IRIS Explorer User’s Guide
Release 3

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Chapter 5

Creating Groups and Applications

This chapter describes how to extend map construction into more complex realms. It explains how to streamline maps by combining the functions of several modules into one, thus creating a group of functions. It covers:

- types of groups
- selecting modules for a group
- using the Group Editor
- editing input and output ports
- creating a group control panel
- creating an application

5.1. Overview

In a remarkably short time, maps tend to overflow the available space, even with micro control panels. To reduce the clutter and simplify the map, you can cluster related modules together under a single control panel, called a*group.* A group is an encapsulated collection of modules with its own module control panel.

When you have an elaborate map containing several opened control panels, it is possible to misplace some of them: they become hidden behind one another or behind other windows on the screen. To minimize the visual complexity of a map, you can group several related modules under one control panel, creating a more manageable network of modules. Even with a smaller number of modules, you will probably have more accessible controls than you really need for a specific map.

Frequently, the creator of a map is not the end user but is producing the map or application for a group of co−workers or customers. Such a map is created for a specific purpose, and many of the module parameters available to the map developer will not be needed by the end user. The developer can group modules in the Group Editor to reveal only those parameters relevant to the application at hand. This restricts the functionality of the map, but also streamlines its user interface.

You can use the Group Editor to promote specific widgets and their ports from individual modules to the group control panel. When you have placed the widgets on the group control panel, you can edit them using the Control Panel Editor, which runs from inside the Group Editor. Once you have established the group, those parameters from the original set of modules that are not connected to the group control panel cannot be changed without opening the group.

5.2. Module Groups

A group is a collection of modules that serve a common purpose, sharing a single control panel and having some of the parameters of the constituent modules raised to the group level. From the viewpoint of the operating system, the constituent modules are still separate processes: from the user's point of view, however, they behave as a single entity.

You create groups of modules that are frequently used in combination, or that together form a unit of computation. For example, you might want to create a map that processes an image using four different parameters, each of which resides in a different module. When you wire all the modules into the map, you get the parameters you want as well as several others you don't need.

In this case, you can simplify the map by creating a group for the four image−processing modules. This reduces the apparent number of modules, and thus wires, on screen, as well as reducing the number of control panels and widgets.

5.2.1. Types of Groups

Groups have two forms, *open* and *closed*:

- An open group retains much of the character of the constituent modules. All the modules and their wiring connections are visible, and their controls are operational. The constituent modules are outlined in red.
- A closed group takes on a new character. It has a single control panel that contains selected widgets from the constituent modules, and only the widgets on this control panel work. None of the individual modules or the internal wiring is visible.

A group can contain several modules, and it can also contain other groups. You can therefore create a nested hierarchy of modules under a single control panel.

5.2.2. Selecting Modules

You must select each module before you can include it in a group.

To select several modules easily at one time, use the "lasso" technique: click the left mouse in the Map Editor background and sweep it around the modules; otherwise, hold down the < **`Shift`**> key select individual modules one by one.

The selected modules are saved in the group with the exact relative placement they had when you selected them. It is a good idea to arrange modules in as compact a structure as possible before you group them. This eases the task of sorting them out if you ungroup them again.

Once you have grouped modules by selecting "Group" from the Group menu, the modules behave as a single entity and have a single control panel. If you select another module, then reselect one module in an open group, all the modules in the group are selected. Likewise, when you drag any module in the group, they all move together.

5.2.3. Creating a Group

To create a new group or work with an existing group, follow these steps.

1. Select the modules you want to group together, and click on "Group" from the Group menu. A single control panel appears for the new group, which is closed.
2. Use the Group Editor (select "Edit" from the Group menu) to promote the ports and parameters you want visible in the group control panel. The Group Editor is described fully in **Editing a Group**.
3. Use the Control Panel Editor to provide widgets for parameters in the group control panel.

The name of the new group module defaults to *Group*. You can rename it anything you like in the Group Editor. Group control panels are colored differently from individual modules.

Example 5–1 Creating a Group in a Map

This example illustrates how to select three modules in a map and group them.

Figure 5–1 shows the original map with all the modules ungrouped. It is a typical map: it reads two images from disk using two *ReadImg* modules and filters both images. One image is sharpened and the other is edge–enhanced with a Sobel filter. The resulting images are blended together and sent to *DisplayImg*.

The center three modules, *SobelEdgeImg*, *SharpenImg*, and *BlendImg*, can be collapsed into a single group to simplify the map.

