apply both the

index select and reflect operator you could change the attributes of either one of them with the appropriate attribute window. Of course, there really is no practical reason to apply the reflect operator more than once.

4.11 Using the Notepad

The notepad is a scrolling window you can use for posting many of the popup windows. The notepad is for frequently used windows that you want to access quickly, but don't constantly want to have present. All the popup windows that can be posted will have a *Post* button located at the bottom of the window. All the plot and operator attribute windows, along with several other windows, may be posted to the notepad.

- Press the *Post* button on the *Pseudocolor attributes* window. The window will be posted to the notepad, and the *Post* button will change to the *Unpost* button.
- Press the *Post* button on the *Reflect plot attributes* window.
- Scroll the notepad area.

Windows can be unposted by pressing the *Unpost* button. Windows can also be dismissed directly from the notepad by pressing the *Dismiss* button.

- Press the *Unpost* button on the *Pseudocolor attributes* window.
- Press the *Dismiss* button on the *Pseudocolor attributes* window.
- Press the *Dismiss* button on the *Reflect attributes* window.

4.12 Saving a Window

In this section, we will save the contents of a vis window to a disk file.

To save a window using the current save options, simply select "Save window" from the *File* pulldown menu on the *MeshTV Main* window. This saves a window using the default options. Many times, however, you might want to modify the defaults before you save. Let's change the default save options.

- Select "Set save options" from the *File* pulldown menu on the *MeshTV Main* window.

