5 Color Tables and the Palette Editor

Overview

In this chapter the use of the Palette Editor window is described. Color table editing is described an a short description of what a color table is and how it works is also included.

What Is a Color Table?

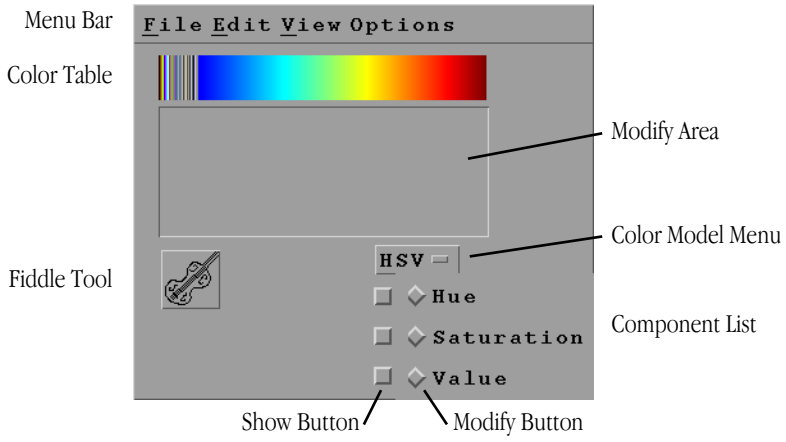
On a typical pseudo-color graphics device, only 256 colors can be displayed at a time. In order to do this, there is a table, called a color look-up table or palette, with 256 entries that contains a color representation at each entry. Each of the 256 colors are stored as some blend of varying quantities of red, green, and blue. Any or all of the three components can be changed at any entry in the color table to change the color displayed for that pixel value. Pixel values of 1 are displayed using the second entry in the color table, pixel values of 2 are displayed using the third entry, and so on. The resolution typically support by a pseudo-color graphics device is 8 bits per component, so the 256 colors in use at any given time are selected from 16 million possible colors.

The 256 colors in use at any time can be changed using the Palette Editor. (This is not entirely true, since the first color must be white and the last color black.) This editor provides a convenient method for choosing among the 16 million available colors.

Palette Editor Window

For the manipulation of colors, a special Palette Editor window is provided. To display the Palette Editor, select the Palette Editor option from the Windows menu in the NCSA Collage Main window.

Figure 5.1 Palette Editor Window



Palette Editor Window Structure

The color table is displayed horizontally with the low values at the left and the high values at the right. Below the color table is an area to show and modify the component colors. Different color models may be chosen from the Color Model Menu. Each component can be shown or modified using the buttons next to the name of the component. Any number of components from any model can be displayed at a time using the Show buttons. Only one component can be edited at a time using the Modify buttons of the window.

Palette Editor Menus

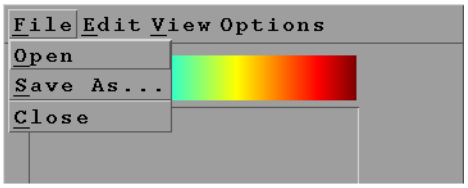
This section contains a description of the Palette Editor menus.

File Menu

The File menu contains the following options:

- Open, to open a color table stored in an HDF file
- Save As..., to save a color table to an HDF file
- Close, to hide the Palette Editor window

Figure 5.2 File Menu

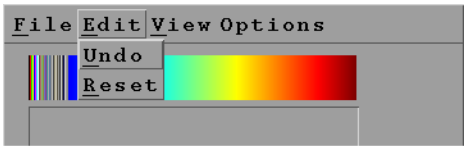


Edit Menu

The Edit menu contains the following options:

- Undo, to undo the last operation on the Palette Editor
- Reset, to reset the color table to its original state before editing

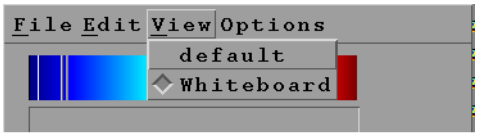
Figure 5.3 Edit Menu



View Menu

The View menu contains a list of all available color tables that have been loaded into NCSA Collage.

