
```
clc;
clear all;
close all;

% Cutoff
imgCutOff = 100;

% Load image
img = imread('cameraman.tif');
img = im2double(img);
yres = size(img, 1);
xres = size(img, 2);
figure;
imshow(img);
title('Original image');

% Pad image
xres2 = 2 * xres;
yres2 = 2 * yres;
imgPad = zeros(yres2, xres2);
imgPad(1:yres, 1:xres) = img;
figure;
imshow(imgPad);
title('Padded image');

% Multiply with  $(-1)^{(x+y)}$ 
imgMul = imgPad;
for y = 1 : yres
    for x = 1 : xres
        imgMul(y, x) = imgMul(y, x) *  $(-1)^{(x + y)}$ ;
    end
end
title('Shifted image');

% Frequency domain image
imgFreq = fft2(imgMul);
figure;
imshow(real(imgFreq));
title('Image in frequency domain');

% Compute distance plot
imgDist = zeros(yres2, xres2);
for y = 1 : yres2
    for x = 1 : xres2
        xDist = xres - x;
        yDist = yres - y;
        imgDist(y, x) = sqrt(xDist^2 + yDist^2);
    end
end
figure;
imshow(imgDist / xres);
title('Distance image');
```

```
% Obtain impulse response
imgImpls = 1 ./ (1 + (imgDist / imgCutOff) .^ 2);
figure;
imshow(imgImpls);
title('Impulse response');

% Obtain frequency filtered image
imgFreqFilt = imgFreq .* imgImpls;
figure;
imshow(imgFreqFilt);
title('Freq. filtered image');

% Obtain filtered unshifted image
imgFiltUnshft = real(ifft2(imgFreqFilt));
figure;
imshow(imgFiltUnshft);
title('Filtered, but unshifted image');

% Obtain filtered, but unextracted image
imgFiltUnextrct = imgFiltUnshft;
for y = 1 : yres
    for x = 1 : xres
        imgFiltUnextrct(y, x) = imgFiltUnextrct(y, x) * (-1)^(x + y);
    end
end
figure;
imshow(imgFiltUnextrct);
title('Filtered, but unextracted image');

% Obtain filtered image
imgFilt = imgFiltUnextrct(1:yres, 1:xres);
figure;
imshow(imgFilt);
title('Filtered image');
```

Warning: Displaying real part of complex input.

