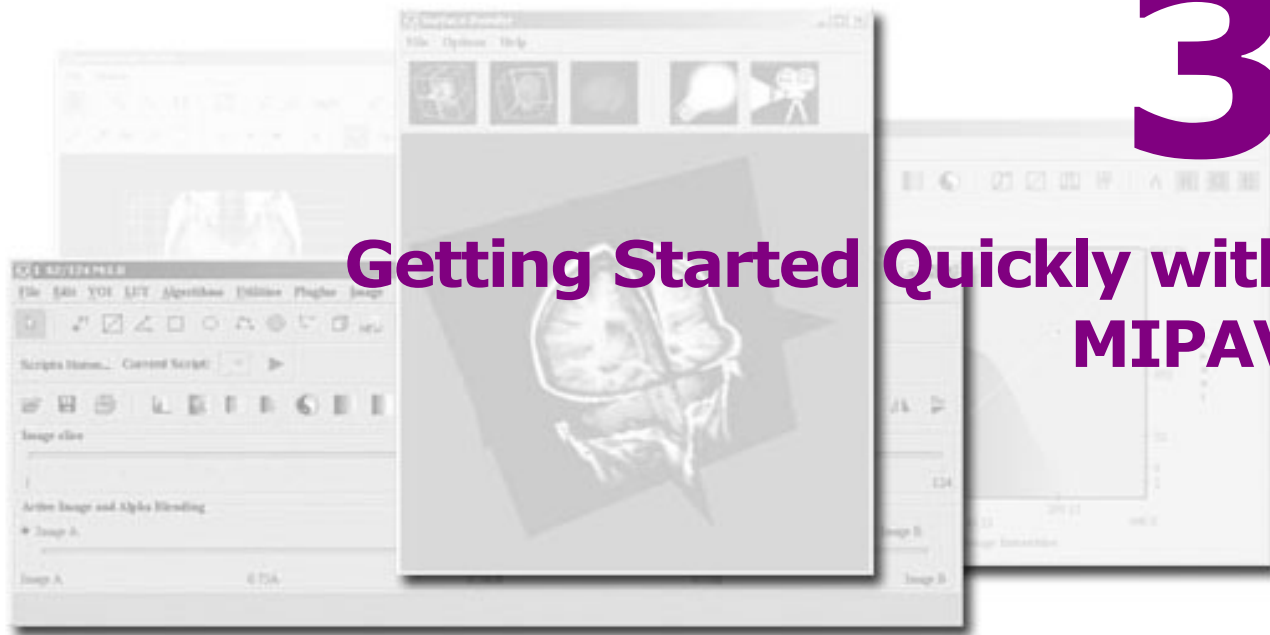


3

Getting Started Quickly with MIPAV



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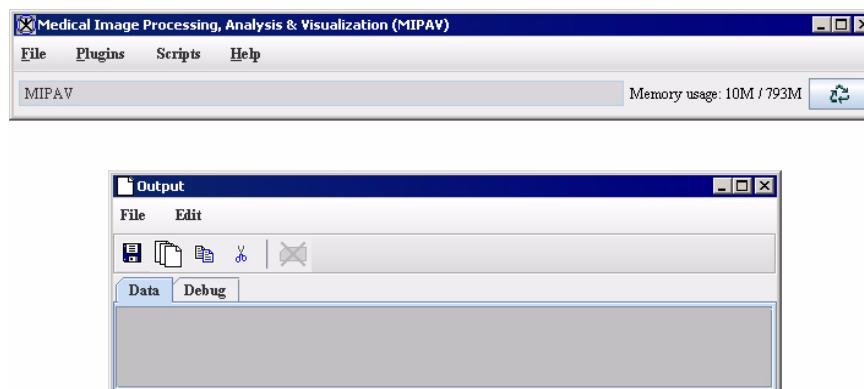
This chapter provides information to help you get started quickly using MIPAV. It explains basic tasks, such as starting and ending the program, opening and loading images, creating new images, and saving and printing images. In addition, it discusses how to create volumes of interest (VOIs), how to compare images using alphablending, and how to customize the program.

Starting MIPAV

Starting MIPAV differs depending on your platform. To begin a MIPAV session, do the following:

If your platform is . . .	Then . . .
Windows 95, 98, 2000, NT, XP	Select Start > Programs > mipav > mipav.
Linux	Open a shell. Go to the directory where you downloaded the installer. At the prompt, type sh ./installMIPAV.bin .
Mac Operating System (OSX)	Unzip the installer (StuffIt expander may open automatically). Double-click the installer icon on your desktop.
Unix OS (Sun Solaris, OS/2 Warp, and others)	In a shell tool, command tool, or terminal window, go to the directory where you installed MIPAV. At the prompt, type ./mipav .

Both the main Medical Image Processing, Analysis, & Visualization (MIPAV) window and the Output window (Figure 5) appear on your desktop. You can access most of MIPAV's features from the main menu bar.



The Output window menu options

Figure 5. MIPAV–Main and Output windows

File	<p>Save Messages—Saves all of the messages displayed on the currently open page (e.g., Global Data page, Data page, or Debug page). When you select this command, the Save dialog box opens.</p> <p>Add tab— Adds a new tab to the Output window. When you select this option, the Add Tab dialog box opens. In this dialog box, enter the name for the new tab and press OK.</p>
Edit	<p>Clear messages—Clears all of the messages that are displayed on the currently open page. Be sure that you want to use this command. There is no undo!</p> <p>Copy—Copies the selected text on the currently open page.</p> <p>Cut—Removes the selected text from the currently open page.</p> <p>Select All—Selects all of the text on the currently open page.</p>
The Output window toolbar	
Save Results	Saves all of the messages displayed on the currently open page. When you select this command, the Save dialog box opens.
Copy	Copies the selected text on the currently open page.
Paste	Pastes copied text into the currently open page at the cursor point.
Cut	Removes the selected text from the currently open page.
Remove selected tab	Removes selected tab from the output window.
The Output window default tabs	
Data tab	Displays messages that apply to the currently active image.
Debug tab	Displays debugging information for the currently selected image.

Figure 5. MIPAV–Main and Output windows (continued)

After starting MIPAV, you can open and load image files, create new images, access DICOM images, customize MIPAV, and end the session.

Managing memory resources

MIPAV requires at least 35 Mb of random access memory (RAM). Additional memory is needed to correctly display image files and to quantify the data. To determine the amount of additional memory needed, multiply the size of the image file that you want to display by 10. Thus, if an image file is 2 Mb, you must allocate an additional 20 Mb of RAM (in addition to the base of 35 Mb) for it to display correctly. Because memory requirements

fluctuate depending on the size and number of image files open, it may be necessary to allocate additional memory during a session.

Allocating memory in MIPAV

When you run MIPAV for the first time you must specify the amount of memory that you would like to allocate, so that MIPAV can take the full advantage of the memory resources available in your machine.

- 1** Select Help > Memory allocation in the MIPAV window. The Change JavaRuntime Memory Allocation dialog box opens. See Figure 6.
- 2** Change the maximum heap size number so that it reflects the maximum amount of memory that should be allocated.

In a Microsoft Windows system, you can specify a maximum to 1.2 or 1.3 Gb. If additional memory is needed, MIPAV allocates it until the memory reaches the maximum heap size that you specify.

- 3** Click OK to close the dialog box.



Figure 6. Change Java-Runtime Memory Allocation dialog box

You must restart of MIPAV for the changes to take effect. To exit MIPAV, select File > Exit. Then, restart the software.

TO ALLOCATE ADDITIONAL MEMORY

The first step is to view how much memory is currently being used and to free needlessly reserved memory. Then, if necessary, you may need to allocate additional memory.

To determine how much memory is currently being used by MIPAV

- 1 Select Help > Memory Usage in the MIPAV window. The Memory Monitor dialog box appears (Figure 7).

When MIPAV performs a function, such as visualizing an image file, it uses memory. When the function completes (i.e., the visualized image closed), you can manually free the memory so it can be used for another function.

The Memory Monitor dialog box shows how much memory is allocated and how much memory has been used. The vertical bar on the right of the window displays a pictorial representation of the ratio of allocated memory or amount of memory used. The chart shows the memory usage for the past 3 minutes and 45 seconds. The chart is updated every second.

If you want to constantly monitor your memory resources, you can leave the Memory Monitor dialog box open on your desktop. Otherwise, close it.

- 2 Click Free memory to free memory.

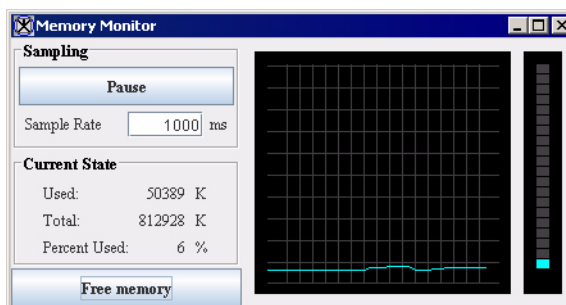


Figure 7. Memory Monitor dialog box

If you need more memory, you can allocate virtual memory or disk swap space if there is free space on your hard drive. For instructions on how to do this, refer to the documentation for your system. If you cannot assign more virtual memory or disk swap space, you may need to install additional memory.

To manually free the memory

As Java-based programs run, they often leave old variables, objects, or constructors in memory. For instance, if you delineate a VOI, the coordinates of

the contours may remain in memory even after you close the image. Java provides a method called the *garbage collector* (or *memory recycling*) that automatically freeing objects that are no longer referenced by the program and clears all unnecessarily reserved memory. Generally, the software does this automatically when free memory becomes very limited. However, you can run the garbage collector at any time to free memory by clicking the Memory Usage button. Refer to Figure 8.

To allocate additional memory,

Repeat the steps described in “Allocating memory in MIPAV” on page 61.



Figure 8. Running the garbage collector to free the memory in MIPAV

Opening and loading image files

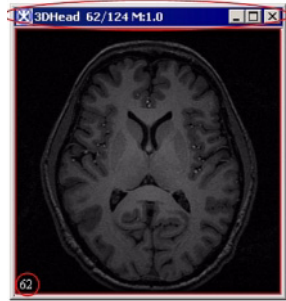
MIPAV displays images in windows, or frames, that you can move or arrange around the desktop (Figure 9). You can display as many image datasets as needed as long as your computer has enough allocated memory.

Note: The amount of memory required depends on the number of image datasets that are open and the size of each image file. For more information, refer to “Managing memory resources” on page 60.

You can either open or load an image file. When you *open* an image file, MIPAV displays the image in a new image window. *Loading* an image file imports the file into an image window in which another image file is open. In other words, two image files share a common image window.

UNDERSTANDING IMAGE WINDOWS

An *image window* (Figure 9) consists of a title bar and an image itself.



The title bar displays:

- the image file name, e.g. "3DHead";
- the number of the current slice and the total number of slices in the dataset, e.g. 62/124;
- the magnification level, e.g. M:1.0.

The number of the current slice is also shown in the lower left corner of the image.

Figure 9. An image window

You can move an image window around your desktop by clicking the title bar and dragging the window to a new location.

Sometimes, depending on the view, a toolbar or menu bar also appears in the image window. For example, the image window using the *light box view* contains a toolbar and menu bar. See also "Displaying images using the lightbox view" on page 76.

IMAGE A AND IMAGE B

In MIPAV, the first image opened in an image window (see "Understanding image windows") is referred to as *Image A*. When you load, or import, a second image in the same window, MIPAV refers to the second image as *Image B*.

Supported formats

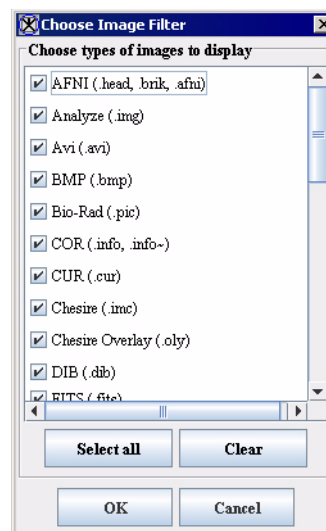
You can use MIPAV to open or load files of a variety of medical and generic graphics and multimedia file formats. Table 1 lists the format, extension, and whether MIPAV can read or write files of a particular format. The *extension*, which is the last few characters of a file name including the period, indicates the file format. For example, in the file name *DOE255.ima*, the extension *.ima* indicates that the file is stored in DICOM format. In the table, the Read column indicates that MIPAV can display image files of a particular format. When a file is read, it is stored in main memory so that MIPAV can access it. The Write column means that MIPAV can copy the data from the memory to a storage destination, such as your hard disk. In this context, *write* is synonymous with *save*.

For more information on file formats, the list of supported formats and other information, refer to Appendix C: "Supported formats" Table 1 on page 628.

IMAGE BROWSER

You can select the image formats to display using the File > Open Image(A) > Image Browser menu. This opens the **Choose Image Filter** dialog box. In this dialog box, use the check boxes to select the image types which you would like to use in MIPAV.

Select All Selects all image types.



Clear Removes selection.

OK Applies the image type selection to MIPAV.

Cancel Disregards any changes you made in this dialog box and closes the dialog box.

Figure 10. Choose Image Filter dialog box

Opening image files

The **Open Image A from disk** menu allows you to open an image which is stored on your hard drive (or network drive).

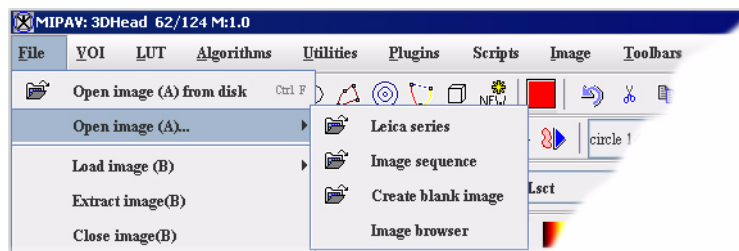


Figure 11. File > Open menu

The **Open Image A** menu (Figure 11) provides you with additional options such as to open a single image file, or image sequence, or Leica series images – the images that were taken on a Leica microscope. You can also call Create Blank Image to create a blank image (refer to “Creating new images” on page 91).

To open an image file or multifiles

An option on the Open Image dialog box (Figure 11), which appears after you select File > Open Image(A), is **Open as multifile**. This option lets you open the image as a *multifile*.

Multifiles are image datasets that are composed of multiple files.

- 1** Select File > Open Image(A) from disk. The Open Image dialog box (Figure 12) opens.
- 2** Navigate to the directory where the file is stored.
- 3** Select an image file.
- 4** To open the image file as a multifile, select the **Open as multifile** box.
The name of the image appears in File Name.

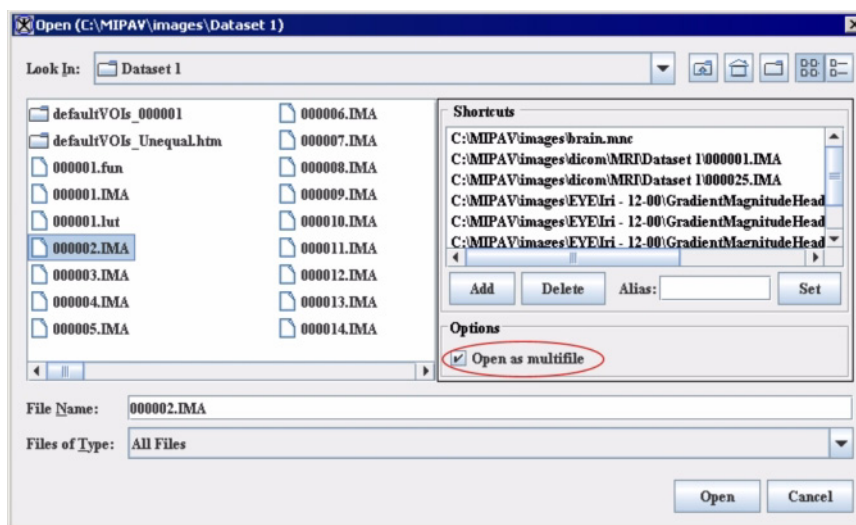


Figure 12. Open as Multifile option

If you can't find the image,

check the files types listed in Files of Type (showing in Figure 12) near the bottom of the dialog box. If the file type you are looking for does not appear in Files of Type, select All Files or All.

To form a 4D dataset in Analyze format,

use **Open as multifile** to open a series of individual 3D Analyze, formatted, consecutively ordered images. For example, you can use Open as multifile to open an array of TIFF, JPEG, BMP, etc., files if their file names meet the following format: *foo_001.tiff*, *foo_002.tiff*, *foo_003*, etc. where *foo* is the name of the file.

MIPAV window

After the first image is opened, the MIPAV window changes. It includes more menus, the title bar displays more information, and tool bars appear. Because the MIPAV window is context sensitive, it displays or hides commands on the menus depending on the characteristics of the image file that is opened. If you opened a dataset file that contains more than one image, an *image slice slider* also appears. Refer to Figure 13.