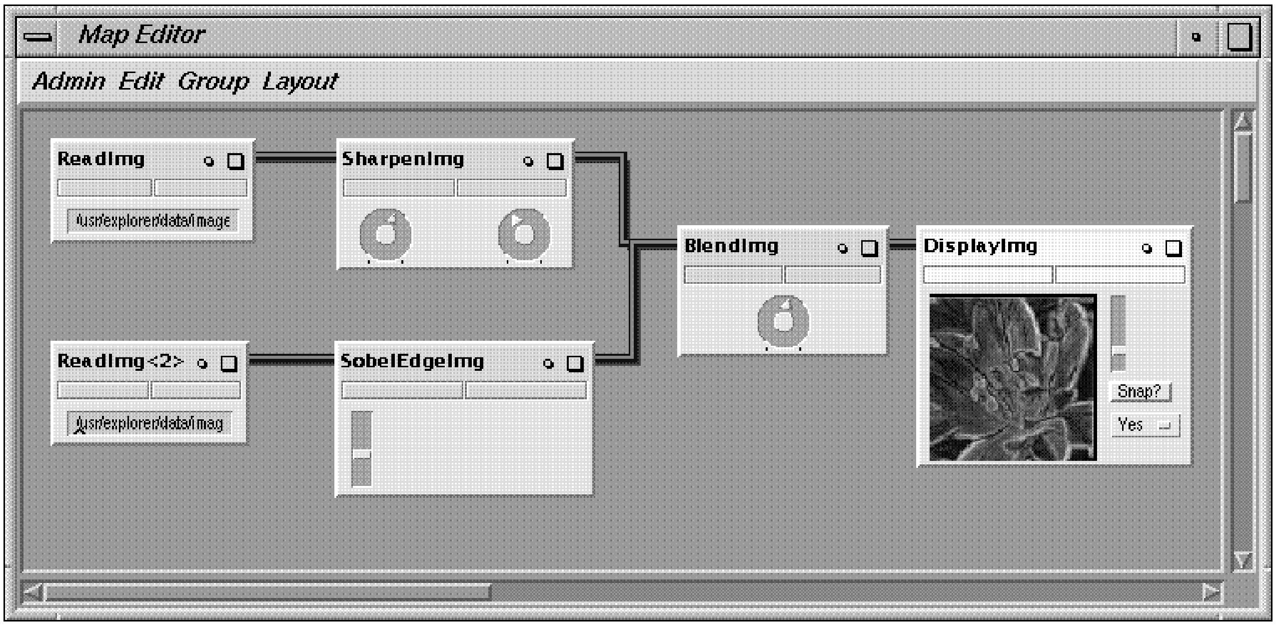

Figure 5–1 An Image Processing Map

1. Select the modules and then select "Group" from the Group menu. The default group control panel is shown in **Figure 5–2**.

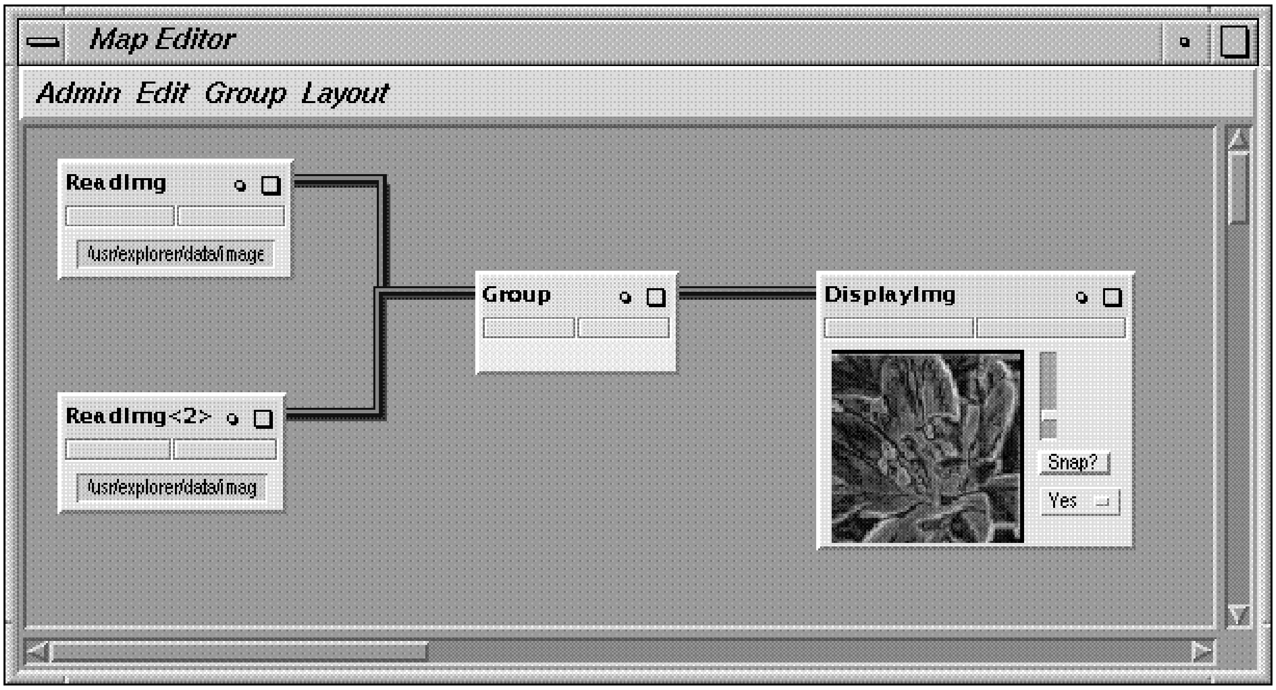

Figure 5–2 The Closed Group

1. To open the group, select the group and then select "Open" from the Group menu. The original modules appear with a red border, indicating that they are part of a group (see **Figure 5–2**).