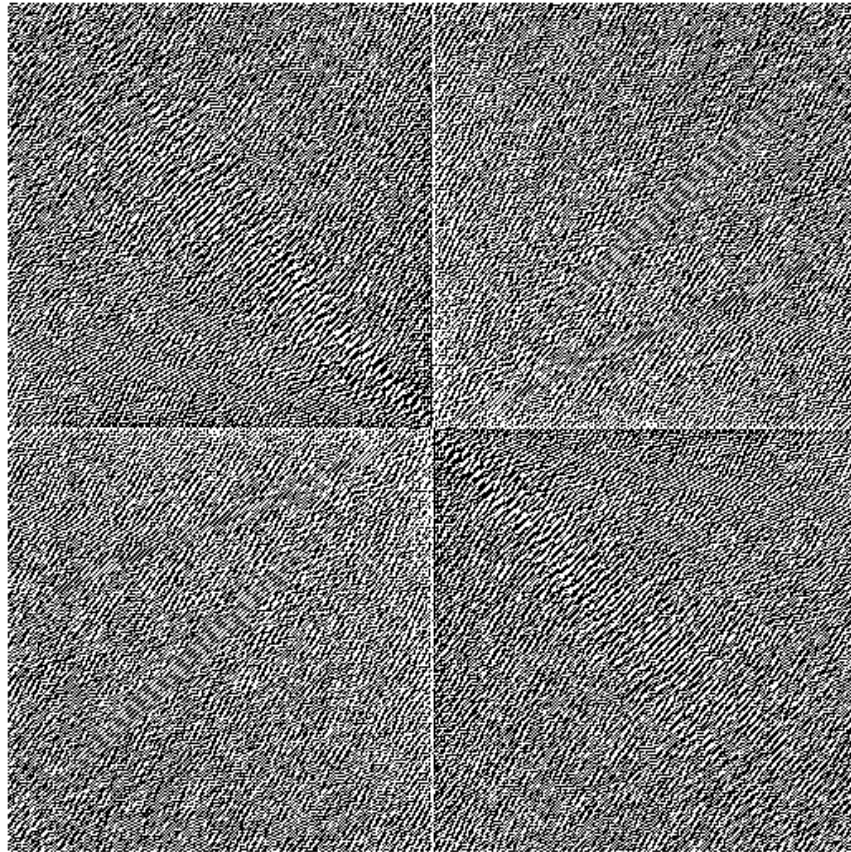
Original image



Shifted image



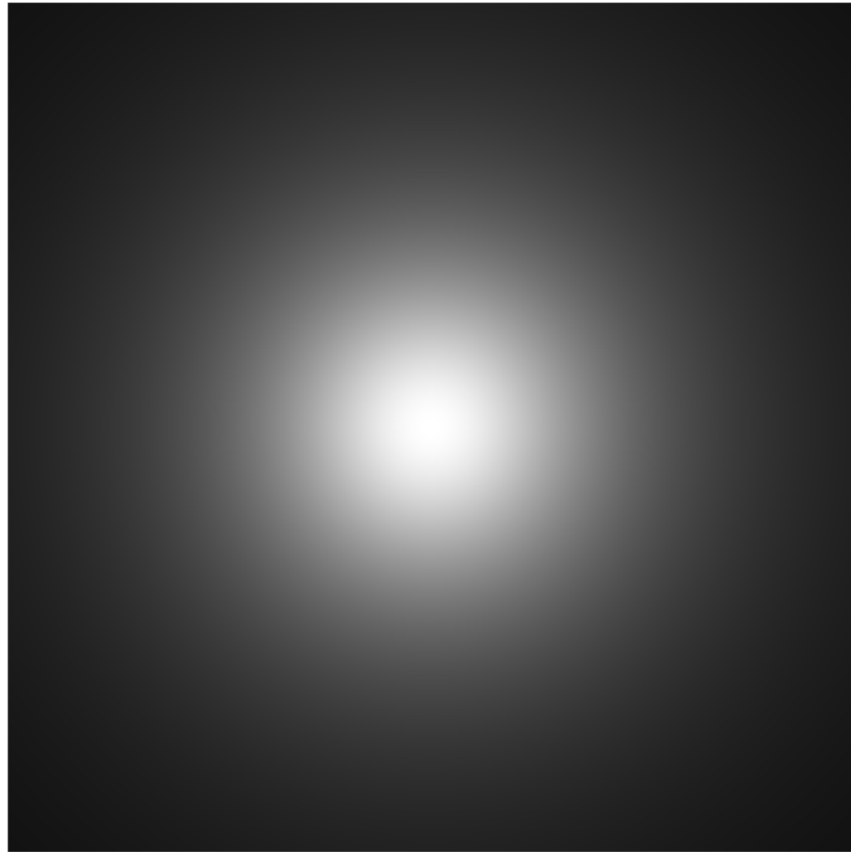
Image in frequency domain



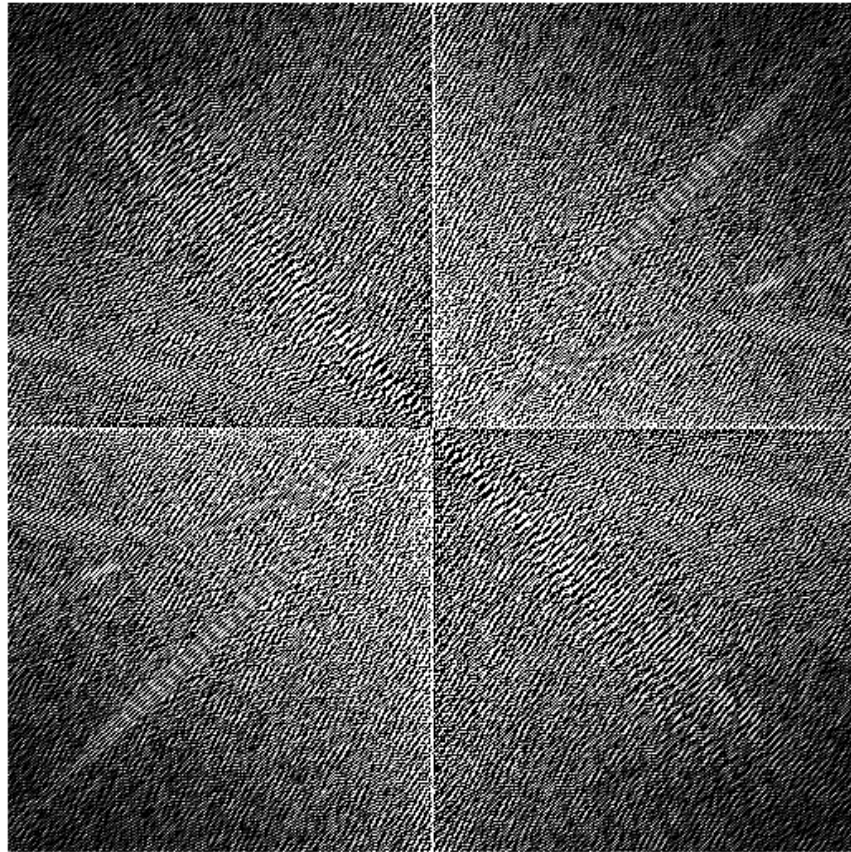
Distance image



Impulse response



Freq. filtered image



Filtered, but unshifted image



Filtered, but unextracted image



Filtered image



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