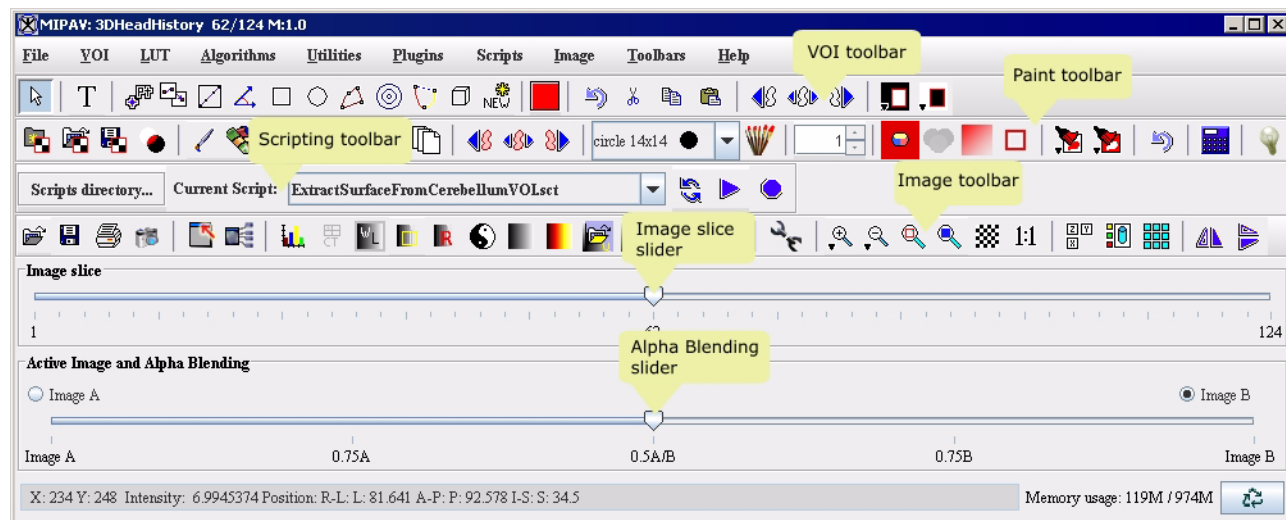


Figure 13. Expanded MIPAV window showing toolbars, image slider, and more menus after the first image is opened. See also “MIPAV toolbars” on page 71

If you prefer for MIPAV to use the style of Open and Save dialog boxes that are used by the operating system (e.g., Microsoft Windows, Unix, or Apple) on your computer, read the section on “Using platform-specific Open and Save dialog boxes” on page 124.

Loading image files

When you *load* an image file, MIPAV imports it into an existing image window. The loaded image shares the same window with another image file. Loading a file allows you to compare two datasets.

To load an image file

- 1 Open the first image by selecting File > Open Image(A) from disk. The image appears in an image window.
- 2 Select the title bar of the image window (in this case, the image that you just opened) in which you want to load another image.
- 3 Select one of the following:
 - **File > Load Image (B) > From Frame** to load another image dataset from an already opened image dataset;
 - **File > Load Image (B) > From File** to load another image dataset;

- **File > Load Image (B) > Create a Blank Image** to create a blank image.

- 4 If you chose Image (B) from File, the Open dialog box appears, see Figure 12. Select the image file you want to load, and click OK.

If MIPAV does not recognize the type of file based on its extension, the Choose Image Filter dialog box opens (see also “Image Browser” on page 66). Here, select the file type and click OK.

As the image file is loading, a pop-up window appears with the status. When the image file finishes loading, it appears in the image window. At this point, take note of several changes:

- MIPAV pseudo-color was applied to the images in the image frame. The pseudo-color indicates that two images are loaded in the same image frame.
 - In the MIPAV window, the Active Image and Alphablending slider appears. The slider allows you to control which image is displayed in the foreground of the window. The image in the foreground is the *active image*. You can adjust the translucency of the alpha channels in each image using the technique.
- 5 If you chose Image (B) from Frame, the Load Image onto <file name> (Figure 14) opens. Select one of the images in Set as Image (B), and then click OK. The image is loaded onto the first image file.

Note: The abbreviations (A) or (B) appear after some commands. (A), which is the abbreviation for “Image A,” indicates that the option is applied to the first image opened in an image window. (B), which is the abbreviation for “Image B,” indicates that the option is applied to second image loaded in the image window. For example, if you select Close Image (B), MIPAV closes the second image (Image B) that was loaded in the image window.

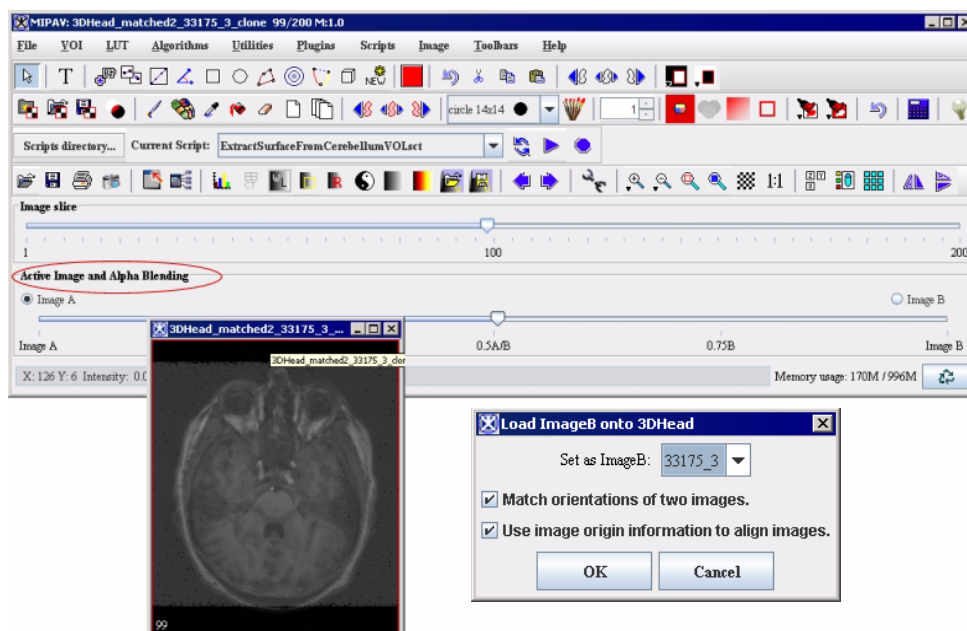


Figure 14. After loading an Image B, the Active Image and Alpha Blending slider appears in the main MIPAV window. The slider allows you to control which image is displayed in the foreground of the window

Note: MIPAV recognizes file types by the file extension. For example, if you select an image named "Smith.tiff", MIPAV tries to open the file as a TIFF file. If that image is actually a JPEG file and mistakenly has the TIFF extension, MIPAV fails to open the file.

MIPAV toolbars

After you open an image in MIPAV and the MIPAV window expands to display all of its menus and toolbars, such as

- **VOI toolbar.** Volume of interest toolbar (Figure 15). The VOI toolbar contains tools that help you in selecting the specific area of interest on the image.

- **Paint toolbar.** The Paint toolbar (Figure 16) includes tools that allow you to add, adjust, or remove colors and color intensity, erase paint, and adjust the opacity level of the paint.
- **Scripting toolbar.** The Scripting toolbar allows you to locate and run previously recorded scripts, or macros, that contain two or more algorithms on images. See Figure 17.
- **Image toolbar.** The Image toolbar includes tools for opening, printing, saving, maximizing, and minimizing an image; converting an image from gray scale to color or from color to gray scale; and adding to and removing slices from an image or changing their order; and rotating, cropping, and flipping an image. See Figure 18.

By default, the MIPAV window displays only the VOI and Image toolbars.
























Icon	Name	Icon	Name	Icon	Name
	Default Mode		Protractor tool		Change VOI color
	Annotation Tool		Draw rectangle VOI		Undo
	Draw a point VOI		Draw polyline VOI		Cut VOI
	Draw inter-slice polyline		Levelset VOI		Copy VOI
	Draw line VOI		Draw 3D rectangular VOI		Paste contour
	Propagate VOI down		Propagate both sides		Propagate VOI up
	Split VOI contour		Live wire VOI		View VOI properties
	Quick AND VOI mask operation		Quick NOT VOI operation		

Figure 15. VOI Toolbar







Icon	Name	Icon	Name	Icon	Name
	Add a blank mask		Fill an area with color		Paint brush editor
	Open a mask from a file		Erase a paint		Change paint color

Figure 16. Paint Toolbar


















	Save the current mask		Erase a paint from a current frame		Change opacity of the paint
	AND mask operation		Erase all paints		Display a border around painted areas
	Draw using a brush		Propagate the paint to the previous slice		Masks the inside of the painted area
	Load advanced brush tools		Propagate the paint both sides		Masks the outside of the painted area
	Pick up a color from an image		Propagate the paint to the next slice		Undo
			Calculate volume		Load power paint tools

Figure 16. Paint Toolbar





Icon	Name	Icon	Name
	Open the Scripts Home catalogue		Refresh the Scripts Home catalogue
Current Script: <input type="text" value="ExtractSurfaceFromCerebellumVOLset"/>	Show the current script to run		Run the script from Current Scripts
			Start recording the script

Figure 17. Scripting Toolbar



















Icon	Name	Icon	Name	Icon	Name
	Open image, CTRL+F		Adjust window and level		Decrement image slice
	Save image, CTRL+S		Quick LUT		Increment image slice
	Print image		Reset LUT		Link images
	Capture image to TIFF file		Invert LUT		Zoom in
	View header, CTRL+H		Gray LUT		Zoom out
	Edit attributes, CTRL+E		Hot metal LUT		Magnify region

Figure 18. Image Toolbar

















	Display Lookup table		Open user-defined LUT		Window region of Image B
	CT preset function		Save LUT		Checker board
	Magnify 1:1		Tri-planar view		Volume Tri-planar view
	Volume Renderer		GPU based volume renderer		GPU rendering
	View light box		Flip horizontally		Flip vertically
	Multi histogram rendering				

Figure 18. Image Toolbar (continued)

Displaying MIPAV Toolbars

The Toolbars menu contains check boxes for each of the four toolbars: Image, Paint, Scripting, and VOI. Use these check boxes to select which toolbars should appear. See Figure 19.

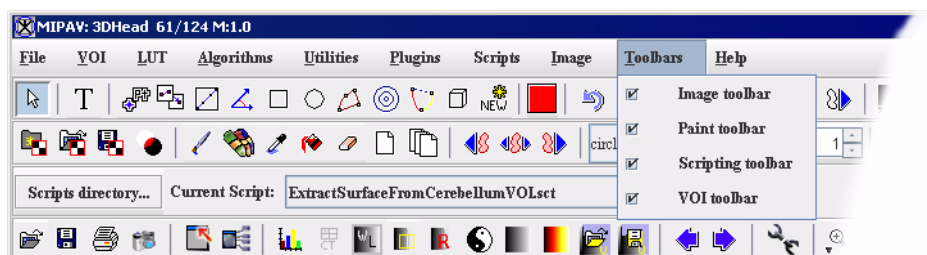


Figure 19. Toolbars menu

By marking or clearing these check boxes, you can choose which toolbars to display and which to hide. For example, suppose you just started MIPAV a moment ago. You then open an image. The MIPAV window expands in size and displays its full complement of menus. Although it displays the VOI, Scripting, and Image toolbars, you want to work with the Paint toolbar as well as the Image toolbars. However, you don't need to use the VOI and Scripting toolbars. The next section explains how to hide and show toolbars.











TO HIDE THE VOI AND SCRIPTING TOOLBARS AND DISPLAY THE PAINT TOOLBAR

- 1 Select Toolbars > VOI to hide the VOI toolbar. MIPAV removes the check mark from the check box and removes the VOI toolbar from the MIPAV window.
- 2 Select Toolbars > Scripting to hide the Scripting toolbar. MIPAV removes the check mark from the check box and removes the Scripting toolbar from the MIPAV window.
- 3 Select Toolbars > Paint to display the Paint toolbar. The program marks the check box and displays the Paint toolbar in the MIPAV window.

Because the Image toolbar is already displayed, you do not need to do anything.

Selecting views

A *view* refers to the way an image file is displayed. A view indicates how many images are shown at one time and whether images are advanced manually or automatically. Depending on the view, the size and shape of the image window in which an image is displayed can vary. MIPAV allows you to display images using the following views:

Icon	View	Icon	View
	Default		Surface plotter
	Animate		Volume renderer
	Cine (movie)		Tri-planar
	Lightbox		Tri-planar dual
	Link to another image		Volume Tri-planar

This section explains how to display image files in the *default*, *lightbox*, and *cine* view. To learn how to display image files in other views, refer to Chapter 6 in the *MIPAV User's Guide*.

Displaying images using the default view

In the *default view*, MIPAV displays the images in a dataset one at a time in an image window (Figure 20). This window can display datasets of any dimension.

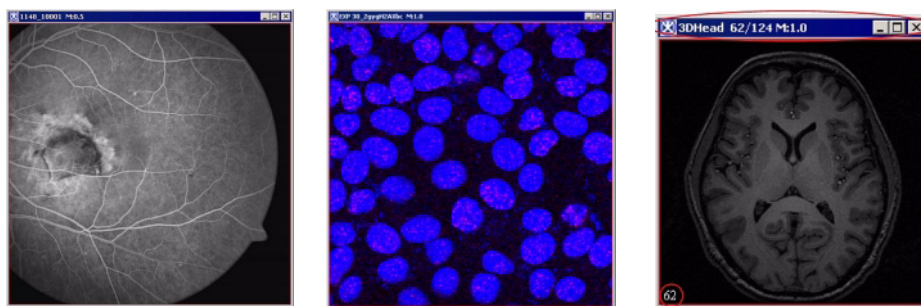


Figure 20. Images open in the default image windows

Displaying images using the lightbox view

The *lightbox view* is similar to the default view, except that all images in the dataset appear in one window at the same time (Figure 21).

To display images in the lightbox view

- 1 Open an image file. The image appears in an image window.
- 2 Select the image window. Do one of the following in the MIPAV window:
 - Click the View Light Box icon;
 - Select Image > Views > Light box.

The image now appears in a lightbox view.

- 3 Select Options > Settings in the lightbox view window to adjust the size and shape of the window. The Lightbox Settings dialog box (Figure 21) opens.
- 4 In the dialog box, indicate the number of rows and columns, the grid size, frame border size, color settings, and the magnification. For more information on these attributes, see the *MIPAV User's Guide*, “Visualizing Images”, “Adjusting the lightbox view”.

- 5 Click Close when complete. The image appears in the lightbox view, see Figure 21.

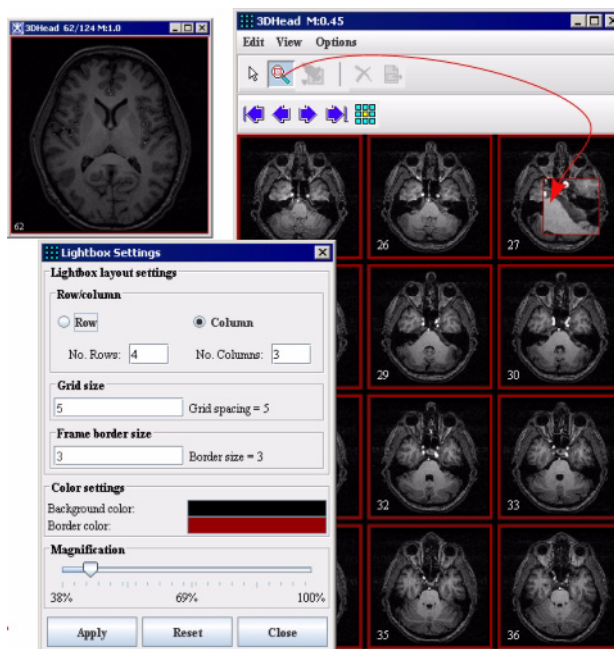


Figure 21. An image shown in the lightbox view and the Lightbox Settings dialog box

To magnify a portion of the image in the lightbox, click Magnify Region and move the pointer to the image section to be magnified. Click Default Mode when finished.

Double-clicking an image in the lightbox view updates the 2D image frame for that image.

Displaying images using the cine view

When you view an image file in cine view, MIPAV automatically advances images one frame at a time. The effect is much like a film loop.

To display images in cine view

- 1 Open an image file. The image appears in the default image window.
- 2 Select Image > Views > Cine (Movie). The images in the image window are advanced automatically.

Adjusting magnification

MIPAV allows you to magnify images from $\frac{1}{4}$ to 32 times the size of the original image. Using the magnification tools, you can magnify or minify the entire image or just a portion of the image. Much like a traditional magnifying glass, the magnification box can also *minify*—or reduce the level of magnification—a portion of the image.

Changing the magnification level

This section explains how to change the magnification level of the image using the icons on the Image toolbar in the MIPAV window.

To learn how to adjust the magnification level using the Image toolbar, refer to

- “Magnifying images” on page 78
- “Reducing the magnification level” on page 78
- “Restoring the original level of magnification” on page 79
- “Magnifying regions within images” on page 79

To learn how to set the magnification level using the other methods, see volume 1 of the *MIPAV User's Guide*.

MAGNIFYING IMAGES

To magnify an image, click the Magnify Image icon, and then click the image. Each time you click the Magnify Image icon and click the image, the image doubles in size. If an image is too large for the current window size, scroll bars appear, and you may need to manually adjust the size of the window.

