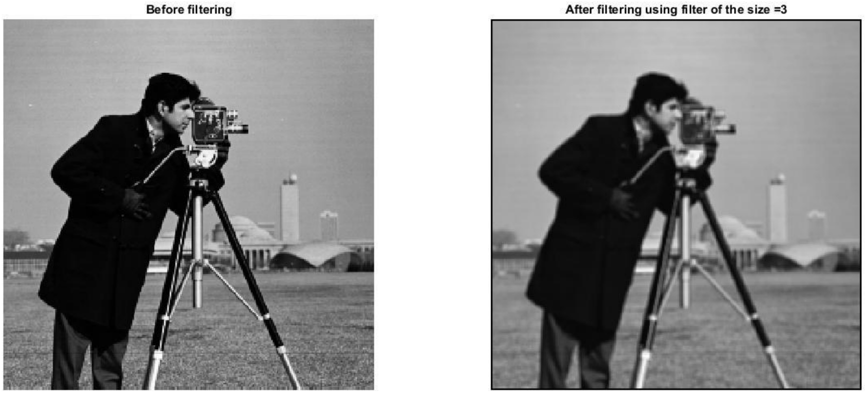
Appendix C

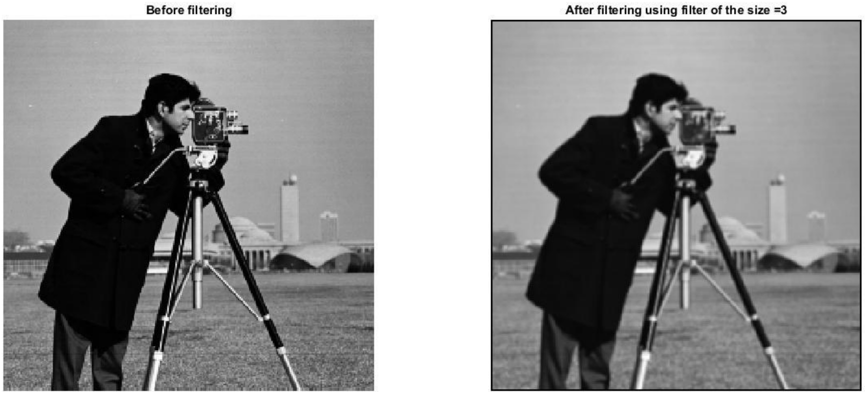
Average Filter :

```
A = im2double( imread('cameraman.tif') );
[r, c] = size(A);
B = zeros(r, c);

filter = (1/9)*[1, 1, 1; 1, 1, 1; 1, 1, 1];
filterSize = size(filter, 1);

start = floor(filterSize/2)+1;
stop_r = r - floor(filterSize/2);
stop_c = c - floor(filterSize/2);

for i = start:stop_r
    for j = start:stop_c
        B(i, j) = sum(  sum( A(i-1:i+1, j-1:j+1) .* 
filter )  );
    end
end

figure,
subplot(1, 2, 1), imshow(A, []), title('Before 
filtering');

subplot(1, 2, 2), imshow(B, []), 
title( strcat('After filtering using filter of the size = 
', num2str(filterSize)) );
```



Weighted mean filter :

```
A = im2double( imread('cameraman.tif') );
[r, c] = size(A);
B = zeros(r, c);

filter = (1/16)*[1, 2, 1; 2, 4, 2; 1, 2, 1];
filterSize = size(filter, 1);

start = floor(filterSize/2)+1;
stop_r = r - floor(filterSize/2);
stop_c = c - floor(filterSize/2);

for i = start:stop_r
    for j = start:stop_c
        B(i, j) = sum(  sum( A(i-1:i+1, j-1:j+1).*
filter)  );
    end
end

figure,
subplot(1, 2, 1), imshow(A, []), title('Before
filtering');

subplot(1, 2, 2), imshow(B, []),
title( strcat('After filtering using filter of the size =
', num2str(filterSize)) );
```