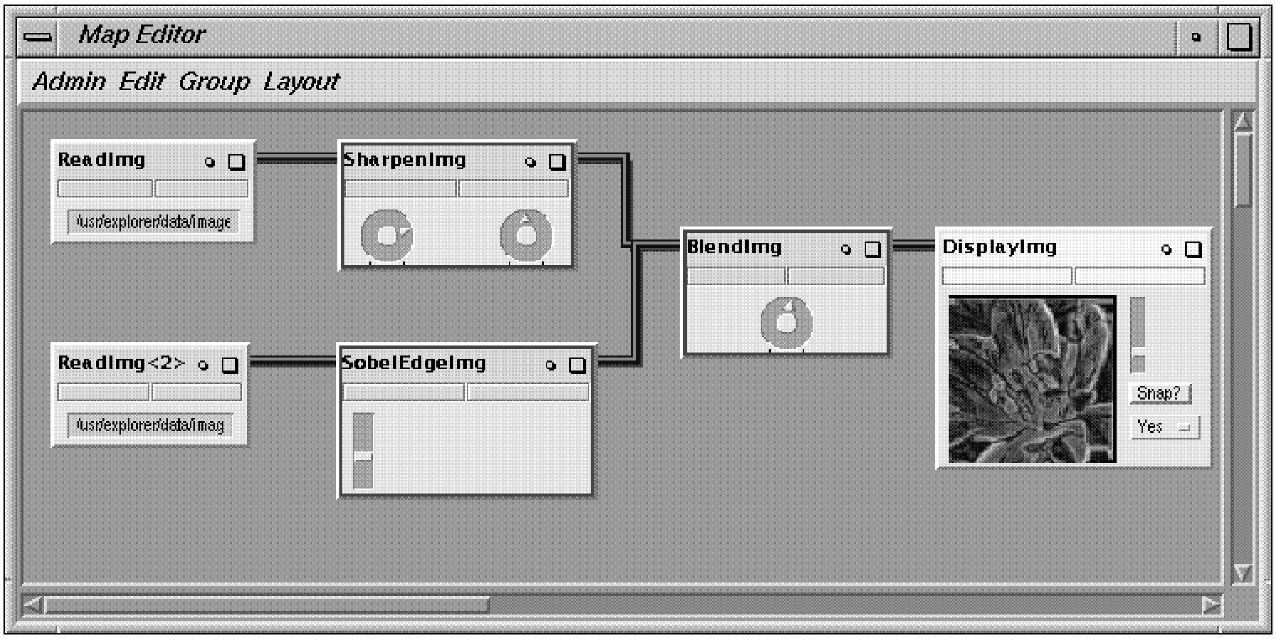

Figure 5–3 The Open Group

5.3. Editing a Group

A group usually consists of several modules. Each module can have several input and output ports and numerous widgets. In the context of a group module, not all these ports and widgets make sense or are usable.

The Group Editor (see **Figure 5–4**) allows you to:

- select the ports and widgets you want in the group
- create a group control panel using the Control Panel Editor (described in **Chapter 4**)