REDUCING THE MAGNIFICATION LEVEL

To reduce the magnification level of an image, click Minify Image. Each time you click the Minify Image icon, MIPAV reduces the magnification level of the image by half.

RESTORING THE ORIGINAL LEVEL OF MAGNIFICATION

To return the image to its original size or original level of magnification, click Original Magnification.

MAGNIFYING REGIONS WITHIN IMAGES



The Magnify Region icon allows you to view a square portion, or region, of the image at a specific magnification level. If you have loaded **two images** into the same image window, the Window Region of Image B icon appears on the toolbar. Use this icon to view a region on the second image, or Image B.

To use the Magnify Region icon

- 1 Open an image.
- 2 Click Magnify Region and move it over the image.

As you move the mouse over the image, the Magnify Region icon displays a magnified square region in the image in a red box. The number at the left corner of the square is the magnification level. See also Figure 23.

To change the size of the magnified region

You can change the size of the magnifying region to allow you to view larger or smaller regions of the image.

- 1 Right-click on the image while displaying a magnified region. The Magnification dialog box (Figure 22) opens.
- 2 Type either a higher number for a larger region or a lower number for a smaller region in the Width box. Valid values range from 64.0 to 198.0.
- 3 Click Apply. The size of the magnified region, or square, either increases or decreases in size.

Changing the magnification level of the magnified region works similarly to changing the size of the magnified region.

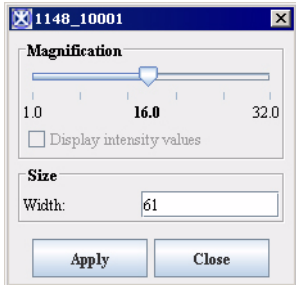
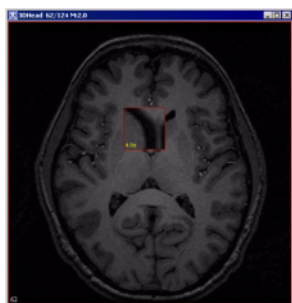
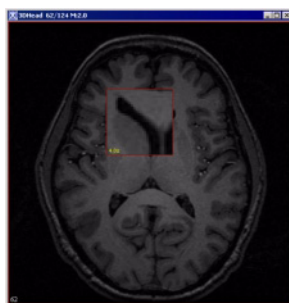
Magnification	Move the Magnification slide to the right to increase the magnification level or to the left to decrease the magnification level	
Display intensity values	When you slide the Magnification slider right past a certain point, this check box becomes active.	
Size	Type either a higher number for a larger region or a lower number for a smaller region in the Width box. Valid values range from 64.0 to 198.0.	
Apply	Applies the changes.	
Close	Closes the dialog box.	

Figure 22. Magnification dialog box options

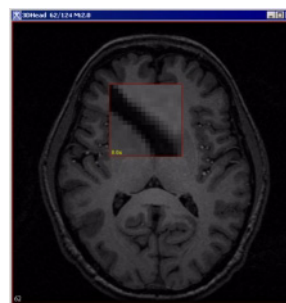
Tip: To review or compare a magnified region of the image with the same region at its original magnification, press Shift. To return to the Magnified view, release the key.



A—the magnified region size is set to 75; the magnification level 4 is shown in the magnified region.



B—the magnified region size is set to 130; the magnification level 4 is shown in the magnified region.



C—the magnified region size is set to 130; the magnification level 8 is shown in the magnified region.

Figure 23. The larger size magnifying glass such as shown in B and C allows to inspect a larger region of the image

To change the magnification level

- 1 Right-click on the image while displaying a magnified region. The Magnification dialog box (Figure 22) opens.
- 2 Complete the dialog box, and then press Apply.
- 3 The magnification level shown in the magnified region changes to the level you specified.

SHOWING INTENSITY VALUES THROUGH THE MAGNIFICATION GLASS

The Display intensity values check box on the Magnification dialog box allows you to display the intensity values within a magnified region of the image. See Figure 22.

To show the intensity values

- 1 Right-click on the image while displaying a magnified region. The Magnification dialog box (Figure 22) appears.
- 2 Select the Display intensity values check box.

If the check box is not available, or dimmed (as it is in Figure 22), increase the magnification by sliding the magnification slider to the right until the check box is active. See Figure 24.
- 3 Move the mouse over the image. The intensity values appear within the magnified region (Figure 24).

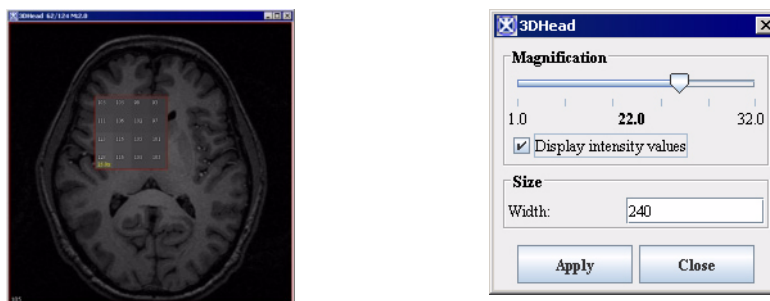


Figure 24. An image window displaying intensity values for a magnified region in the image

Tip: If you hold down the middle mouse button, MIPAV writes the intensities by position within the image to the Data page of the Output window. You can then save these messages and print them.

Improving contrast, adding color, etc.

This section explains how to improve image contrast, add color to images, and create negative images by applying a *quick lookup table* (LUT), generating and modifying a histogram, applying pseudo-color LUTs, and creating negative images by inverting their color.

histogram— is a representation of a frequency distribution by means of rectangles whose widths represent class intervals and whose areas are proportional to the corresponding frequencies.


lookup table (LUT)— maps the frequency distribution in a histogram to pseudo-color values.

Improving contrast on images quickly

MIPAV provides the following quick ways to improve the contrast on images:

- Using the Quick LUT icon
- Using the right mouse button
- Using the Adjust Window and Level icon

USING THE QUICK LUT ICON

 An easy way to improve the contrast in an image is by using the Quick LUT icon, which is located on the image toolbar in the expanded MIPAV window.

To use the Quick LUT icon

- 1** Open an image file. The image appears in an image window. If an image was not previously open, the initial MIPAV window expands to include all of the menus.
- 2** Select the image window.
- 3** Click Quick LUT.
- 4** Hold down the left mouse key and draw a rectangle on a portion of the image.
- 5** Release the left mouse key. Based on the amount of dark and light in the portion of the image that you selected, MIPAV changes the contrast in the image.

Repeat steps 3 through 5 as often as you wish to further improve image contrast. When you are satisfied with the contrast, save the image.

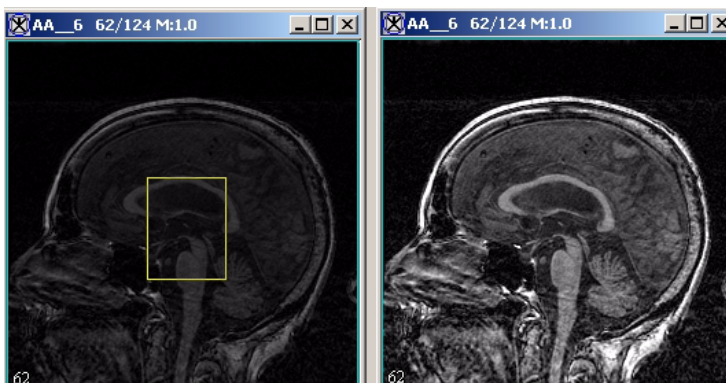


Figure 25. Images before and after applying the Quick LUT icon

USING THE RIGHT MOUSE BUTTON

The right mouse button provides you with a very simple way of changing image contrast. To do so, open an image and then hold down the right mouse button and drag it around the screen. The cursor changes from a red cross to one that is shown in Figure 26. To restore an image to its original appearance, refer to “Restoring images to their original appearance” on page 85.

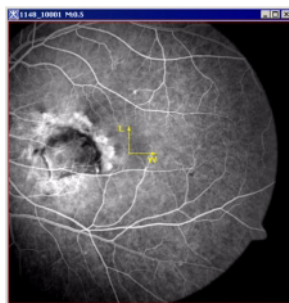


Figure 26. Changing image contrast using the right mouse button

When you drag the cursor up and down or across the image, the image may become darker and gradually disappear or become lighter in appearance.

At some points you may be able to create a negative of the image.

ADJUST WINDOW AND LEVEL

 The Adjust Window and Level icon on the Image toolbar provides another way to change the contrast of images.

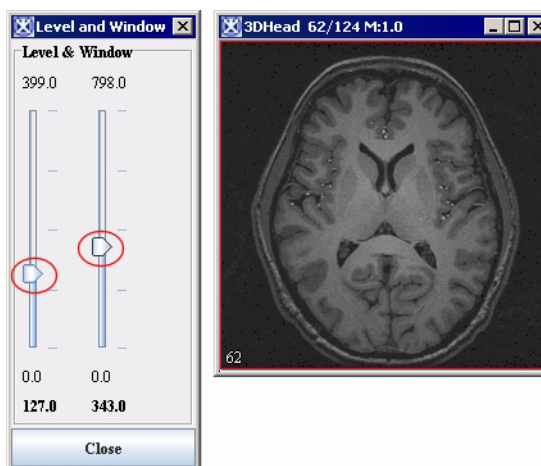


Figure 27. The Level and Window dialog box

Move each slider up or down to change the contrast of the image. The changes are immediately effective in the image.

To adjust image contrast

- 1** Open an image file. The image appears in an image window.
- 2** Click Adjust Window and Level. The Level & Window dialog box appears.

- 3 In the dialog box, move each slider up or down to change the contrast of the image. The changes are immediately effective in the image. Click Close when done.

RESTORING IMAGES TO THEIR ORIGINAL APPEARANCE



To return to the original appearance of the image, click Reset LUT.



In addition, you can click the Gray icon to restore the image to grayscale if you have changed it or added colors.

Improving contrast by generating and modifying histograms



To generate a histogram of an image, you can use the Lookup Table icon or call LUT > Histogram LUT. To obtain a histogram summary, which is in the tabular form, use the Algorithms > Histogram Tools > Histogram Summary command.

To generate a histogram for an image

- 1 Open an image. The image appears in an image window.
- 2 Do either of the following: click Lookup Table icon or select LUT > Histogram–LUT. For images that do not contain VOIs, the Lookup Table window opens.
- 3 For images that contain VOIs, the Histogram dialog box appears. In the dialog box, select either Whole image or VOI region(s).
- 4 Click OK. A progress message appears. After a few moments, the Lookup Table window (Figure 29) opens.

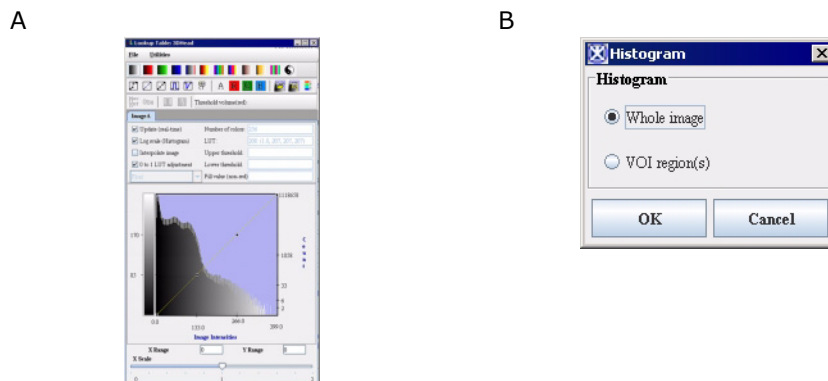


Figure 28. The Lookup Table window (A) and Histogram dialog box (B)

Definition: Lookup table (LUT) indicates the intensity of each voxel in the image and, in MIPAV, allows you to remap the original intensities to other intensities.

transfer function reflects the relationship between the original image intensity values and how they are mapped into the LUT. The line in the LUT represents the transfer function.



To change back to the original grayscale intensities, click Gray LUT in the MIPAV window.

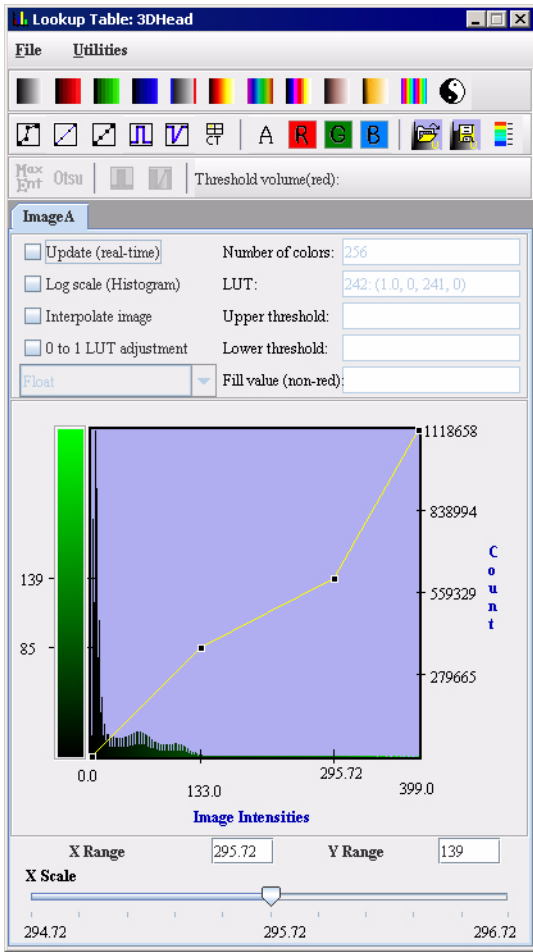












File	<p><i>Open LUT</i>—Opens a previously saved LUT file. LUT files have an. <i>LUT</i> extension.</p> <p><i>Save LUT</i>—Saves the LUT displayed in this window in a LUT file.</p> <p><i>Open user defined LUT</i>— opens a file with the user defined LUT.</p> <p><i>Save user defined LUT</i>— saves a user defined LUT.</p> <p><i>Open Transfer Functions</i>—Opens a previously saved transfer function. Transfer function files have a <i>.FUN</i> extension.</p> <p><i>Save Transfer Functions</i>—Saves the transfer function displayed in this window to a file.</p> <p><i>Close LUT</i>—Closes the LUT window.</p>	
Utilities	<p><i>Change number of colors</i>—Allows you to change the number of colors displayed in the image. Valid values are 2 to 256.</p> <p><i>CT function</i>—Allows you to select a preset LUT that is appropriate for the image content. Values are abdomen, head, lung, mediastinum, spine, and vertebrae.</p>	
	<p><i>Invert LUT</i>—Creates a negative of the image.</p> <p><i>Reset transfer function</i>—resets the chosen LUT back to Gray LUT.</p> <p><i>Reset histogram and LUT A</i>—Returns image A to its original values.</p> <p><i>Reset histogram and LUT B</i>—Returns image B to its original values. This command is only available if two images are open.</p>	
LUT toolbar	<p> – Gray LUT;  – Red LUT;  – Green LUT;  – Blue LUT;  – Cool-Hot LUT;  – Gray/Blue/Red LUT;  – Hot Metal LUT;  – Spectrum LUT;  – Skin LUT;  – Bone LUT;  – Stripped LUT;  – Invert LUT.</p>	

Figure 29. Lookup Table dialog box














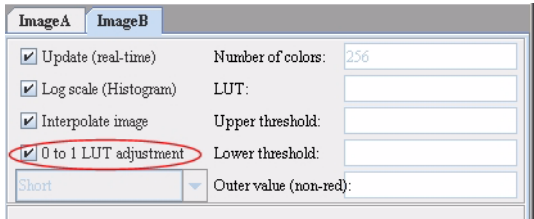
Functions toolbar	<p>  – Transfer function;  – Reset Transfer function;  – Even Distributed Transfer function;  – Dual Trashed function;  – Dual Inverse Trashed function;  – CT preset function;  – Edit Alpha function;  – Edit Red LUT;  – Edit Green function;  – Edit Blue function;  – Open user Defined LUT;  – Save User Defined LUT;  – Generate LUT. </p>
Update (real-time)	Changes the image as you make changes to the LUT, which allows you to see the effect of your changes immediately on the image.
Log scale (histogram)	Displays the image's histogram count in log scale along the Y axis.
Interpolate image	<p>Displays image using interpolation, which reduces pixilated image to appear more smooth.</p> <p>Caution: Depending on the memory resources of your workstation, interpolation can be very lengthy.</p>
0 to 1 LUT adjustment	<p>Appears only for in the ImageB tab when two images are loaded in the same image frame. It processes the image for contrast as follows: for contrast <0, it uses a linear function to calculate the entire contrast look-up-table; for contrast 0, the contrast look-up-table is an identity table, and for contrast greater than 0, a linear function is used to calculate the linear region and for regions near min and max, the nonlinear function $y=x^n$ is used. .</p> 
Number of colors	Allows you to change the number of colors displayed in the image.
LUT	Displays the image intensities.
Upper threshold Lower threshold Fill value	The threshold options is a tool for setting thresholds for a gray level of the image in order to segment the image into an object and a background. This tool does applys a pceudo color (spesified in the Fill Value parameter) to the image, to show the pixels selected by the threshold setting, that is, those pixels with values equal to and between the thresholds.

