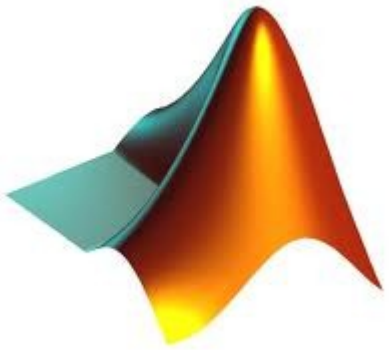
Spracovanie obrazu a GUI v MATLABe

Cvičenia z PoČítaČového Videnia

Zuzana Haladová

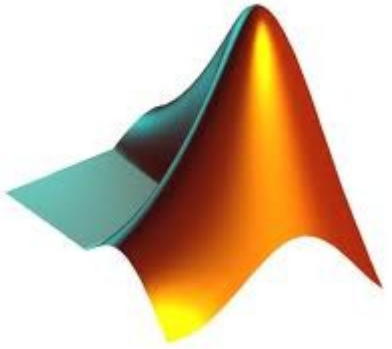
Spracovanie obrazu

- Vyhladzovanie
  - Mean, Median
- Prahovanie
- Detekcia hrán
  - Sobel, Roberts

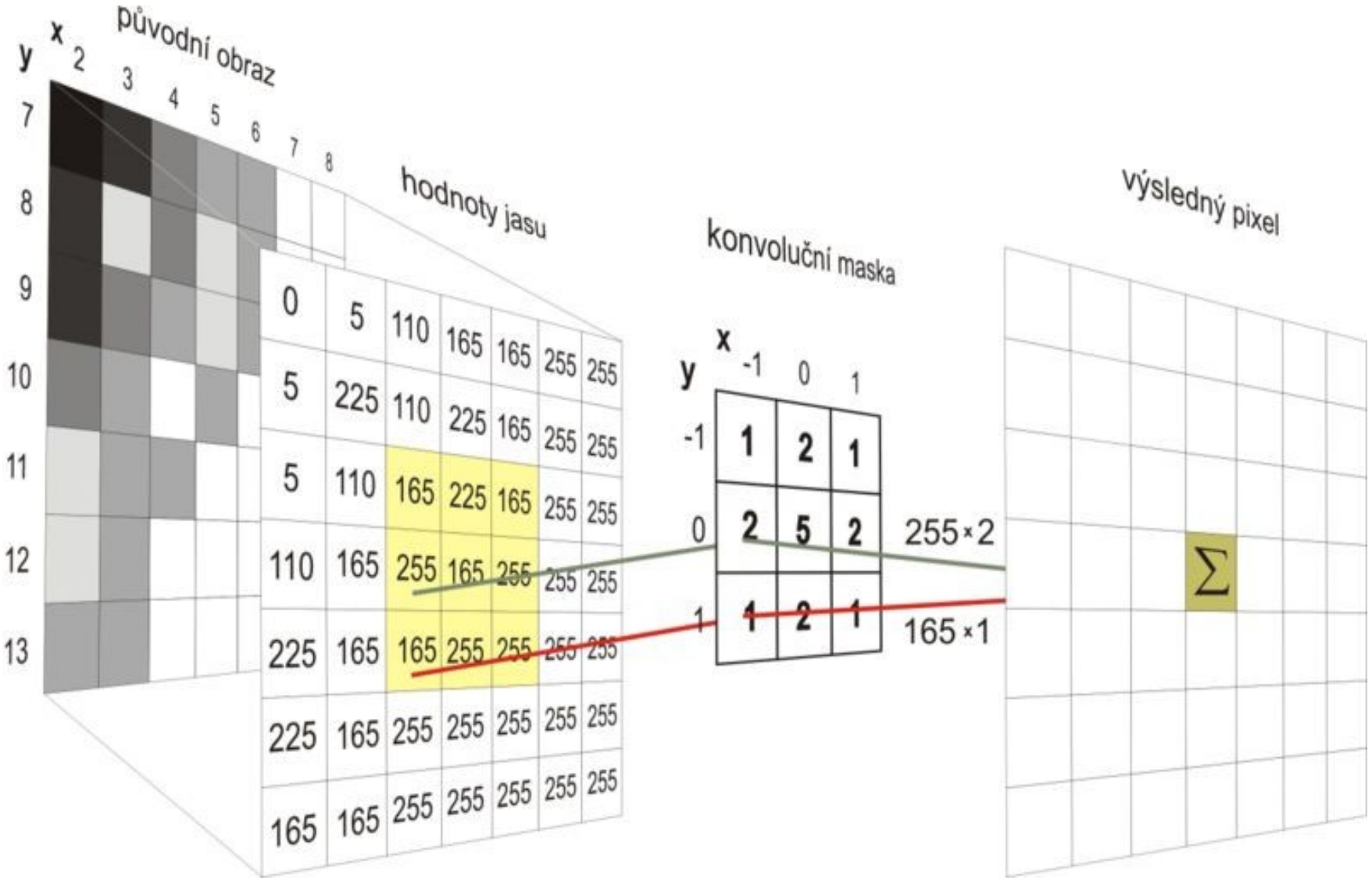


Spracovanie obrazu

- Konvolúcia a Korelácia 2D obrázku
  - Totožné pri symetrických filtroch
  - Korelacia: $$F \circ I(x,y) = \sum_{j=-N}^{N} \sum_{i=-N}^{N} F(i,j) I(x+i, y+j)$$
  - Konvolucia. $$F * I(x,y) = \sum_{j=-N}^{N} \sum_{i=-N}^{N} F(i,j) I(x-i, y-j)$$
  - Konvolucia je asociativna

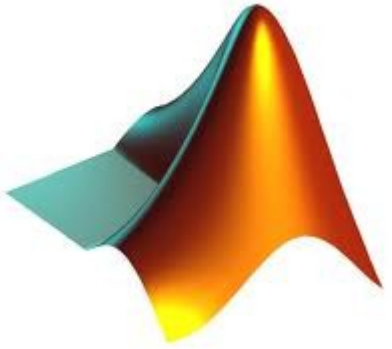


Spracovanie obrazu



Spracovanie obrazu