Figure 5.4 View Menu

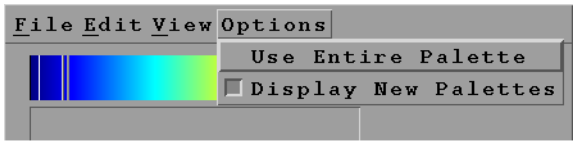


Options Menu

The Options Menu has the following options:

- Use Entire Palette, which is used to map the raster image onto the entire range of palette values, including the system colors
- Display New Palette is used to immediately display a palette that has been published to a collaborative session

Figure 5.5 Options Menu

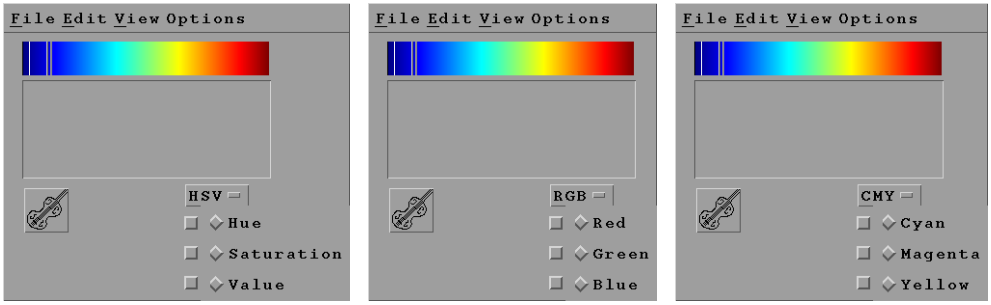


Color Model and Component Selection

The Color Model menu of the window allows you to choose which color model is used to display the color components. There are three color models:

- HSV, for hue, saturation, and value
- RGB, for red, green, and blue
- CMY, for cyan, magenta, and yellow

Figure 5.6 Color Model Components



Component Descriptions

HSV

Hue is the shade of color in the spectrum from red through yellow, green, cyan, blue, and magenta then circularly back to red again. Saturation is the gradation of color made by adding the degree of difference from a gray of the same brightness. Value is gradation of

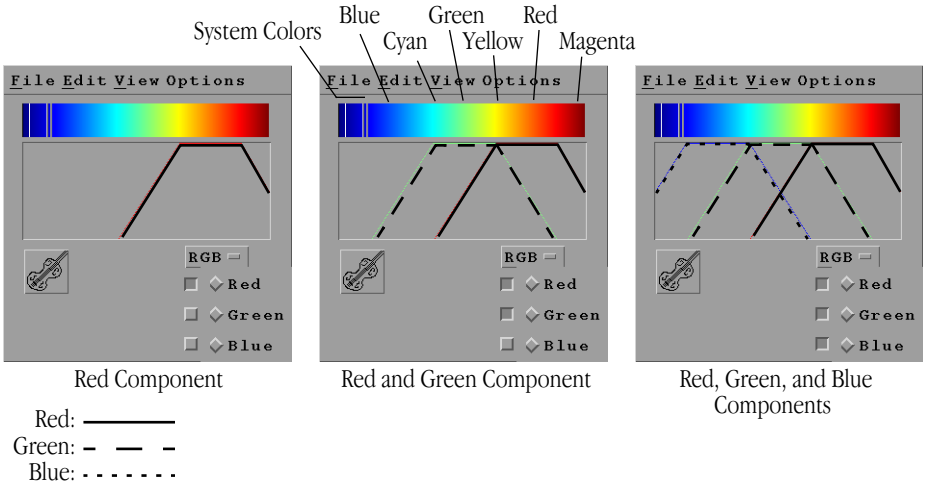
color made by adding white to reduce its intensity, or the relative darkness or lightness of a color. Hue is the only color component of the three. Saturation and value are expressed as numeric values between 0 and 1. White is defined as a value of 1 and a saturation of 0 Black is defined as a value of 0 and a saturation of 0. A example of a pure color would be defined as a hue of red, a value of 1 and a saturation of 1. HSV is not based on an additive or subtractive process of producing colors, but together numerically define a color.

