scipy.signal.convolve2d

`scipy.signal.` **`convolve2d`** (*in1*, *in2*, *mode='full'*, *boundary='fill'*, *fillvalue=0*) **[source] (http://github.com/scipy/scipy/blob/v0.19.1/scipy/signal/signaltools.py#L957-L1050)**

Convolve two 2-dimensional arrays.

Convolve *in1* and *in2* with output size determined by *mode*, and boundary conditions determined by *boundary* and *fillvalue*.

Parameters:

in1 *: array_like*

First input.

in2 *: array_like*

Second input. Should have the same number of dimensions as *in1*. If operating in 'valid' mode, either *in1* or *in2* must be at least as large as the other in every dimension.

mode *: str {'full', 'valid', 'same'}, optional*

A string indicating the size of the output:

`full`

The output is the full discrete linear convolution of the inputs. (Default)

`valid`

The output consists only of those elements that do not rely on the zero-padding.

`same`

The output is the same size as *in1*, centered with respect to the 'full' output.

boundary *: str {'fill', 'wrap', 'symm'}, optional*

A flag indicating how to handle boundaries:

`fill`

pad input arrays with fillvalue. (default)

`wrap`

circular boundary conditions.

`symm`

symmetrical boundary conditions.

fillvalue *: scalar, optional*

Value to fill pad input arrays with. Default is 0.

Returns: **out** *: ndarray*

A 2-dimensional array containing a subset of the discrete linear convolution of *in1* with *in2*.

Examples

Compute the gradient of an image by 2D convolution with a complex Scharr operator. (Horizontal operator is real, vertical is imaginary.) Use symmetric boundary condition to avoid creating edges at the image boundaries.

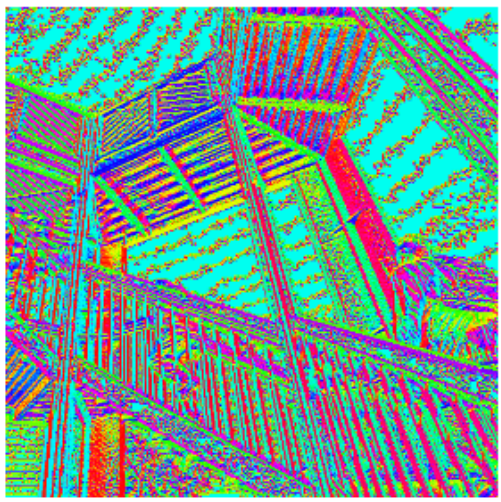
```
>>> from scipy import signal
>>> from scipy import misc
>>> ascent = misc.ascent()
>>> scharr = np.array([[ -3-3j, 0-10j,  +3 -3j],
...                    [-10+0j, 0+ 0j, +10 +0j],
...                    [ -3+3j, 0+10j,  +3 +3j]]) # Gx + j*Gy
>>> grad = signal.convolve2d(ascent, scharr, boundary='symm', mode='same')


>>> import matplotlib.pyplot as plt
>>> fig, (ax_orig, ax_mag, ax_ang) = plt.subplots(3, 1, figsize=(6, 15))
>>> ax_orig.imshow(ascent, cmap='gray')
>>> ax_orig.set_title('Original')
>>> ax_orig.set_axis_off()
>>> ax_mag.imshow(np.absolute(grad), cmap='gray')
>>> ax_mag.set_title('Gradient magnitude')
>>> ax_mag.set_axis_off()
>>> ax_ang.imshow(np.angle(grad), cmap='hsv') # hsv is cyclic, like angles
>>> ax_ang.set_title('Gradient orientation')
>>> ax_ang.set_axis_off()
>>> fig.show()
```

(Source code (../generated/scipy-signal-convolve2d-1.py))

Gradient magnitude

Gradient orientation



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