Read Data

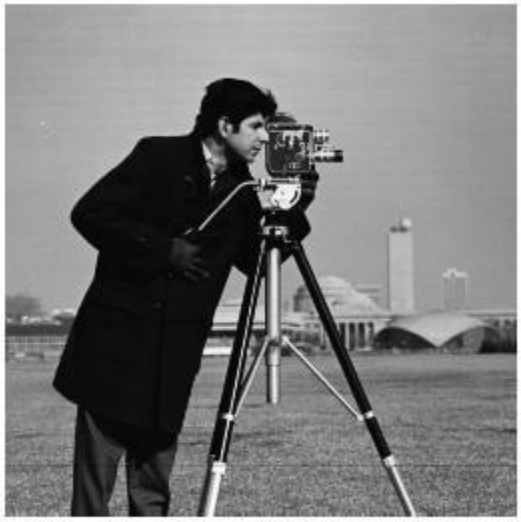
```
camera = imread('lab2/images_lab2/cameraman.png');
```

Q1 - Different Kernels

We will apply three different kernels in the spatial domain with one sharpening, one smoothing and apply them in different sizes.

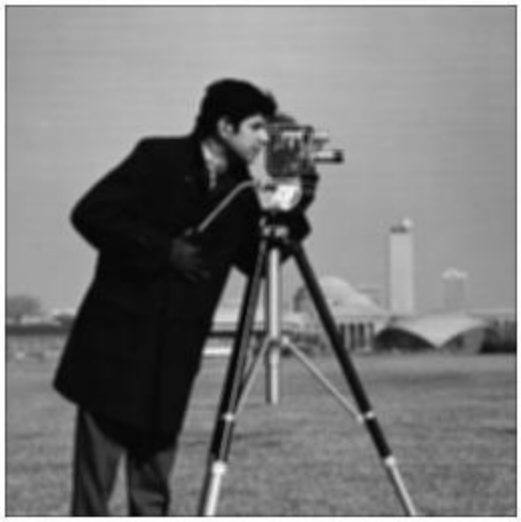
Firstly we begin with showing the original image that we will use.

```
figure;
imshow(camera);
```



Now, let's introduce a mean filter of size 3×3 and apply the convolution using **imfilter**. The mean filtered image is shown below.

```
h1 = fspecial('average', 3);
meancamera3 = imfilter(camera, h1);

figure;
imshow(meancamera3);
```



And using mean filter of sie 7×7 we get

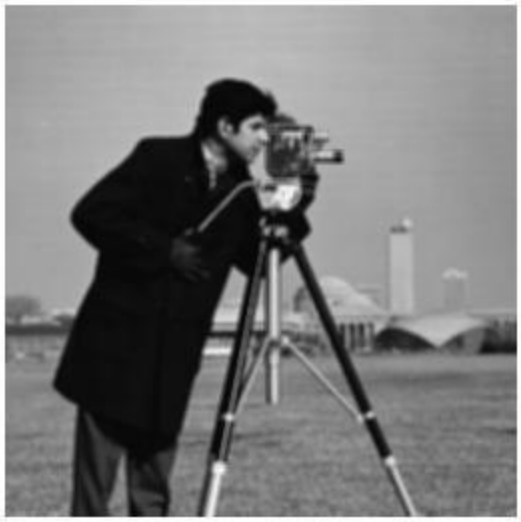
```
h2 = fspecial('average', 7);
meancamera7 = imfilter(camera, h2);

figure;
imshow(meancamera7);
```

And lastly, a 31×31 mean filter.

```
h3 = fspecial('average', 31);
meancamera31 = imfilter(camera, h3);

figure;
imshow(meancamera31);
```

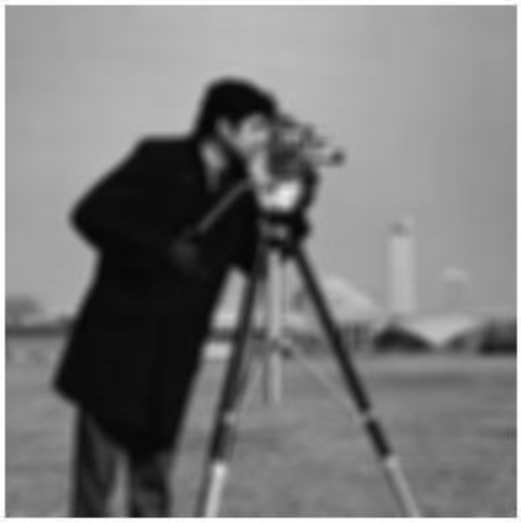
Lets introduce gaussian filters and perform the same calculations as above. Since the gaussian filter is based on the gaussian distribution We also have an additional parameter in addition to the size of the kernel, namely σ. We have assumed this to be $\sigma = 3$ for this exercise. We use the function imgaussfilt due to the documentation recommending to use that one instead of imfilter.

```
gausscamera3 = imgaussfilt(camera, 3, FilterSize=3);

figure;
imshow(gausscamera3);
```



