

5th tutorial in IVP

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Input image.

```
i = imread('eight.tif'); imshow(i);  
title('\it Original Image', 'interpreter','latex');
```

Original Image



```
% xlabel('\it U', 'interpreter', 'latex')
```

To grayscale the image.

```
% g = rgb2gray(i); imshow(g);  
% title('\it{Greyled Image}','interpreter','latex');  
% max(g, [], 'all')  
% size(g)
```

S&p 2

```
H = fspecial('motion',20,45);
```

```

MotionBlur = imfilter(i,H,'replicate');
imshow(MotionBlur);
title(['\it Motion blur, $l = 20$ $px,$ $\theta$ ...' ...
      ' = 45^\circ$'], 'interpreter','latex');

```

Motion blur, $l = 20 \text{ px}$, $\theta = 45^\circ$



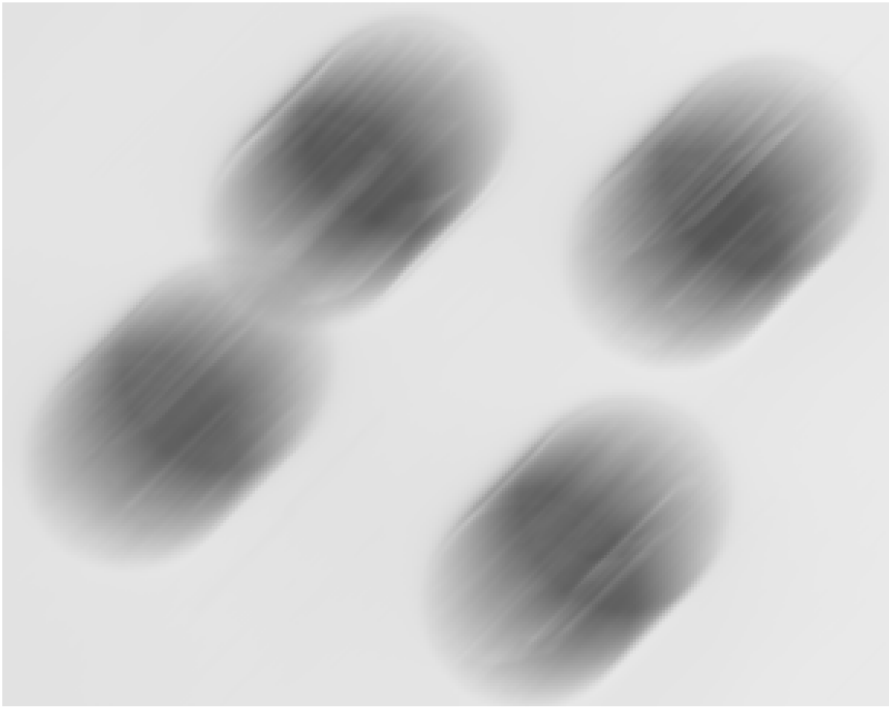
50

```

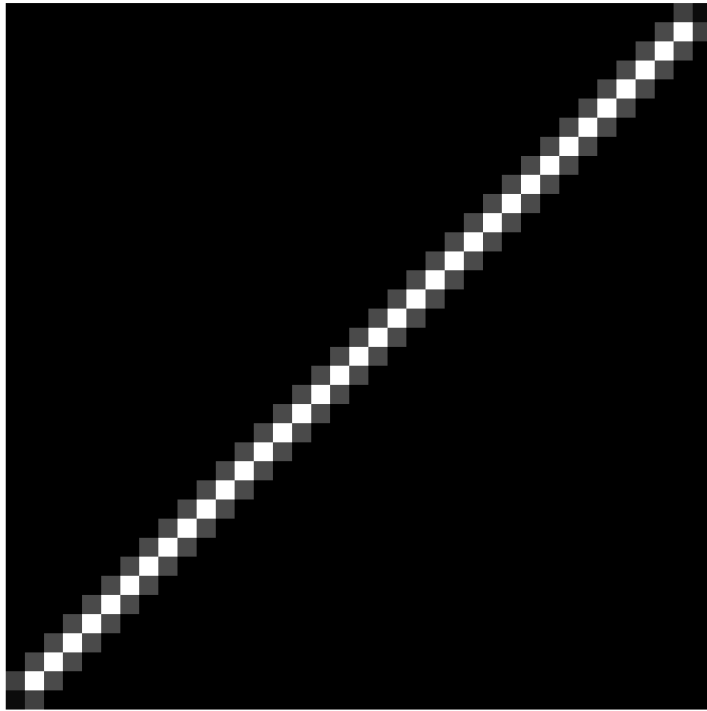
H = fspecial('motion',50,45);
MotionBlur = imfilter(i,H,'replicate');
imshow(MotionBlur);
title(['\it Motion blur, $l = 50$ $px,$ $\theta$ ...' ...
      ' = 45^\circ$'], 'interpreter','latex');

