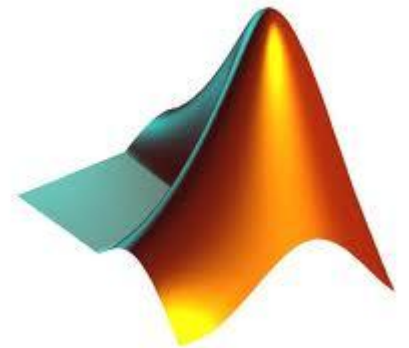


Obrázky v MATLABe

Cvičenia z Počítačového Videnia

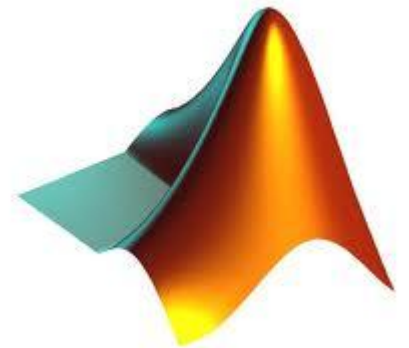
Opakovanie

- vektory $v = [1,2,3,4]$
- matice $m = [v; v^*2; v.^2]$
 $m = \text{eye}(3);$
- $[riadky, st\acute{p}pce] = \text{size}(m);$
- $M = m(:);$



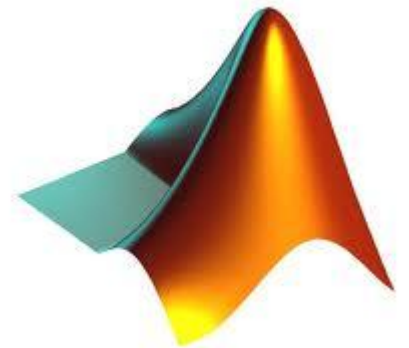
Opakovanie

- Case Sensitive
 - 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);`
 - `disp(['hodota z je ', num2str(z)]);`
- `['hodnota z je', num2str(z)];`
- `str = 'string';`
- `s = length(str);`



Opakovanie

- fcie sa píšu ako M-files

- fcia mocnina.m:

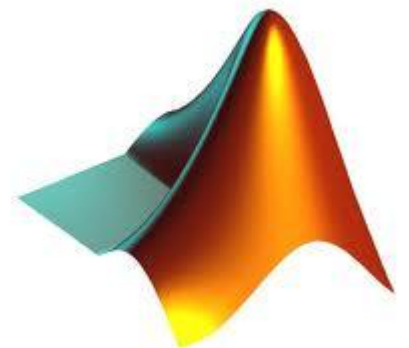
```
function y = mocnina(x)
```

```
%fcia vráti druhú mocninu
```

```
y = x^2
```

- viac výstupných hodnôt:

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



Obrázky

- zobrazovanie matíc ako obrázkov

```
k = 1:20;
```

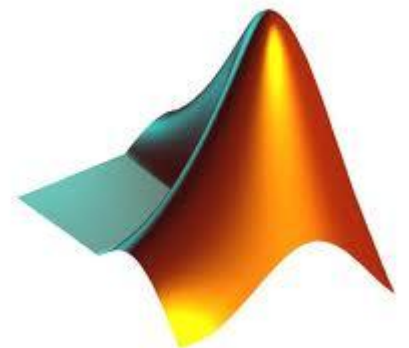
```
M = ones (20);
```

```
M (:,4) = k;
```

```
M(17,:) = k*2;
```

```
M(2,:) = k*4;
```

```
image(M);
```



Typy obrázkov: True Color vs. Indexed Images

True color:

- obrázok veľkosti MxN je uchovaný v 3-rozmernom poli
- M x N x 3 (RGB hodnoty)