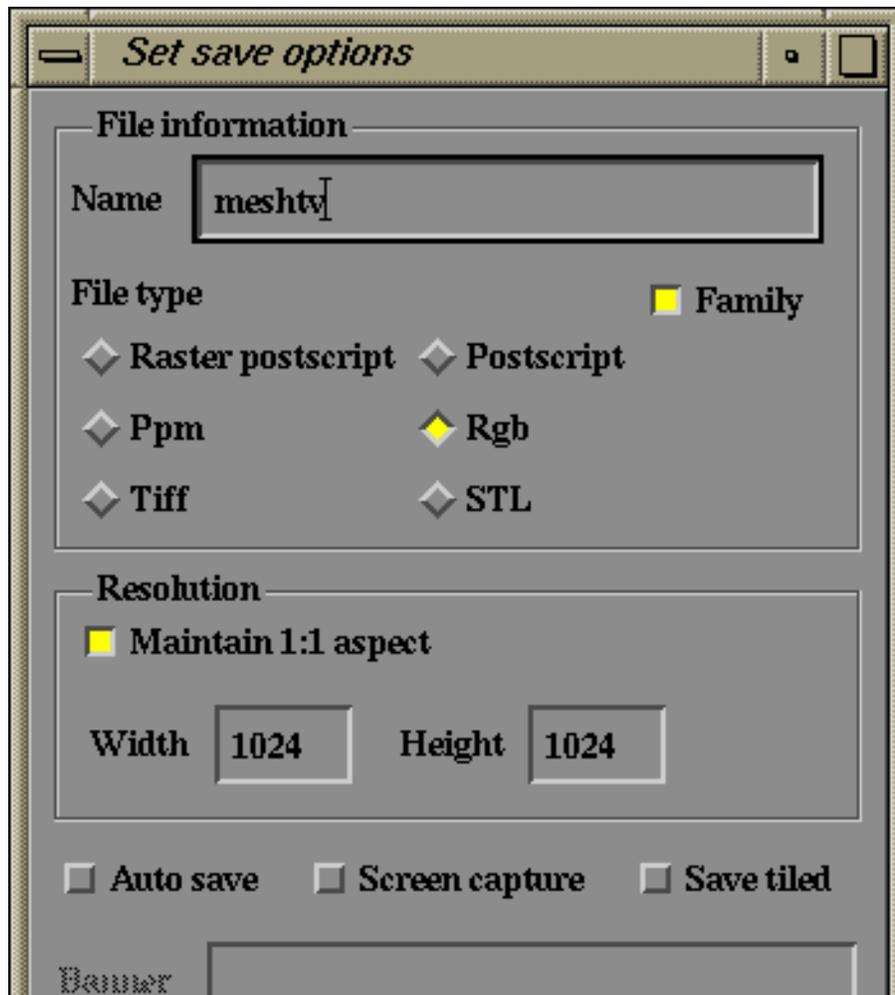


Figure 12: Set save options window

The *Set save options* window contains a *Name* text field, a *File type* setting, a *Family* on/off button, an *Autosave* on/off button, a *Save tiled* on/off button, a *Screen Capture* on/off button, an *X/Y resolution* text field, and a *Banner* text field. The *File type* setting selects the format that the contents of the window will be saved as. The options are Raster postscriptTM, Postscript, PPM, SGI's rgb, TIFF, and STL. The Postscript format should only be used for 2D images, while the raster formats, including Raster postscript, work for all images. STL works only for 3D datasets, and it provides a way for a special machine, called a Stereolithography machine, to construct 3D replicas of the plots in the vis window. Because MeshTV outputs STL, it's more exact to refer to saving the "contents of the window" rather than saving the "image," but this manual often does the latter for simplicity's sake.

If the *Family* setting is not selected ("popped out"), the name of the file used to store the image will match that in the *File* text field, else the name of the file will be the *Name* text concatenated with four digits. The digits start at 0000 and are incremented after each

image is stored. If the *Autosave* setting is selected (“pushed in”), the image on the screen will be saved whenever the image changes. If *Save tiled* is selected, MeshTV saves all open vis windows to one image. If the *Screen capture* setting is selected, the image that is saved is captured from the screen, otherwise an image is created from the screen at the appropriate resolution and saved. If the *Screen capture* is not selected, the *X/Y resolution* text field is used to set the size of the image. If the user specifies a banner in the *Banner* text field, a banner will appear at the top and bottom of the saved image. The banner only works with Postscript files.

When you are saving an image with the *Screen capture* setting *On*, you should not have any other windows obscuring the window you are saving because they will appear in the saved image.

- Change the *File type* setting to *Tiff*.
- Press the *Apply* button.
- Press the *Dismiss* button.
- Select “Save window” from the *File* pulldown menu on the *MeshTV Main* window or “Save image” from the popup menu in the vis window.

The *Busy* indicator will appear while the image is being saved. The image will have been saved in the directory from which MeshTV was started, and the name of the file will be “meshtv0000.tif”.

You can display the saved image using the *xv* utility.

- Type `xv meshtv0000.tif` in a shell window.
- Press the `q` key to exit *xv*.

4.13 Printing a Window

In this section, we will print the contents of a vis window.

To print using the current print options, simply select “Print window” from *File* pulldown menu on the *MeshTV Main* window. Many times, however, you might want to modify the defaults before you print the window. Let’s change the default print options.

- Select “Set print options” from the *File* pulldown menu on the *MeshTV Main* window.

