

## Geometric Functions

### Introduction to Geometric Transformations

The geometric transformation commands are used to shift, rotate, scale, and align images. For quick rotation by 90° or mirroring of an image, the mirror and rotate commands are available. The Translate, Scale, and Rotate commands provide greater control over the transformation process. The Translate command allows selection of shift from and to points using the mouse. Two images can also be aligned using the Translate command. Select the shift to point from a reference image and select the shift from point from the second image. Apply the Translate command to the second image to align it with the reference image. The Rotate command also provides similar operations using the mouse. The size of an image can be changed using the Scale command.

*General raw conversion, calibration, alignment, and stacking operations on large sets of images are performed using the Automatic Image Set Processing, Calibrate Files , Align Files , and Combine Files commands on the main Image Set Operations menu.*

### Mirror Vertical

The Mirror Vertical command flips the current image top-to-bottom. The Translate, Scale, and Rotate commands offer greater control of geometric changes to your images.



Performs mirror vertical from the left vertical toolbar.



The color channel toolbar buttons are disabled.

### Mirror Horizontal

The Mirror Horizontal command flips the current image left-to-right. The Translate, Scale, and Rotate commands offer greater control of geometric changes to your images.



Performs mirror horizontal from the left vertical toolbar.



The color channel toolbar buttons are disabled.

### **Rotate CW**

The Rotate CW command rotates the current image clockwise 90 degrees. The Translate, Scale, and Rotate commands offer greater control of geometric changes to your images.



Performs rotate CW from the left vertical toolbar.



The color channel toolbar buttons are disabled.

### **Rotate CCW**

The Rotate CCW command rotates the current image counter-clockwise 90 degrees. The Translate, Scale, and Rotate commands offer greater control of geometric changes to your images.



Performs rotate CCW from the left vertical toolbar.



The color channel toolbar buttons are disabled.

### **Mirror All Images Vertical**

The Mirror All Images Vertical command flips each image top-to-bottom.



The color channel toolbar buttons are disabled.

### **Mirror All Images Horizontal**

The Mirror All Images Horizontal command flips each image left-to-right.



The color channel toolbar buttons are disabled.

### **Rotate All Images CW**

The Rotate All Images CW command rotates each image clockwise 90 degrees.



The color channel toolbar buttons are disabled.

### **Rotate All Images CCW**

The Rotate All Images CCW command rotates each image counter-clockwise 90 degrees.

 The color channel toolbar buttons are disabled.

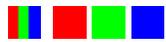
### **Center Image**

The Center Image command is primarily used to center an image of a planet but can also be used to center a cluster or galaxy.

 The color channel toolbar buttons are disabled.

### **Center All Images**

The Center All Images command is used to center each image.

 The color channel toolbar buttons are disabled.

### **Auto Align**

The Auto Align command is used to automatically register a group of images. First open the group of images that need to be registered and then select the appropriate image type from Auto Align.

 The color channel toolbar buttons are disabled.

### **Image Group Types**

#### 1) All Planetary Images

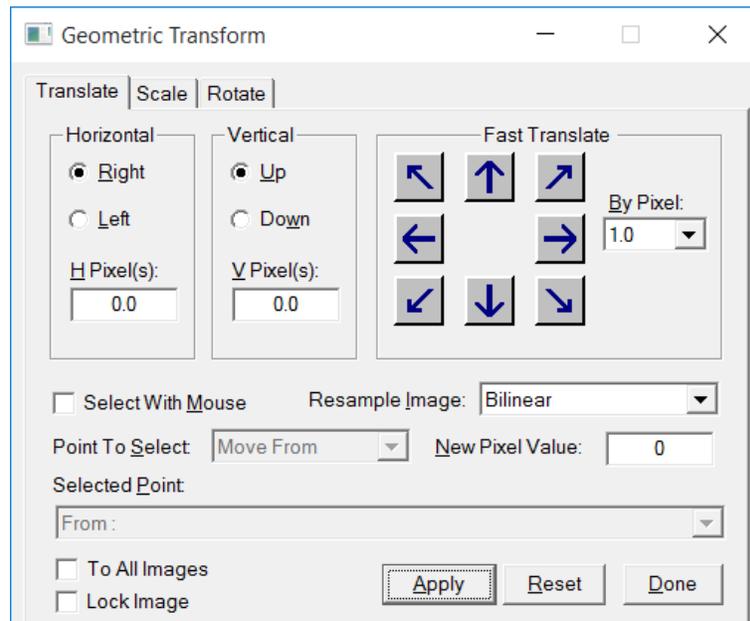
This command is used to center and register a group of planetary images. The images do not need to have the same width and height but must have the same image scale.