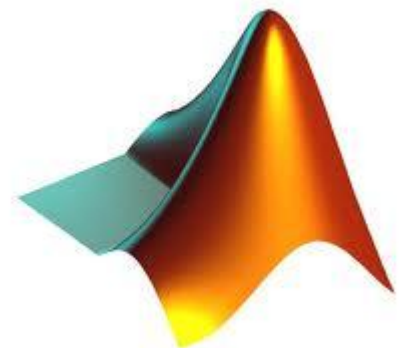


	0.2235	0.1294	Blue	0.4196	0.4196	0.4196	0.4196
0.5804	0.2902	0.0627	0.2902	0.2902	0.4824	0.4824	0.4824
0.5804	0.0627	0.0627	0.0627	0.2235	0.2588	0.2588	0.2588
0.5176	0.1922	0.0627	Green	0.1922	0.2588	0.2588	0.2588
0.5176	0.1294	0.1608	0.1294	0.1294	0.2588	0.2588	0.2588
0.5176	0.1608	0.0627	0.1608	0.1922	0.2588	0.2588	0.2588
0.5490	0.2235	0.5490	Red	0.7412	0.7765	0.7765	0.7765
0.5490	0.3882	0.5176	0.5804	0.5804	0.7765	0.7765	0.7765
0.5176	0.2588	0.2902	0.2588	0.2235	0.4824	0.2235	0.2235
0.2235	0.1608	0.2588	0.2588	0.1608	0.2588	0.2588	0.2588
0.2235	0.1608	0.2588	0.2588	0.2588	0.2588	0.2588	0.2588



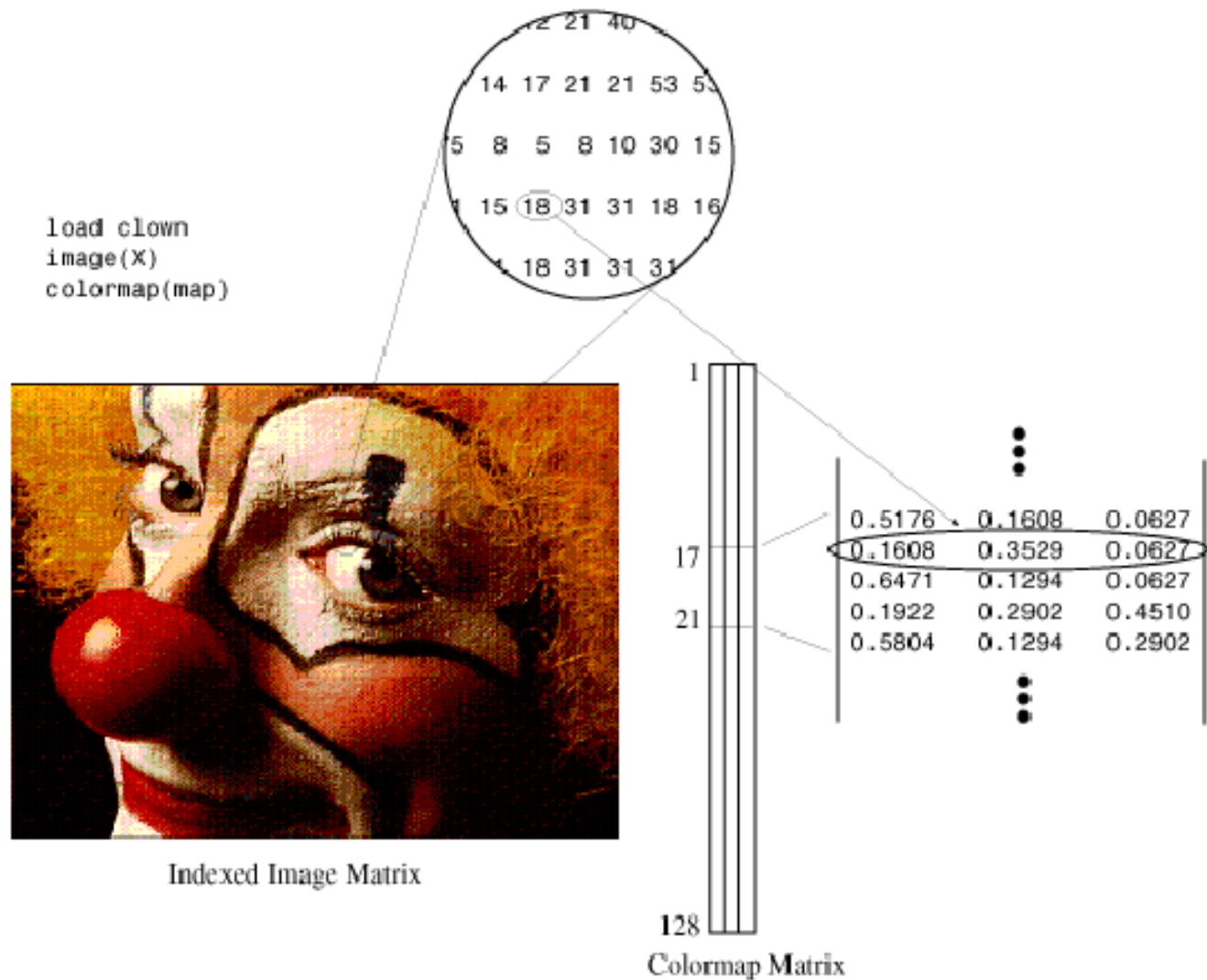
True color

- 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

- obrázok $M \times N$ je uchovaný v poli $M \times N$
- colormap je pole



Colormap

hodnoty v intervale [0,1]

```
colormap('map');
```

```
colormap('default');
```

