

Filtrovani v prostorove domene

Korelace

```
f = [0 0 0 1 0 0 0];  
w = [1 2 3 2 8];  
  
g = imfilter(f,w,'corr','same')  
  
g = 1×7  
    0    8    2    3    2    1    0
```

Konvoluce

```
f = [0 0 0 1 0 0 0];  
w = [1 2 3 2 8];  
g = imfilter(f,w,'conv','same')  
  
g = 1×7  
    0    1    2    3    2    8    0
```

Korelace ve 2D

```
f = [ 0 0 0 0 0;  
      0 0 0 0 0;  
      0 0 1 0 0;  
      0 0 0 0 0;  
      0 0 0 0 0];  
  
w = [ 1 2 3;  
      4 5 6;  
      7 8 9];  
g = imfilter(f,w,'corr','same')  
  
g = 5×5  
    0    0    0    0    0  
    0    9    8    7    0  
    0    6    5    4    0  
    0    3    2    1    0  
    0    0    0    0    0
```

Konvoluce ve 2D

```
g = imfilter(f,w,'conv','same')  
  
g = 5×5  
    0    0    0    0    0  
    0    1    2    3    0  
    0    4    5    6    0  
    0    7    8    9    0  
    0    0    0    0    0
```

Vyhlazovací filtry

Filtarce prumerovanim

```
B = imread('lenagraysum.bmp');  
w = 1/9 * [1 1 1;  
           1 1 1;  
           1 1 1];  
  
C = imfilter(B,w,'corr','same');  
figure, imshow(C);
```



```
figure, imshow(B);
```



Vazene prumerovani

```
B = imread('lenagraysum.bmp');  
w = 1/16 * [1 2 1;  
            2 4 2;  
            1 2 1];  
  
C = imfilter(B,w,'corr','same');  
figure, imshow(C);
```



Medianová filtrace

```
B = imread('lenagraysum2.bmp');  
w = 1/9 * [1 1 1;  
           1 1 1;  
           1 1 1];  
  
C = imfilter(B,w,'corr','same');  
  
C2 = medfilt2( B,[3 3] );  
  
figure  
subplot(1,2,1)  
imshow(C,[])  
title('prumer')  
subplot(1,2,2)
```

```
imshow(C2,[])
title('median')
```



Ostrici filtry

Laplaceuv operator

```
I = imread('pastelkygrayblurred.png');
w = [-1 -1 -1;
     -1 8 -1;
     -1 -1 -1];

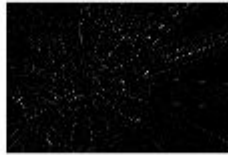
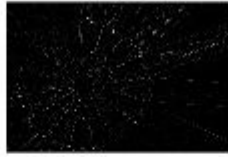
w2 = [-0 -1 0;
     -1 4 -1;
     0 -1 0];

C = imfilter(I,w,'corr','same');
C2 = imfilter(I,w2,'corr','same');

figure
subplot(2,3,1)
imshow(I,[])
subplot(2,3,2)
imshow(C,[])
subplot(2,3,3)
imshow(I-C,[])

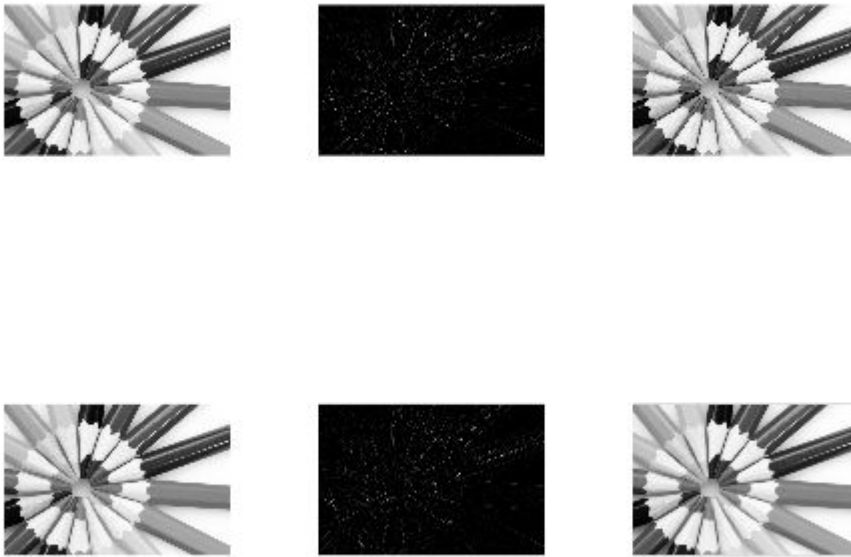
subplot(2,3,4)
```

```
imshow(I,[])  
subplot(2,3,5)  
imshow(C2,[])  
subplot(2,3,6)  
imshow(I-C2,[])
```