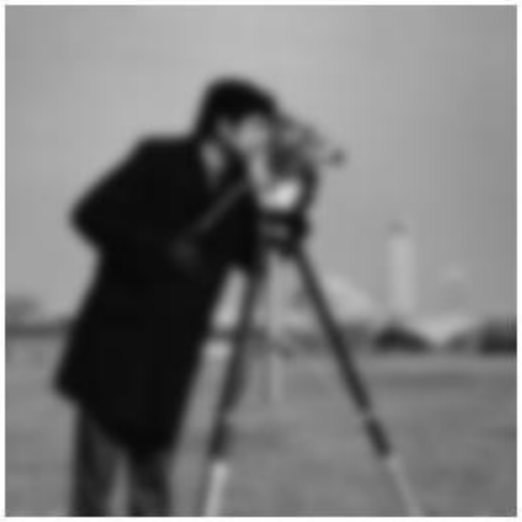
And using a gaussian filter size of 7×7 we get

```
gausscamera7 = imgaussfilt(camera, 3, FilterSize=7);

figure;
imshow(gausscamera7);
```



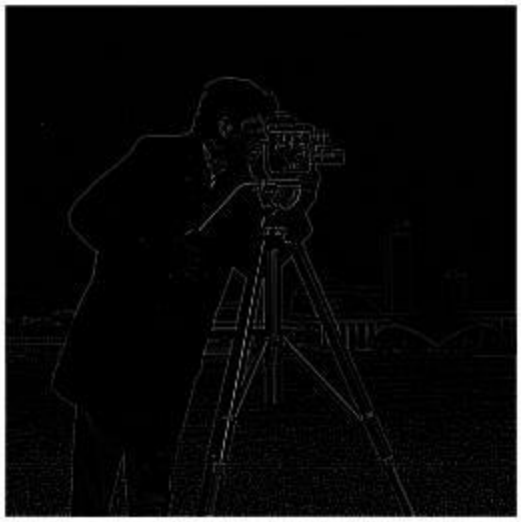
And lastly using a gaussian filter size of 31×31 we get

```
gausscamera31 = imgaussfilt(camera, 3, FilterSize=31);

figure;
imshow(gausscamera31);
```



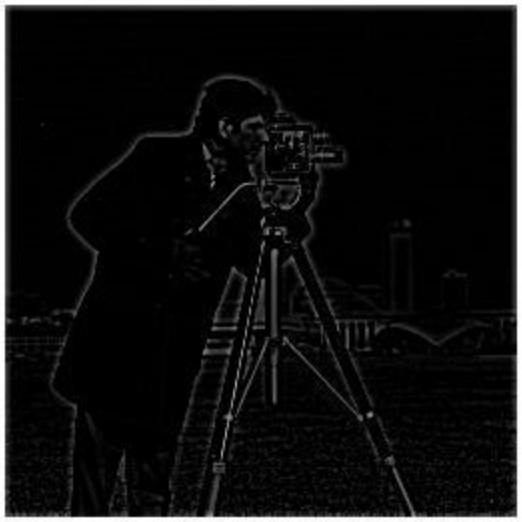
For a sharpening (high pass) filter, we will use a unsharp masking of the mean filter for different sizes. Below we do this for a 3×3 unsharping mean filter.

```
size = 3;
h4 = fspecial('average', size);
h4 = h4 * -1;
h4(size - floor(size/2), size - floor(size/2)) = h4(size -
 floor(size/2), size - floor(size/2)) + 1;

msharpcamera3 = imfilter(camera, h4);

figure;
imshow(msharpcamera3);
```



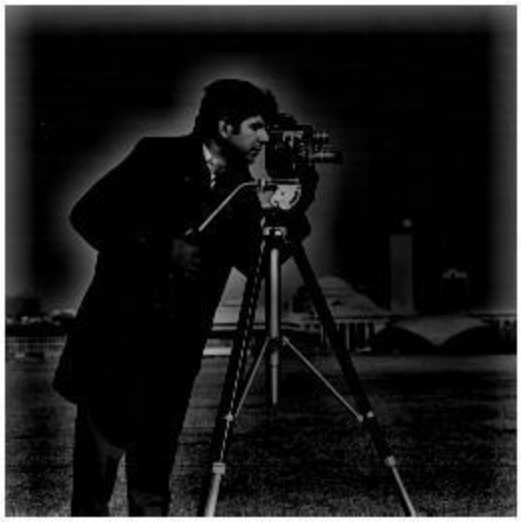
And once again for the mask of size 7×7

```
size = 7;
h5 = fspecial('average', size);
h5 = h5 * -1;
h5(size - floor(size/2), size - floor(size/2)) = h5(size -
 floor(size/2), size - floor(size/2)) + 1;

msharpcamera7 = imfilter(camera, h5);

figure;
imshow(msharpcamera7);
```



And lastly, one last time for the mask of size $31 \times 31£

```
size = 31;
h6 = fspecial('average', size);
h6 = h6 * -1;
h6(size - floor(size/2), size - floor(size/2)) = h6(size -
 floor(size/2), size - floor(size/2)) + 1;

msharpcamera31 = imfilter(camera, h6);

figure;
imshow(msharpcamera31);
```



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