Figure 29. Lookup Table dialog box (continued)

Applying color to images using predefined LUTs

MIPAV provides a variety of pseudo-color LUTs. When a pseudo-color LUT is applied to an image, the grayscale intensities are remapped to the pseudo-color intensity values.

Using interpolation to smooth images

If you are zooming in on a portion of an image and want to reduce the appearance of pixilations in the image, make sure to select the Interpolate image check box. Interpolation smooths the pixilation.

To apply a pseudo-color LUT

- 1 Open an image.
- 2 Select the image window.
- 3 Click Displays Lookup Table icon to call the Lookup Table dialog box.
- 4 In the dialog box that appears, select one of the LUTs on the LUT toolbar.
- 5 Check the Update (real-time) box.
- 6 MIPAV immediately applies the LUT to the image.



To change back to the original grayscale intensities, click Gray LUT in the MIPAV window.

Creating negatives of images



The invert LUT icon creates a negative of an image.

To create a negative image

- 1 Select the image window of the image you want to invert.
- 2 Click Invert LUT.

Based on the 256-step color values scale, MIPAV assigns the inverse value to each pixel of the image (refer to Figure 30).

Tips: You may wish to apply a LUT to the image or adjust the histogram of the image first before applying creating the negative. The Invert LUT icon is a toggle. To change the image back to its previous appearance, simply select Invert LUT again. To change the image back to its *original* appearance, select Reset LUT.

Note: Invert LUT appears on two different windows: in the Image toolbar in the MIPAV window (select Toolbars > Image toolbar to display the toolbar) and in the LUT toolbar in the Lookup Table window.

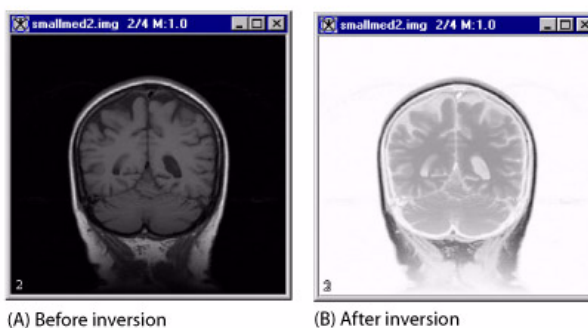


Figure 30. Image before and after inversion

Comparing images using alphablending

Alphablending is a technique that adds transparency information to translucent objects. When two images share the same window such as when you *loading the image*, you can adjust the alphablending settings so that you can see a blend of both images and can compare overlapping regions in two datasets. See also “Loading image files” on page 69.

To use the alphablending function

- 1** Open the first image, then load the second image in the same window.
- 2** Adjust the alphablending slider at the bottom of the MIPAV window.
- 3** Move the slider to select the best ratio for the datasets of interest.

The level of translucency for one image is inversely proportional to the other. Thus, if image A is 75 percent transparent (25 percent opaque), then image B is 75 percent opaque (25 percent transparent).

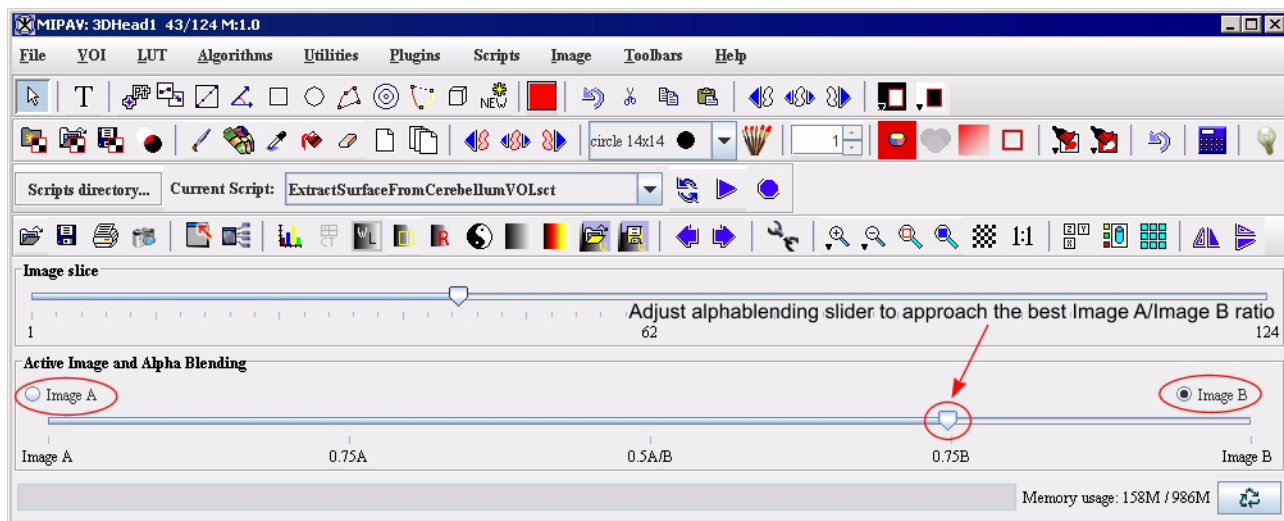


Figure 31. MIPAV window showing the alphablending slider at the bottom of the window

Creating new images

To create a new image file

- 1 Do one of the following:
 - If an image file is not already open, select File > Open Image(A) > Create Blank Image.
 - If an image file is already open, select File > Load Image (B)> Create Blank Image. The Raw dialog box (Figure 32) appears.
- 2 In the dialog box, select the image type.
- 3 Select the units of measure for each dimension.
- 4 Enter the header offset and byte ordering information.
- 5 Click OK. A blank image (Figure 32) appears in an image window.
- 6 Use the paint and VOI tools to create an image.
- 7 Click File > Save image as. The Save dialog box opens.

8 Type the name of the file in File Name, and select the file type in Files of type.

9 Click OK. MIPAV saves the image under the file type you selected.

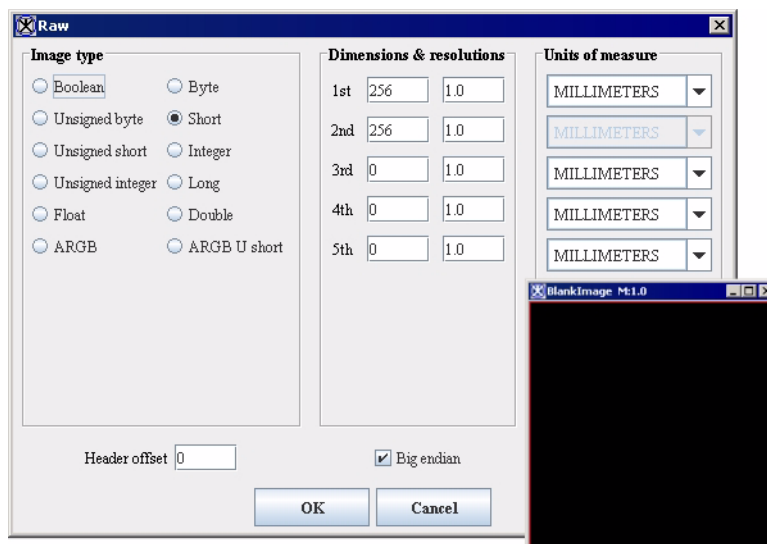


Image type

Synonymous with data type. The image type determines the number of intensities that can be represented in an image. For example, a Boolean image can display two intensities: 1 and 0.

- *Boolean*—1 bit per pixel (1 on, 0 off)
- *Unsigned byte*—1 byte per pixel (0, 255)
- *Unsigned short*—2 bytes per pixel (0, 65535)
- *Unsigned integer*—4 bytes per pixel (0, $2^{32}-1$)
- *Float*—4 bytes per pixel (-3.4E38, 3.4E38)
- *ARGB*—3 bytes per pixel, plus 1 byte; 8 bits per color channel (alpha, red, green, and blue)
- *Byte*—1 byte per pixel (-128, 127)
- *Short*—2 bytes per pixel (-32768, 32767)
- *Integer*—4 bytes per pixel (-2^{31} , $2^{31}-1$)
- *Long*—8 bytes per pixel (-9.22E18, 9.22E18)
- *Double*—8 bytes per pixel (-1.8E308, 1.8E308)
- *ARGB U short*—2 bytes per color channel and 2 bytes for alpha channel

Figure 32. Raw dialog box

Dimensions and resolutions	<p>Degree of manifolding of a quantity such as space or time. Two-dimensional datasets are composed of one image (the two dimensions are length and width). Generally, three-dimensional datasets are composed of more than one image. The third dimension is generally space. The fourth dimension is generally time. (Either time or space can be the third or fourth dimensions.) Zeros in the text boxes indicate that the dimension is not represented in the image. For example, if the text boxes for the first and second dimensions are filled, and the rest of the text boxes are filled with a zero, the image only has two dimensions.</p> <p><i>Dimensions</i></p> <ul style="list-style-type: none"> • 1st—Width (along x axis) • 2nd—Length (along y axis) • 3rd—Depth (along z axis) • 4th—Time (along t axis) • 5th—Fifth dimension <p><i>Resolutions</i></p> <p>Size of pixel or voxel per dimensions 1 through 5.</p>
Units of measure	Indicates the unit of measurement for each of the applicable dimensions.
Header offset	Indicates the size of the space reserved at the beginning of the file where specific types of information is kept. This space, which is called the <i>header</i> , precedes the image data. If you know the length of the header, type it in this box. When MIPAV accesses the file, it skips the header offset and begins to read the image data. Note that not all image file formats have a header.
Big endian	Indicates whether image data is stored in the big endian format. If not, the image data is stored in the little endian format. <i>Endianess</i> refers to the byte ordering of the data. Some computers order the data with the least significant byte (LSB) first followed by the most significant byte (MSB). This byte order is referred as <i>little endian</i> or Intel byte ordering. Machines that use little-endian byte ordering are VAXes, Intel x86, and Pentium. The reverse is MSB and then LSB, which is referred as <i>big endian</i> or Motorola byte ordering. Machines that use big-endian byte ordering are IBM System 3D, RISC, and a Motorola 680x0. MIPAV is biendian; it supports both big- and little-endian byte-ordering formats.
OK	Applies the parameters that you specified and creates a blank image.
Cancel	Disregards any changes you made in this dialog box, closes the dialog box, and does not create a blank image.
Help	Displays online help for this dialog box.TBD.

Figure 32. Raw dialog box

Delineating volumes of interest (VOIs)

MIPAV provides tools that allow you to automatically, semiautomatically, and manually identify and modify volumes of interest (VOIs).

volume of interest—the portion of the image in the dataset on which you want to focus. It may be either one slice or multiple slices throughout the dataset.

Each VOI can be formed from multiple contours in a single slice or multiple slices. Once an object is segmented and defined by a VOI, statistics of the volume can be calculated.

MIPAV supports over 32,000 unique VOIs on a single dataset. Additionally, you can move or delete nodes on the VOI and add new points. VOI types include:

- Point, which is created by using
- 2D line
- Rectangular
- 3D rectangular
- 2D elliptical
- Polygonal
- 3D polygonal
- Interactive level-set

Generating contour VOIs using predefined shapes

MIPAV includes icons of predefined shapes, such as points, lines, ellipses, or rectangles, that you can use to create VOIs. These icons are on the VOI toolbar.

To generate contour VOIs using the predefined shapes

- 1 Select one of the contour icons from the VOI toolbar in the expanded MIPAV window. See also Figure 15.
- 2 Move the pointer to the image window. The pointer changes to a cross-hair shape. Do one of the following:

- **Points, levelset:** Position the cursor on the area where the point or levelset should be drawn. Click the mouse button.

- **Straight lines, rectangles (2D and 3D), ellipsoids:** Position the cursor on the area where the contour should begin.

Click the mouse button.

While holding down the mouse button, drag the cursor until the contour is the desired size.

- **Polylines, polygons:** Position the cursor over the area where the contour should begin.

Click the mouse button. A point appears. Alternate between moving the mouse and selecting the mouse button to outline the VOI.



To complete a polyline, double-click the mouse button. To complete a polygon, connect the first and last nodes.

Tip: To draw the same shape several times in succession, hold down the Shift key while you select the applicable icon from the VOI toolbar and draw.

Adding and moving boundary points on VOIs

No matter which method chosen to delineate a VOI, you can add points and change the boundaries of the VOI. For example, suppose you created a VOI on an image with the Rectangle VOI icon. If you notice that a part of the image that should be included in the VOI is not included, the boundary of the rectangle needs to be adjusted to include the missing portion of the image.

To add a point and change the boundary of the VOI

- 1  Select the VOI. Notice that white points appear at the corners of the VOI and a small cross appears in the middle of the VOI.
- 2  Place the cursor on the portion of the VOI you want to adjust. The cursor changes from a cross to.
- 3 Click once. A white point appears on the line.
- 4 Select the point and drag it to include the missing part of the image.

Tip: Circular VOIs are composed of a continuous series of points around the diameter of the circle. You only need to select one of those points and drag it to enlarge the circle.

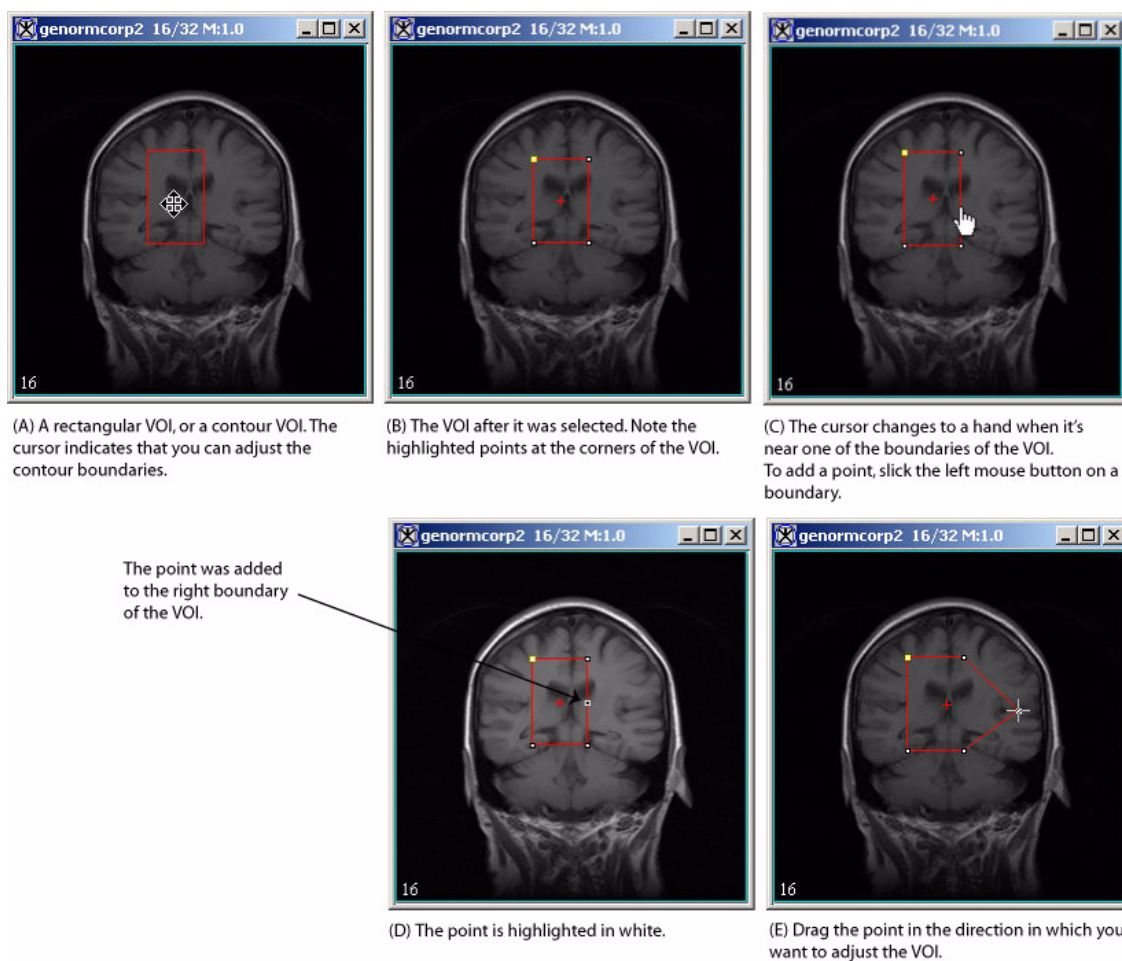


Figure 33. Adding a point and adjusting the boundary of a rectangular VOI

Automatically adjusting contour boundaries

After a contour is drawn, it might be necessary to adjust the boundaries so it more closely matches the VOI region.

To adjust contours

- 1 Click a contour. The nodes become visible.
- 2 Select VOI > Evolve boundary 2D > Active Contour. The Evolve Boundary dialog box opens.
- 3 Modify the information in the window if necessary.
- 4 Click OK.

A new contour, that more closely outlines the VOI, appears on the image. The old contour also remains.



