

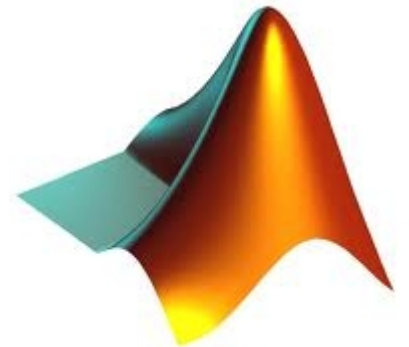
Obrázky v MATLABe

Cvičenia z Počítačového Videnia

Zuzana Haladová

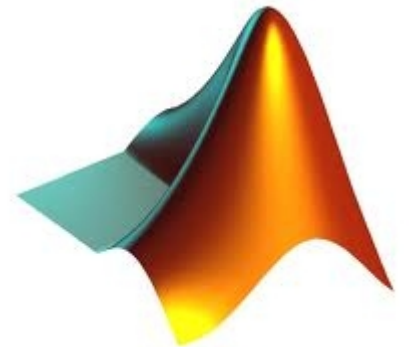
Opakovanie

- Vektory $v = [1,2,3,4]$
- Matice $m = [v; v^*2; v.^2]$
 $m = \text{eye}(3);$
- $[\text{riadky}, \text{stlpce}] = \text{size}(m);$
- $M = m(:);$



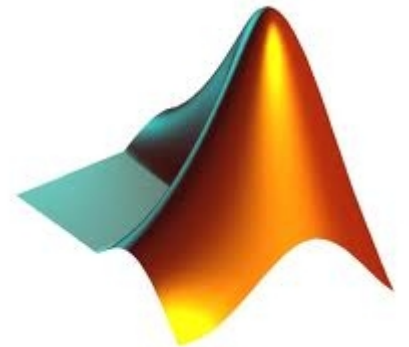
Opakovanie

- B a b sú rôzne premenné!
- premenná ans
- ; za príkazom zabráni výpisu na obrazovku



Opakovanie

- Volanie fcií: $k = \sin(\pi/2)$
- Grafy: `plot(x,y); grid;`
- `bar(x);`
- Výpis: `fprintf('hodnota z je %g', z)`
- `str = 'string';`
- `s = length(str);`



Opakovanie

- Fcie sa píšu ako M-files

- Fcia mocnina.m:

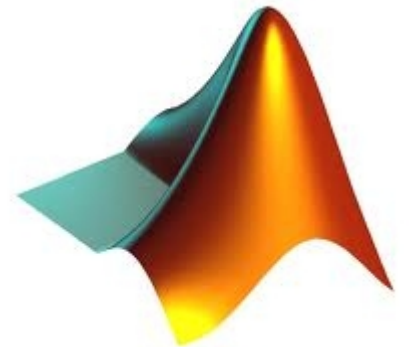
```
function y = mocnina(x)
```

```
%Fcia vráti druhú mocninu
```

```
y = x^2
```

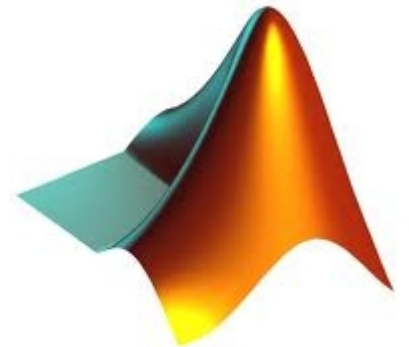
- Viac výstupných hodnôt:

```
function [y,z,p] = prvy(x)
```



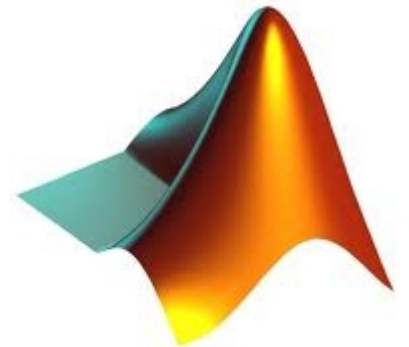
Obrázky

- Zobrazovanie matíc ako obrázkov
- $k = 1:20$
- $M = \text{ones}(20)$;
- $M(:,4) = k$; $M(17,:) = k*2$; $M(2,:) = k*4$;
- $\text{image}(M)$;