RGB

In the RGB color model, an entry in the color table is specified by the intensity of red, green, and blue components that are combined to produce a color. This color model is based on the color television components used in monitors to produce images on a screen. RGB is an additive process of combining primary colors to produce a color.

The following figure shows the RGB component graphs for a color table. The names of the colors are shown in their approximate position within the color table so the graphs can be matched accordingly. On a color monitor, the graphs lines of the components are drawn in their respective colors (i.e., red for red). In the following figure, the component graphs are drawn with different line types to make them easier to read.

Figure 5.7 Example Graphs of RGB Components



CMY

The CMY color model is the complement of the RGB color model. In the CMY color model, an entry in the color table is specified by the intensity of cyan, magenta, and yellow components that are combined to produce a color. The CMY color model is based on the printing process of applying inks to paper. The difference in CMY to RGB is that CMY subtracts primary colors from white light, that is to say light that is reflected off the ink on paper.

Editing the Palette

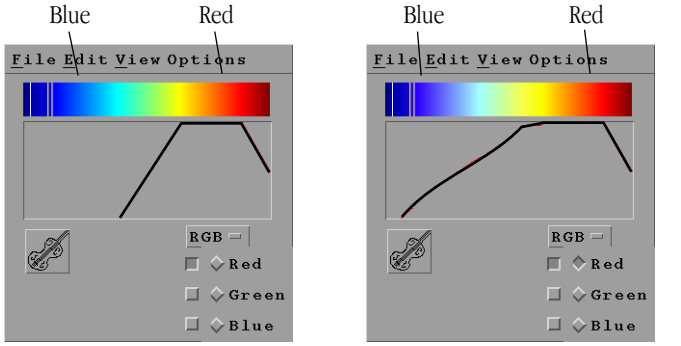
Component Modification

When you select a color model, the components of the color model are displayed below the menu name. Each component has a Show button and a Modify button. The Show button displays a graph of the component in the Modify Area. The Modify button allows you to edit one component at a time by modifying its graph.

To modify a component, click on the modify button. The Show button will automatically be invoked if it was not previously selected. Move the cursor to the Modify Area and it will change to a pen cursor. When you click and drag the mouse, the graph of the component will change to the line you draw with the cursor. Lines drawn at the top of the Modify Area increase the value of the component and lines drawn at the bottom of the Modify Area decrease the value of the component.

In the following figure, the red component was modified by drawing the line over to the left side of the modify area which increases the red content in those colors. The blue and green components are effectively diminished, though their component graphs have not changed.

Figure 5.8 Modifying the Red Component



Red Component Before Modification Red Component After Modification

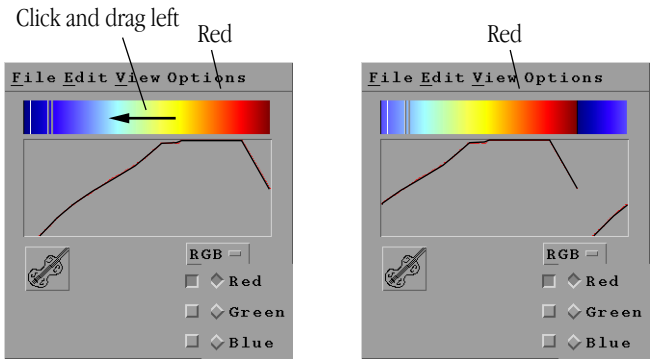
Exercise 5.1 Manipulating the Component Graph

1. Display the default color table by selecting Default from the list of available color tables in the View menu.
2. Select the RGB color model. If necessary, unselect all the check boxes in the component section.
3. Click the check box for the component labeled Red. The component graph is now displayed.
4. Click the radio button next to the component labeled Red. This component is now editable. Draw new lines for the red component.
5. Click the check box for the component labeled Blue in order to display the blue component.