#### **Note:**

For the best results the disk of each planet should be at least 15 pixels from the edge of the image. In general the image background should be reasonably dark with an average background pixel brightness several thousand less than 10000. The brightness of each disk should be above 10000. The Cross-hair Analysis command can be used to measure pixel intensities, reasonably good exposures do not require any measurement. If necessary it is easy to apply the same brightness or stretching algorithm to a group of images by using the Apply to All option with the various commands.

This registration method is not designed for use with a group of negative images of a planet.

## Transforms - Translate



The Geometric Translate command is used to shift an image. This command can be used to align a set of images with a reference image by using the Select With Mouse feature.



Activates the Geometric Transform dialog box from the left vertical toolbar.



The color channel toolbar buttons are enabled on a color image and have no effect on a monochrome image.

### Control Summary

#### Horizontal

**Right:** Translate the image to the right.

**Left:** Translate the image to the left.

**H Pixel(s):** The number of pixels the image is translated in the horizontal direction.

#### Vertical

**Up:** Translate the image to the top.

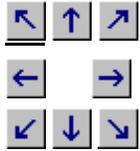
**Down:** Translate the image to the bottom.

**V Pixel(s):** The number of pixels the image is translated in the vertical direction.

**Resample Image:** Selects the interpolation method used when pixel values are approximated.

**New Pixel Value:** The value used as the brightness of a new border pixel that results from translating the image.

#### Fast Translate



Shifts the image in the direction shown.

**By Pixel:** The number of pixels the image is translated in the direction of the selected arrow.

**Select With Mouse:** Check this box to enable the selection of translation points using the mouse.

**Point To Select:** The Move From and Move To selections define the starting and ending points of the shift. The image is translated from the Move From point to the Move To Point. The Move From and Move To points do not need to be selected from the same image.

The Border Pixel selection is used to select a pixel brightness from an image. The value is used to fill new pixels that result from translating the image. Selecting a Border Pixel sets the New Pixel Value control.

**Selected Point:** This control is used only to display the selected information.

**To All Images:** The operation is applied to each image if this box is checked.

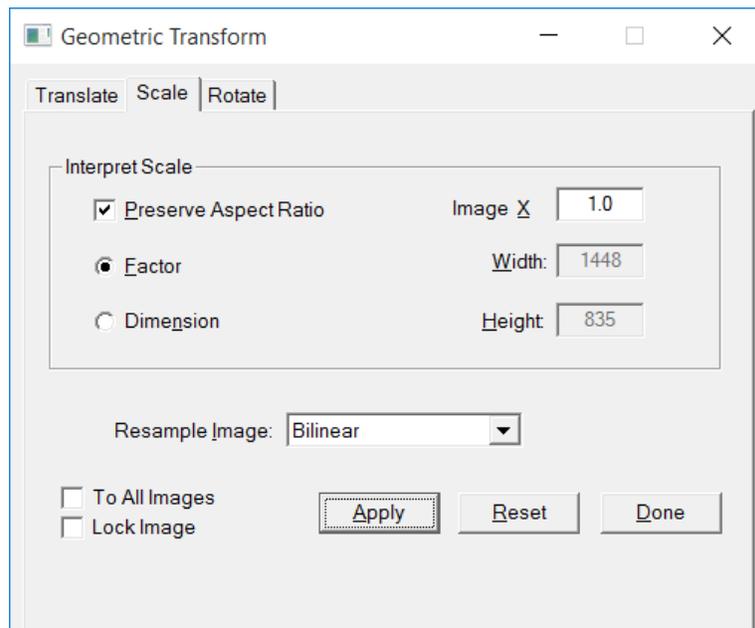
**Lock Image** Check this box to lock or couple an image with this command. Each time you press the Apply button the command is applied to the same image even if the image is not the current active image.

**Apply:** This button applies the shift to the current active image.

**Reset:** Sets the controls to their initial values.

**Done:** Choose this button to close the Translate dialog box

## Transforms – Scale



The Geometric Scale command is used to change the size of an image. The images aspect ratio can be preserved or the width and height can be adjusted separately.



Activates the Geometric Transform dialog box from the left vertical toolbar.



The color channel toolbar buttons are disabled.

### Control Summary

**Resample Image:** Selects the interpolation method used when pixel values are approximated.

#### Interpret Scale

**Preserve Aspect Ratio** Check this box to preserve the ratio of the images width and height.

**Image X** Multiply the dimensions of an image by this factor.

**Factor** Select this option to multiply the images width and height by a factor. If Preserve Aspect Ratio is checked, then the same factor applies to the width and height. Otherwise enter a factor for the width and height.