To delete an old contour, select the contour, and then select Cut Selected Contour, or press the Del key on the keyboard.

Scale of the Gaussian	Enter values for X,Y, and Z directions which will be used to correct blurring. The default value is 2.0
Resolution options	If this box is checked, the algorithm uses the image resolution to normalize the Z scale.
Evolve Boundary	<p>Single slice – the VOI boundary will be evolved only for the current slice;</p> <p>Propagate to Adjacent Slices – the VOI will be propagated to adjacent slices;</p> <p>Replace Original Contour – the original VOI will be replaced with the new one.</p>

Figure 34. Evolve Boundary dialog box

Algorithm parameters	<p>Move Boundary – depending on the selected option, the VOI will be moved in 1) any direction, 2) only inward, 3) only outward.</p> <p>Boundary Iterations– specify the number of iterations needed to calculate the new boundary.</p> <p>Smoothness– enter the number from 0.5 to 2.4 to specify smoothness.</p>
OK	Applies the algorithm according to the specifications in this dialog box.
Cancel	Disregards any changes that you made in this dialog box and closes it.
Help	TBD.

Figure 34. Evolve Boundary dialog box (continued)

Annotating images with text

T Another icon on the VOI toolbar is the Annotation tool icon, which you can use to place text directly on an image at any position on the image. You can use any font family, or typeface, that is installed on your computer to display the text.

To annotate images with text

- 1 Open an image.
- 2 Click the Annotation tool icon. The Annotation dialog box (Figure 35 on page 99) opens.
- 3 Click the image on which you want the text to appear. The image becomes the active image.
- 4 Select the font family and style (bold or italic). To select a regular font style, simply specify the font family.
- 5 Type the font size of type in the **pt.** box.
- 6 Press Enter. The Annotation dialog box either enlarges or reduces in size depending on the type size you chose (see “Previewing Font Selection” on page 100 below).
- 7 Click Color to select the color of the text. The color of the type in the Text box changes to the color you have chosen.

- 8 Select "Enter text here" and type the text that you want to display on the image in the Text box.
- 9 Click OK. The text appears near the top of the image.
- 10 Click the text and drag it to any position on the image.

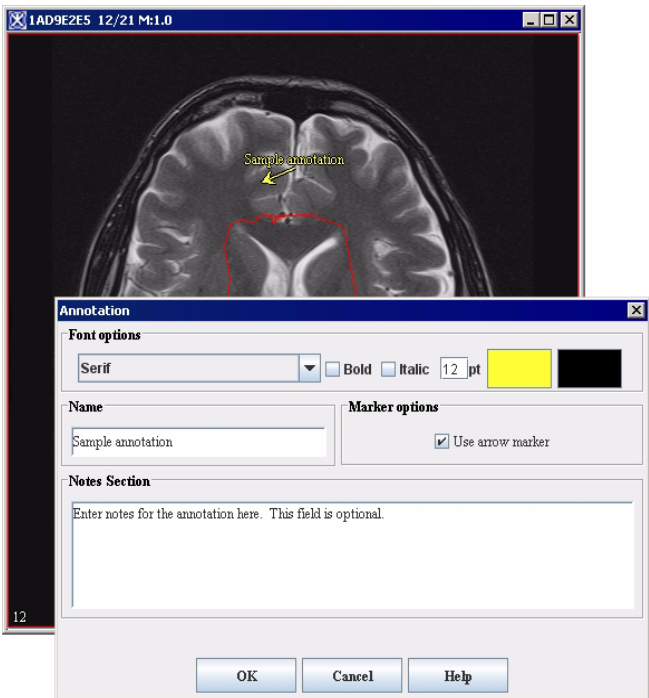
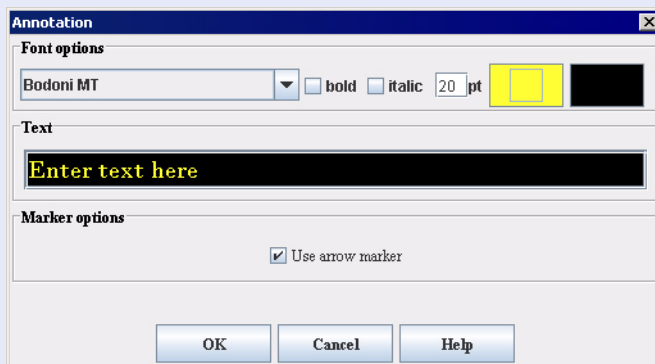
Font options	<p>Font—Specifies the font family, or typeface, for the text. When you select another typeface, "Enter text here" appears in that typeface.</p> <p>Bold—Specifies that the type style should be bold.</p> <p>Italic—Specifies that the type style should be italic.</p> <p>Pt. (point) size—Specifies the point size of the typeface.</p> <p>Color—Specifies the color of the text. When you click this box, the Pick VOI Color dialog box opens.</p>	
Text	Displays the text that should appear on the image.	
Marker options	The arrow marker appears if you check the Use Arrow Marker box.	
OK	Applies the parameters that you specified and places the text on the image, which you can move to any position on the image.	
Cancel	Disregards any changes you made in this dialog box, closes the dialog box, and does not place text on the image.	
Help	Displays online help for this dialog box.	

Figure 35. Annotation dialog box

Previewing Font Selection

The Annotation dialog box allows you to preview the font family, style, size, and color of the text before you click OK and add the text to the image.



To edit the text

- 1 Double-click the added text on an image. The Annotation dialog box opens.
- 2 Make any changes you want to the text, font family, font style, and color.
- 3 Click OK. The changes you made to the text should appear on the image.

To delete the text

- 1 Select the added text on an image.
- 2 Press Del. MIPAV removes the text from the image.

To restore the text to the image, select Edit > Undo VOI. The text reappears on the image.

Calculating VOI statistics

Once a VOI is drawn, you can calculate the number of voxels in the VOI, the volume, and area. You can also calculate the average and standard deviation of the voxel intensity and the center of mass. For 2D images, you can calculate the principal axis and the eccentricity. MIPAV provides two methods for you to obtain VOI statistics:

- *By using VOI properties*—This method is fast and simple and provides statistics for the entire VOI. Although it allows you to save the results in a text file, that is an additional step. However, using this method, you can type additional information directly onto the Data page with the statistics.
- *By using the Statistics Generator*—Using this method, you can obtain statistics on the entire VOI, on a single slice of the VOI, or by contour and slice. The Statistics Generator also automatically saves the results in either a tab-delimited file or an XML file of your choosing. In addition, it displays statistics in a tabular format.

Note: MIPAV can calculate statistics for only one VOI at a time. In addition, MIPAV calculates the volume and area in a VOI using image pixel (voxel) resolutions.

Using VOI properties

To calculate VOI statistics

- 1 Select the desired VOI in the image window.
- 2 Select VOI > Properties in the MIPAV window. The VOI Statistics dialog box appears.
- 3 Select the statistics to be calculated in Statistics to Calculate. Click Calculate. The VOI Statistics dialog box remains on the desktop. In a few moments, statistical data appears on the Data page in the Output window.
- 4 To close the dialog box, click Cancel in the VOI Statistics dialog box when complete.
- 5 To add information to the statistics, just type it in into the statistics on the Data page.
- 6 To remove the data, select them first, and then click the Cut icon or select Edit > Cut to cut the selected data. MIPAV removes the selected text from the Output window and copies it to the clipboard for use in other applications.

- 7 Select the data that you want to copy, and then click Copy or select Edit > Copy to copy the data to another location in the window or to another application (such as a word processor).
- 8 Click Save or select File > Save messages to save the data and any comments you've added to a text file.
- 9 Click Clear Messages or select Edit > Clear Messages to clear the window.

VOI Properties	
Name of VOI	Shows the name of VOI.
Thickness of VOI	Shows the number which represents how many slices has a selected VOI.
Color of VOI	Shows the color that was used to outline the VOI.
Show contour bounding box	Highlights the VOI and, when you select the VOI, displays a box that encompasses all of the VOI's borders and lists the measurements and position of each boundary.
Use additive polarity for VOI	If selected, put VOI names, such as "polygon1" to indicate VOI location.
Include for processing	This option is very helpful if you have a set of VOIs delineated on your image and want to use some of them for masking. See "Using the Include for Processing option".
Show VOI name	If selected, shows the name of the chosen VOI. E.g. "polygon1."

Figure 36. VOI Statistics dialog box

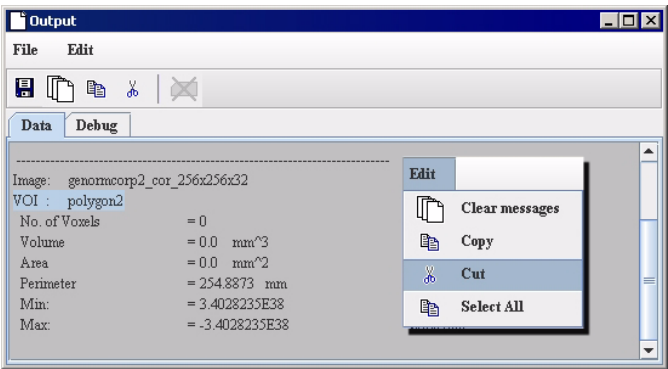
Display VOI shading	Shades the area inside a chosen VOI. When this option is selected, the Opacity slider becomes also available, so you can regulate the opacity of the shaded area.
Statistics to calculate	
	Provides a list of statistics. Select the statistics that you want to include in the report.
Select all	Selects all of the statistics listed in the Statistics to calculate list.
Clear	Clears all of the check boxes that you selected in the Statistics to calculate list.
	
VOI Tree	Displays all VOIs delineated on the image in an hierarchical view.
Tree options	Frame follows VOI selection - if this option is selected, the current selected VOI appears in a frame in the VOI tree.
Exclude intensity range	Allows you to select specific intensity ranges that you want to exclude from the calculation.
Watershed seed value (0-32K)	Indicates the basin value used when running the Watershed algorithm on images.
Apply	Applies the changes you made in this dialog box and leaves the dialog box open for you to make further changes.
Cancel	Disregards any changes you made in this dialog box, closes the dialog box, and does not run a statistics report.
Calculate	Calculates the statistics requested in this dialog box and displays them in the Data page of the Output window.

Figure 36. VOI Statistics dialog box (continued)

Using the Include for Processing option

The Include for Processing option is very helpful if you have a set of VOIs delineated on your image and want to use some of them for masking. In that case, select the VOI(s) of interest, then activate the Include for Processing option, and after that, call one of the mask tools, e.g. the Quick AND VOI mask operation. The tool will apply on the selected VOI(s). In case when the Include for Processing option has not been activated, then the Quick AND VOI mask operation will apply on the whole image and darken it. See Figure 37 (a) and (b).

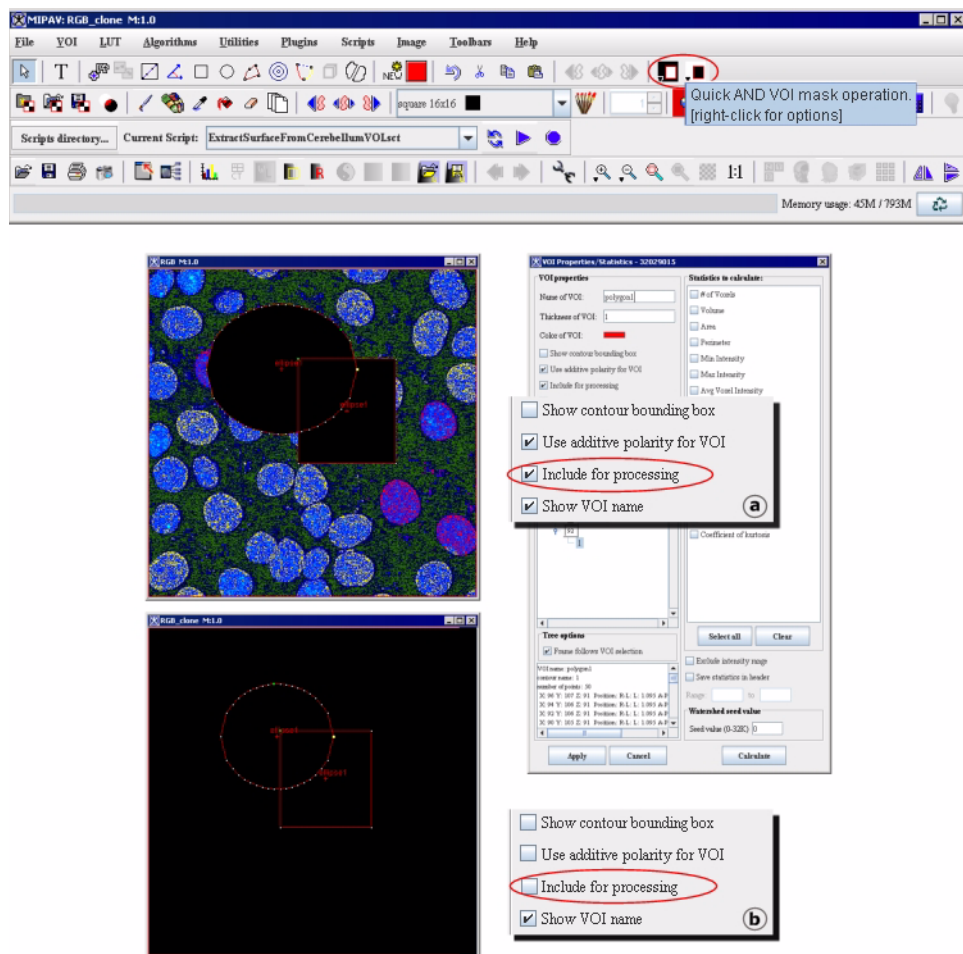


Figure 37. Using the Include for processing option for the Quick AND VOI mask operation. (a) The Include for Processing option is activated and (b) the Include for Processing option is disabled.

Using the Statistics Generator

If you plan either to use a database or spreadsheet to keep track of VOI statistics or to obtain them in an XML format, use the Statistics Generator. As mentioned earlier, the Statistics Generator can provide statistics on an entire VOI(s) or a particular slice or by contour and slice.

Using the Statistics Generator involves three tasks:

- Selecting VOI and save options, refer to page 105
- Selecting statistics options, see page 106

- Reviewing the statistics, see page 107

SELECTING VOI AND SAVE OPTIONS

The first task is to select the VOIs on which you want to obtain statistics and select the file in which the resulting statistics should be saved.

To Calculate Statistics on VOI Groups

- 1 Delineate or select the VOI(s) on the image.
- 2 Select VOI > Statistics Generator in the MIPAV window. The Calculate Statistics on VOI Groups window appears (Figure 38). This window displays all of the VOIs on the image in the VOI group list on the left.

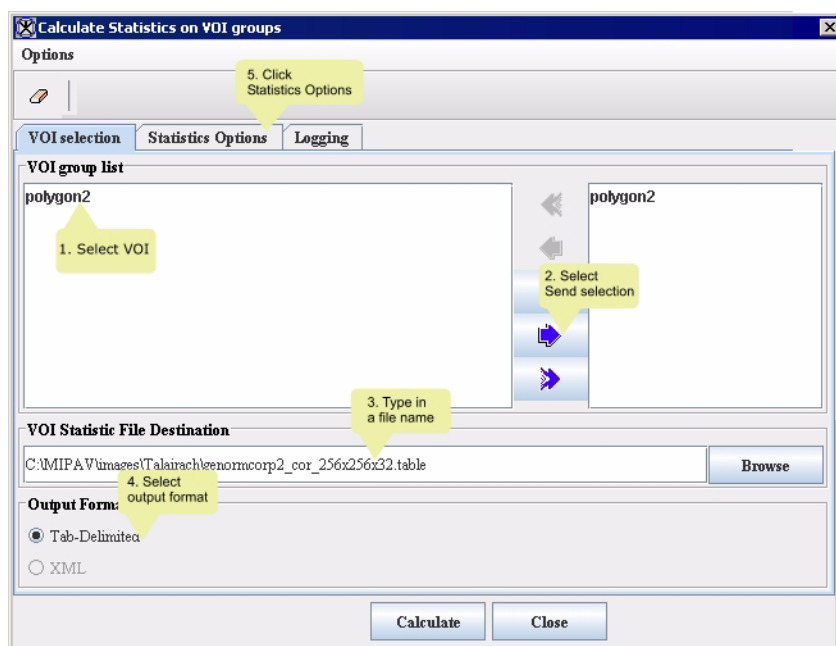


Figure 38. Calculate Statistics on VOI Groups window

- 3 Select the VOI on which you want to obtain statistics.
- 4 Press Send Selection Right. The name of the VOI appears in the VOI group list on the right.
- 5 Use Browse to choose a file name in the VOI Statistic File Destination box.

- 6 Select either one of the two formats in the Output Format group: Tab delimited or XML.
- 7 Click Statistics Options. The Statistics Options page opens.
- 8 Proceed to the next task: Selecting statistics options.

SELECTING STATISTICS OPTIONS

The Statistics Options page (Figure 39) provides a list of statistics from which you can select and the options to obtain statistics by slice, by contour and slice, or by the total VOI.