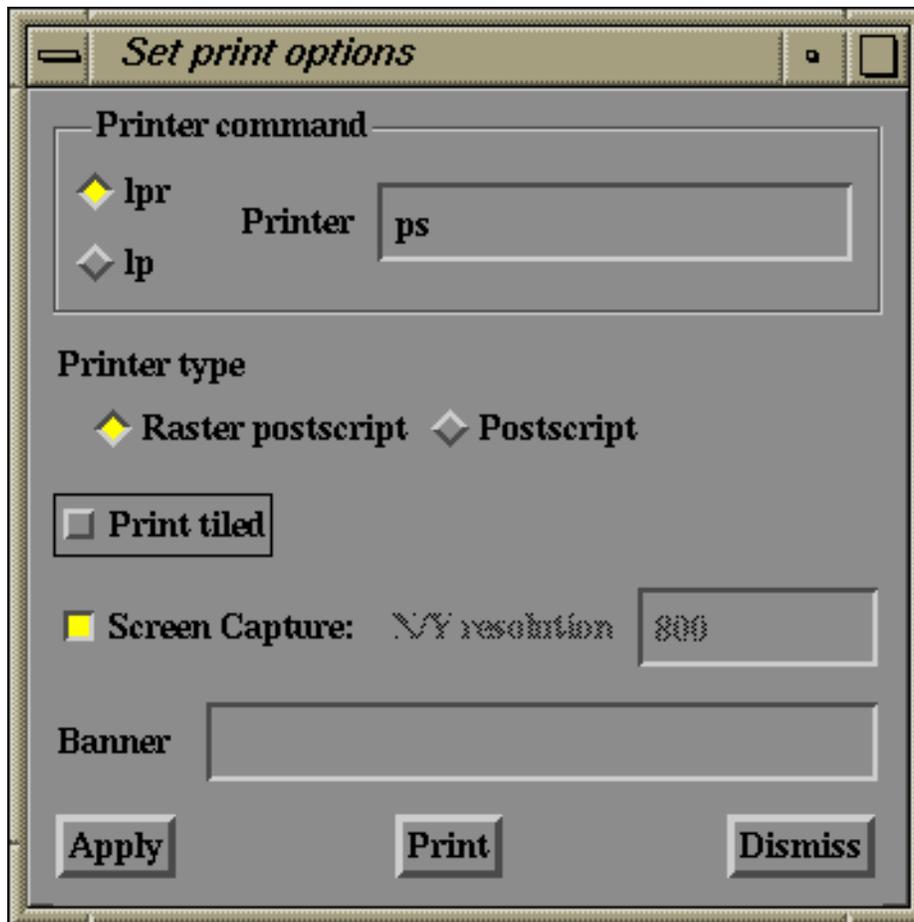


Figure 13: Set print options window

The *Set print options* window contains a *Printer command* selection, a *Printer* text field, a *Printer type* setting, a *Print tiled* on/off button, a *Screen Capture* on/off button, an *X/Y resolution* text field, and a *Banner* text field. The *Printer command* selection indicates whether to use `lpr` or `lp` for your printer command; once set, this should not normally need to be changed. The *Printer* text field specifies the name of your printer. The *Printer type* setting specifies the format of the image files that it prints. The options are Raster postscript and Postscript. The Postscript format should only be used for 2D images, while Raster postscript will work for all images. The *Print tiled* and *Screen capture* settings, as well as the *X/Y Resolution* and *Banner* text fields, function the same as on the *Set save options* window.

When you are printing a window with the *Screen capture* setting selected (“pushed in”), you should not have any other windows obscuring the window you are printing because they will appear in the printed image. In addition, when capturing the image from the screen, you should make the window as large as possible before printing to get the highest resolution image possible.

- Change the *Printer* text field to the name of a color printer.

-
- Set the *Printer type* setting to the correct type.
 - Press the *Apply* button.
 - Press the *Dismiss* button.
 - Select “Print window” from the *File* pulldown menu on the *MeshTV Main* window or “Print image” from the popup menu in the vis window.

The *Busy* indicator will appear while the image is being printed.

4.14 Exiting

You are now ready to exit MeshTV.

- Select “Quit” from the *File* pulldown menu on the *MeshTV Main* window.

5.0 Tutorial 2: Using Multiple Windows

In this tutorial you will learn how to use multiple windows, how to make reference plots, how to use pick and query, how to use the command line interface, and how to define expressions.

5.1 Starting the Tutorial

To start the tutorial you will open a datafile and display an initial plot in the vis window.

- Start MeshTV by typing **meshtv** at the prompt.
- Bring up the *File selection* window and select all the files in the directory **/usr/local/meshtv/data** matching the filter ***.silo**.
- Select the file **ucd3d.silo**.
- Select a pseudocolor plot of “d,” a mesh plot of “ucdmesh3d,” and a boundary plot of “mat1.”
- Select the “Orthogonal slice” operator from the *Operators* pulldown menu.
- Make the plots visible by pressing the *Draw* button.

5.2 Opening Three Windows

You are now ready to open three windows. You will create four windows and then delete the fourth one so that you are left with the desired three windows.

- Select “2 x 2” from the *Layout* pullright menu from the *Window* pulldown menu on the *MeshTV Main* window.

Four smaller windows will now appear on the screen, laid out in a 2 by 2 grid in the upper right hand corner of the screen. You can now delete the fourth window.

- Select “4” from the *Active Window* setting on the *MeshTV Main* window.
- Select “Delete” from the *Window* pulldown menu on the *MeshTV Main* window.

The fourth window will now be deleted.

5.3 Changing the Current Window

You will now make window 2 current.

- Select “2” from the *Active Window* setting on the *MeshTV Main* window.

Since this is the first time that you have referenced window 2, the properties from window 1 were copied to window 2.

You are now going to remove the mesh and change the pseudocolor plot variable.

- Highlight the mesh plot from the *Active plots* scrolling list.
- Press the *Delete* button above the *Active plots* scrolling list.
- Highlight the pseudocolor plot from the *Active plots* scrolling list.
- Select “p” from the *Variable* pulldown menu.
- Press the *Draw* button.

5.4 Performing the Line-out Operation

MeshTV’s line-out functionality allows you to draw lines (called reference lines) on a plot with the mouse that generates a curve that contains the values of a variable as a function of distance along the reference line. The values vs. distance line that MeshTV draws in a second vis window is called a curve plot. The visualization window that receives the curve plot is specified in the *Line-out* window accessible from the *Controls* menu on the *MeshTV Main* window. The variable being plotted is the variable associated with the first highlighted plot in the *Active plots* list.