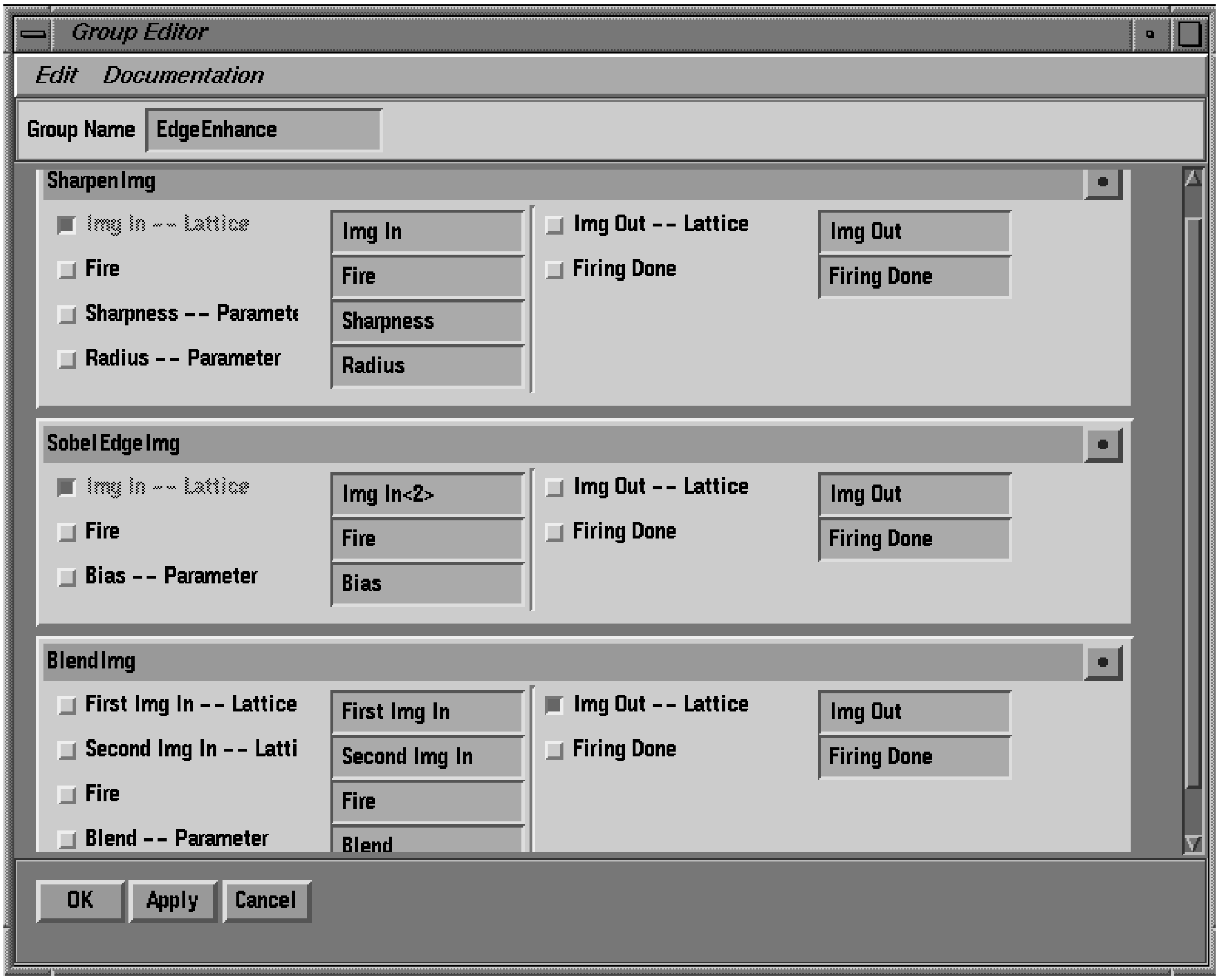

Figure 5–4 The Group Editor

5.3.1. The Group Control Panel

The group control panel has ports, widgets, and a module pop–up menu, just like the module control panel. It is, however, a different color. The widgets on the control panel allow you to control the value of the module parameters directly.

You can reorder the module sequence in the Group Editor by grabbing the module title bar and dragging it to the desired location. This changes the sequence in which ports are shown on the module control panel's input and output port lists.

If you are creating a group or application control panel, you get a default widget setting. The Control Panel Editor allocates to each parameter in the new control panel the same widget type and properties as the parameter had in its module control panel.

For example, the *SobelEdgeImg* module has a slider for its Bias parameter. If you create a group containing *SobelEdgeImg* and promote the Bias parameter to the group control panel, the slider appears on the group control panel by default.

You can change this default to whatever suits your needs at the group level.

5.3.2. Promoting Ports

Selecting a port for the group control panel is called "promoting" the port. In deciding which ports and widgets to promote, you need to determine how you want to reuse this group and how your users (if any) will be using the group.

To select a port, click on the port button in the Group Editor.

Ports that are not promoted to the group level are not visible in the group control panel. The ports still exist, however, and widget−based parameter input ports retain the value they had when you first created the group. You can adjust the values of hidden parameters by opening the group, using "Open" on the Group menu.

5.3.3. Required Input Ports

Groups have two kinds of required input ports: those that are required at the module level and hence at the group level also, and those that are optional at the module level and have been promoted to the group.

Some module input ports must have data on them before the module will fire. These ports are also required at the group level, if there is no connection to them within the group, otherwise, the group will not fire. In the Group Editor, required ports are automatically promoted. They appear in the Group Editor as selected and you cannot deselect them.

For example, *SharpenImg* and *SobelEdgeImg* in **Figure 5−4** both have required module input ports that also appear as required group input ports. Neither module will fire unless:

- it has a connection to its "Img In− − Lattice" port
- it has data on its "Img In − − Lattice" port

These ports will be promoted to the group level and appear on the input port menu of the group control panel. The group control panel will not fire unless both ports have data on them.

5.3.4. Renaming Ports

Port names are shown on the input and output port lists in the group control panel and on the parameter widgets, so it is important that each port have a unique name. However, group modules often contain two modules whose ports have identical names. For example, there are two "Img In" ports in **Figure 5−4**.

Sometimes you may want to rename a port even if the name does not conflict with another port in the group. The focus of the group and the intent of an individual module are different, and a new name may make more sense in the context of the group.

The Group Editor provides an "alias" text slot for each port so you can set up a unique name for it.

To change the name of a port, type a new name in the text type−in slot. **Figure 5−5** shows the Group Editor after both the "Img In" ports have been renamed.

5.3.5. Selecting Parameters

To complete the new group control panel, select these parameters in the Group Editor:

- "Sharpness" from *SharpenImg*
- "Bias" from *SobelEdgeImg*
- "Blend" from *BlendImg*

You can change the parameter names if you wish.

