Cvičení 1

- Seznámení s Matlabem
- Příkazy, vektory, matice
- Vytváření skriptů a funkcí
- Práce s obrázky

Matlab: více slidy (Martin Trnecka) https://www.dropbox.com/s/idbyumx5xgi339a/matlab.pdf?dl=0

```
% Nápověda k příkazům
% help prikaz
help sum
```

```
sum Sum of elements.
   S = sum(X) is the sum of the elements of the vector X. If X is a matrix,
   S is a row vector with the sum over each column. For N-D arrays,
   sum(X) operates along the first non-singleton dimension.

   S = sum(X,'all') sums all elements of X.

   S = sum(X,DIM) sums along the dimension DIM.

   S = sum(X,VECDIM) operates on the dimensions specified in the vector
   VECDIM. For example, sum(X,[1 2]) operates on the elements contained in
   the first and second dimensions of X.

   S = sum(...,OUTTYPE) specifies the type in which the
   sum is performed, and the type of S. Available options are:

   'double'    -  S has class double for any input X
   'native'    -  S has the same class as X
   'default'   -  If X is floating point, that is double or single,
                  S has the same class as X. If X is not floating point,
                  S has class double.

   S = sum(...,NANFLAG) specifies how NaN (Not-A-Number) values are
   treated. The default is 'includenan':

   'includenan' - the sum of a vector containing NaN values is also NaN.
   'omitnan'    - the sum of a vector containing NaN values
                  is the sum of all its non-NaN elements. If all
                  elements are NaN, the result is 0.

   Examples:
       X = [0 1 2; 3 4 5]
       sum(X, 1)
       sum(X, 2)

       X = int8(1:20)
       sum(X)             % returns double(210), accumulates in double
       sum(X,'native')    % returns int8(127), because it accumulates in
                          % int8 but overflows and saturates.

   See also prod, cumsum, diff, accumarray, isfloat.

   Documentation for sum
   Other functions named sum
```

Práce s obrázky

```
% nacteni obrazku
% imread(cesta);
I=imread('picture1.png');

% zobrazeni obrazku
% imshow(obrazek);
figure, imshow(I);
```

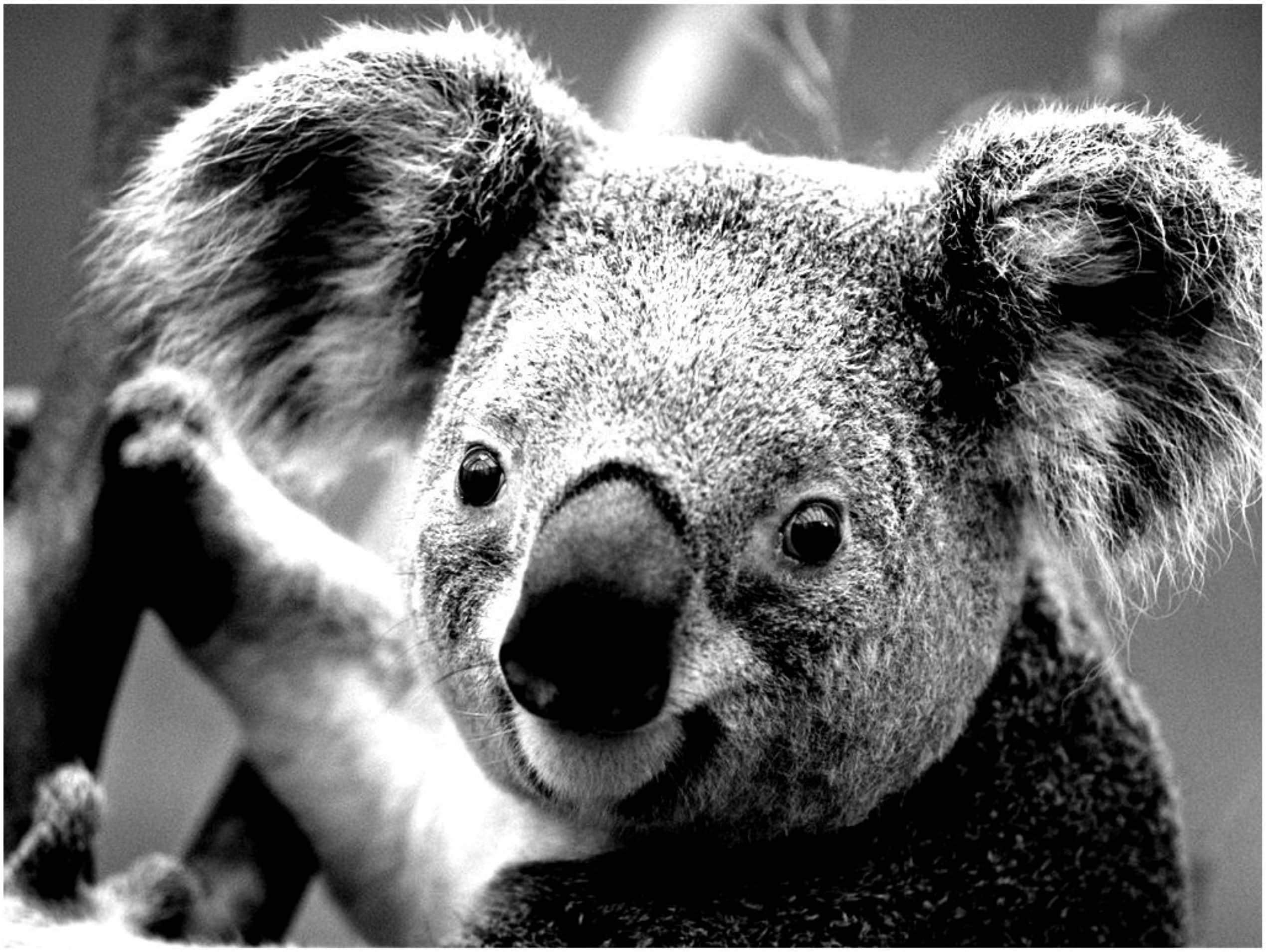
```
% roztazeni intenzit (vsechny hodnoty mensi nez low budou nastaveny na 0,
% vsechny vetsi nez height na 255, a hodnoty mezi low a height budou
% roztazeny pravidelne mezi 0 a 255
% imshow(obrazek, [low,high]);
% [] na 0 je nastavena nejnizsi hodnota a na 255 nejvyssi
low = 48
```

```
low = 48
```