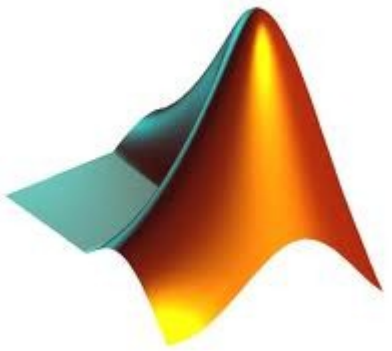
- Konvolúcia a Korelácia
  - conv2(I,h,'same')
  - conv2(I,h,'full') = conv2(h,I,'full')
  - conv2(I,h,'valid')
  - filter2(h,I, 'full') = conv2(h,I,'full') pre symetrické h
  - Otočí h o 180° a zavolá conv2



Spracovanie obrazu

```
A = rand(3);
B = rand(4);
C = conv2(A,B)   % C is 6-by-6
```

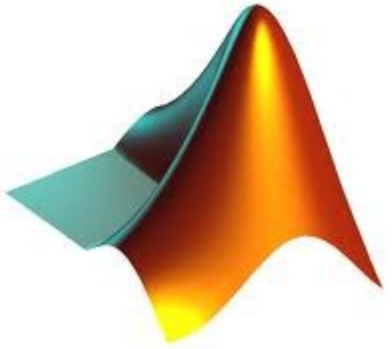
```
C =

   0.1838   0.2374   0.9727   1.2644   0.7890   0.3750
   0.6929   1.2019   1.5499   2.1733   1.3325   0.3096
   0.5627   1.5150   2.3576   3.1553   2.5373   1.0602
   0.9986   2.3811   3.4302   3.5128   2.4489   0.8462
   0.3089   1.1419   1.8229   2.1561   1.6364   0.6841
   0.3287   0.9347   1.6464   1.7928   1.2422   0.5423
```