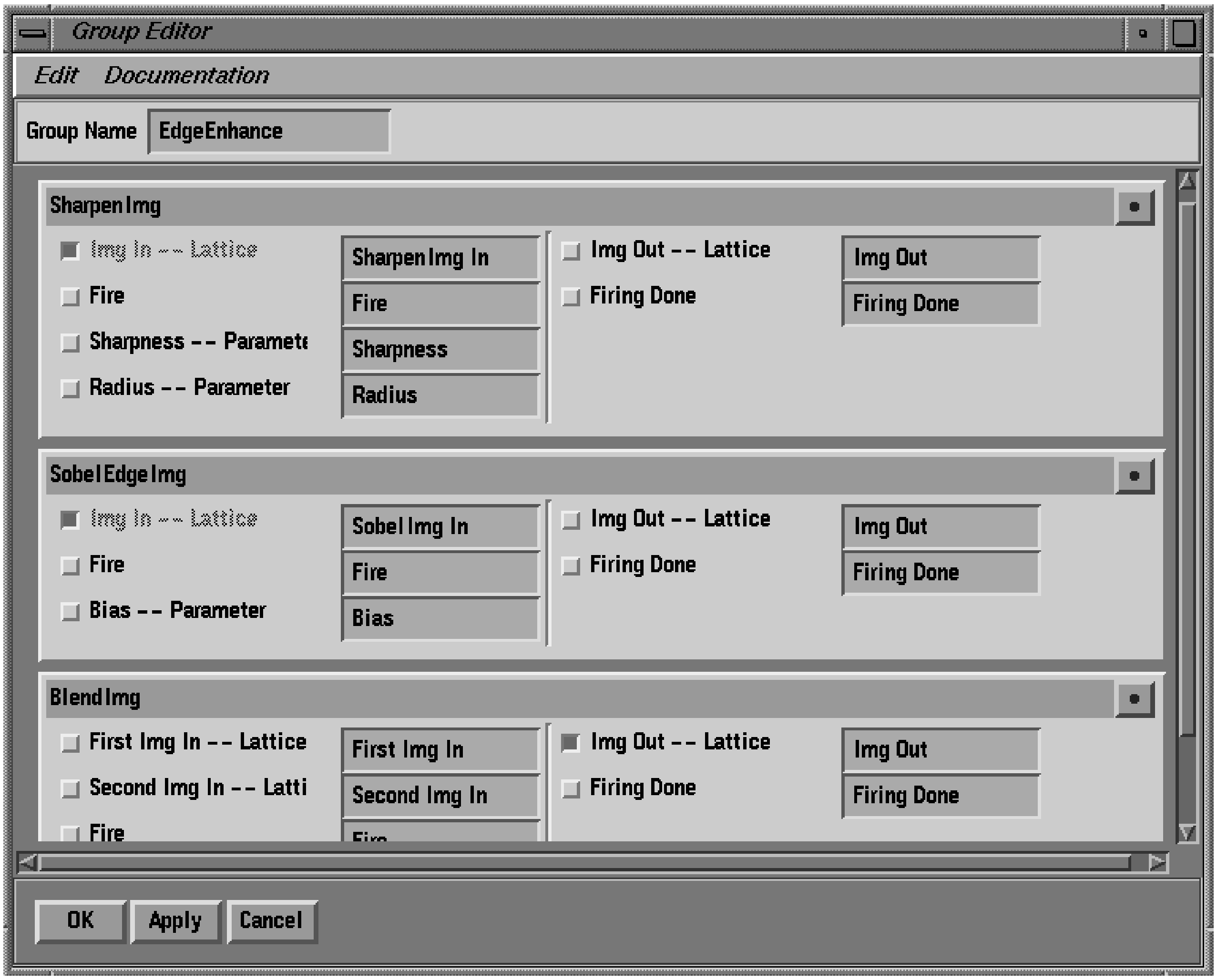

Figure 5–5 Renaming a Port

For example, in the context of the group, "Bias" needs some clarification so it can be renamed "Sobel Bias."

You can rename ports and parameters at any stage of the grouping process by entering the new name in the Group Editor.

Click on *Apply* or *OK* to apply the changes and set up the new control panel.

5.3.6. Grouping Optional Ports

Some ports may not be required by an individual module, but must be promoted once the module is part of a group, because there are connections to other modules in the map outside the group at the time of creating the group.

Suppose you select *ReadLat*, *Contour*, and *WireFrame* to make a group. The group has one outside connection, a hookup from *GenerateColormap* to *Contour*. The "Colormap – – Lattice" input port on *Contour* is not intrinsically a required port, but in the context of the new group, it becomes required because of its link to *GenerateColormap.* Hence, it is automatically promoted to a group–level port.

This principle also holds true for output ports. If a connection exists downstream of the group, the port with that connection is automatically promoted and indicated as selected in the Group Editor.

5.3.7. Grouping Modules in a Loop

You cannot promote loop controller capability from the loop controller to a group module. If you want to link a grouped loop into another loop, you must include a separate loop controller module in the new loop.

5.4. Creating a Group Control Panel

You can create a group control panel in two ways, by default and by conscious design.

5.4.1. The Default Control Panel

Use the Group Editor to create a default layout.

To do this, click on the *OK* button at the bottom of the Group Editor window after you have selected the ports and parameters you want. This dismisses the Group Editor, applies the changes, and updates the Map Editor. In the process, it creates a default control panel for the group.

