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1. For the given masks the order of the smoothness is

* **M2** has the highest smoothness than any other filter because the dividing factor of the mask is 16 much higher than any other mask and it has the falling edges and the corners values from the center in the mask which makes the heavy smoother image. This filter name is Gaussian filter.
* **M1** has the next highest smoothness filter than M2, M4 because the dividing factor of the mask is 9 much higher than any other masks and it has consistent value ‘1’ for all the values. This filter name is box filter.
* **M3** has the next highest smoothness filter than M1 because the dividing factor of the mask is 8 much higher than any other mask and the corners fall far back than the center.
* **M4** has the least smoothness than any other filter because the dividing factor is 1 and it gives all contribution to the center than any other values. So, there is no change in the image. This filter name is identity filter.

1. First-order derivatives vs second-order derivatives

* First order derivative:
* First order derivatives produce thick edges
* It has great response at the grey level change goes up in the graph than the second derivative.
* Second order derivative:
* Second order derivatives produce fine edges
* Gives good response to fine details but also for the noisy points.
* second derivative graph has a positive raise and back to negative of an image and this produces a double fine line.

I think the first order derivative image enhancement produces the better image edge detection because the first order has thick edges and the second order edges produce a kind of double fine lines which is like a shadow of a line.

And second order produces fine details about the isolated points in an image but produces for the noisy details in the image. So, I prefer the first order derivative than the second order derivative image enhancement filter.

But finally depends upon the what kind of details required of an image. If better edges prefer the first order derivative or for finer details of a image points prefer the second order derivative.

1. Sharpen image = original image + edge enhanced image

0 0 0 1 1 1 -1 -1 -1

0 1 0 - 1 -8 1 = -1 9 -1

0 0 0 1 1 1 -1 -1 -1

-1 -1 -1

S = -1 9 -1

-1 -1 -1



I think that we must blur the image first and apply edge detector because if we smooth the image then we can remove the noise data from the image and the edges detected after that are clear.

If we apply the edge detector first, then we may include the noise data into the edges that are detected and if smooth now then we won’t able to get the clear edges.

1. Appling the median filter 3\*3 square shape for the Image I

4 4 4 4 4 4 4 4

4 4 4 48 4 4 4 4

4 4 64 64 64 64 4 4

4 17 64 64 96 64 4 4

4 4 64 85 64 64 8 4

4 4 64 64 64 64 4 4

4 56 4 4 23 4 4 4

4 4 4 4 4 4 4 4

For the sub part we sort the elements and take the median value

4 4 4

4 4 4 Ascending order of the elements: 4, 4, 4, 4, 4, 4, 4, 4, 64

4 4 64 median value is 4. So, replace position with 4

Final answer is:

4 4 4 4 4 4 4 4

4 4 4 4 4 4 4 4

4 4 48 64 64 4 4 4

4 4 64 64 64 64 4 4

4 4 64 64 64 64 4 4

4 4 56 64 64 23 4 4

4 4 4 4 4 4 4 4

4 4 4 4 4 4 4 4

1. The 5\*5 cross shape median filter for image I is:

4 4 4 4 4 4 4 4

4 4 4 48 4 4 4 4

4 4 64 64 64 64 4 4

4 17 64 64 96 64 4 4

4 4 64 85 64 64 8 4

4 4 64 64 64 64 4 4

4 56 4 4 23 4 4 4

4 4 4 4 4 4 4 4

we take every 5\*5 cross elements from the matrix and sort them in ascending order

4

4

4 4 64 64 64

64

64

Elements in ascending order is : 4, 4, 4, 4, 64, 64, 64, 64, 64, 64

Medina value is: 64

Final answer is:

4 4 4 4 4 4 4 4

4 4 4 4 4 4 4 4

4 4 64 64 64 64 4 4

4 4 64 64 64 64 4 4

4 4 64 64 64 64 4 4

4 4 64 64 64 64 4 4

4 4 4 4 4 4 4 4

4 4 4 4 4 4 4 4

c) By comparing the M1 and M2 indicates that M2 has more noise reduction than the M1. M2 have very uniform values for the sub region but M1 has still some noise in the Image. So, I prefer M2 better than the M1.

II

5. I think LOG 7x7 is better than LOG 11x11 because the over smoothing by the LOG 11x11

We lose lot of details in the image to detect the edges. So, LOG 7x7 is better image edge detector.