Spracovanie obrazu

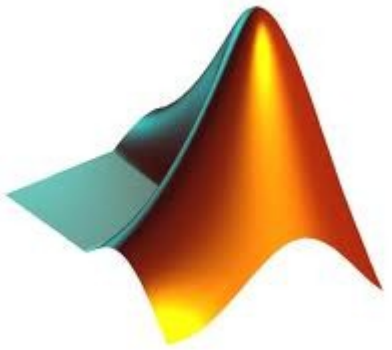
- Priemerovací filter
- a = [5 4 3 2 1; 1 2 3 4 5; 1 2 3 4 5;

  5 4 3 2 1; 1 2 4 5 3]
- h = ones(3)./9
- c = conv2(h,I, 'valid'); // konvolúcia
- c = filter2(h,I, 'valid')   //korelácia
- a(2:4,2:4)= c;



Spracovanie obrazu

- im=imread('1.jpg');
- gr = rgb2gray(im);
- h = ones(3)/9
- c = conv2(gr,h, 'valid');
- image(c);



Spracovanie obrazu

- fspecial(typ, parametre)

h = fspecial('average', hsize)

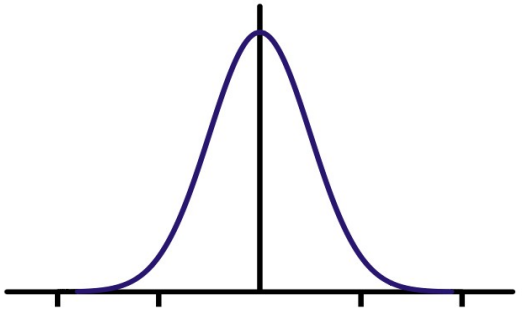
h = fspecial('disk', radius)

h = fspecial('gaussian', hsize, sigma)

Sigma- štandardná odchýlka

h = fspecial('log', hsize, sigma)

image(h*255)



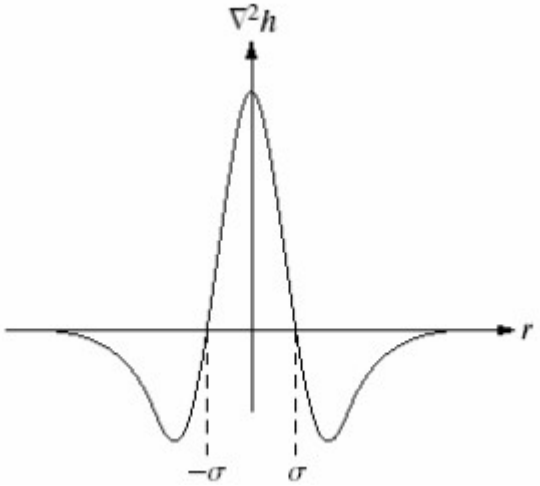


Image Processing Toolbox

- Mean
  - h = fspecial('average', 3)
  - imfilter(I,h);
- Median
  - medfilt2(I,[3,3],'symetric')

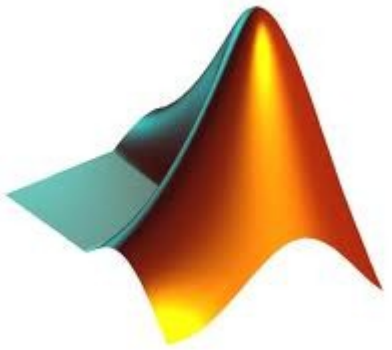


Image Processing Toolbox

Adaptívne okolie

- wiener2(I, [5,5])
- Gaussian noise

Adaptívne použitie filtra, lepšie výsledky ako pri lineárnych filtroch

Vyhladzuje viac pri nízkej variancii a menej pri vysokej

Adaptívne okolie- predná plocha/zadná plocha

Využitie pravidiel podobnosti

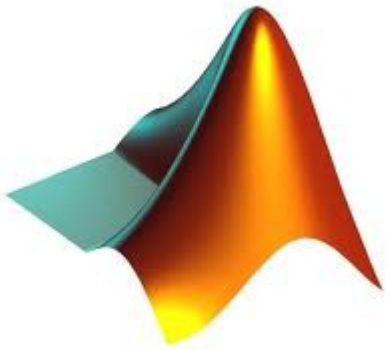
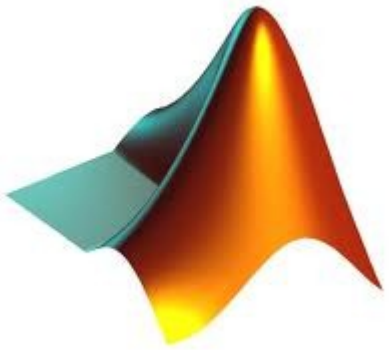