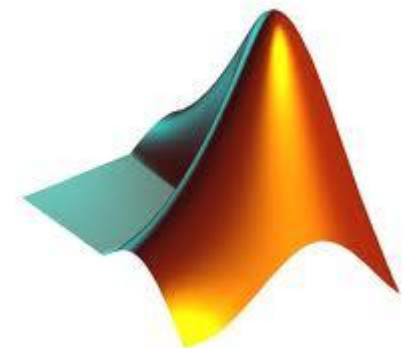
```
colormap(hsv(128));
```

```
image=imread('4.jpg');
```

```
[image1, map] = rgb2ind(image, 256);
```

```
imshow(image1,colormap(jet));
```

```
imshow(image1,colormap(spring));
```



Indexed color

podľa typu dát:

- Double precision (Double array):

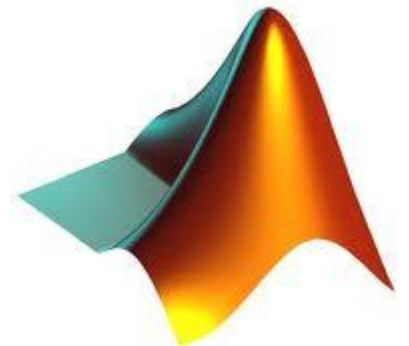
pole $M \times N$ je pole int v $[1, \text{length}(\text{colormap})]$

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

- 16 Bit (uint16):

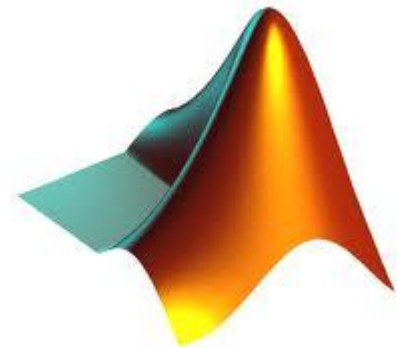
Pole $M \times N$ je pole int v $[0, 65535]$

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

- posun v indexovaní:

Double: 1 == prvý riadok v colormap

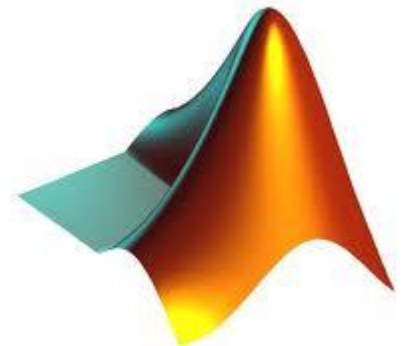
Int: 0 == prvý riadok v colormap



Supported files

MATLAB podporuje formáty

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



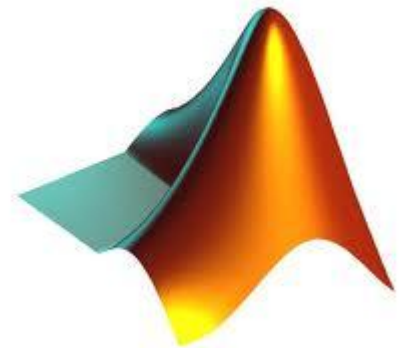
Read True color image

```
im = imread('nazov.jpg');
```

```
image(im);
```

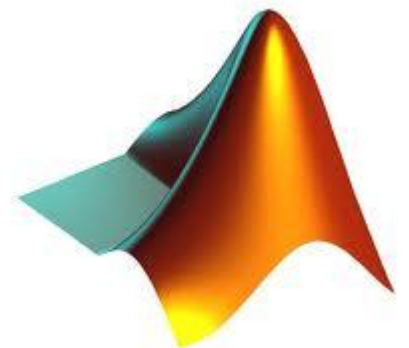
konverzia True na Indexed:

```
[X,map] = rgb2ind(im, 5);
```



