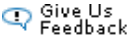
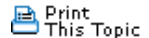
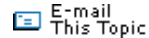


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ArcGIS Image Server > Image service processes

Using the Convolution Filter process



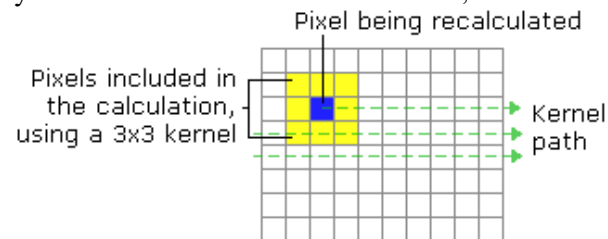
Release 9.2

Last modified April 14, 2008 Print all topics in : ["Image service processes"](#)**Related Topics**

- [An overview of image service processes](#)
- [Adding, removing, and chaining service processes](#)

The Convolution Filter performs filtering on the pixel values in an image, which can be used for sharpening an image, blurring an image, detecting edges within an image, or other kernel-based enhancements.

It is based on a moving kernel (matrix or window) across the image. The filter operation is performed on the pixels contained within the kernel, and the output is a new value for the center pixel in the window. The kernel moves one pixel at a time through the entire raster datasets for each row. The size of the kernel can be defined, but it is optimized for smaller sizes from 3 x 3 to 7 x 7. The size of the kernel defines the number of pixels you want used in the filter calculation, and the size must always be a combination of odd numbers.

**There are five convolution filter methods:**

Filter	Description
Average	Replaces the pixel with the average (mean) value of the pixels within the kernel.
Maximum	Replaces the pixel value with the maximum value of the pixels within the kernel.
Minimum	Replaces the pixel value with the minimum value of the pixels within the kernel.

Standard Deviation

Replaces the pixel value with the standard deviation of the pixels within the kernel. This is a way of creating contrast in the image.

Applies one of the following specific filters:

- User Defined—Enables the users to specify the kernel width, height, weight, and the factors used to calculate the kernel values
- Sharpen—Uses a simple 3 x 3 sharpening kernel

0	-0.25	0
-0.25	2	-0.25
0	-0.25	0

Kernel

- Sharpen More—Uses a simple 3 x 3 sharpening kernel but with a stronger effect than the Sharpen kernel

-0.25	-0.25	-0.25
-0.25	3	-0.25
-0.25	-0.25	-0.25

- Point Spread Function—Uses a 3 x 3 kernel to apply a point spread function

-0.627	0.352	-0.627
0.352	2.923	0.352
-0.627	0.352	-0.627

Statistical filters measure a local statistical property and are useful for reducing noise in an image or for texture feature extraction. There are many types of kernels you can define using the User Defined kernel parameter. Some examples are given below.

Edge or line detection

Vertical Horizontal Left diagonal Right diagonal

```
-1 0 1 -1 -1 -1 0 1 1 1 1 0
-1 0 1 0 0 0 -1 0 1 1 0 -1
-1 0 1 1 1 1 -1 -1 0 0 -1 -1
```

Compass gradient mask

Northwest North Northeast

```
1 1 1 1 1 1 1 1 1
1 -2 -1 1 -2 1 -1 -2 1
1 -1 -1 1 -1 -1 -1 -1 1
```

West

East

```
1 1 -1 -1 1 1
1 -2 -1 -1 -2 1
1 1 -1 -1 1 1
```

Southwest South

Southeast

```
1 -1 -1 -1 -1 -1 -1 -1 1
1 -2 -1 1 -2 1 -1 -2 1
1 1 1 1 1 1 1 1 1
```

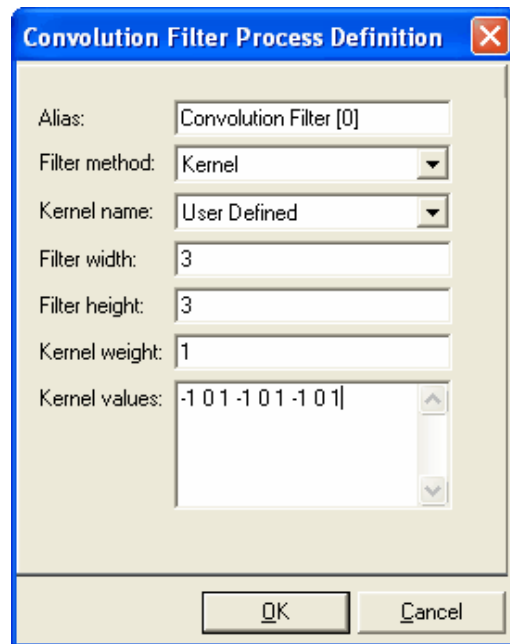
When calculating the edge values, the Image Server Convolution Filter uses a mirror algorithm. Therefore, when processing the left side of the image with a 3 x 3 kernel, the values used for the last column of the kernel are the same values used in the second-last column. For example, to apply a 3 x 3 kernel filter on the left edge where the center pixel value is 7 (shown below):

```
3 6
4 7
3 8
```

The last column is duplicated to form the third column in the kernel; therefore, the processing would be performed on the following kernel values:

```
3 6 6
4 7 7
3 8 8
```

You specify the type of convolution filter by choosing a method from the Filter Method drop-down box on the Convolution Filter Process Definition dialog box. If you choose the Average, Maximum, Minimum, or Standard Deviation Filter Method, you can specify the filter dimensions by typing in values for the Filter Width and Filter Height. If you choose the Kernel Filter Method, you must choose the Kernel Name. Sharpen, Sharpen More, and Point Spread Function kernel names are predefined; however, if you choose User Defined, you can alter any of the lower parameters on the dialog box. When you enter the kernel values into the Kernel Values text box on the Convolution Filter Process Definition dialog box, the filter is listed from the top left corner to the bottom right corner. For example, the vertical edge detection filter listed above would be entered into the Kernel Values text box as follows: -1 0 1 -1 0 1 -1 0 1. You must use a space to delimit the values.



The image shows a dialog box titled "Convolution Filter Process Definition" with a close button (X) in the top right corner. The dialog contains the following fields and controls:

- Alias: Convolution Filter [0]
- Filter method: Kernel (dropdown menu)
- Kernel name: User Defined (dropdown menu)
- Filter width: 3
- Filter height: 3
- Kernel weight: 1
- Kernel values: -1 0 1 -1 0 1 -1 0 1 (text input with a scrollable area below it)

At the bottom of the dialog are two buttons: "OK" and "Cancel".

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