Image Processing Toolbox

- Šum

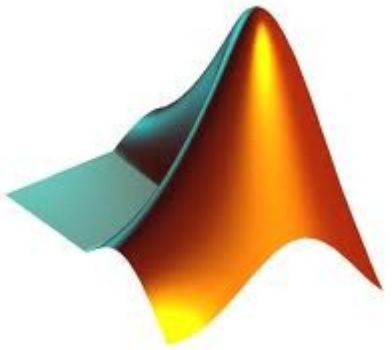
J = imnoise(I,type)

'gaussian', 'salt & pepper', 'speckle'



Spracovanie obrazu

- Prahovanie
- I = X >= 50;
- I = X < 0.5;



Spracovanie obrazu

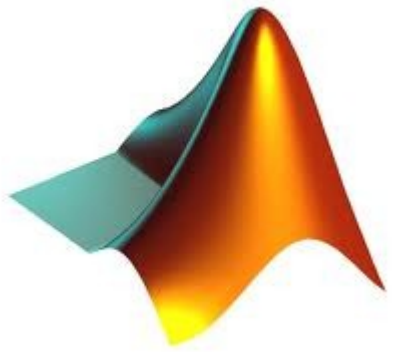
Hľadanie hrán, Diferenčné gradientné operátory

- Sobel filter
  - Obrázky Gx a Gy konvolúciou z

$$\mathbf{G}_y = \begin{bmatrix} +1 & +2 & +1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} * \mathbf{A} \quad \text{and} \quad \mathbf{G}_x = \begin{bmatrix} +1 & 0 & -1 \\ +2 & 0 & -2 \\ +1 & 0 & -1 \end{bmatrix} * \mathbf{A}$$

$$\mathbf{G} = \sqrt{\mathbf{G}_x^{\,2} + \mathbf{G}_y^{\,2}}$$

- Gx = conv2(GR,Sx,'same');
- X = sqrt(Gx.^2 + Gy.^2);



Spracovanie obrazu

- Hľadanie hrán
- Prewitt filter, Roberts

Prewitt

$$\mathbf{G_x} = \begin{bmatrix} -1 & 0 & +1 \\ -1 & 0 & +1 \\ -1 & 0 & +1 \end{bmatrix} * \mathbf{A} \quad \text{and} \quad \mathbf{G_y} = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ +1 & +1 & +1 \end{bmatrix} * \mathbf{A}$$

Roberts

$$\begin{bmatrix} +1 & 0 \\ 0 & -1 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} 0 & +1 \\ -1 & 0 \end{bmatrix}$$

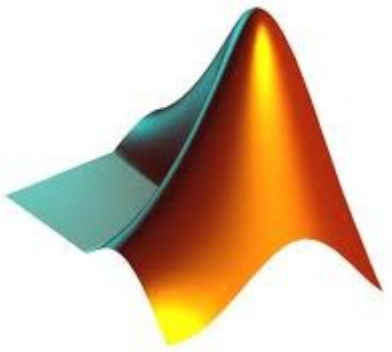


Image Processing Toolbox

- Methods
  - Sobel (Sobelova aproximácia derivácie)
  - Canny (Noise red., 4 filters, hister. thres)
  - Roberts (Robertsova aprox. derivácie)
  - Prewitt (Prewitt aprox. derivácie)
  - Log (Laplacian of Gaussian method)
  - Zero crossing