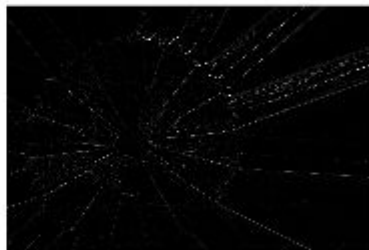
Zvýraznění hran - ostření

```
w2 = -[0 -1 0;  
      -1 3 -1;  
      0 -1 0];  
  
C2 = imfilter(I,w2,'corr','same');  
imshow(C2,[])
```



Robertsuv operator

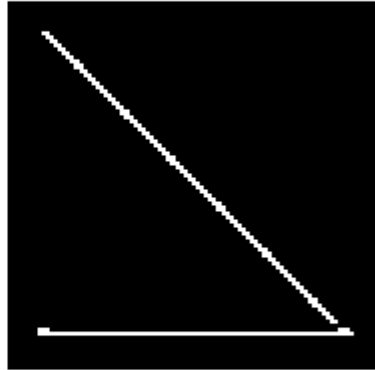
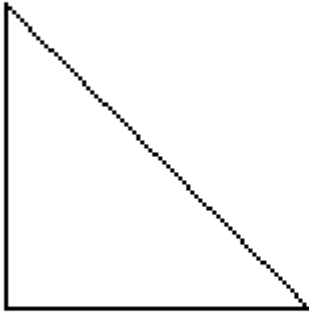
```
I = imread('pastelkygray.jpg');  
w = [-1 -1;  
     1 1];  
  
I2 = imfilter(I,w,'corr','same');  
  
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(I2,[])
```

Sobeluv operator

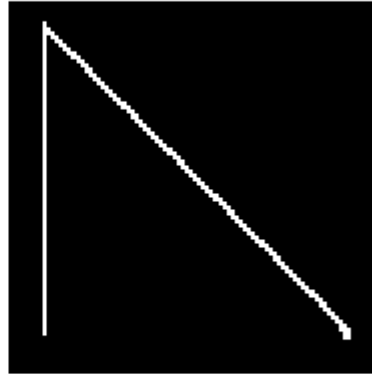
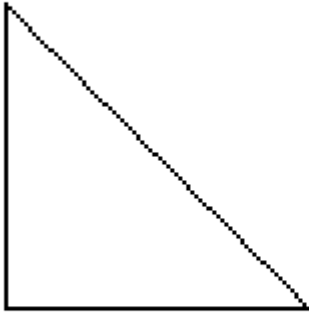
vodorovne hrany

```
I = imread('trojuhelnik.png');  
w = [-1 -2 -1;  
      0 0 0 ;  
      1 2 1];  
I2 = imfilter(I,w,'corr','same');  
  
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(I2,[])
```

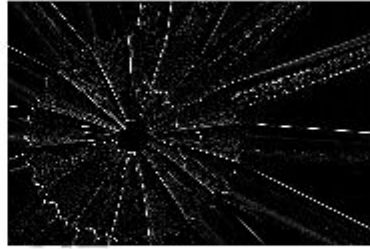
svisle hrany

```
I = imread('trojuhelnik.png');  
w = [-1 0 1;  
     -2 0 2;  
     -1 0 1];  
  
I2 = imfilter(I,w,'corr','same');  
  
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(I2,[])
```



