4 Visualization

Overview

Raster images are probably the most popular form of scientific visualization. Even 3D renderings take the form of raster images at some point. Here the use of the raster image displays are discussed, and the tools for manipulating the images are described.

Opening a Raster Image

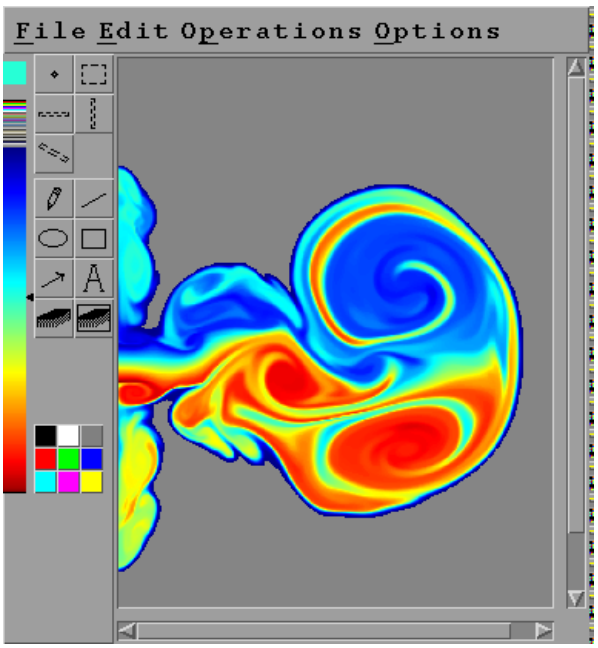
Raster images stored in HDF, GIF, or XWD files may be opened by NCSA Collage. The following sections describe how to open a raster image file.

Opening a Raster Image from an HDF file

To open a raster image from an HDF file, select the Open option from the File menu in the NCSA Collage Main window. The File Selection window will be displayed. Locate the HDF file and double-click on file name. The HDF Browser window will be displayed. Select RIG (Raster Image Group) from the buttons on the left of the HDF Browser window and the RIG data objects will be listed in the Tag Name area. Double-click on an RIG data object to open it in an Image window.

If there are several RIG data objects that you would like to open, click and drag the cursor to highlight more than one data object. Select Send Selection from the Transport menu in the HDF Browser window. Each raster image will be opened in its own window.

Figure 4.1 A Raster Image Displayed in an Image Window



Opening a Raster Image from a GIF or XWD file

To open a raster image from an GIF or XWD file, select the Open option from the File menu in the NCSA Collage Main window. The File Selection window will be displayed. Locate the GIF or XWD file and double-click on file name. The file will be loaded and the information displayed in an Image window.

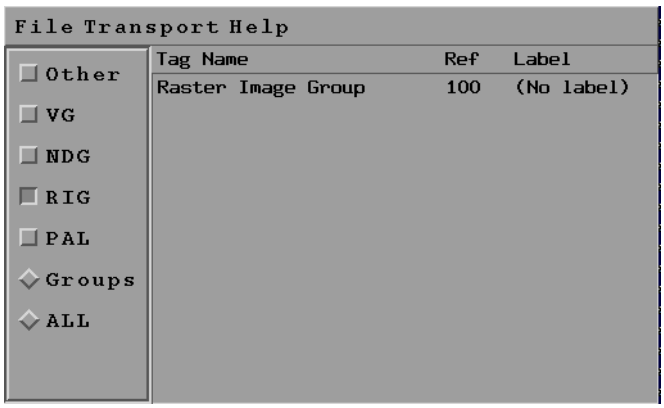
Exercise 4.1 Load a Raster Image File

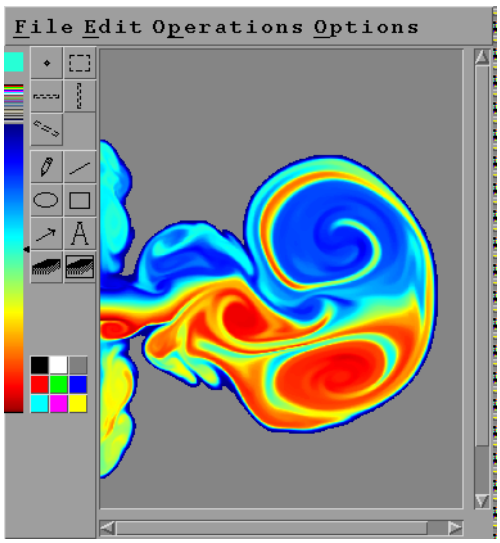
For this example, use the sample data file:

`/Samples/jet2.hdf`

1. Select the Open option from the File menu in the NCSA Collage Main window. The File Selection window is displayed.
2. Select the data file **`jet2.hdf`** by double-clicking on the name of the file. The HDF Browser window is displayed.
3. Select the RIG button to display the RIG data items in the Tag Name area. Select the Raster Image data set by double-clicking on its name. The information is displayed in the Image window.