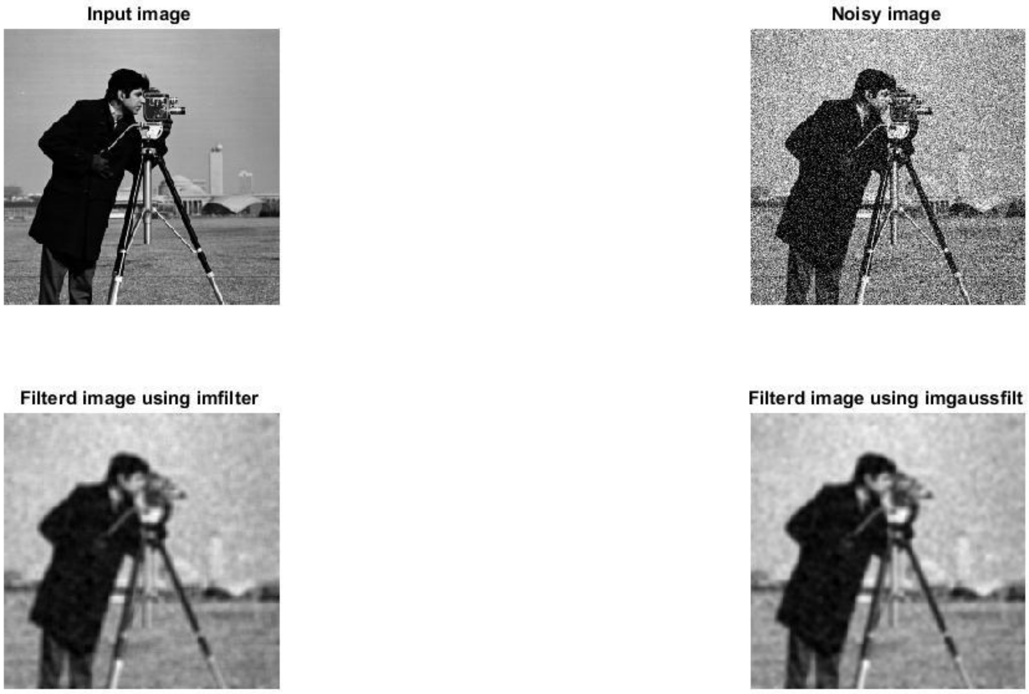
Before filtering

After filtering using filter of the size =3

Gaussian filter :

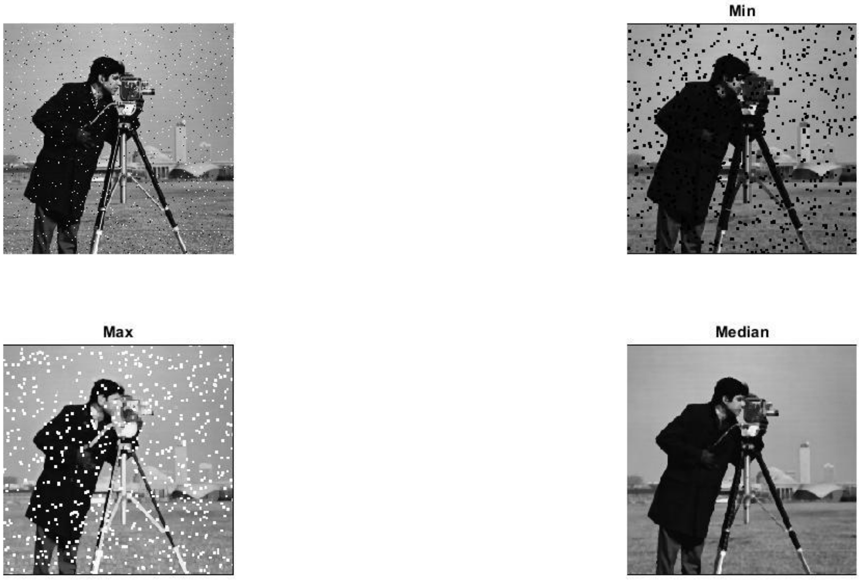
```
InputImage = im2double( imread('cameraman.tif') );

Mean = 0.02;
Variance = 0.025;
NoisyImage =
imnoise(InputImage,'gaussian',Mean,Variance);
```

```
filterSize = 7;
filterSigma = 3;
GaussianFilter = fspecial('gaussian', filterSize,
filterSigma);

FilterdImage1 = imfilter(NoisyImage, GaussianFilter,
'conv' , 'replicate');

FilterdImage2 = imgaussfilt(NoisyImage, filterSigma/1.5);

subplot(2,2,1)
imshow(InputImage, []);
title ('Input image ');

subplot(2,2,2)
imshow(NoisyImage, []);
title ('Noisy image ');

subplot(2,2,3)
imshow(FilterdImage1, []);
title ('Filterd image using imfilter ');

subplot(2,2,4)
imshow(FilterdImage2, []);
title ('Filterd image using imgaussfilt ');
```