```

Motion blur, $l = 50$ px, $\theta = 45^\circ$



```
imshow(H, [])
```

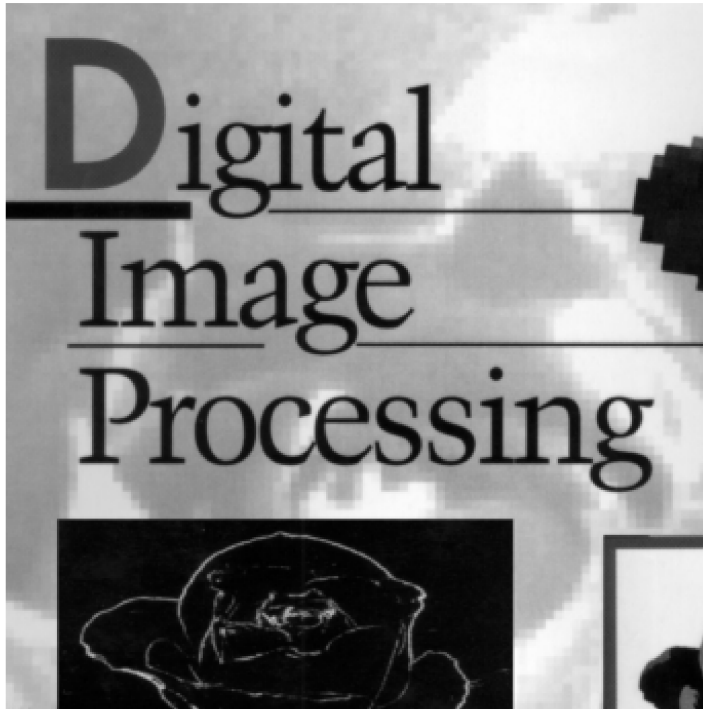


```
% H
```

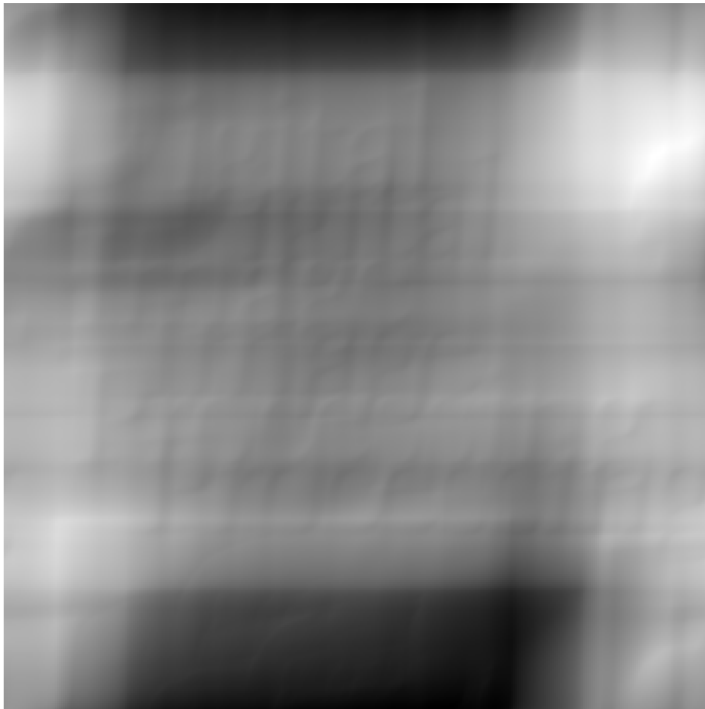
G

```
im = imread(['http://users.rowan.edu/~shreek/' ...  
            'fall09/dip/lab3/GW_Fig5_26.jpg']); imshow(im);  
[m, n] = size(im); [u, v] = meshgrid(1:m, 1:n);  
title(['\it Original Image (' num2str(m) ...  
        '$^2$)'], 'interpreter','latex');
```