To select statistics to perform on VOIs

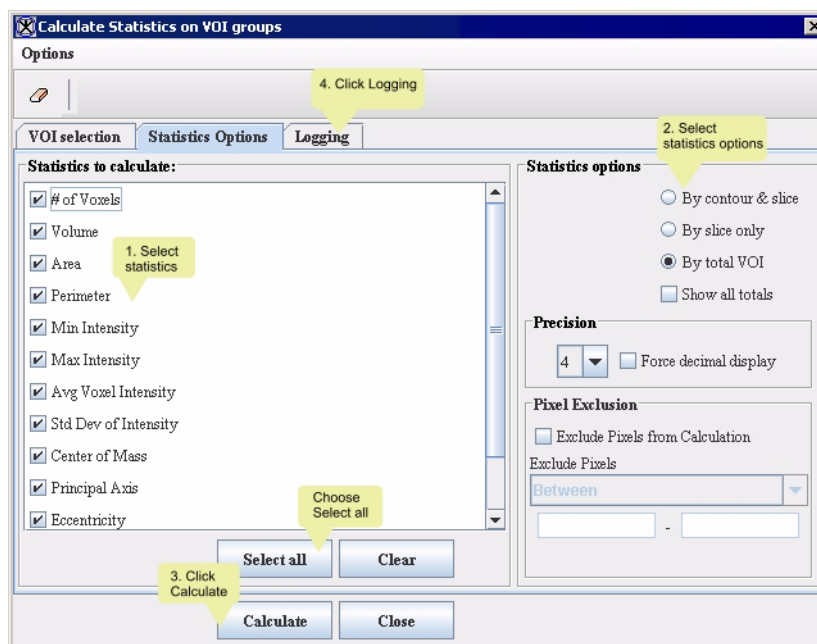


Figure 39. Statistics Options page

- 1 Do either of the following in the Statistics to calculate group:
 - Select one or more of the listed types of statistics.
 - Click Select all to obtain all of the statistic types.
- 2 Select one of the following options in the Statistics options group:
 - By contour & slice

- By slice only
 - By total VOI (the default selection)
- 3 Select Show all totals if you want to record the totals for each type of statistic.
 - 4 Click Calculate.
 - 5 Select Logging. The Logging page (Figure 40) appears.
 - 6 Proceed to the next task: "Reviewing the statistics".

REVIEWING THE STATISTICS

The Logging page (Figure 40) displays the statistics in tabular form. Whether or not you chose a type of statistic on the Statistics Options page, the table includes a heading for each type. Blank cells in the table indicate that you did not choose to obtain that particular type of statistics.

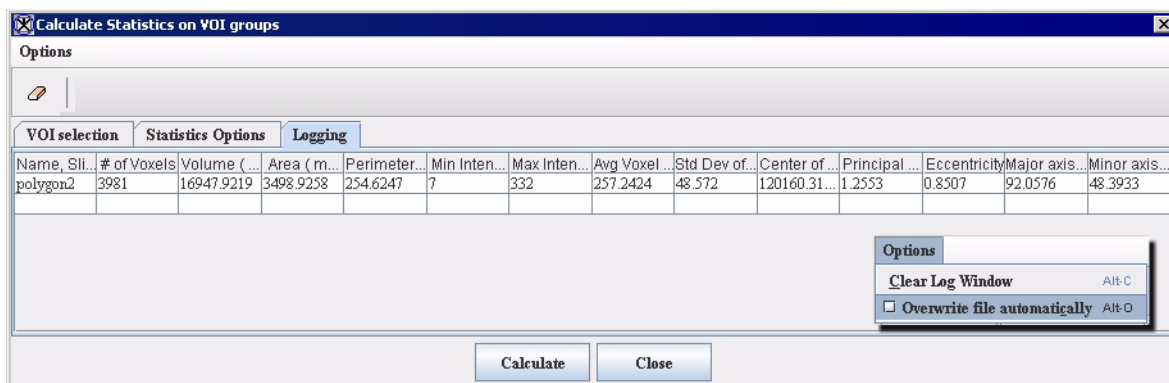


Figure 40. The Logging page in the Calculate Statistics on VOI Groups window

Each time you calculate the statistics for a VOI the Statistics Generator adds another row of statistics to the table. Note that the first column in the table lists the name of the VOI and, if appropriate, the slice and contour numbers. Also, you can change the width of each of the columns in the table by dragging the line between the columns in the heading.

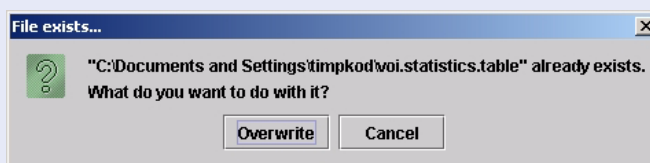
You can include and review the statistics file in a database or in a spreadsheet program by double-clicking on the file name in Windows Explorer window and, in the Open with dialog box, selecting the application in which you want to open the file.

When the number of rows in the table exceeds the length of the Logging page, scroll bars appear on the right side of the table to allow you to scroll from the beginning or to the end of the table.

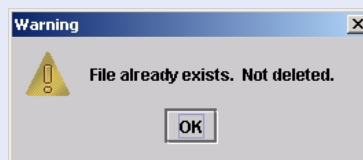
If at any time you want to clear, or erase, all of the rows of the table, select Options > Clear log window. The complete table disappears from the Logging page, which is now totally gray.

Overwriting statistics files

If you previously ran the Statistics Generator and obtained statistics, after you click Calculate a message appears stating that a statistics file already exists. It asks whether to overwrite the file or to cancel the action.



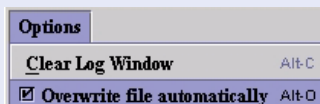
If you not want to overwrite the file, click Cancel. The following warning message appears.



Return to the VOI selection page and choose another file name in the VOI statistic file destination box. Then click Calculate to obtain the new set of statistics. The Statistics Generator calculates the statistics and saves them in the file that you indicated. The statistics appear on the Logging page.

If it's all right to overwrite the file, click Overwrite. The Statistics Generator calculates the statistics and overwrites the previously recorded statistics file.

Tip: If you always want the Statistics Generator to overwrite the file, either select Options > Overwrite file automatically or press Alt+O.



Go to the next task: "Reviewing the statistics".

Modifying image resolutions

To modify the image resolution

- 1 Open an image.
- 2 Select Image > Attributes > Edit attributes in the MIPAV window. The Image Attributes dialog box opens. See Figure 41.
- 3 Click Resolutions. The Resolution page appears.
- 4 Modify the resolutions.
- 5 Click Apply.
- 6 Click OK or Close when complete. The window closes.

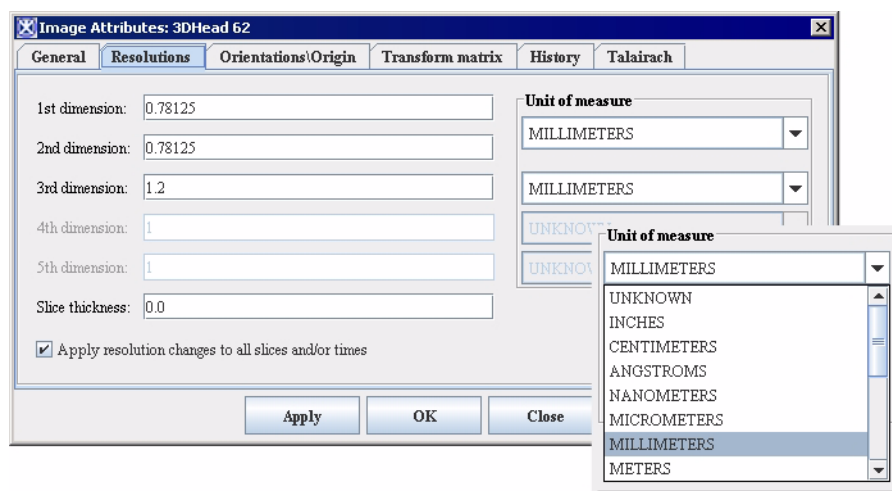


Figure 41. The Resolutions tab of the Image Attributes dialog box; the Unit of Resolutions list box shows different units available in MIPAV

Generating graphs (intensity profiles)

MIPAV can generate a graph of the intensity values of a region bound by a VOI. You can then save this graph or *intensity profile*, to a file for future reference.

Generating new graphs

You can generate an intensity profile for any VOI.

To generate a graph of a VOI

- 1 Select a VOI in an image window.
- 2 Use the right mouse button to call the context menu, then select one of the following:
 - Graph > Boundary Intensity
 - Graph > Total Intensity
 - Graph > Average Intensity
 - Graph > Total Intensity with Threshold
 - Graph > Average Intensity with Threshold

The chosen Intensity Graph window appears. Each function on the graph represents the intensity levels within each channel. Refer to Figure 42.

- 3 Close the graph by either selecting File > Close graph or pressing CTRL+X.

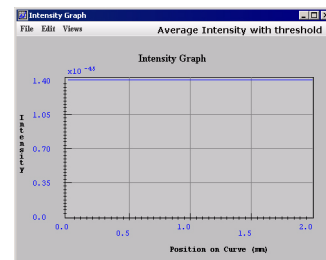
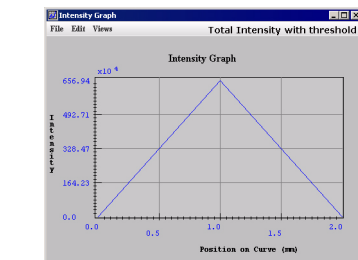
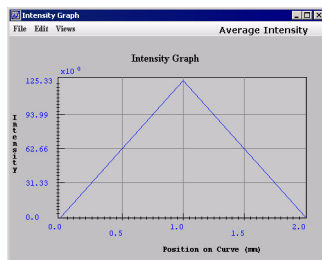
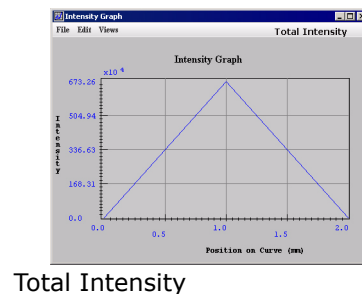
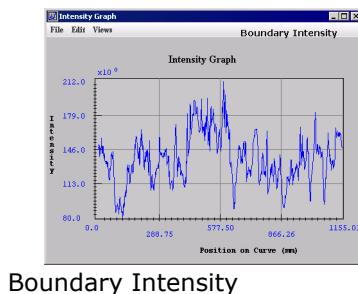


Figure 42. The Intensity graphs

SAVING GRAPHS TO A FILE

To save a graph

- 1 Select File > Save graph in the Intensity Graph window or press Ctrl S.
The Save dialog box appears. See Figure 43.
- 2 Type a name for the graph in File name.
- 3 Make sure that Graphs (.plt) appears in Files of type. Refer to Figure 43.
- 4 Click Save. MIPAV saves the file under a specified name.

PRINTING GRAPHS

To print graphs

- 1 Select File > Print graph in the Intensity Graph window. The Print dialog box appears.
- 2 In the dialog box, select the printer and adjust the print options if necessary.
- 3 Click OK to print the graph or image on your default printer.

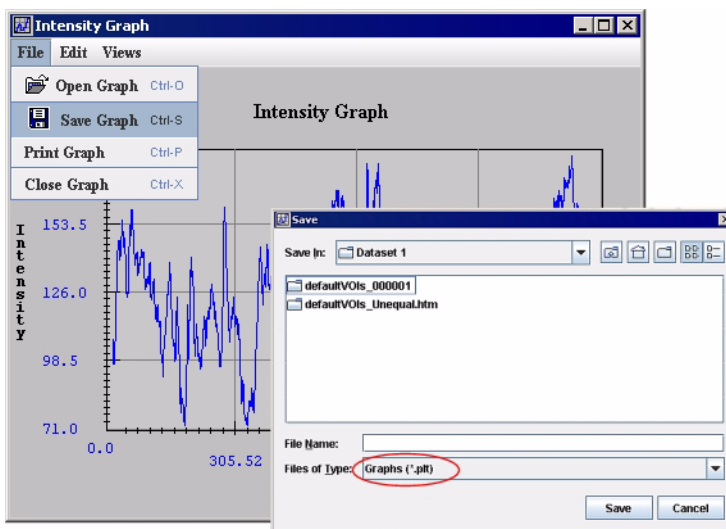


Figure 43. Saving and printing intensity graphs

Saving and printing images

This section explains how to save images to the same format (as when opened) or in a different format. It also shows how to print images. In addition, it explains how to save an image as a TIFF file.

Saving images to the same format

To save an image file in the same format (as when opened)

- 1 Do one of the following in the MIPAV window:
 - Click the Save Image icon or use the Ctrl+S combination of keys.
 - Select File > Save Image.

The Save dialog box appears (Figure 44).

- 2 In the dialog box, type the name of the file in File name and click Save.

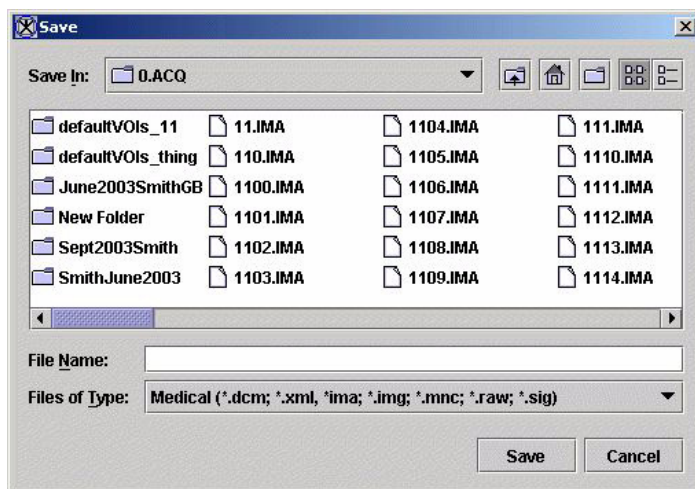


Figure 44. Save dialog box

Note: If you prefer for MIPAV to use the style of Open and Save dialog boxes that are used by the operating system (e.g., Microsoft Windows, Unix, or Apple) on your computer, read the section on "Using platform-specific Open and Save dialog boxes" on page 124.

Capturing images as TIFF(RGB) files

MIPAV allows you to capture entire images or portions of images as RGB TIFF files.

- 1 Select File > Capture image to TIFF(RGB) in the MIPAV window. The Capture Screen dialog box opens. See Figure 45.
- 2 To capture only a portion of the image:
 - Select **Region**, then draw a rectangle with the mouse around the region in the image you want to save. Click OK. The Save dialog box opens. Type the name of the file in File Name, and select the TIFF type of file. Click Save. The region is saved under the specified file name.
- 3 To capture the entire image:
 - Select **Window**, then click OK. The Save dialog box opens. Follow the instructions provided by the dialog box to save the image in TIFF format.

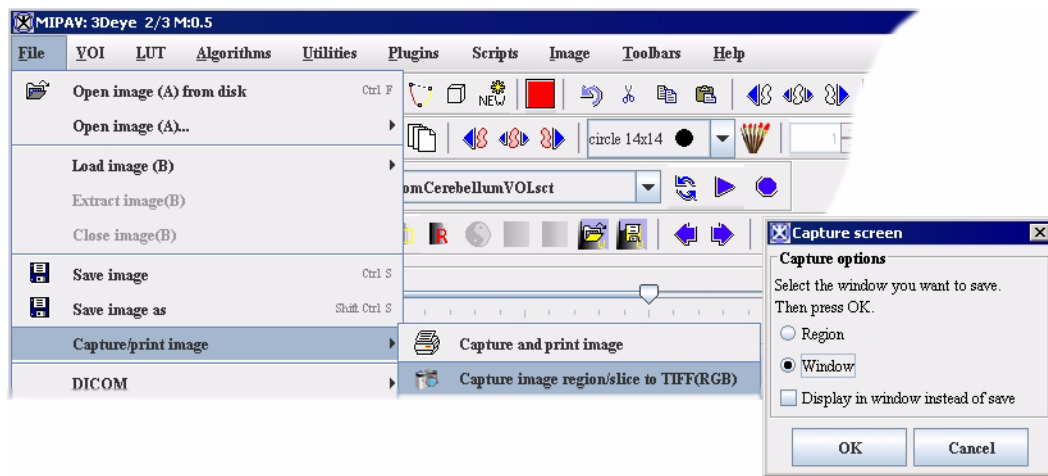


Figure 45. Capturing images or image regions

To display the region in a separate window rather than save it, select **Display in Window Instead of Save**. The selected region appears in a separate window.

To display the image in a separate window rather than save it, select **Display in Window Instead of Save**. The entire image appears in a separate window.

Saving images as

MIPAV uses the file extension to save image into various formats. Thus, saving an image with the extension of *TIFF* causes the image to be saved as a TIFF image. Saving an image with the extension of *IMG* causes the image to be saved as an Analyze image. See Table 1 for file extensions supported by MIPAV.

TO SAVE IMAGES AS RGB TIFF FILES

- 1 Select File > Save as in the MIPAV window.

The Save Image as dialog box appears.