**Dimension** Select this option to enter the width and height of the new image.

**Width:** The value is either the width of the new image in pixels or a width factor.

**Height:** The value is either the height of the new image in pixels or a height factor.

**To All Images:** The operation is applied to each image if this box is checked.

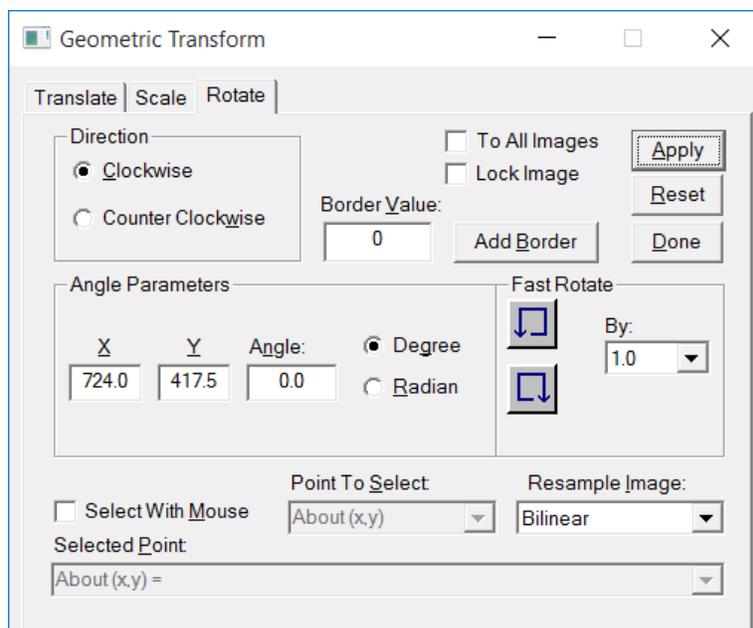
**Lock Image** Check this box to lock or couple an image with this command. Each time you press the Apply button the command is applied to the same image even if the image is not the current active image.

**Apply:** This button applies the scale change to the current active image.

**Reset:** Sets the controls to their initial values.

**Done:** Choose this button to close the Scale dialog box

## Transforms - Rotate



The Geometric Rotate command is used to rotate an image. The mouse can be used to select the center of rotation as well as the points to rotate from and to.



Activates the Geometric Transform dialog box from the left vertical toolbar.



The color channel toolbar buttons are enabled on a color image and have no effect on a monochrome image.

## Control Summary

### Direction

**Clockwise:** Rotate an image to the right.

**Counter Clockwise:** Rotate an image to the left.

#### Angle Parameters

**X:** The x-coordinate of the center of rotation.

**Y:** The y-coordinate of the center of rotation.

**Angle:** The angle used to rotate the image.

**Degree:** The angle represents degrees.

**Radian:** The angle represents radians.

**Resample Image:** Selects the interpolation method used when pixel values are approximated.

**Border Pixel Value:** The value used as the brightness of a new border pixel that results from rotating the image.

**Add Border:** Adds a border around an image so that the image can be rotated without clipping.

#### Fast Rotate



Rotates the image in the direction shown.

**By:** The number of degrees or radians the image is rotated in the direction of the selected arrow.

**Select With Mouse:** Check this box to enable the selection of rotation points using the mouse.

**Point To Select:** The About point defines the center of rotation. The From and To selections define the starting and ending points of the rotation. The From and To points do not need to be selected from the same image.

The Border Pixel selection is used to select a pixel brightness from an image. The value is used to fill new pixels that result from rotating the image. Selecting a Border Pixel sets the New Pixel Value control.

**Selected Point:** This control is used only to display the selected information.

**To All Images:** The operation is applied to each image if this box is checked.

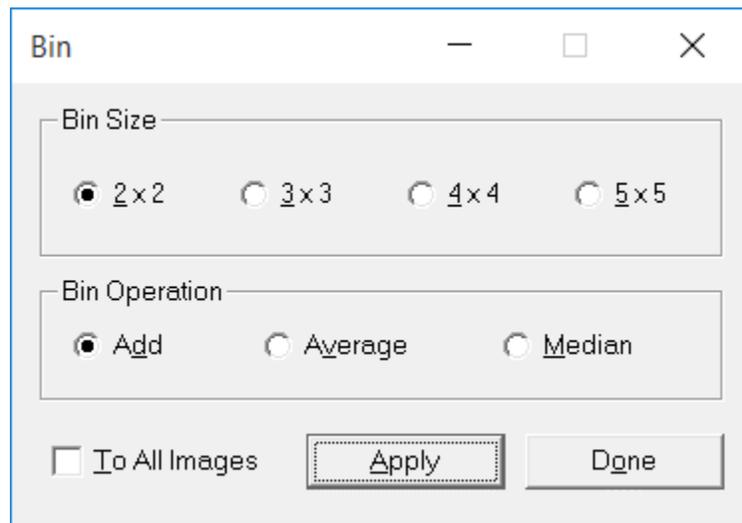
**Lock Image** Check this box to lock or couple an image with this command. Each time you press the Apply button the command is applied to the same image even if the image is not the current active image.