Non-linear filters :

```
A = im2double( imread('cameraman.tif') );
B = imnoise(A, 'salt & pepper', 0.02);
[r, c] = size(B);

C1 = zeros(r, c);
C2 = C1;
C3 = C2;

for i=2:r-1
    for j=2:c-1
        mask = B(i-1:i+1, j-1:j+1);
        sorted_mask = sort(mask)
        min_ = sorted_mask (0);
        max_ = sorted_mask (9);
        median_ = sorted_mask (5);
        C1(i, j) = min_;
        C2(i, j) = max_;
        C3(i, j) = median_;
    end
end

figure,
subplot(2, 2, 1), imshow(B);
subplot(2, 2, 2), imshow(C1), title('Min');
subplot(2, 2, 3), imshow(C2), title('Max');
subplot(2, 2, 4), imshow(C3), title('Median');
```



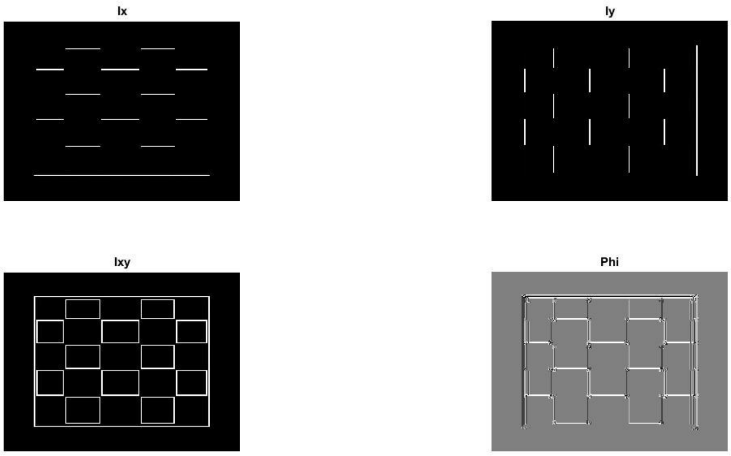
Min

Max

Median

Prewit edge detector :

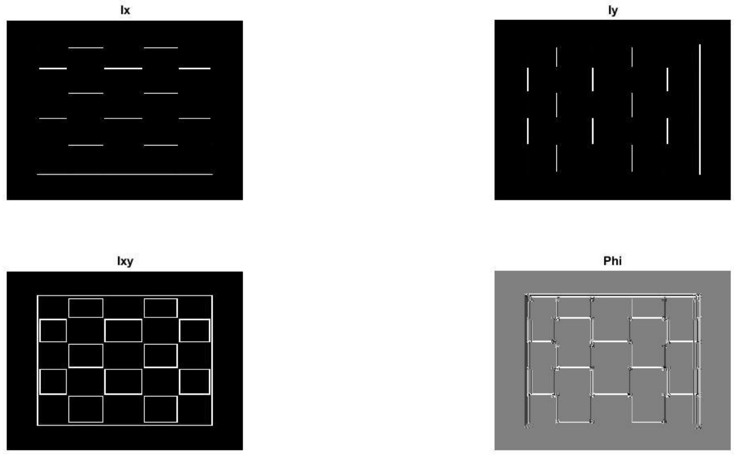
```
I = imread('squares.jpg');
I = rgb2gray(I);
I = im2double(I);
[r, c] = size(I);

mask_x = [1 1 1; ...
          0  0  0; ...
         -1  -1  -1];

mask_y = mask_x';


Ix = zeros(r, c);
Iy = Ix;
Ixy = Iy;

Ix = imfilter(I, mask_x, 'conv', 'same');
Iy = imfilter(I, mask_y, 'conv', 'same');
Ixy = sqrt( Ix.^2 + Iy.^2 );
phi = atan2(Iy, Ix);

figure, subplot(2, 2, 1),
imshow(Ix);
title('Ix');

subplot(2, 2, 2),
imshow(Iy);
title('Iy');

subplot(2, 2, 3),
imshow(Ixy);
title('Ixy');

subplot(2, 2, 4),
imshow(phi, []);
title('Phi');
```



Sobel edge detector :

```
I = imread('squares.jpg');
I = rgb2gray(I);
I = im2double(I);
[r, c] = size(I);

mask_x = [1 2 1; ...
          0   0   0; ...
         -1  -2  -1];

mask_y = mask_x';


Ix = zeros(r, c);
Iy = Ix;
Ixy = Iy;

Ix = imfilter(I, mask_x, 'conv', 'same');
Iy = imfilter(I, mask_y, 'conv', 'same');
Ixy = sqrt( Ix.^2 + Iy.^2 );
phi = atan2(Iy, Ix);

figure, subplot(2, 2, 1),
imshow(Ix);
title('Ix');

subplot(2, 2, 2),
imshow(Iy);
title('Iy');

subplot(2, 2, 3),
imshow(Ixy);
```

```
title('Ixy');

subplot(2, 2, 4),
imshow(phi, []);
title('Phi');
```



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1st term