This is useful if the group does not have any parameters for which widgets are required, or if you can use all the default settings and layouts for selected parameters.

5.4.2. The Designer Control Panel

Use the Control Panel Editor, accessible from the Edit menu of the Group Editor, to lay out the control panel of the new group and customize it (see **Chapter 4, "Editing Control Panels and Functions"**).

Figure 5–6 shows the control panel for the new group in the Map Editor, along with its maximized form. It is easily recognizable as a group module because it is a different color.

If you select the input port access pad of the new group, you see only those ports you selected in the Group Editor, with the names you chose for them.

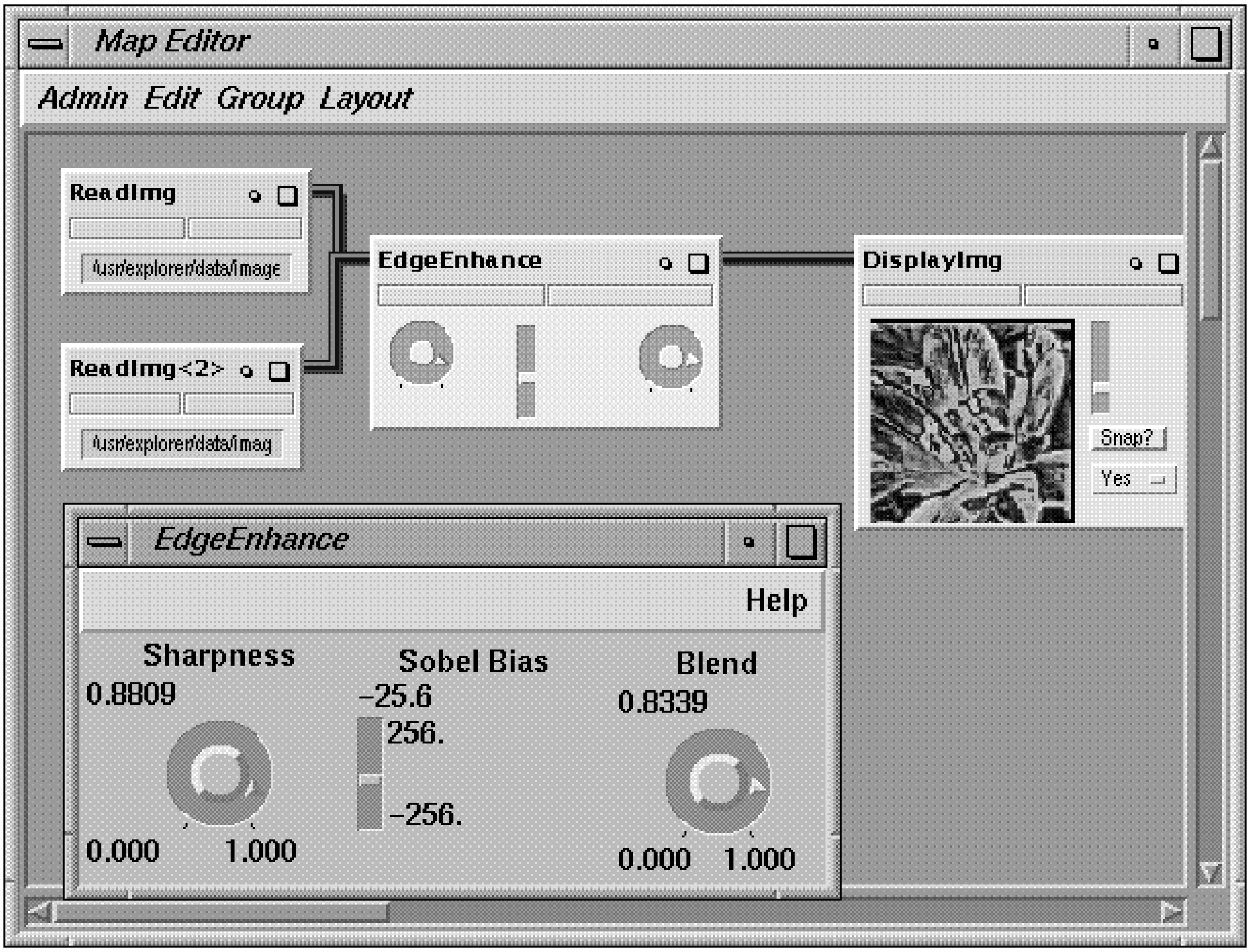

Figure 5–6 The Group Control Panel

Example 5–2 Using a Drawing Area

Figure 5–7 shows a group control panel with a drawing area. It uses the collection of modules and maps from the previous examples, but adds some of the *DisplayImg* module's widgets, including its drawing area, promoted by selecting "Window – – Parameter" in the Group Editor.

Notice the difference in size between this map and the one in **Figure 5–7**. A considerable savings has been obtained by combining four of the original six modules into a single group.