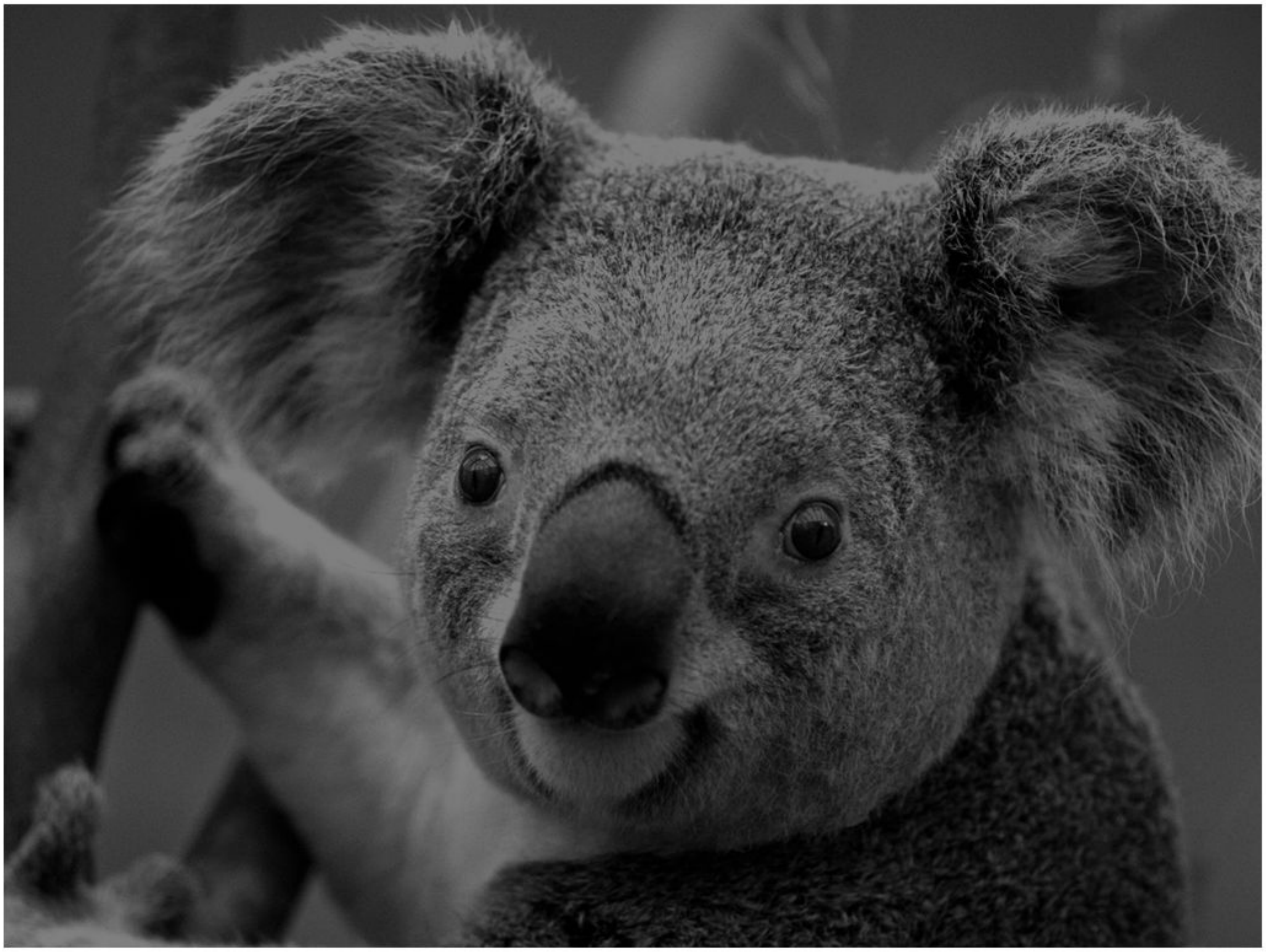
```
high = 212
```

```
high = 212
```

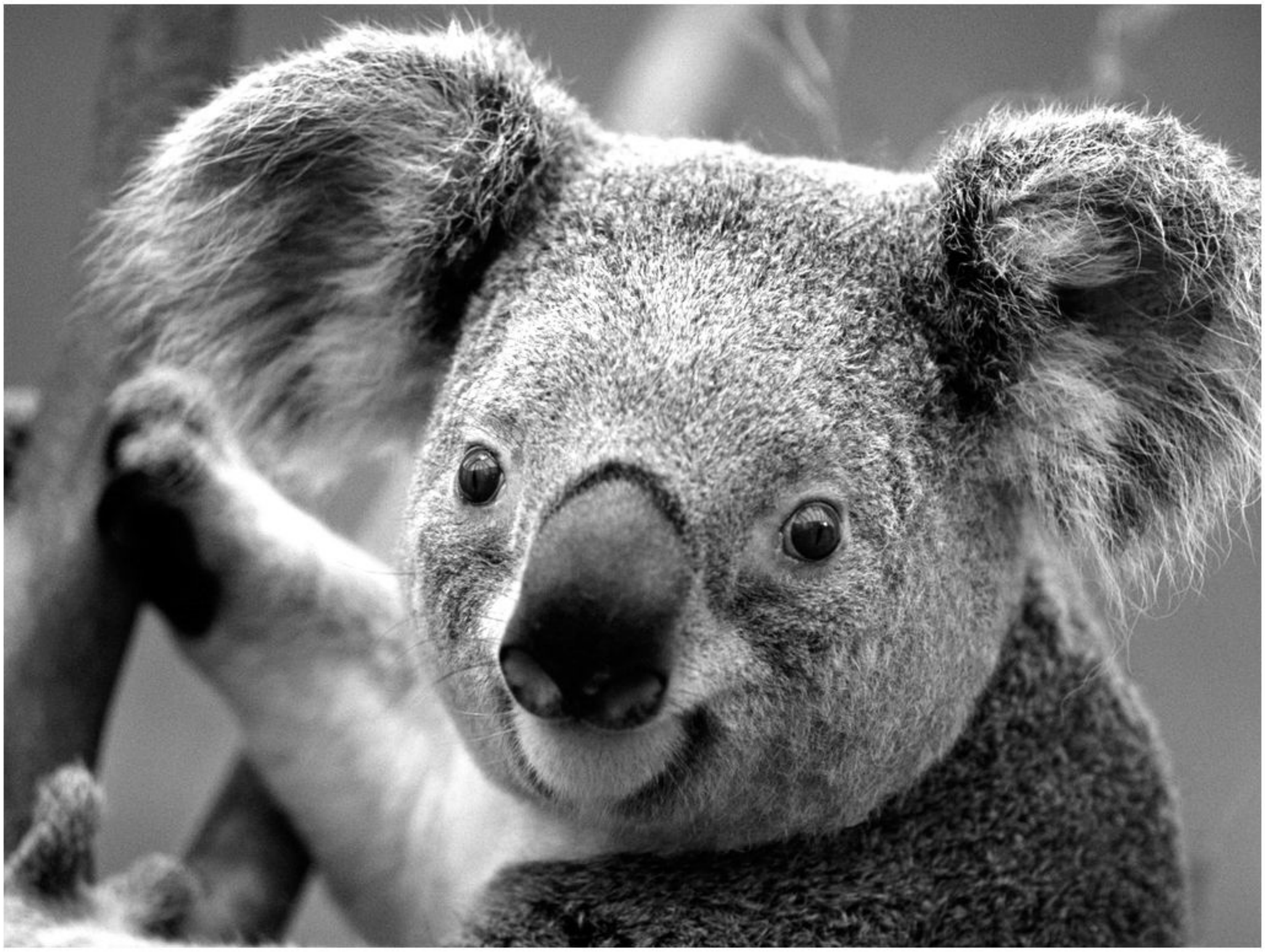
```
imshow(I,[low,high]);
```



```
K = I/2;
imshow(K);
```



```
imshow(K,[]);
```



```
% hodnota pixelu na souradnicich 1, 1 (funkce display vypise vystup)
% I(x,y)
% pozor indexuje se od 1
display(I(1,1));
```

```
  uint8

   90
```

```
% velikost obrazku, h - vyska obrazku (pocet radku), w - sirka obrazku