Figure 4.2 Opening a Raster Image from an HDF File





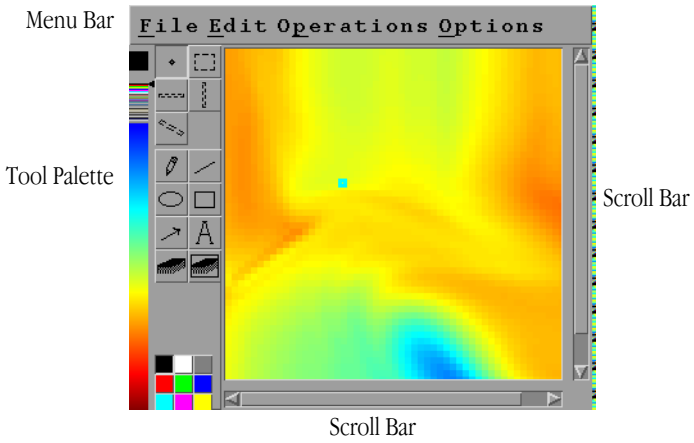
Selecting the RIG data object of **`jet2.hdf`** opens this raster image

The Image Window

Raster images are displayed graphically in the Image window. Scroll bars are available to change the view of large images by dragging the slide control or clicking on the arrows.

The tool palette is displayed on the left of the Image window. The use of the tools is described later in this chapter with detailed instructions presented in Chapter 2, “Basic Procedures.”

Figure 4.3 Image Window Components



The Image Menu

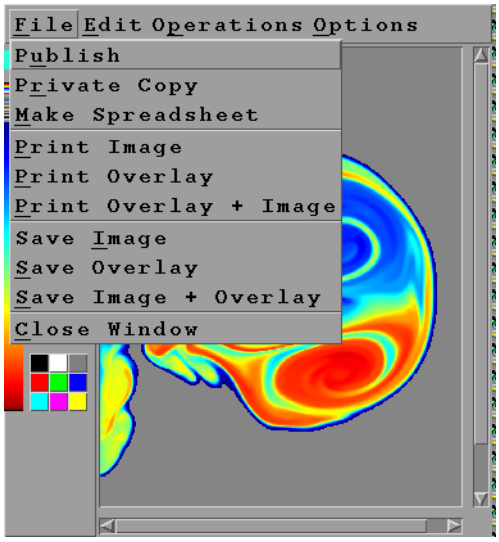
This section briefly describes the menus for the Image window. Detailed descriptions are given in later sections.

File Menu

The File menu contains the following options:

- Publish, to publish data to a collaborative session so that other participants may view the data
- Private Copy, to make a private copy of the data (other collaborative participants will not be able to see the data or annotations you make on the data)
- Make Spreadsheet, to generate a spreadsheet from the raster image data
- Print Image, to print the raster image to a device or file
- Print Overlay, to print the overlay to a device or file
- Print Overlay and Image, to print both to a device or file
- Save Image, to save the raster image to and HDF file
- Save Overlay, to save the overlay to and HDF file
- Save Image and Overlay, to save both to an HDF file
- Close Window, to hide the Image window from view

Figure 4.4 Image Window File Menu

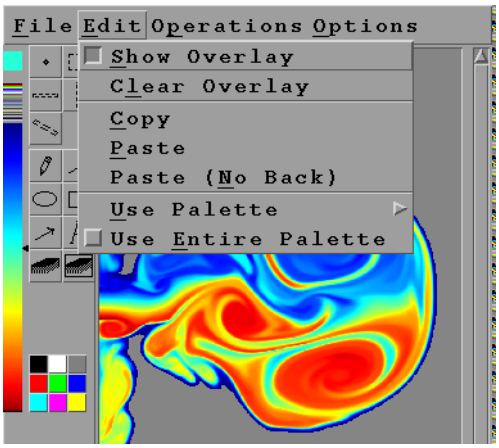


Edit Menu

The Edit menu has the following options:

- Show Overlay, to display the overlay layer and its annotations
- Clear Overlay, to erase all annotations from the overlay
- Copy, a screen capture tool that copies any portion of the screen image to a cut buffer
- Paste, to paste the image captured by Copy into the current NCSA Collage image
- Paste (No Back), same as Paste, but without the background of the X window
- Use Palette, to select a color table palette
- Use Entire Palette, to map the range on raster image pixel values onto the entire range of color table values, including the system color table

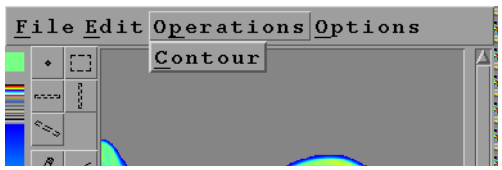
Figure 4.5 Image Window Edit Menu



Operations Menu

The Operations menu has a single option to generate a contour drawing on the overlay based on the raster image data values

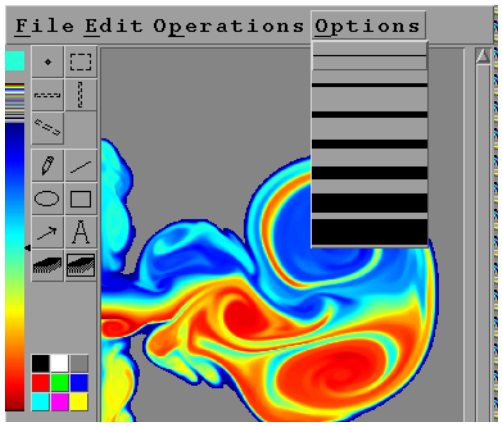
Figure 4.6 Image Window Operations Menu



Options Menu

The Options menu allows you to change the line thickness for the drawing tools.

Figure 4.7 Image Window Options Menu



Making a Private Copy and Publishing Data

When using NCSA Collage as a single-user or during a collaborative session, you can make a private copy of the raster image data. This operation creates a new Image window containing the copy. The name of the window will contain the name of the original data appended with the word COPY.

To generate a copy, select the Private Copy option from the File menu of the image you want to copy. A new Image window will be created containing the copied data.

When you are participating in a collaborative session, all work that you perform on the private copy will not be viewed by the other session participants. This allows you to add annotations or adjust the color table before sending the data to the collaborative session. When you are ready to show the data to the other users, select Publish from the File menu of the private copy Image window. The data will then be sent to all other participants of the collaborative session.

Generating a Spreadsheet from a Raster Image

To examine a raster image in numeric form, a spreadsheet can be generated from the raster image. When a spreadsheet is generated from a raster image, the spreadsheet is automatically associated with the image. Any data analysis operations performed on one window will automatically appear on the associated window.

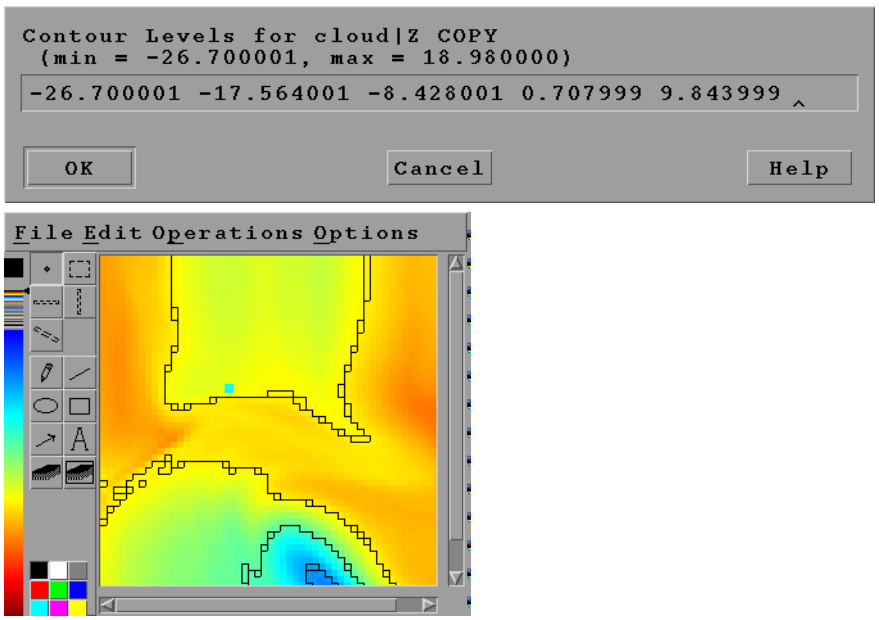
To generate a spreadsheet from a raster image, select the Make Spreadsheet option from the File menu in the Image window. A new spreadsheet window will be displayed containing the numeric data.