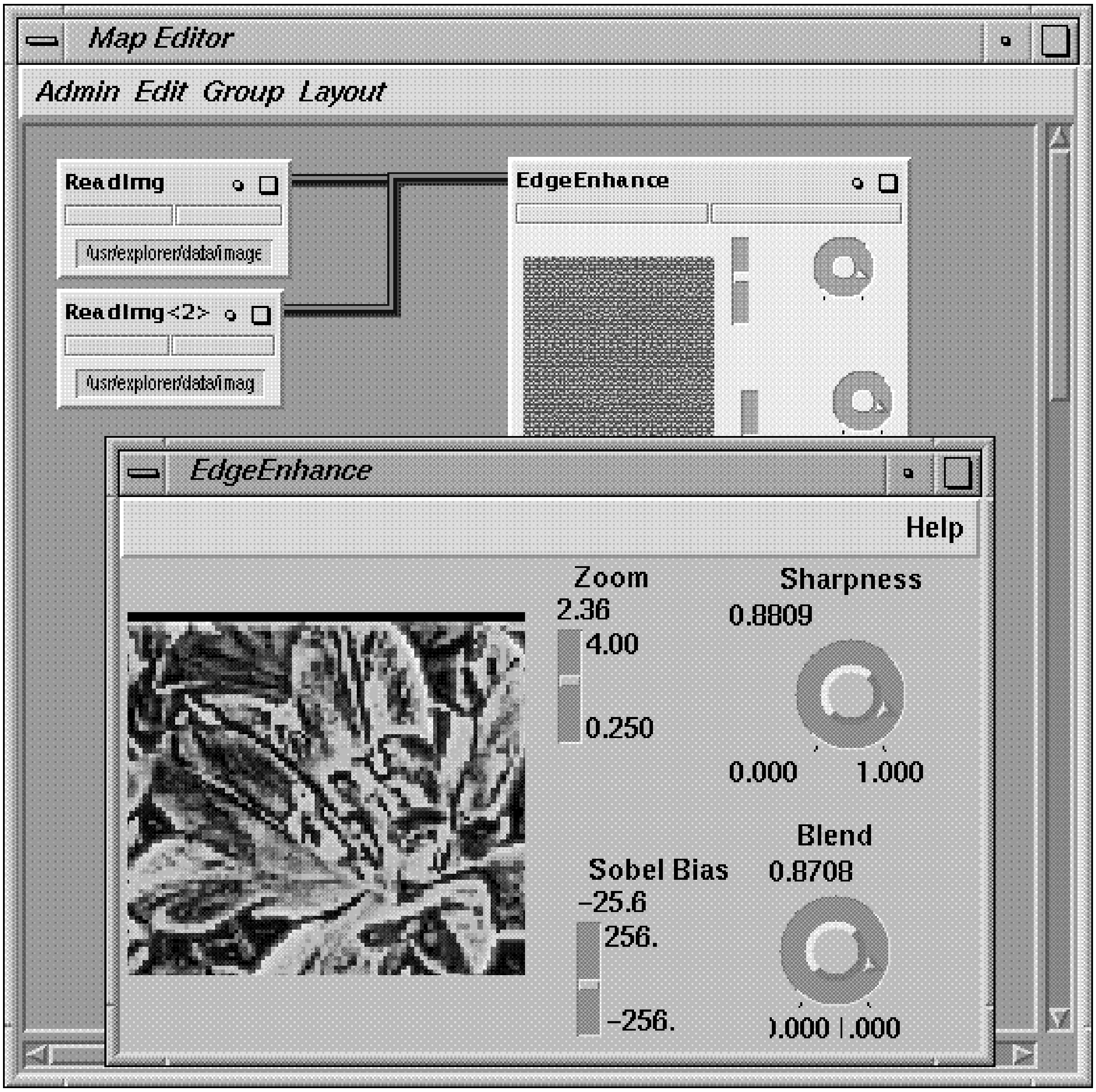

Figure 5–7 The New Group Control Panel

5.5. Opening a Group

To display the full−scale control panel, click on the *Maximize* button, just as you would an ordinary module.

To open a group again, select "Open" from the Group menu. The original modules reappear with each module outlined in red.

While a group is opened you can interact with any of the widgets of the constituent modules to change their parameter settings.

If you have a nested hierarchy of groups, you may open all groups in the hierarchy. However you can use "Edit Group" only on a top level group, you cannot edit a group within a group. Therefore you should have finalised selecting promoted ports before including it within another group.

Click on the background to deselect the open group. To select one or more modules in the group hold down the **`<Shift>`** key and click on each module to toggle selection on and off. To select one module in the group, deselecting all other modules currently selected, hold down the **`<Alt>`** key and click on the module.

To close the group and display the group control panel again, select "Close" from the Group menu.

5.5.1. Modifying Connections

You can create and destroy connections within the opened group, those between modules belonging to the group. Use the port menus to create and destroy a connection as usual. When creating a connection you will see that compatible ports are highlighted only on modules within the group.

If you use the Disconnect and Reconnect options on these modules, only those connections between modules within the group are broken with Disconnect and recreated with Reconnect. Using Disconnect and Reconnect on a closed group breaks and recreates the connections from the promoted ports of the group, but not the connections internal to the group.

