

# JAVA DIP - SOBEL OPERATOR

[http://www.tutorialspoint.com/java\\_dip/applying\\_sobel\\_operator.htm](http://www.tutorialspoint.com/java_dip/applying_sobel_operator.htm)

Copyright © tutorialspoint.com

Sobel operator is very similar to Prewitt operator. It is also a derivative mask and is used for edge detection. Sobel operator is used to detect two kinds of edges in an image: Vertical direction edges and Horizontal direction edges.

We are going to use **OpenCV** function **filter2D** to apply Sobel operator to images. It can be found under **Imgproc** package. Its syntax is given below:

```
filter2D(src, dst, ddepth, kernel, anchor, delta, BORDER_DEFAULT );
```

The function arguments are described below:

Sr.No.	Argument
1	<b>src</b> It is source image.
2	<b>dst</b> It is destination image.
3	<b>ddepth</b> It is the depth of dst. A negative value <i>such as</i> - 1 indicates that the depth is the same as the source.
4	<b>kernel</b> It is the kernel to be scanned through the image.
5	<b>anchor</b> It is the position of the anchor relative to its kernel. The location Point -1, - 1 indicates the center by default.
6	<b>delta</b> It is a value to be added to each pixel during the convolution. By default it is 0.
7	<b>BORDER_DEFAULT</b> We let this value by default.

Apart from the filter2D method, there are other methods provide by the Imgproc class. They are described briefly:

## Sr.No. Methods

1

**cvtColor***Matsrc, Matdst, intcode, intdstCn*

It converts an image from one color space to another.

2

**dilate***Matsrc, Matdst, Matkernel*

It dilates an image by using a specific structuring element.

3

**equalizeHist***Matsrc, Matdst*

It equalizes the histogram of a grayscale image.

4

**filter2D***Matsrc, Matdst, intdepth, Matkernel, Pointanchor, doubledelta*

It convolves an image with the kernel.

5

**GaussianBlur***Matsrc, Matdst, Sizeksize, doublesigmaX*

It blurs an image using a Gaussian filter.

6

**integral***Matsrc, Matsum*

It calculates the integral of an image.

## Example

The following example demonstrates the use of Imgproc class to apply Sobel operator to an image of Grayscale.

```
import org.opencv.core.Core;
import org.opencv.core.CvType;
import org.opencv.core.Mat;

import org.opencv.highgui.Highgui;
import org.opencv.imgproc.Imgproc;

public class convolution {
    public static void main( String[] args ) {

        try {
            int kernelSize = 9;
            System.loadLibrary( Core.NATIVE_LIBRARY_NAME );

            Mat source = Highgui.imread("grayscale.jpg", Highgui.CV_LOAD_IMAGE_GRAYSCALE);
            Mat destination = new Mat(source.rows(),source.cols(), source.type());

            Mat kernel = new Mat(kernelSize,kernelSize, CvType.CV_32F){
                {
                    put(0,0,-1);
                    put(0,1,0);
                    put(0,2,1);

                    put(1,0-2);
                    put(1,1,0);
                }
            }
        }
    }
}
```

```

        put(1, 2, 2);

        put(2, 0, -1);
        put(2, 1, 0);
        put(2, 2, 1);
    };
};

Imgproc.filter2D(source, destination, -1, kernel);
Highgui.imwrite("output.jpg", destination);

} catch (Exception e) {
    System.out.println("Error: " + e.getMessage());
}
}
}

```

## Output

When you execute the given code, the following output is seen:

## Original Image



This original image is convolved with the Sobel operator of vertical edges, which is given below:

## Vertical Direction

```

-1  0  1
-2  0  2
-1  0  1

```

## Convolved Image *VerticalDirection*

This original is convolved with the Sobel operator of horizontal edges, which is given below:

### Horizontal Direction

$$\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$$

### Convolved Image

*Horizontal Direction*