Displaying Contour Lines

Contour lines can be displayed on the overlay layer. To generate the contour lines, select the Contour option from the Operations menu. A Contour window will be displayed with some suggested values for the contour levels. You may add or delete contour levels but the level values must be between the maximum and minimum values of the raster image.

After you have entered the contour levels, click OK to display the contour lines. Since the contour lines reside on the overlay layer, they can be modified using the annotation tools.

Figure 4.8 Contour Window and Contours Displayed on the Overlay Layer



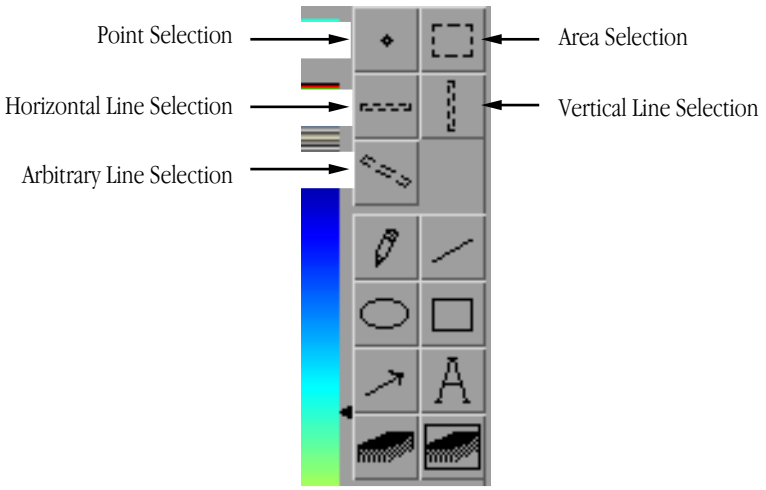
Data Analysis

Several data analysis tools are available in the tool palette of the Image window. These tools are also described in the section *Using Data Analysis Tools* in Chapter 2, "Basic Procedures."

The data analysis tools available for the raster image are:

- Point Selection tool to examine the value of a single point of data
- Line Selection tools to examine the values along a line
- Area Selection to generate a histogram plot

Figure 4.9 Selection Tools and Drawing Tools



Selecting Points in the Raster Image

To select a point on the raster image, select the Point Selection tool and click on the raster image. If an associated spreadsheet has been generated from the raster image (or a raster image has been generated from a spreadsheet), then the selection will also be highlighted in the raster image.

Selecting Lines in the Raster Image

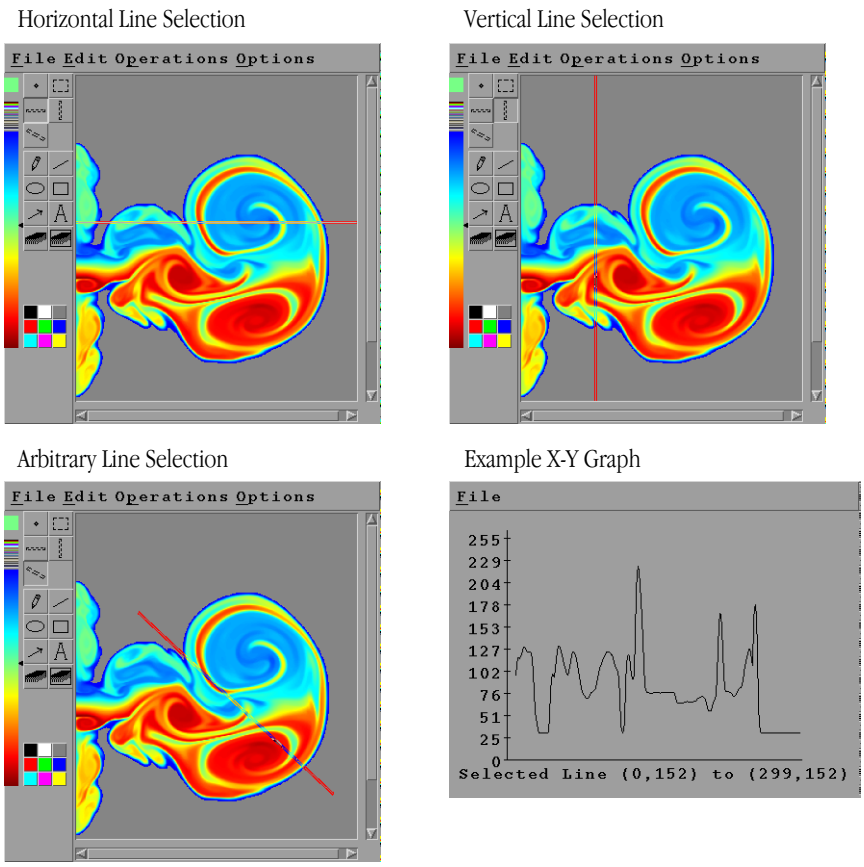
To select a line in a spreadsheet, select one of the line selection tools in the tool palette:

- Horizontal Line Selection
- Vertical Line Selection
- Arbitrary Line Selection

For the Horizontal and Vertical Line Selection tools, click on the raster image and a horizontal or vertical line will appear on the image, respectively. Click and drag the mouse to move the horizontal line up or down, or the vertical line left or right. For the Arbitrary Line Selection tool, click on the raster image and drag the mouse to another end point and release the mouse. This tool allows you to draw a line at any angle in the raster image. If an associated spreadsheet has been generated from the raster image (or a raster image has been generated from a spreadsheet), then the selection will also be highlighted in the associated window. Once an area is selected, an X-Y graph of the data will be generated.

When you are through examining the X-Y graph, you may remove the window by selecting Done from the File menu.

Figure 4.10 Line Selections and an X-Y Graph



Exercise 4.2 Extracting a slice from an image for the X-Y plot window

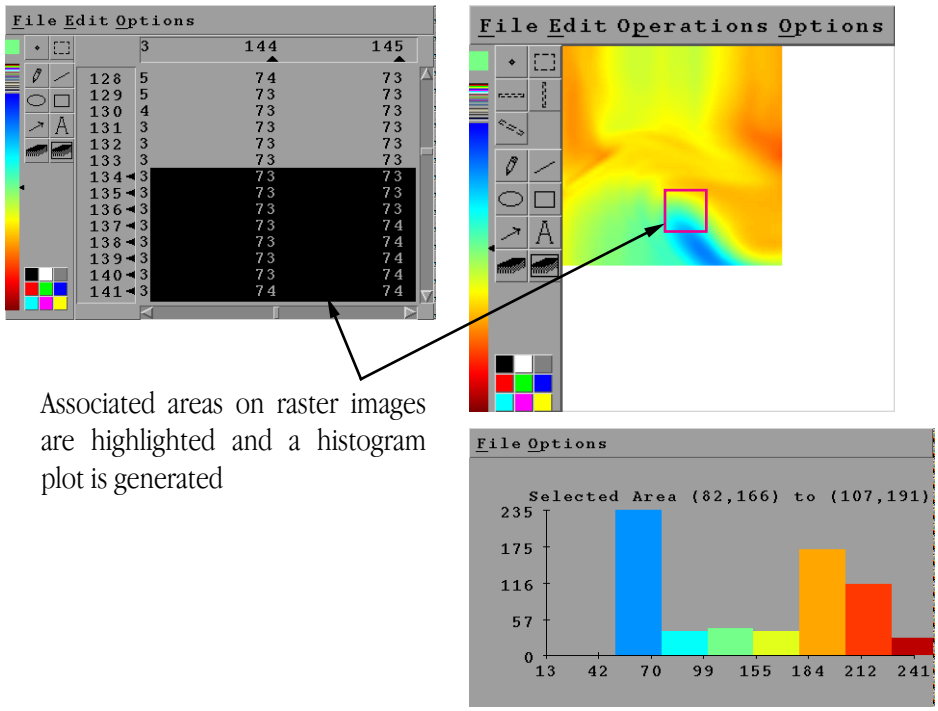
1. Select the Arbitrary Line Selection Tool from the tool palette.
2. In the raster image, click the mouse button around the upper left hand corner of the image.
3. With the mouse button still depressed, drag to the lower right hand corner of the Raster Image window and release the mouse button. The selected line is plotted in the X-Y Plot window.

The X-Y Graph window is resizable. As you increase or decrease the size of the window, the graph will be resized.

Selecting Areas in the Raster Image

To select an area in a raster image, select the Area Selection tool. In the data display of the raster image, click and drag the mouse from the upper left hand corner to lower right hand corner to highlight an area. If an associated spreadsheet has been generated from the raster image (or a raster image has been generated from a spreadsheet), then the selection will also be highlighted in the associated window. Once an area is selected, a histogram plot of the data will be generated. Use the Number of Intervals option in the Options menu of the Histogram window to modify the intervals used in plotting the histogram.