- 2 Type the name of the image in File name. Make sure you add *.tiff* as the extension.
- 3 Click Save. MIPAV saves the file as a TIFF file under the name you specified.

TO SAVE IMAGES TO MINC FORMAT

- 1 Select File > Save As. The Save Image as dialog box appears. See Figure 44.
- 2 Type the name of the file in File name. Make sure you add *.mnc* as the extension.
- 3 The Attributes to Save dialog box appears. See Figure 47.
- 4 Complete the text boxes with the appropriate information. Note that the *x*, *y*, and *z* values differ from DICOM.
- 5 Click Save. MIPAV saves the image to MINC format.

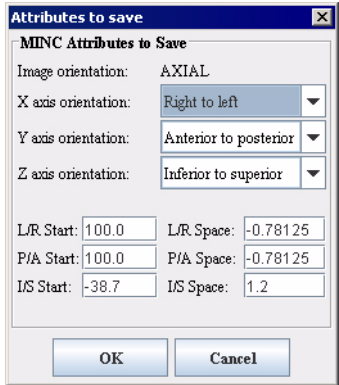
Image orientation	<p>Specify the image orientation here if need. Note that, often the proper value is already entered in the dialog box.</p> <p>Then use the appropriate list boxes to specify the X, Y and Z axis orientation.</p> <p>L/R Start – TBD</p> <p>L/R Space – TBD</p> <p>P/A Start – TBD</p> <p>P/A Space – TBD</p> <p>I/S Start – TBD</p> <p>I/S Space – TBD</p>	
OK	Saves the selected image based on your choices in this dialog box.	
Cancel	Disregards changes you made in this dialog box and closes the dialog box.	

Figure 46. MINC Attributes to Save dialog box

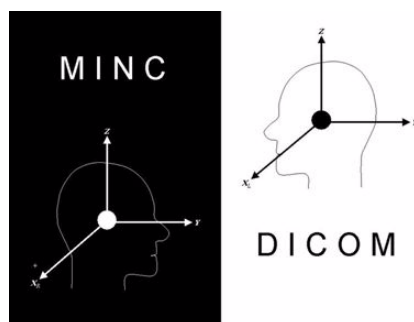


Figure 47. The MINC Attributes to Save dialog box and comparison of MINC and DICOM image orientation

SAVING IMAGES TO XML FORMAT

To record a history of actions that were performed on images, you should save the images to XML format. When you save images to XML format, MIPAV creates two files for each image: a RAW file, which contains image data, and an XML file. The XML file includes image attributes, such as

action history. You can view the attributes of an image by selecting Image > Attributes > Edit Attributes or by viewing the *.xml* file using a text editor or an internet browser. For more information on recording a history of actions, refer to “Saving a history of actions on images (TBD)” on page 126.

To save images to XML format

- 1 Select File > Save as.

The Save Image as dialog box opens.

- 2 Accept the name currently in File name or type a new name. Make sure you add *.xml* as the extension.
- 3 Click Save.

MIPAV saves the file under the name and extension you specified and begins, from this point on, recording a history of actions performed on the image.

SAVING IMAGES TO ANOTHER FORMAT OR RENAMING IMAGES

To save images to format different from the original file

- 1 Select File > Save as. The Save Image as dialog box appears (Figure 48).
- 2 Type the new name in File name. To save the file in a different format, change the file extension. A list of extensions appears in Table 1 on page 628.
- 3 Click Save. MIPAV saves the file under the name and extension you specified.

To rename images

- 1 Select File > Save as. The Save Image as dialog appears (Figure 48).
- 2 Type the new name in File name. Either keep the extension already specified or change it to another file type. A list of extensions appears in Table 1 on page 628.

- 3 Click Save. MIPAV saves the file under the name and extension you specified.

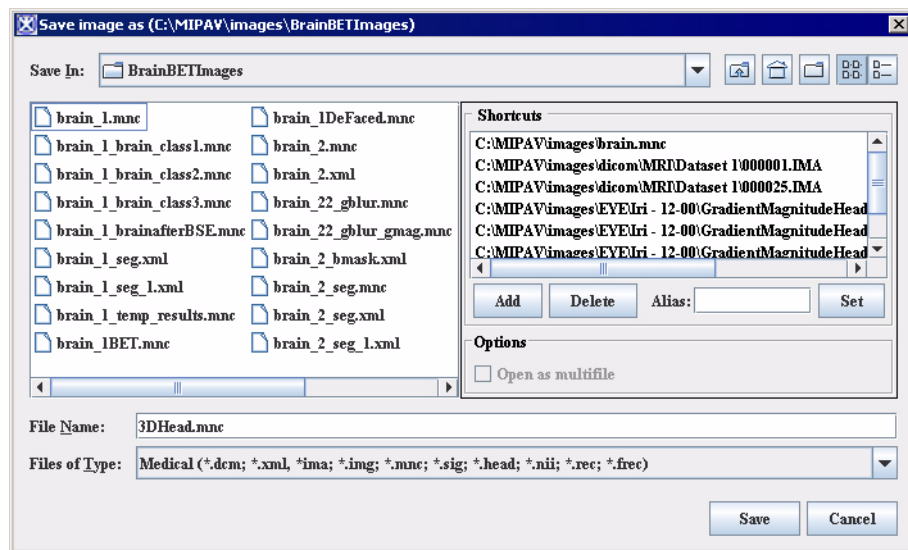


Figure 48. Save Image as dialog box

Printing Images

MIPAV offers the following printing command **File > Capture and Print Image**. This command calls the Print dialog box. Using this dialog you can set up a printer (to do it press the Properties button) or a file for printing (using the Print to File option), select the print copies and print range (all pages, current page, or selected pages).

To print an image with its current options:

Choose File > Capture and Print Image, and click OK.

To set printer and page setup options:

- 1 Choose File > Capture and Print Image.
- 2 Select an installed printer from the pop-up list at the top of the dialog box.
- 3 Set additional options, such as paper size and layout, as desired. The available options depend on your printer, print drivers, and operating system.

Customizing MIPAV

You can set the following MIPAV configuration options:

- “Showing or hiding the splash screen on start-up” on page 118
- “Using platform-specific Open and Save dialog boxes” on page 124
- “Debugging MIPAV” on page 126
- “Saving a history of actions on images (TBD)” on page 126
- “Choosing the default file types to display or save” on page 129
- “Adding shortcuts” on page 132
- “Developing and using plug-in programs” on page 134

Showing or hiding the splash screen on start-up

The *splash screen* is the window that first appears briefly when you start MIPAV. It appears immediately before the MIPAV window and the Output window open. The splash screen displays the name of the program and the MIPAV logo.

By default, MIPAV always displays the splash screen on start-up unless you decide to hide it. To do so, you need to change the option in the MIPAV Options dialog box.

TO HIDE THE SPLASH SCREEN OR PREVENT IT FROM APPEARING ON START-UP

- 1 Select Help > Program Options. The MIPAV Options dialog box (Figure 50) opens.
- 2 Clear the Display Splash Screen box.
- 3 Click Close.

After you quit MIPAV and then start it again, the splash screen doesn't appear.

TO SHOW THE SPLASH SCREEN

After hiding the splash screen, you may later decide to display it.

- 1 Select Help > Program Options. The MIPAV Options dialog box (Figure 50) opens.
- 2 Mark Display splash screen. A check mark appears in the check box.
- 3 Click Apply, and then click Close.

After you quit MIPAV and then start it again, the splash screen appears.

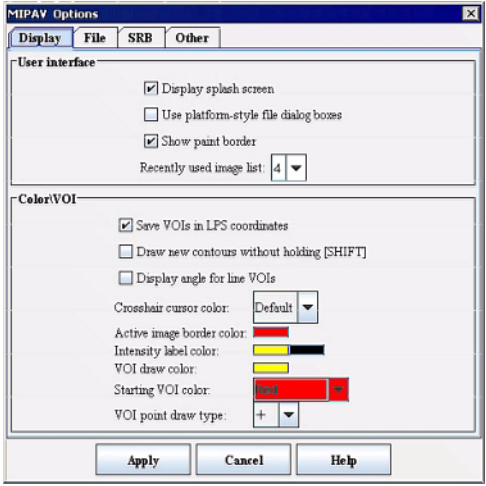
Display Splash screen	Displays the MIPAV opening splash screen, or title screen, when MIPAV is started. By default, this check box is clear.	
Use platform-style File dialog boxes	Uses the style of Open and Save dialog boxes that are provided with the operating system of your computer, rather than the MIPAV style. For more information, refer to "Using platform-specific Open and Save dialog boxes" on page 124. By default, this check box is clear.	
Show Scripting toolbar	Shows the Scripting toolbar, which you can use to create and run scripts, in the MIPAV window. By default, this check box is clear.	
Show Paint toolbar	Shows the Paint toolbar, which allows you to paint directly on images. By default, this check box is clear.	
Show Paint border	Shows a border around the painted area. By default, this check box is clear.	
Snap paint cursor to pixels	Causes the paint cursor to snap to the nearest pixel.	

Figure 49. The Display page in the MIPAV Options dialog

Recently used image list	<p>Specifies the number of recently displayed images that appear near the bottom of the File menu on the MIPAV window. To open a recently displayed image, simply select the image on the File menu.</p> <p>The number of images that can be displayed can be from 2 to 9. By default, the number of images displayed on the File menu is 4.</p>
Crosshair cursor color	<p>Specifies the color of the crosshair cursor. You can choose from several colors and styles. By default, the color is set to "Default."</p>
Active image border color	<p>Specifies the color of the border around images. When you click on this box, the Pick Active Color dialog box, which allows you to select a different color, opens.</p> <div data-bbox="669 644 1278 1071" data-label="Image"> </div> <p>By default, the color is red.</p>
VOI draw color	<p>Allows you to choose the color that is used to draw VOIs. After you finish drawing VOIs, the completed VOIs appear in the Starting VOI color.</p>
Starting VOI color	<p>Allows you to select the initial color for completed VOIs. That is, when you draw VOIs, they appear in the color chosen for VOI draw color; the completely drawn VOIs appear in the color you selected for this field.</p>
Apply	<p>Saves and immediately applies all of the selected parameters in this dialog box.</p>
Cancel	<p>Disregards any changes you made in this dialog box, closes the dialog box, and does not save the specified options.</p>
Help	<p>Displays online help for this dialog box</p>

Figure 49. The Display page in the MIPAV Options dialog

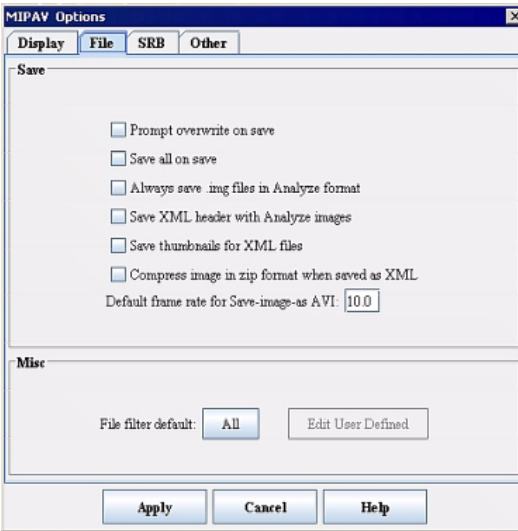
Prompt overwrite on save	Displays a prompt, or message, when you save a file under the same name as an already existing file. The message indicates that saving the file under the same name as an existing file overwrites the file.	
Save all on save	Saves the active image and all VOIs presently displayed on the image so that the next time you open the image MIPAV opens the image and VOIs. The VOIs are saved in a subdirectory of the directory in which the image is stored. By default, this check box is clear.	
Save dialog settings	Saves the settings you specified on algorithm dialog boxes so that the next time you use the algorithms, your specific settings override the default settings. By default, this check box is clear.	
Save XML header with Analyze images	Saves an XML header for an Analyze image when the image is saved. If you choose this option, the image has two headers: the normal header and an XML header. Both point to the image file. By default, this check box is clear.	
Save thumbnails for XML files	Saves a thumbnail image in the XML header, allowing you to view the thumbnails in the image browser	
Compress image in zip format when saved as XML	Compresses images in a zip format when they are saved in XML format. When an image is saved in XML format, MIPAV produces a RAW file that describes the image and an XML file that includes image attributes. When you select this check box, MIPAV compresses only the RAW file, which compensates for the size of the RAW file. By default, this check box is clear.	
Default frame rate for Save-image-as AVI	Specifies the default frame rate in frames per second for images that are saved as AVI. By default, this check box is clear. If you select this option, the default frame rate is 10.0.	
File filter default	Specifies the types of files that should be shown in the Files of type box in the Open Image and Save Image as dialog boxes. Refer to "Choosing the default file types to display or save" on page 129 for more information.	
Apply	Saves and immediately applies all of the selected parameters in this dialog box.	

Figure 50. The File page in the MIPAV Options dialog box

Cancel	Disregards any changes you made in this dialog box, closes the dialog box, and does not save the specified options.
Help	Displays online help for this dialog box

Figure 50. The File page in the MIPAV Options dialog box (continued)

Save dialog settings	Saves the active dialog box settings in a log file.
Global data provenance	<p>Keeps a global record of all of the actions—algorithms and utilities—performed on images. The history may be viewed in the MIPAV system data provenance dialog box.</p> <p>By default, this check box is clear.</p>
Image level data provenance	<p>Keeps a record of all of the actions—algorithms and utilities—performed on images. The history may be viewed in the Image data provenance dialog box while the actions are performed, or in the XML file when an image is saved to an XML file.</p> <p>By default, this check box is clear.</p>
LAX/Preferences memory check	<p>Enables MIPAV developers to debug the program. If you experience problems with the program, you may be asked to select this check box.</p> <p>Recommendation: Do not select this check box unless otherwise instructed by MIPAV development. By default, this check box is clear.</p>
Check on closing frame?	Adds messages to confirm deletions of images. By default, this check box is clear.
Log errors to:	Allows you to select the file in which MIPAV records any errors that occur. By default MIPAV logs errors to C:\Program Files\mipav\mipav.log unless the name and path of the log file was changed during installation.
Debug levels: Minor	Records only minor error messages in mipav.log.

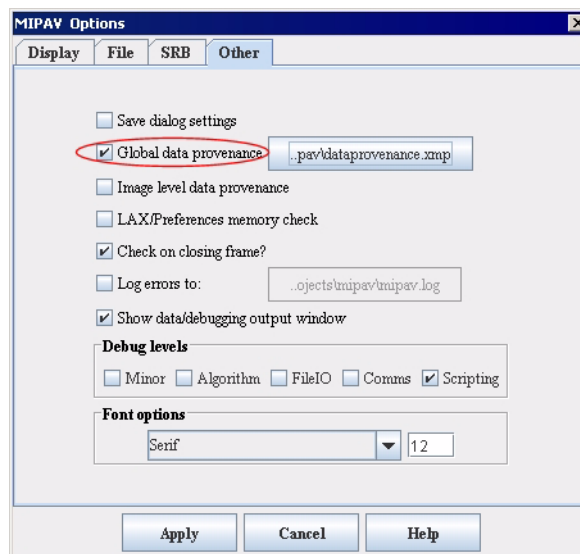


Figure 51. The Other page in the MIPAV Options dialog box

Debug levels: Algorithm	Records only error messages with algorithms in mipav.log.
Debug levels: FileIO	Records only FileIO (file input and output) error messages in mipav.log.
Debug levels: Comms	Records only error messages involving communications in mipav.log.
Debug levels: Scripts	Records all error messages in mipav.log.
Apply	Saves and immediately applies all of the selected parameters in this dialog box.
Cancel	Disregards any changes you made in this dialog box, closes the dialog box, and does not save the specified options.
Help	Displays online help for this dialog box.

Figure 51. The Other page in the MIPAV Options dialog box (continued)

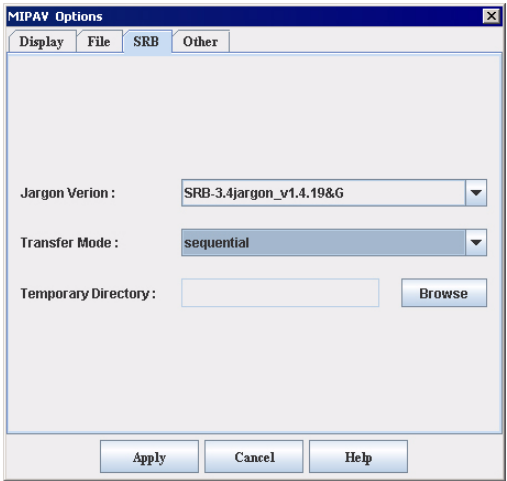
Jargon version:	A version of Jargon API library, which should be used to communicate to the SRB server. Select one from the list;	
Transfer Mode	Parallel or sequential specifies the file transfer protocol. There are SRB parallel transfer protocol and SRB sequential transfer protocol available;	
Temporary Directory	Is your local directory, where you keep your files which need to be transferred FROM or TO the SRB server. See also "Connecting to SRB BIRN" .	
Apply	Saves and immediately applies all of the selected parameters in this dialog box.	
Cancel	Disregards any changes you made in this dialog box, closes the dialog box, and does not save the specified options.	
Help	Displays online help for this dialog box.	

