|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 0 |
| 0 | 0 | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 0 |
| 0 | 0 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 8 | 8 | 8 | 8 | 8 | 0 | 0 | 0 |
| 0 | 0 | 8 | 8 | 8 | 8 | 8 | 0 | 0 | 0 |
| 0 | 0 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 0 |
| 0 | 0 | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 0 |

Image

Sobel Masks (3X3)

Y-direction (Horizontal) = Gy

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

X-direction (Vertical) = Gx

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

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | -8 | -24 | -32 | -32 | -24 | -8 | 0 |
| 0 | 0 | 0 | -8 | -24 | -32 | -32 | -24 | -8 | 0 |
| 0 | 0 | 0 | 8 | 24 | 32 | 24 | 8 | 0 | 0 |
| 0 | 0 | 0 | 8 | 24 | 32 | 24 | 8 | 0 | 0 |
| 0 | 0 | 0 | -8 | -24 | -32 | -24 | -8 | 0 | 0 |
| 0 | 0 | 0 | -8 | -24 | -32 | -24 | -8 | 0 | 0 |
| 0 | 0 | 0 | 8 | 24 | 32 | 32 | 24 | 8 | 0 |
| 0 | 0 | 0 | 8 | 24 | 32 | 32 | 24 | 8 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Filtered image in the Y-direction

Filtered image in the X-direction

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 32 | 32 | 0 | 0 | 0 | 0 | -32 | -32 | 0 |
| 0 | 32 | 32 | -8 | -8 | 0 | 0 | -24 | -24 | 0 |
| 0 | 32 | 32 | -24 | 0 | 0 | -8 | -8 | -8 | 0 |
| 0 | 32 | 32 | -24 | -24 | 0 | -8 | -8 | 0 | 0 |
| 0 | 32 | 32 | -8 | -8 | 0 | -24 | -24 | 0 | 0 |
| 0 | 32 | 32 | -8 | -8 | 0 | -24 | -24 | 0 | 0 |
| 0 | 32 | 32 | -24 | -24 | 0 | -8 | -8 | 0 | 0 |
| 0 | 32 | 32 | -24 | -24 | 0 | 0 | -8 | -8 | 0 |
| 0 | 32 | 32 | -8 | -8 | 0 | 0 | -24 | -24 | 0 |
| 0 | 32 | 32 | 0 | 0 | 0 | 0 | -32 | -32 | 0 |

Comparison

As you can see that in the first picture on which we apply vertical mask, all the vertical edges are more visible than the original image. Similarly, in the second picture we have applied the horizontal mask and in result all the horizontal edges are visible.

So, in this way you can see that we can detect both horizontal and vertical edges from an image. Also, if you compare the result of Sobel operator with Prewitt operator, you will find that Sobel operator finds more edges or make edges more visible as compared to Prewitt Operator.

This is because in Sobel operator we have allotted more weight to the pixel intensities around the edges.

**Advantages:**

* Simple and time efficient computation
* Very easy at searching for smooth edges

**Limitations:**

* Diagonal direction points are not preserved always
* Sensitive to noise
* Not very accurate in edge detection
* Detect with thick and rough edges does not give appropriate results