You cannot create a connection from inside the group to outside. You should promote the inside port to the group, using "Edit Group" on the closed group, and then connect selecting from the port menu of the closed group.

You will see when disconnecting to ports of modules within a group that the name of the module is preceeded by the name of the group to further identify the connection.

5.5.2. Redefining a Group

The modules within a group can be reselected, retaining the attributes of the edited group, using the "Regroup" option on the Group menu. Select modules from the open group, leaving as unselected those to be omitted from the redefined group, and selecting modules not currently within a group to be added to the group. Then select "Regroup".

The control panel of the original group is retained, except that widgets corresponding to parameters from omitted modules are removed.

Settings for promoted ports and alias names are also retained. There may be additional required ports that are promoted from the new modules within the group. Note that it is possible for a port that was "required" for the original group to no longer be so. For example, by adding a module into the group that has a connection to an originally required port, removes the need for that port to be promoted to the group. This port will still be marked as promoted in the Group Editor, but can now be deselected.

You can "ungroup" a closed or open group by selecting "UnGroup" from the Group menu. You are left with the original collection of separate modules. If the group is closed and only the group control panel is showing, it opens before it is ungrouped.

5.6. Defining an Application

When you have created a group with its own control panel, you can run it as an application. An application is a module or map that runs in a special IRIS Explorer mode outside the Map Editor. You can engage the application mode only when you start IRIS Explorer from the command line. You cannot change an ordinary IRIS Explorer session into an application−mode session.

Application mode operates on ordinary IRIS Explorer maps, which consist of one or more modules or groups. Usually, a map contains several modules, collected into one or more groups.

5.6.1. Creating an Application

There is no special procedure for creating an application, since an application is simply a map run in a special mode.

- For details on creating a group, refer to **"Module Groups"**.
- For details on creating group control panels, refer to **Chapter 4, "Editing Control Panels and Functions"**.

In most applications, you will want a drawing area in order to visualize the results of the process that the application is performing on the incoming data.

Setting Parameters in an Application

When you are building an application, special attention should be given to the values of parameters in the application map.

When a map is run as an application, the parameters in the map will have whatever values they were set to when the map was saved. This matters particularly for parameter widgets associated with input and output filenames.

For example, suppose you are building an image processing application from a map that contains *ReadImg*. While testing the map, you typed the filename *fish.rgb* into *ReadImg* and then saved the map.

When you run the map as an application, *ReadImg* will be given the specific input filename *fish.rgb* and, therefore, will attempt to read in *fish.rgb* each time it starts up. In an image processing application for general use, this may not be the best behavior. However, for some parameters, setting the values in the map to default initial values may be the correct thing to do.

When you save a map that will be used as an application, be careful to set parameters to the start–up values that the application user expects.

5.6.2. Saving the Application

You must make sure that any map saved for later use as an application has at least one open control panel, that is, maximized to its full size; otherwise, nothing will be visible when you run the application. In application mode, the mini control panels are not visible and there is no way to maximize a module control panel. You can save a map with more than one control panel maximized if you wish.

To save the map, select "Save Selected" from the File menu on the Module Librarian. Save each map with a name and the suffix *.map*.

5.6.3. Running an Application

You can run an application using the command **`–app`**.

To open and use a standard application, at the shell prompt, type:

```
explorer –app applicationname.map
```

When you run an application, only the application control panel is displayed on the screen. The IRIS Explorer window, the Map Editor window, and the Librarian are not displayed.

5.6.4. Quitting an Application

Applications generally have a main window, which is a control panel that must be visible for the application to work properly. The Motif window "Quit" command is issued to a window when the user double–clicks in the upper left hand corner of the Motif window frame.

When IRIS Explorer is running normally (not in application mode), the double–click merely dismisses maximized control panels. The user can still access the corresponding mini control panel in the Map Editor and can re–maximize the control panel from there.

In application mode, the default behavior is the same, that is, double clicking dismisses maximized control panels. This is fine for secondary windows that may have been exposed under the control of the application itself.

However, if you dismiss an application main window in this manner, you cause the application to cease operating. This is because there is no visible Map Editor and thus no way for a user to recover the maximized control panel.

It is a good idea to add "Quit" to the menu bar on the main group control panel in your application map, otherwise, the only way to quit an application is through the Motif window menu.

You can also use the script command:

```
(set-app-main-win my-module)
```

to change the default behavior of the main window so that double−clicking on the control panel for "my−module" quits the application. The user will be asked to confirm the quit operation.

5.6.5. Application Busy Indicators

In application mode, the Map Editor is not visible and so the user does not observe the usual signals that a map is executing, such as yellow highlighting and the "Busy" cursor.

Instead, IRIS Explorer displays a "Busy" cursor over all control panels when any module in an application is executing.

Note: If you turn execution highlighting off, you disable the display of the "Busy" indicator.

Debugging an Application

To run an application so you can check its development and do debugging tasks, at the shell prompt, type:

```
explorer -map applicationname.map
```

When you run IRIS Explorer with this command, the application is displayed, along with the IRIS Explorer window. The IRIS Explorer window gives you access to the Map Editor and the Module Librarian if you require it.