Figure 4.11 Selecting an area in a Spreadsheet



Exercise 4.3 Selection of a Raster Image and Associated Spreadsheet

1. Select the Image window.
2. Select the Area Selection tool. Click near the upper left hand corner of the image.
3. With the mouse button still depressed, drag the cursor down and to the right.
4. Release the mouse button. The corresponding area of the spreadsheet that was generated will also be selected and shown in a rectangle. A histogram plot will also be generated displaying the distribution of values in the area selected.

The Histogram window is resizable. As you increase or decrease the size of the window, the graph will be resized.

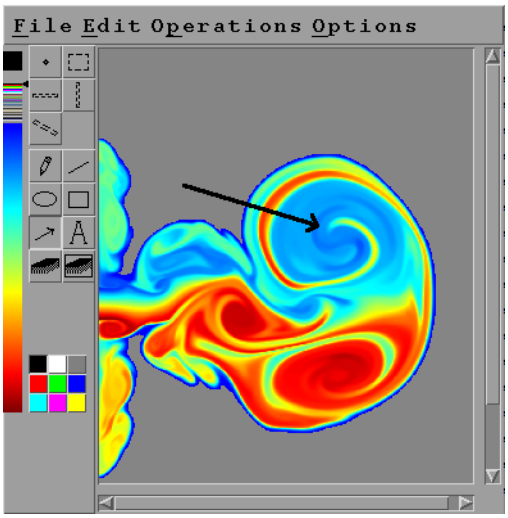
Selecting Areas of the Spreadsheet using the Raster Image

Since large data sets can be difficult to view using the spreadsheet window, you may find it easier to view the generated raster image of the data. When you want to examine an area to see the kind of values it contains, you can select an area on the raster image and the associated area will be highlighted on the spreadsheet.

Image Annotation

All the drawing tools are available for annotating the raster image. All drawings are made on the overlay layer and do not affect the data. You can draw freehand lines, straight lines, arrow lines, ellipses, rectangles, and text on the images. The drawing tools are described in section *Using Annotation Tools and Overlays* in Chapter 2, “Basic Procedures.”

Figure 4.12 Image with Annotations



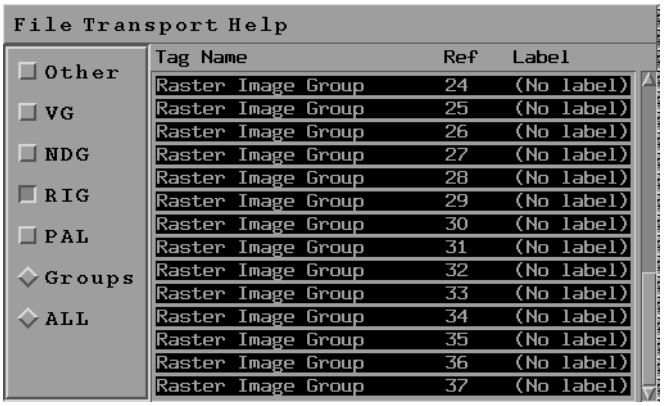
Animation

An animation is a sequence of raster images that can be displayed one after another to create the effect of movement. NCSA Collage supports raster image animation. Raster image animations can be treated like and operated on much like single raster images. To use raster images as animation, all the images should be the same size and stored in consecutive order in an HDF file. You may want to name the raster images with a number to denote the frame number of the animation when you store the images in the HDF file.

Opening Raster Images for Animation

To open a set of raster images as an animation, select the Open Animation option from the File menu in the NCSA Collage Main window. The File Selection window is displayed. Select the file by double-clicking on its name. The HDF Browser window is displayed. Select the RIG button to display the raster image groups in the Tag Name area. Highlight all the raster images by clicking on the first image and holding down the mouse button while dragging the mouse down to highlight the other images.

Figure 4.13 Selecting All RIG Data Groups in the HDF Window



Once all the images are selected, choose the Send Selection option from the Transport menu in the HDF window. The Magnify window will be displayed allowing you to increase the magnification of the image before displaying it. Enter a magnification factor for X and Y, then click OK. Each raster image will be loaded and displayed in an Animation window. The color table, or palette, associated with the first raster image will be used to display all the raster images.

Figure 4.14 Animation Window

Exercise 4.4 Load an Animation from a Raster Image File