**Apply:** This button applies the rotation to the current active image.

**Reset:** Sets the controls to their initial values.

**Done:** Choose this button to close the Rotation dialog box.

## Bin Image



The Bin command reduces the size of an image by combining adjacent pixels into bins using the selected operation and bin size. Binning reduces the size of an image by a factor equal to the bin size. Binning also reduces the amount of noise in an image.



The color channel toolbar buttons are disabled.

### Control Summary

#### Bin Size

**2x2** The image is divided into bins that are 2 pixels wide and 2 pixels high.

**3x3** The image is divided into bins that are 3 pixels wide and 3 pixels high.

**4x4** The image is divided into bins that are 4 pixels wide and 4 pixels high.

**5x5** The image is divided into bins that are 5 pixels wide and 5 pixels high.

#### Bin Operation

**Add** This operation adds the pixel values in each bin to form the binned pixel value. Addition will brighten the image and reduce noise.

**Average** This operation averages the pixel values in each bin to form the binned pixel value. Average maintains the current image brightness and reduces noise.

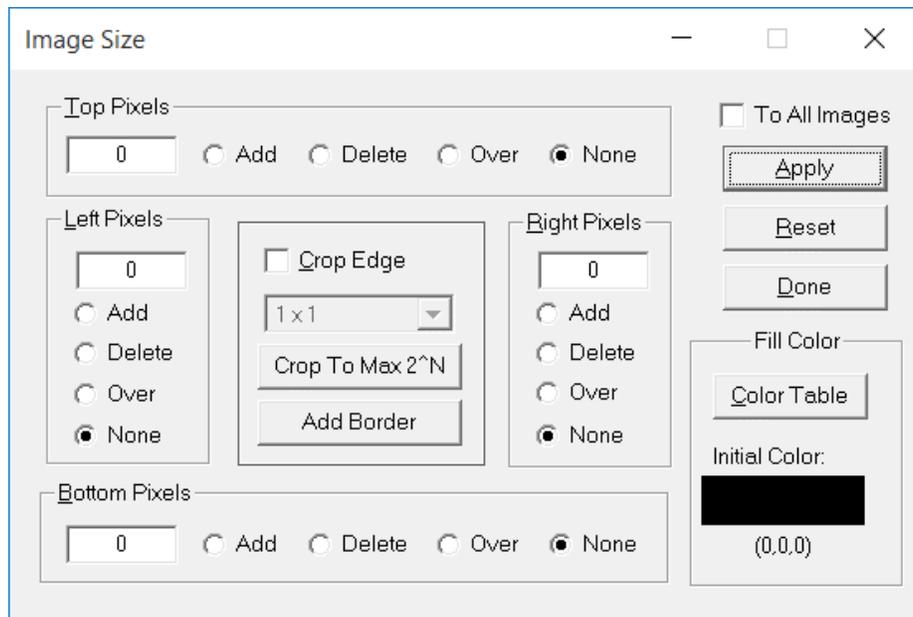
**Median** This operation finds the median pixel value in each bin to form the binned pixel value. Median maintains the current image brightness and reduces noise but not as much as add or average. The median operation is used to remove high and low pixel values.

**Apply:** This button applies the selected bin operation using the selected bin size.

**To All Images:** The bin operation is applied to each image if this box is checked.

**Done:** Choose this button to close the Bin dialog box.

## Image Size



The Image Size command is used to add, delete, or overwrite edge pixels of an image.



Activates the Image Size dialog box from the left vertical toolbar.



The color channel toolbar buttons are disabled.

### Control Summary

#### Top Pixels

**Value** The number of pixels used to perform the operation.

**Add** Adds pixels to the top edge of an image.

**Delete** Deletes pixels from the top edge of an image.

**Over** Overwrites pixels from the top edge of an image with the fill color.

**None** No operation is performed on pixels from the top edge of an image.

The Left Pixels, Right Pixels, and Bottom Pixels controls are similar.

#### Fill Color

**Color Table** This button display the color selection table.

**Initial Color:** The color used by Add and Over to pixels.

**Set Crop** Enables crop mode. The same number of pixels will be deleted from all sides of an image.

**Pixels to Crop:** Specifies the number of pixels to delete in crop mode.

**Crop To Max  $2^N$ :** Crops the largest square image from the center of the current active image. The width and height of the cropped square image is a power of 2. This option is used to reduce artifacts in the frequency spectrum of an image.

**Add Border:** Add 200 to the top, bottom, left, and right pixel values each time Add Border is pressed. The top, left, right, and bottom operations are all set to Add. Press the Apply button to add the border to an image.

**Apply:** This button applies the image size modification to the current active image.

**To All Images:** The operation is applied to each image if this box is checked.

**Reset :** Sets all controls to their initial value.

**Done:** Choose this button to close the Image Size dialog box.