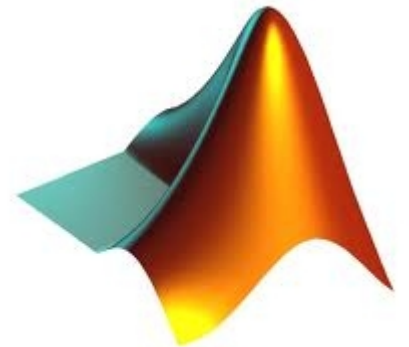
Typy obrázkov

- True color vs. Indexed image
- True color:
- Obrázok veľkosti $M \times N$ je uchovaný v
- 3 rozmernom poli
- $M \times N \times 3$ (RGB hodnoty)



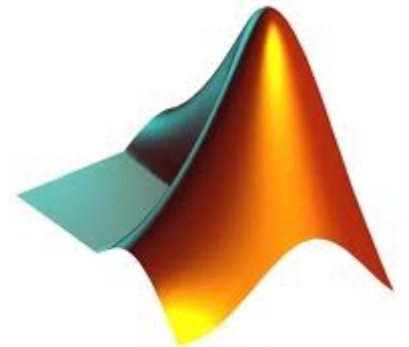
True color

- 3 hodnoty RGB môžu byť typu:
 - **Double precision** (double array)
rgb v rozsahu [0, 1]
 - **8-Bit Data** (uint8)
rgb v rozsahu [0, 255]
 - **16-Bit Data** (uint16)
rgb v rozsahu [0, 65535]



Indexed color

- Indexed color:
- Obrázok $M \times N$ je uchovaný v:
 - Poli $M \times N$
 - colormap je pole $M \times 3$



Indexed color

- Podľa typu dát:
- Double precision (Double array):

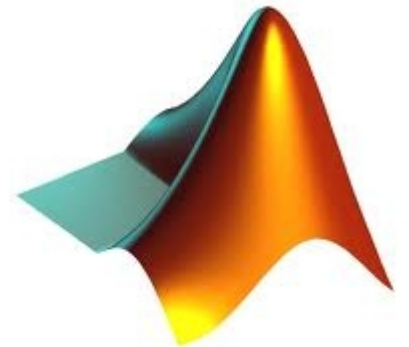
Pole $M \times N$ je pole int v $[1, \text{length}(\text{colormap})]$

Colormap je pole float v $[0, 1]$

- 8 Bit (uint8):

Pole $M \times N$ je pole int v $[0, 255]$

Colormap je pole float v $[0, 1]$



Indexed color

- Podľa typu dát:
- 16 Bit (uint16):

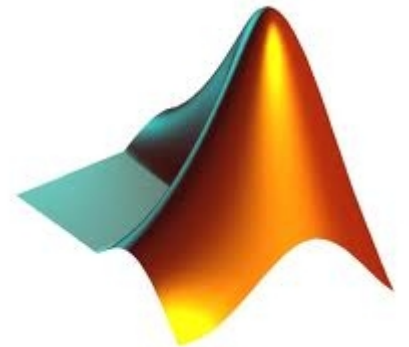
Pole $M \times N$ je pole int v $[0, 65535]$

Colormap je pole float v $[0, 1]$

- Posun v indexovaní:

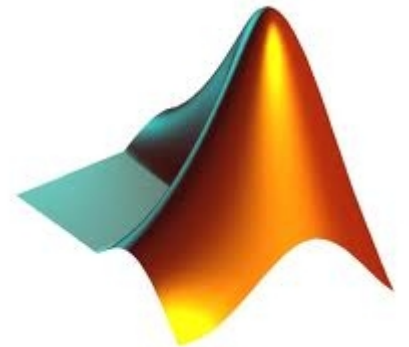
Double: 1 == prvý riadok v colormap

Int: 0 == prvý riadok v colormap



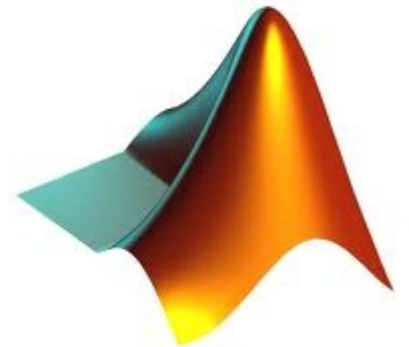
Supported files

- MATLAB podporuje formáty
- BMP, JPG, PNG, TIFF, GIF
- JPEG 2000 formáty: JP2, JPX...
- A Iné: PNM, PCX, ICO, PBM, HDF...