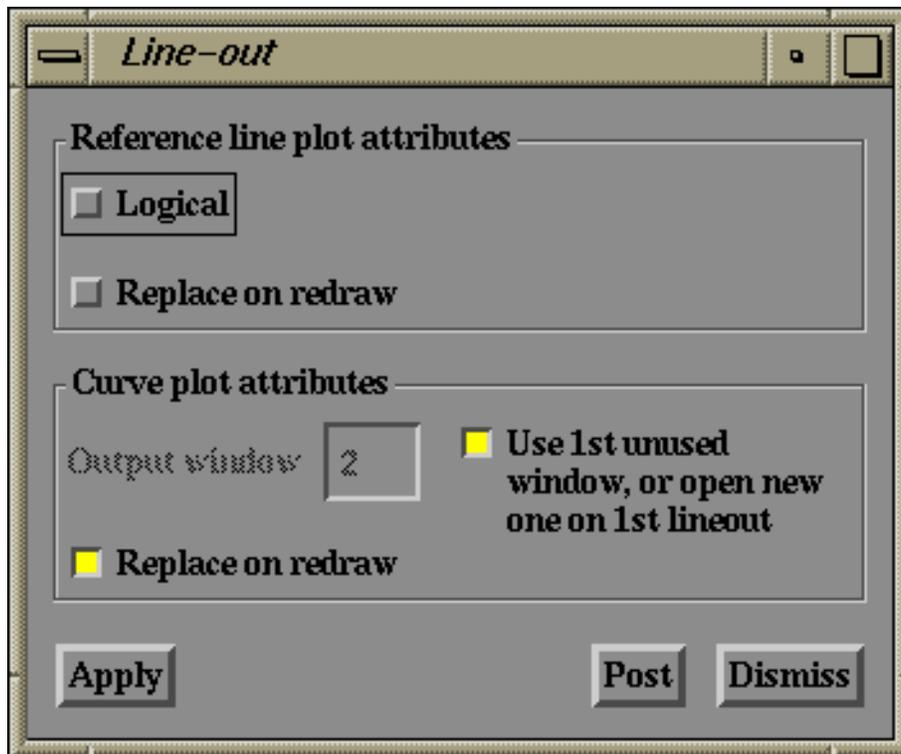


Figure 14: Line-out window

You will now make some line-outs of the variable “p” from window 1.

- Select “Line-out” from the *Controls* pulldown menu on the *MeshTV Main* window.
- Change the *Output Window* text field from 2 to 3.
- Press the *Apply* button.
- Press the *Dismiss* button.
- Select “1” from the *Active Window* setting on the *MeshTV Main* window.
- Highlight the pseudocolor plot in the *Active Plots* scrolling list.
- Place the mouse over the vis window (the window with the image.) When you hold down the right mouse button, a menu will pop up. Put your mouse over the “Mode” selection and move it over the arrow to the right of the word. Another menu will pop up. Select “Line-out” from that.

You are now ready to make some line-outs.

- Move the cursor into window 1 over the plots.
- Press and hold the left mouse button at the first end point of the line.
- As you move the cursor, a line will be displayed showing the line that will be used for the reference line plot.

- Release the mouse button when the second end point is in the correct location.
- A curve plot of the variable versus distance along the selected line will appear in window 3.
- You can create several more lines in window 1, resulting in more curves in window 3. Window 1 will stay in Line-out mode until it is changed.

You can change the way the line-out is done.

- Select “Line-out” from the *Controls* pulldown menu on the *MeshTV Main* window.
- Click on the Logical toggle button so that it is “pressed in.”
- Press the *Apply* button.
- Press the *Dismiss* button.
- Make sure window 1 is still the active window and highlight the pseudocolor plot in the *Active Plots* scrolling list.
- Move the cursor into window 1 over the plots.
- Press and hold the left mouse button at the first end point of the line.
- As you move the cursor, a line will be displayed showing the line that will be used for the reference line plot.
- Release the mouse button when the second end point is in the correct location. Notice that the line moves so that it follows the mesh. This is because we switched the line-out mode into “logical” mode (following the mesh) rather than using “absolute” mode (a straight line between two coordinates).
- A curve plot of the variable versus distance along the selected line will appear in window 3.