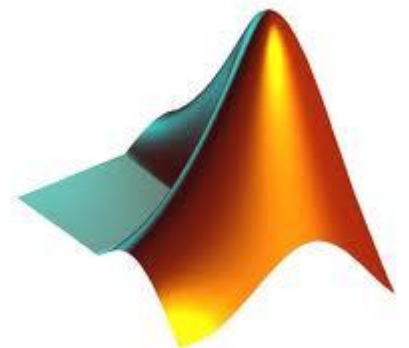
Read Indexed image

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



Konverzie Farebných priestorov

- RGB ==> HSV
- mapy:
 - map = hsv2rgb(hmap);
- True color obrázky
 - im = hsv2rgb(imh);
- naopak: rgb2hsv;
 - imh = rgb2hsv(im); image(imh);



Zobrazovanie obrázkov

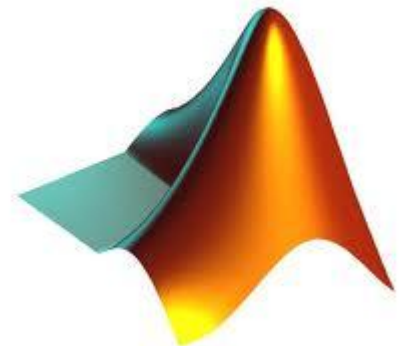
- `image(M);`

- priamo v matlabe
- farby zobrazovaného obrazu vôbec nemusia zodpovedať reálnym farbám

- `imshow(M);`

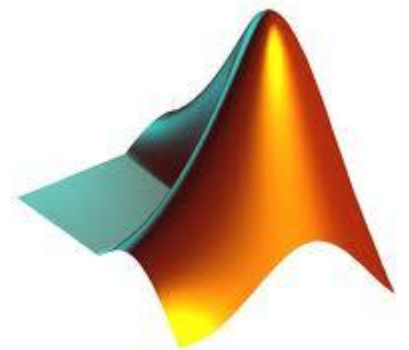
- IPT
- predpokladá, že zobrazované hodnoty sú intenzity pixlov

- `figure;`



Zobrazovanie obrázkov - rozdiel

```
img = imread('cameraman.tif');  
figure;  
image(img);  
set(gcf,'colormap',gray);  
figure;  
subplot(1,2,1);  
image(img);  
subplot(1,2,2);  
imshow(img);
```



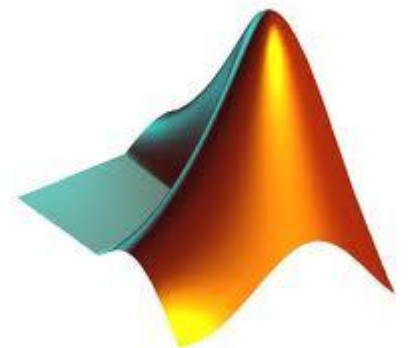
Uloženie obrázku

```
imwrite(I, filename, fmt)
```

```
imwrite(X, map, filename, fmt)
```

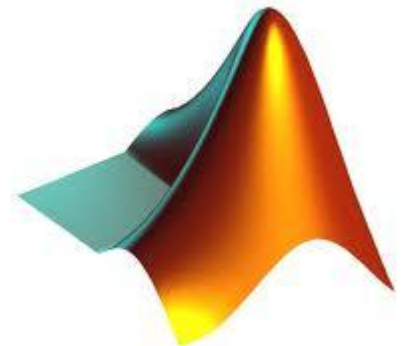
```
imwrite(X, colormap, 'obrazok.jpg', 'jpg')
```

<http://www.mathworks.com/help/techdoc/ref/imwrite.html>



Histogram

- `hist(v)`; v je vektor
- `hist(M)`; M je matica
- 2-D alebo 1-D
- pri 2-D vráti histogram pre každý stĺpec spoločne v jednom grafe
- šedoúrovňový



Histogram

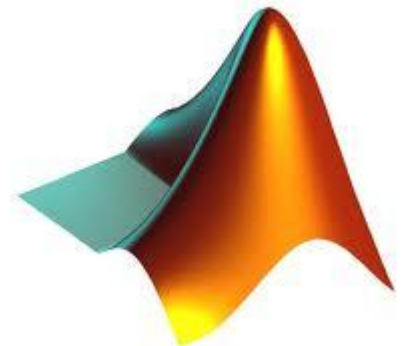
`imhist(I); imhist(I, n); imhist(X, map)`

- `I` je obrazok, `n` počet chlievikov

- `J = histeq(I, n)`

- `J = imadjust(I)`

- `J = imadjust(I, [low_in; high_in],
[low_out; high_out])`



Užitočné skratky

- Ctrl r
 - zakomentovať vyznačené
- Ctrl t
 - odkomentovať vyznačené
- Ctrl c
 - prerušiť bežiaci program/príkaz
- why