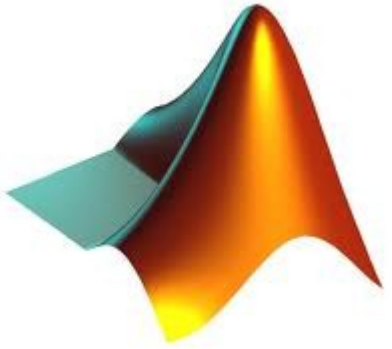


Image Processing Toolbox

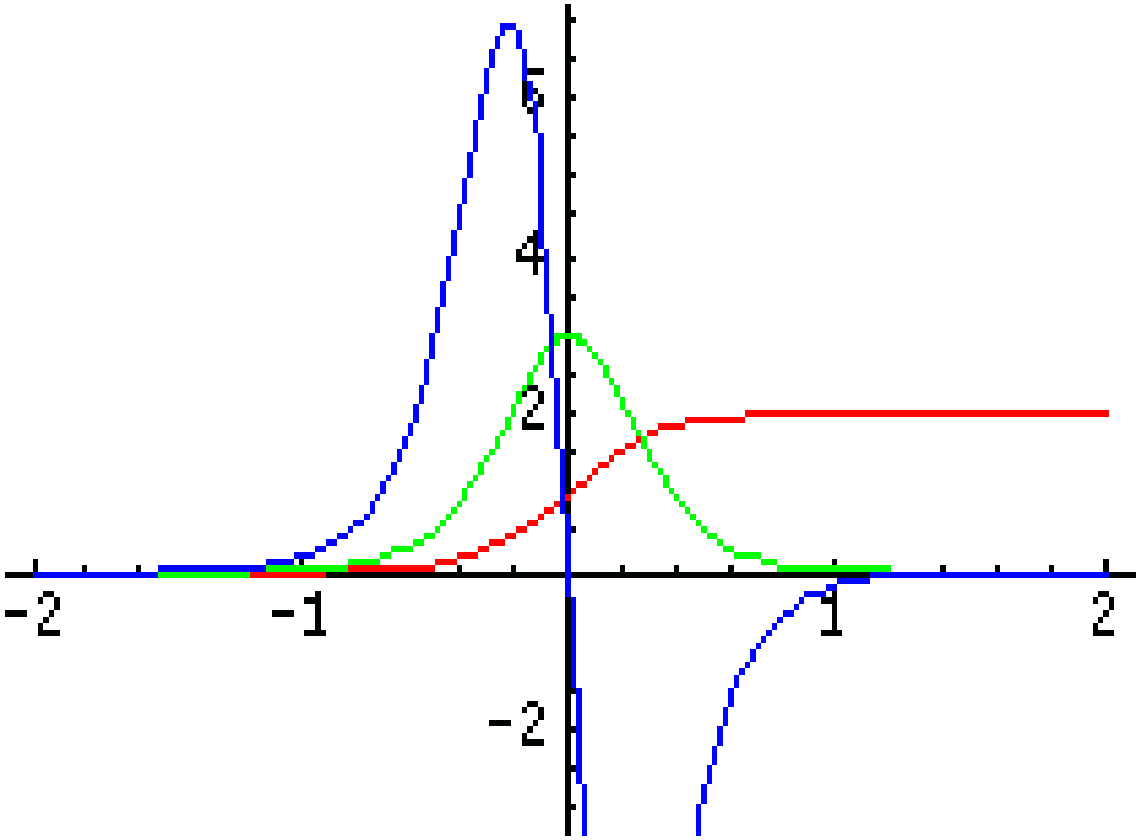


Image Processing Toolbox

- Edges
  - edge(I);
  - edge(I, 'sobel')
  - edge(I, 'log', treshold)
  - edge(I, 'canny', treshold, sigma)

BW = edge(I,'zerocross',thresh,h)

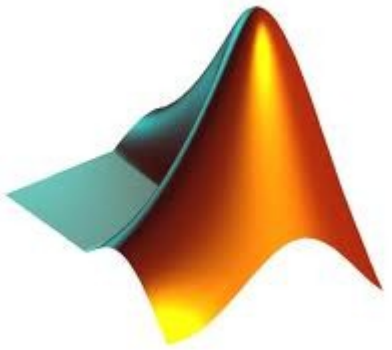


Image Processing Toolbox

- Edge detection
  - Demo
    - Toolbox
    - Image Processing
    - >>Edge detection