Shifting the Color Table

To shift the color table, select the Fiddle tool. The palette can be shifted right or left by clicking and dragging the cursor right or left on the Color Table area of the Palette Editor window. In the following figure, the color table that was modified in the previous illustration, Figure 5.8, Modifying the Red Component, is now shifted to the left. Notice the disjoint lines in the red component graph. This is the left hand portion of the graph wrapping around to the right side as the color table is shifted to the left.

Figure 5.9 Shifting the Color Table



Exercise 5.2 Shifting the Color Table

1. Place the cursor in the Color Table section of the Palette Editor window.
2. Depress the mouse button while the cursor is in the Color Table section.
3. Move the mouse to the right. The color table moves with it.
4. Move the mouse to the left with the mouse button still depressed. Once again the color table shifts left to match the mouse movement.

Squeezing and Expanding the Color Table

By clicking and dragging the Fiddle tool up and down, the corresponding area in the color table can be expanded or squeezed, respectively. When the cursor is dragged up, the effect is to increase the weight of that color value to its neighboring color values and the color table expands at that point. Likewise, by dragging the Fiddle tool down, the effect is to decrease the weight of the color value on its neighboring values and the color table squeezes together with the ends of the color table having more weight. The Fiddle tool operates on the currently active component—not all the components at the same time.

The Fiddle tool may also be used to shift the color table.

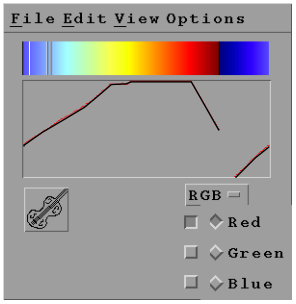
Exercise 5.3 Modifying the Color Table with the Fiddle Tool

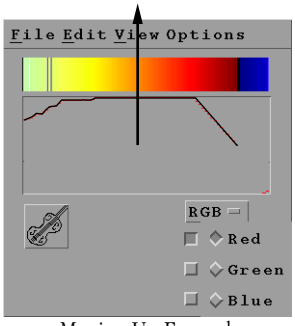
1. Select the Fiddle Tool.
2. Move the cursor to the Color Table section of the Palette Editor window.
3. Depress the mouse button with the cursor in the middle of the Color Table Section.
4. Move the mouse up. As you do, the color spectrum expands beyond the ends of the Color Table Section.

5. Move the mouse down. The spectrum contracts toward the center of the Color Table Section.
6. Move the mouse to the right. The color table shifts to the right.

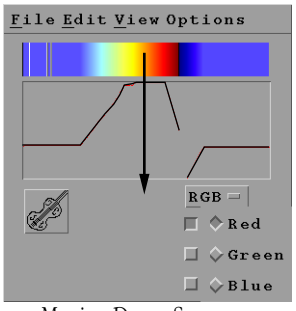
Figure 5.10 Fiddle Tool Effects on the Color Table

Before Modification

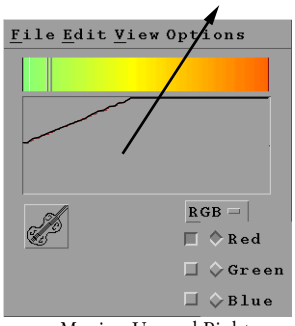




Moving Up Expands



Moving Down Squeezes



Moving Up and Right
Shifts and Expands

Opening a Palette File

Color tables may be stored in HDF files. These files may be opened by selecting the Open option from the File menu. A File Selection window is displayed allowing you to select the file and open the palette information from the HDF Browser window.

Saving A Palette File

To save a palette to a HDF files that contains only palette information, select Save As... from the File menu. A Save window will be displayed. Enter a file name and click OK to save the palette.