Figure 52. The SRB tab

Using platform-specific Open and Save dialog boxes

By default, MIPAV uses its own version of Open and Save dialog boxes, which provide you with the ability to assign aliases, or shortcuts, to frequently used images. Aliases make it easy to locate images, a feature that may be attractive if you work with the same images for a period of time. However, you may prefer instead to use the style of Open and Save dialog boxes that are provided with the operating system of your computer. To do so, you need to select the Use platform-style File dialog boxes check box in the MIPAV Options dialog box. See Figure 53 on page 125.

If this check box is selected and your computer is running Microsoft Windows, MIPAV displays the Windows style of Open and Save dialog boxes. If you use a Sun terminal, when this check box is selected, MIPAV displays the standard Unix-style Open and Save dialog boxes. On Apple Macintosh computers, MIPAV displays dialog boxes that are standard with that operating system.

To use platform-specific dialog boxes

- 1 Select Help > Program Options. The MIPAV Options dialog box opens. See Figure 53 on page 125.
- 2 Mark **Use Platform-Style File Dialog Boxes**. A check mark appears in the check box.
- 3 Click Apply, then click Close. The dialog box closes.

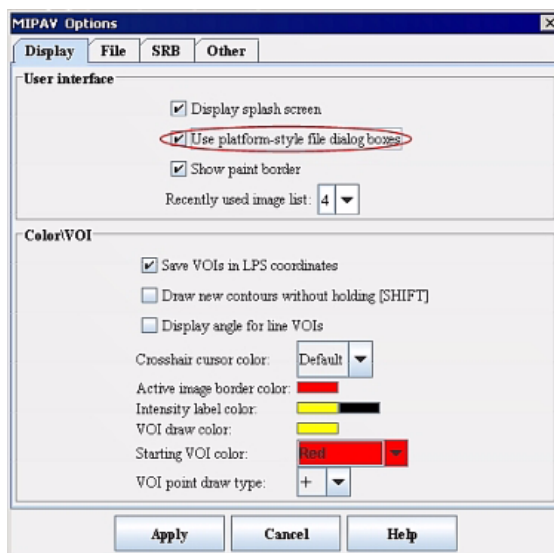


Figure 53. MIPAV Options dialog box showing Use platform-style File dialog boxes check box

Debugging MIPAV

You can track debugging information and error messages generated by MIPAV during a session by placing it in debug mode. If errors occur during the session, the program displays any error messages in the Output window on the Debug page. By default, the debug mode is off when you start the program.

Recommendation: The debugging information is primarily intended for MIPAV developers and not for users. The best course for a user is to leave the debug mode *Off* unless a MIPAV developer asks for he/she to turn it on.

For more information about MIPAV debug mode, please refer to "Troubleshooting" , "Placing MIPAV in debug mode" on page 595.

Saving a history of actions on images (TBD)

MIPAV allows you to keep a history of all of the actions—the algorithms and utilities—that you perform on images. The history includes the specific parameters that were set for the action. In addition, if you save the images as XML, the history of actions and their parameters appears in the dataset attributes section near the beginning of the MIPAV header file (the XML file). Each action appears between the <HISTORY> and </HISTORY> tags.

By default, MIPAV does *not* record a history of actions unless you specifically select the Record history check box in the MIPAV Options > Other dialog box. TBD.

To record a history of actions taken on images TBD

- 1 Select Help > Program Options in the MIPAV window. The MIPAV Options dialog box appears.
- 2 Mark Record history. A check mark appears in the check box.
- 3 Click Apply. From this point on, MIPAV records the actions performed on all images until you clear the Record history check box.

Refer to Figure 54 and "To view the history of actions recorded in the XML file TBD" on page 128.

To view the history of actions as they are performed

The History page in the Image Attributes dialog box allows you to view the list of actions *immediately* after they are performed.

The following example illustrates how to do this:

- 1** Make sure that the Record History check box was selected in the MIPAV Options dialog box.
- 2** Open a sample image.
- 3** Select Image > Attributes > Edit attributes. The Image Attributes dialog box opens.
- 4** Select History. The History page appears.
- 5** Click the image to make it the active window.
- 6** Select Utilities > Flip > Horizontal. The image is flipped horizontally, and the words “Flip(Y_AXIS)” appear on the History page in the Image Attributes dialog box.
- 7** Perform other actions on the image, such as algorithms or other utilities. Note that these actions appear on the History page.

You can type directly onto the History page of the Image Attributes dialog box, letting you add comments to the history, which you can save and print.

Under What Circumstances Do Actions Fail to Appear on the History Page?

If MIPAV is fully operational, actions performed on an image always appear on the History page of the Image Attributes dialog box and in the XML file for that image. However, it's important to know whether the actions were performed on the *original image* or on the *replacement image*.



Several algorithms and utilities offer a choice of either generating a new image (New image check box) or replacing the original image (Replace image check box). If you choose New image and want to see the actions performed on that image, you must select Image > Attributes > Edit Attributes to open an Image

Attributes dialog box for the new image. If, however, you select Replace image, the History page on the Image Attributes dialog box for the original image displays the actions.

To illustrate this point, open a sample image; select Image > Attributes > Edit Attributes to display the Image Attributes dialog box; and select History to display the History page. Perform an action such as Utilities > Image Margins, mark New image in the dialog box, and then click OK. Notice that the action does not appear on the History page. Click on the new image; select Image > Attributes > Edit Attributes; and select History. The History page shows the AddImageMargins action for the new image.

To view the history of actions recorded in the XML file TBD

- 1** Save the sample image as an XML file by selecting File > Save Image as. The Save Image as dialog box opens.
- 2** Select the directory where you want to save the file in the Save in box.
- 3** Type the name of the file—use “SampleImage” as the file name—and type an “.xml” file extension in the File Name box so that the complete file name is “SampleImage.xml.”
- 4** Click Save.
- 5** Open Windows Explorer by right-clicking on Start and then selecting Explore. The Windows Explorer window opens.
- 6** Navigate to the directory where you stored the XML file. This directory should have two files named “SampleImage”: “SampleImage.raw” and “SampleImage.xml.”
- 7** Double-click “SampleImage.xml.” An internet browser page, such as Internet Explorer or Mozilla, appears displaying an XML page.

Notice that, immediately after the <Dataset-attributes> tag, the following line appears:

```
<History>Flip(Y_AXIS)</History>
```

Each action that you perform on the image appears between its own <History> and </History> tags. See also Figure 54.

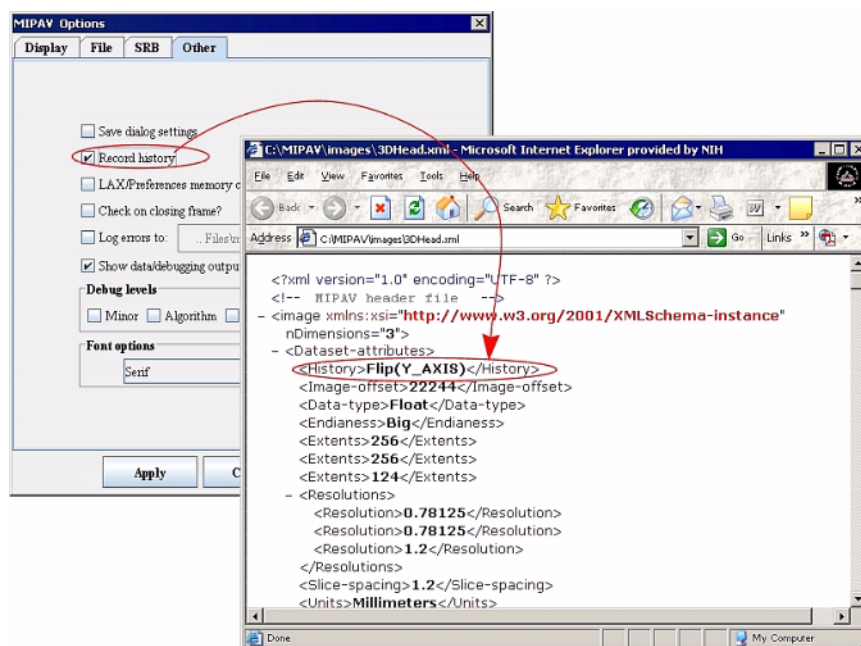


Figure 54. The Record History check box is located in the MIPAV Options dialog box > Other tab. Actions recorded are shown in the header of open XML file. TBD

Choosing the default file types to display or save

When you using MIPAV, chances are that you are working with the same type of files every day or perhaps for a certain period of time. For example, suppose you normally work with medical files (files whose extensions are .dcm, .xml, .ima, .img, .mnc, .sig, .head, etc.). In this situation, when opening or saving images, you want to see only the medical files, not other file types. One of the ways of customizing MIPAV is the ability to show only specific types of files by default.

The File Filter Default box on the MIPAV Options dialog box allows you to choose which types of files should be shown in the Files of type box in the Open Image and Save Image as dialog boxes.

To choose the default file types to display or save

- 1** Select Help > MIPAV Options. The MIPAV Options dialog box opens.
- 2** Click File. The File page appears.
- 3** Click File filter default. The Choose File Filter dialog box appears.
- 4** Select one of the file filters. You can choose one of the following collections of file types:
 - All (*.*)
 - AVI (*.avi)
 - Class files (*.class)
 - FreeSurfer (*.asc)
 - General (*.gif, *.jpeg, *.jpg, *.pict, *.psd, *.tif, *.tiff)
 - Graphs (*.plt)
 - Look-up tables files (*.lut)
 - Matrix files (*.mtx, *.mat)
 - Medical (*.dcm, *.xml, *.ima, *.img, *.mnc, *.sig, *.head)
 - Microscopy (*.avi, *.ics, *.lsm, *.pic, *.stk, *.tif, *.tiff, *.xml)
 - Misc. (*.avi, *.bmp, *.pcx, *.png, *.tga, *.xbm, *.xpm)
 - Optical (*.avi, *.bmp, *.img, *.jpg, *.pict, *.psd, *.tif, *.tiff, *.xml)
 - Project (*.xml)
 - Script files (*.sct)
 - Surface files (*.sur, *.wrl)
 - Transfer function files (*.fun)
 - VOI files (*.voi)
 - Nonlinear transformation files (*.nlt)
 - User Defined
- 5** Click OK. The Choose File Type dialog box closes and the file type you chose appears on the File filter default button.
- 6** Click Apply in the MIPAV Options dialog box. This change takes effect immediately.

See Figure 54 on page 129.

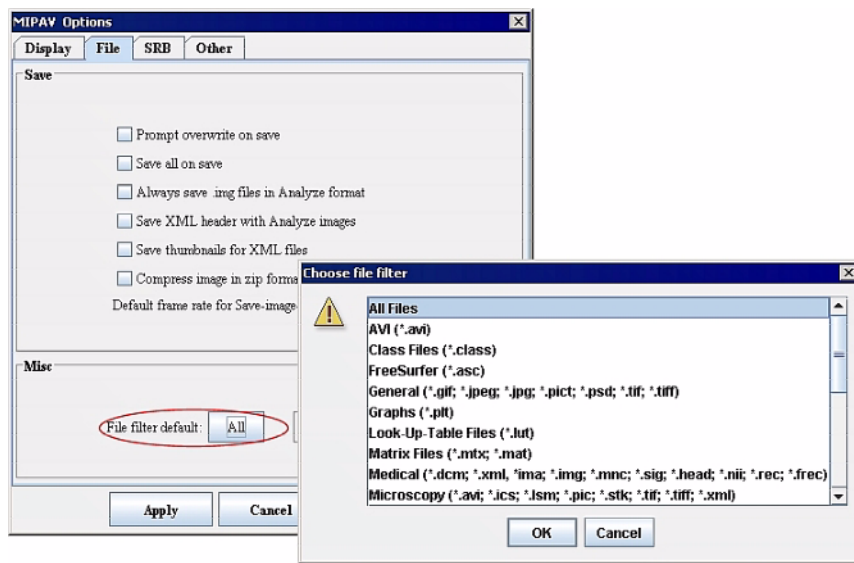


Figure 55. The File Filter Default button is located on File toolbar of the MIPAV Options dialog box. The Choose File Filter dialog box appears when you press that button

To verify that the filters you chose are used as the default filters

- 1** Select File > Open > Image(A). The Open Image dialog box appears. The Files of type box should show the filters you chose.
- 2** Select File > Save Image as. The Save Image as dialog box opens with the Files of type box listing the file filters you chose.



MIPAV allows you to create shortcuts using the Ctrl, Alt, and Shift keys plus the alphanumeric key of your choice. Shortcuts provide a quick way for you to perform a command on a menu or a command on one of the toolbars.

Example: Suppose you frequently clone images. Rather than taking the time to select Utilities > Clone, you may find it easier and faster to simply press Ctrl +C, the keys you assigned to the shortcut.

- 1 Select Help > Shortcut editor. The Shortcuts dialog box opens.
- 2 Click Add. The New Shortcut dialog box opens. See Figure 57–1.
- 3 Select Ctrl, Alt, or Shift or any combination of these check boxes. You can select only one of these check boxes, or you can select any combination of these check boxes. Valid selections can include only Ctrl, only Alt, or only Shift, or you can select Ctrl and Alt, Ctrl and Shift, Alt and Shift, or all three of the check boxes. See Figure 57–2.
- 4 Type an alphanumeric character in Character, and then press OK.

- 5 A message appears directing you to select a command on a menu or in a toolbar. See Figure 57–3. Press OK again. The message disappears.
- 6 Select a toolbar icon or select a command on a menu in the MIPAV window to which you want to assign this shortcut. A message appears indicating that the shortcut was successfully created. See Figure 57–4.
- 7 Click OK. The message disappears, and the shortcut appears on the Shortcuts dialog box.

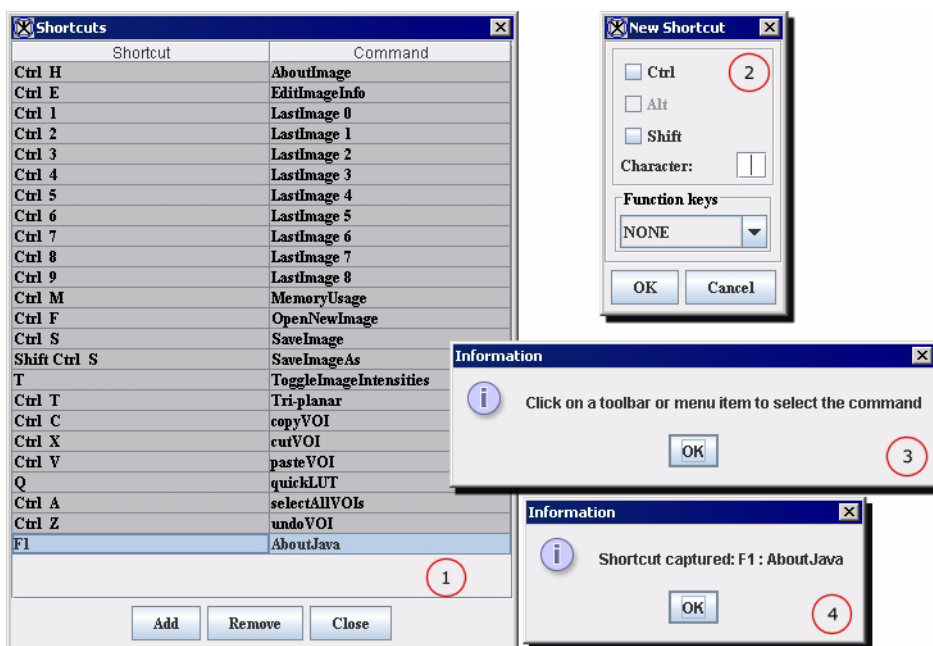


Figure 57. Creating a new shortcut. Steps 1–4 are explained in the text above

To remove shortcut keys

- 1 Select Help > Shortcut editor. The Shortcuts dialog box opens.
- 2 Select the shortcut you want to delete.
- 3 Click Remove. MIPAV removes the shortcut, and the shortcut disappears from the list of shortcuts in the Shortcuts dialog box.

Note: Make sure you want to delete the shortcut. You cannot undo the deletion.

Developing and using plug-in programs

A *plug-in* program allows you to add customized functionality to MIPAV. Before you create a plug-in, you should have a strong understanding of the underlying structure of MIPAV's software design and data structure. Because plug-ins are written in Java, you should also have a basic understanding of that programming language. After you create the plug-in, you must then install it. Once it is installed, you can access it from the Plug-Ins menu in the main MIPAV window. Plug-ins are addressed in Chapter 12, "Developing Plug-in Programs", in the *MIPAV User's Guide*.

Quitting MIPAV

To end a MIPAV session

- 1 Select File > Exit-MIPAV. The MIPAV-Exit dialog box appears asking if you really want to exit the program. See Figure 58.
- 2 Click Yes to end the session.

 You can also exit MIPAV by clicking on Close at the top right of the MIPAV window.

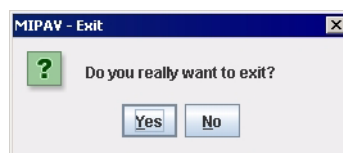


Figure 58. MIPAV Exit Confirmation dialog box