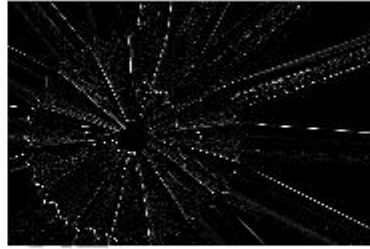
diagonalni hrany

```
I = imread('pastelkygray.jpg');  
w = [0 2 2;  
     -2 0 2;  
     -2 -2 0];  
  
I2 = imfilter(I,w,'corr','same');  
  
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(I2,[])
```



diagonální hrany

```
I = imread('pastelkygray.jpg');  
w = [0 1 2;  
     -1 0 1;  
     -2 -1 0];  
  
I2 = imfilter(I,w,'corr','same');  
  
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(I2,[])
```



Filtrovani barevných obrazku

```
I = imread('pastelky.png');
Ir = I(:,:,1);
Ig = I(:,:,2);
Ib = I(:,:,3);

w1 = fspecial('average',5);
Jr = imfilter(Ir,w1,'same');
Jg = imfilter(Ig,w1,'same');
Jb = imfilter(Ib,w1,'same');

J=uint8([]);

J(:,:,1) = Jr;
J(:,:,2) = Jg;
J(:,:,3) = Jb;

figure
subplot(1,2,1)
imshow(I,[])
subplot(1,2,2)
imshow(J,[])
```

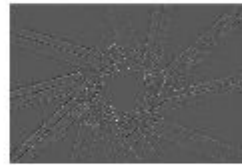


```
I = imread('pastelky.png');  
I2 = rgb2hsv(I);  
w1 = fspecial('average',5);  
I2(:,:,3) = imfilter(I2(:,:,3) ,w1,'same');  
J2 = im2uint8(hsv2rgb(I2));
```

```
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(J2,[])
```



```
K = double(J)-double(J2);  
L = K(:,:,1)/3 + K(:,:,2)/3 + K(:,:,3)/3;  
  
figure  
subplot(1,3,1)  
imshow(I,[])  
subplot(1,3,2)  
imshow(J2,[])  
subplot(1,3,3)  
imshow(L,[])
```



```
I = imread('pastelky.png');
Ir = I(:,:,1);
Ig = I(:,:,2);
Ib = I(:,:,3);

w1 = fspecial('laplacian');
Jr = Ir + imfilter(Ir,w1,'same');
Jg = Ig + imfilter(Ig,w1,'same');
Jb = Ib + imfilter(Ib,w1,'same');

J = uint8([]);
J(:,:,1) = Jr;
J(:,:,2) = Jg;
J(:,:,3) = Jb;

figure
subplot(1,2,1)
imshow(I,[])
subplot(1,2,2)
imshow(J,[])
```




```
I = imread('pastelky.png');  
I2 = rgb2hsv(I);  
w1 = fspecial('laplacian');  
I2(:,:,3) = I2(:,:,3) + imfilter(I2(:,:,3), w1, 'same');  
J2 = hsv2rgb(I2);
```

```
figure  
subplot(1,2,1)  
imshow(I,[])  
subplot(1,2,2)  
imshow(J2,[])
```



Ostreni - jinym zpusobem

```
I = imread('pastelkygray.jpg');  
f = 1/36 * ones(6);  
Iblur = imfilter(I,f,'corr','same');  
mask = I - Iblur;  
Isharp = I + 2* mask;
```

```
figure  
subplot(2,2,1)  
imshow(I,[])  
subplot(2,2,2)  
imshow(Iblur,[])  
subplot(2,2,3)  
imshow(mask,[])  
subplot(2,2,4)  
imshow(Isharp,[])
```