Original Image (688²)



```
T = 1; a = 0.1; b = 0.1;
x = pi*(u*a+v*b);
% x = pi*((u-m/2)*a+(v-n/2)*b);
Hmb = (T./x).*(sin(x)).*(exp(-1j*x));
MB = ifft2(fft2(im).*Hmb);
% MB = ifft2(fft2(double(im).*(-1).^(u+v)).*
% Hmb.*(-1).^(u+v));
% imshow(log(abs(MB)+1), []);
imshow(real(MB), []);
```



G

```
% im.*uint8((-1).^(u+v))
```

```
% double(im).*(-1).^(u+v)
```

```
% (-1).^(u+v)
```

G

```
L = 5; % kernel width
sx=3;
sy=10;
theta=0;

I = imread('cameraman.tif');
x = -L:1.0:L;

[X,Y] = meshgrid(x,x);
rX = X.*cos(theta)-Y.*sin(theta);
rY = X.*sin(theta)+Y.*cos(theta);
H1 = exp(-((rX./sx).^2)-((rY./sy).^2));
Hflag = double((0.*rX+rY)>0);
```

```
H1 = H1.*Hflag;  
comet_kernel = H1/sum((H1(:)));  
  
smearedImage = conv2(double(I),comet_kernel,'same');  
  
imshow(smearedImage,[]);
```

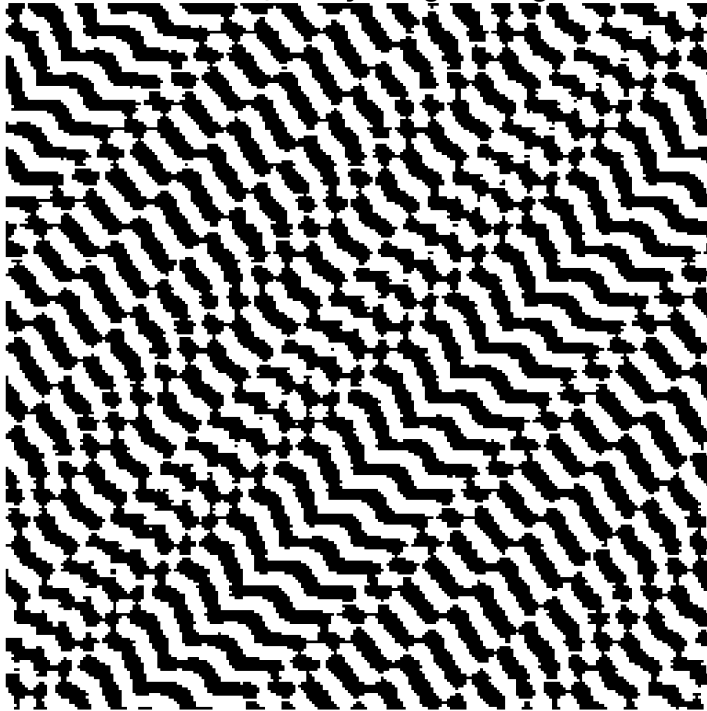


```
MotionBlur = imfilter(double(I),comet_kernel, ...  
    'replicate');  
imshow(MotionBlur);
```

S_2

```
% estimated_nsr = noise_var / var(I(:));  
wnr3 = deconvwnr(MotionBlur, H);  
figure, imshow(wnr3)  
title(['Restoration of Blurred, Noisy Image' ...  
      ' Using Estimated NSR']);
```


Restoration of Blurred, Noisy Image Using Estimated NSR



S_8

```
H = fspecial('motion',20,45);  
% = imfilter(i,H,'replicate');  
MotionBlur = imfilter(i,H,'conv','circular');  
imshow(MotionBlur);  
title(['\it Motion blur, $l = 20$ $px,$ $\theta$' ...  
      ' = 45^\circ$'], 'interpreter','latex');
```

Motion blur, $l = 20$ px, $\theta = 45^\circ$



```
Ioriginal = imread('cameraman.tif');  
imshow(Ioriginal)  
title('Original Image')
```

Original Image



```
PSF = fspecial('motion',21,41);  
Idouble = im2double(Ioriginal);  
blurred = imfilter(Idouble,PSF,'conv','circular');  
imshow(blurred)  
title('Blurred Image')
```

Blurred Image



```
wnr1 = deconvwnr(blurred,PSF);  
imshow(wnr1)  
title('Restored Blurred Image')
```

Restored Blurred Image



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