5.5 Using Pick and Query

The pick and query feature allows the users to inquire about data within computational zones within the mesh. The data is presented as it exists in the datafile without interpolation or manipulation. The variable being picked is the same variable that is associated with the first highlighted plot in the *Active plots* list. You can use pick to inquire about material, mesh, and scalar variables but not vectors.



Figure 15: Pick attributes window

You will now pick the variable “d” from window 1.

- Select “Pick” from the “Mode” pullright menu from the popup menu from vis window 1.

You are now ready to query values.

- Move the cursor into window 1 over the plots.
- Press and release any mouse button over the position you want to query.
- The result of the query will appear in the *Output* window.
- Query several more points in the plot.
- You may continue querying points as long as you are in pick and query mode. The vis window will stay in pick and query mode until it is changed.

5.6 Using the Command Line Interface

Commands can be sent directly to the command line interface, bypassing the graphical user interface (GUI), by typing into the *Command Line Interface* text field on the *MeshTV Main* window. Any commands that the command line interface accepts can be entered in the text field. The commands are not interpreted by the GUI, and therefore, the GUI will not reflect changes made through the command line interface. *Commands that will impact the state of the GUI should only be used with great caution.*

The following is a list of commands that are safe to use in the command line interface. The syntax of the commands can be found in the “MeshTV Command Line Interface Manual” document.

- alias** - Define or list command aliases.
- area** - Define area properties for 3D plots.
- cat** - Print the contents of the given file to Output window.
- clear** - Remove all plots from the given vis window.
- ct** - Set the color table for the current window.
- end** - Exit from the MeshTV session and remove all subordinate windows.

- help** - Print a command list or a brief summary of one command.
- inq** - Inquire the current database attributes.
- latitude** - Set the 3D viewing parameter, latitude.
- longitude** - Set the 3D viewing parameter, longitude.
- matcol** - Assign the material-color correspondence.
- minmax** - Print a variable's minimum and maximum data values.
- pan3** - Perform a relative pan 3D viewing operation.
- panf3** - Perform an absolute pan 3D viewing operation.
- printwin** - Print the current vis window on the network color printer.
- rotx** - Rotate a 3D object about the X-axis.
- roty** - Rotate a 3D object about the Y-axis.
- rotz** - Rotate a 3D object about the Z-axis.
- sh** - Execute an operating system (shell) command.
- source** - Process a command input file.
- unalias** - Remove the definition of a command alias.
- wp** - Set the 2D plotting window using physical coordinates.
- wp3** - Set the 3D plotting window using physical coordinates.
- zoom3** - Set the 3D relative zoom factor.
- zoomf3** - Set the 3D absolute zoom factor.

5.7 Using the Expressions window

The *Expressions* window is used to define new variables from existing variables. To define a new expression, you must specify the variable name, the expression that defines the new variable, and the type of the variable. The operators used in defining expressions can be found in the section on the defvar command in the "MeshTV Command Line Interface Manual" document. A short list is provided below.

Function or operator	Meaning
{ }	The grouping operator. Used for building vectors.
+, -, *, /, ^	The standard arithmetic operators.
absv	Absolute value.
sqrt	Square root.
ln	Natural log.
log	Base-10 log.

The variable type is used to check errors and determine which plots can display the variable.

Variable type	Plots that use the variable type
Constant	None (A constant expression that cannot be plotted, e. g. 3.14159)
Material	Boundary, Filled boundary
Mesh	Mesh
Point	Point
Scalar	Contour, Pseudocolor, Surface
Vector	Vector

You will now define some new variables.

- Select “Expressions” from the *Controls* pulldown menu on the *MeshTV Main* window.
- Enter **d2** into the second text field under the *Name* label and press the **<Tab>** key.
- Enter **2 * d** and press the **<Tab>** key.
- Enter **mom** and press the **<Tab>** key.
- Enter **d * {u, v}**.
- Set the *Type* to “Vector.”
- Press the *Apply* button followed by the *Dismiss* button.

You have now defined two new variables. If you bring up the variable pullright menu from the “Contour” entry from the *Plot* pulldown menu on the *MeshTV Main* window, you should see an entry for “d2.” If you bring up the variable pullright menu from the “Vector” entry from the *Plot* pulldown menu, you should see an entry for “mom.”

5.8 Exiting the Tutorial

You can now exit MeshTV.

- Select “Quit” from the *File* pulldown menu on the *MeshTV Main* window.