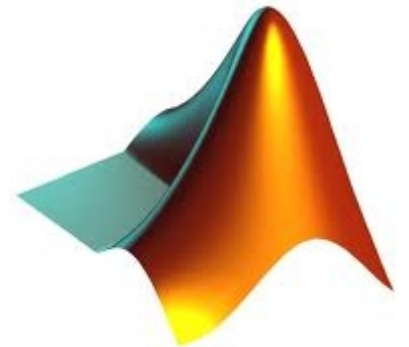
Read True color image

- `im = imread('Obrazky/nazov.jpg');`
- `image(im);`
- Konverzia True na Indexed:
- `[X,map] = rgb2ind(im, 5);` //ide vám to?



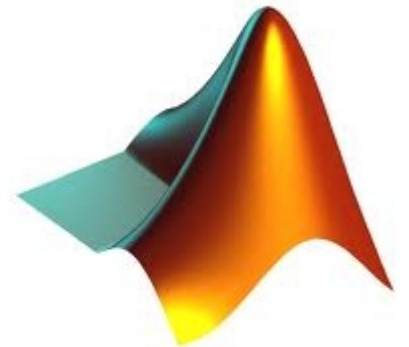
Read Indexed image

- load Durer
- Vytvori sa X (pole $M \times N$) a map (colormap)
- X je typu DOUBLE teda $1 - \text{length}(\text{map})$
- `image(X);`
- `RGB = ind2rgb(X,map)`



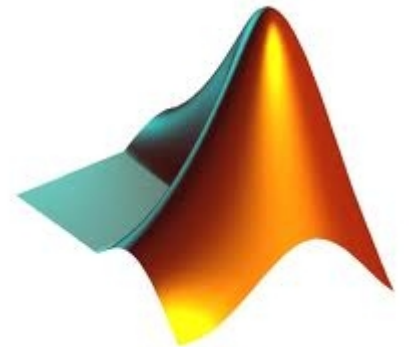
Images and Colormaps

- `>> demo`
- Graphics/
- Examples of Images and Colormaps
- `RGB = ind2rgb(X,hot)`
- `image(RGB);`



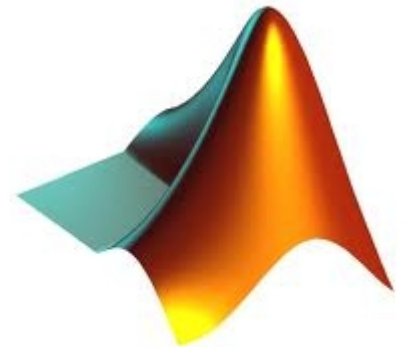
Konverzie Farebných priestorov

- RGB ==> HSV
- Mapy:
 - `map = hsv2rgb(hmap);`
- True color obrázky
 - `im = hsv2rgb(imh);`
- Naopak: `rgb2hsv;`
- `imh = rgb2hsv(im); image(imh);`



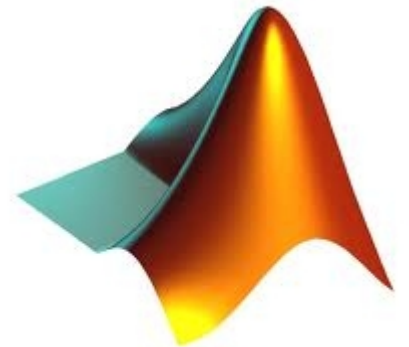
Uloženie obrázku

- `imwrite(I, filename, fmt)`
- `imwrite(X, map, filename, fmt)`
- `imwrite(X, colormap, 'obrazok.jpg', 'jpg')`
- <http://www.mathworks.com/help/techdoc/ref/imwrite.html>



Histogram

- $\text{hist}(v)$; v je vektor
- $\text{hist}(M)$; M je matica
- 2-D alebo 1-D
- Pri 2-D vráti histogram pre každý stĺpec spoločne v jednom grafe
- Šedoúrovňový



Histogram

`imhist(I); imhist(I, n); imhist(X, map)`

- `I` je obrazok, `n` pocet chlievikov
- `J = histeq(I, n)`
- `J = imadjust(I)`
- `J = imadjust(I,[low_in; high_in],[low_out; high_out])`

