

Digital Image Processing Lab

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Apply Gaussian Smoothing Filters to Images

```
I = imread('cameraman.tif');
```

```
Iblur1 = imgaussfilt(I,2);  
Iblur2 = imgaussfilt(I,4);  
Iblur3 = imgaussfilt(I,8);
```

Display the original image and all the filtered images.

```
figure  
imshow(I)  
title('Original image')
```

Original image



```
figure
imshow(Iblur1)
title('Smoothed image, \sigma = 2')
```

Smoothed image, $\sigma = 2$



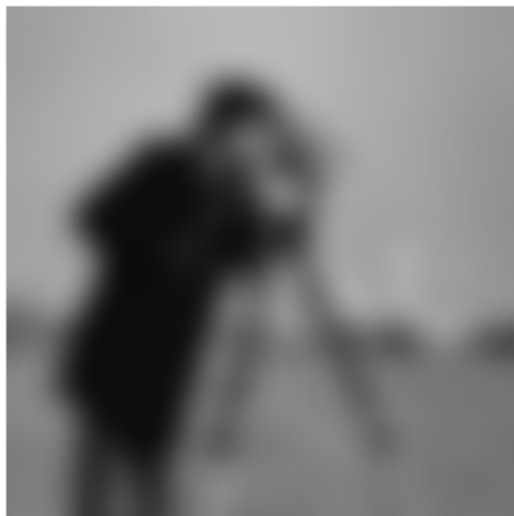
```
figure
imshow(Iblur2)
title('Smoothed image, \sigma = 4')
```

Smoothed image, $\sigma = 4$



```
figure
imshow(Iblur3)
title('Smoothed image, \sigma = 8')
```

Smoothed image, $\sigma = 8$



```
IblurX1 = imgaussfilt(I,[4 1]);
IblurX2 = imgaussfilt(I,[8 1]);
IblurY1 = imgaussfilt(I,[1 4]);
IblurY2 = imgaussfilt(I,[1 8]);
```

Display the filtered images.

```
figure
imshow(IblurX1)
title('Smoothed image,  $\sigma_x = 4, \sigma_y = 1$ ')
```

Smoothed image, $\sigma_x = 4, \sigma_y = 1$



```
figure
imshow(IblurX2)
title('Smoothed image,  $\sigma_x = 8, \sigma_y = 1$ ')
```

Smoothed image, $\sigma_x = 8, \sigma_y = 1$



```
figure
imshow(IblurY1)
title('Smoothed image,  $\sigma_x = 1, \sigma_y = 4$ ')
```

Smoothed image, $\sigma_x = 1, \sigma_y = 4$



```
figure
imshow(IblurY2)
title('Smoothed image, \sigma_x = 1, \sigma_y = 8')
```

Smoothed image, $\sigma_x = 1, \sigma_y = 8$



```
I_sky = imadjust(I(20:50,10:70));
IblurX1_sky = imadjust(IblurX1(20:50,10:70));
```

Display the original patch of sky with the filtered version.

```
figure
imshow(I_sky), title('Sky in original image')
```

Sky in original image



```
figure
imshow(IblurX1_sky), title('Sky in filtered image')
```

Sky in filtered image



Image Sharpening Using Laplacian Filter

```
% MatLab program for edge sharpening.
% Read the image in variable 'a'
a=imread("cameraman.jpg");

% Defined the laplacian filter.
Lap=[0 1 0; 1 -4 1; 0 1 0];

% Convolve the image read
% in 'a' with Laplacian mask.
a1=conv2(a,Lap,'same');

% After convolution the intensity
% Values go beyond the range.
% Normalise the range of intensity.
a2=uint8(a1);

% Display the sharpened image.
imtool(abs(a-a2),[])

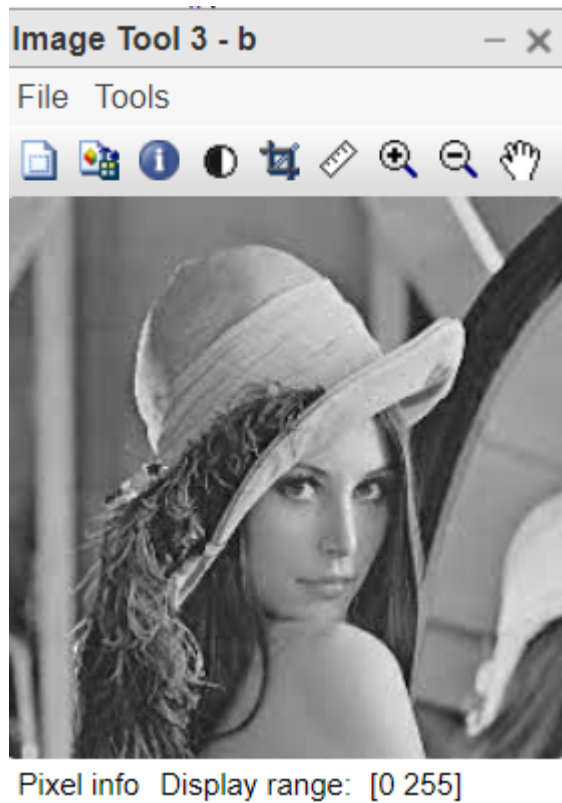
% Define strong laplacian filter
lap=[-1 -1 -1; -1 8 -1; -1 -1 -1];

% Apply filter on original image
a3=conv2(a,lap,'same');

% Normalise the resultant image.
a4=uint8(a3);
```

```
% Display the sharpened image.  
imtool(abs(a+a4), [])
```

Output:





Pixel info: (X Display range: [0 255]



Pixel info Display range: [0 255]