% (pocet sloupcu), o - dimenze urcujici kolik hodnot je potreba k
% reprezentaci informace o obraze, barevny = 3, sedotonovy = 1)
% size(promenna)

[h,w,o] = size(I);
display(h);
```

```
h = 768
```

```
display(w);
```

```
w = 1024
```

```
display(o);
```

```
o = 1
```

```
I_rgb = imread("picture2.jpg");
figure, imshow(I_rgb);
```

```
display(I_rgb(1,1,:));
```

```
  1×1×3 uint8 array

(:,:,1) =

   101
```

```
(:,:,2) =

   90


(:,:,3) =

   58
```

```
[h,w,o] = size(I);
display(h);
```

```
h = 768
```

```
display(w);
```

```
w = 1024
```

```
display(o);
```

```
o = 1
```

```
% Vytvoreni vyrezu obrazku I(xmin:xmax, ymin:ymax)
xmin = 303
```

```
xmin = 303
```

```
xmax = 479
```

```
xmax = 479
```

```
ymin = 301
```

```
ymin = 301
```

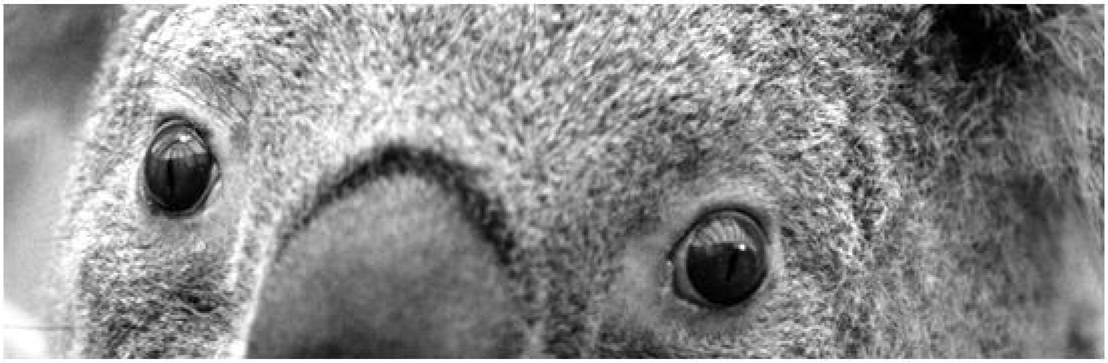
```
ymax = 850
```

```
ymax = 850
```

```
J = I(xmin:xmax,ymin:ymax);

imshow(J);
```

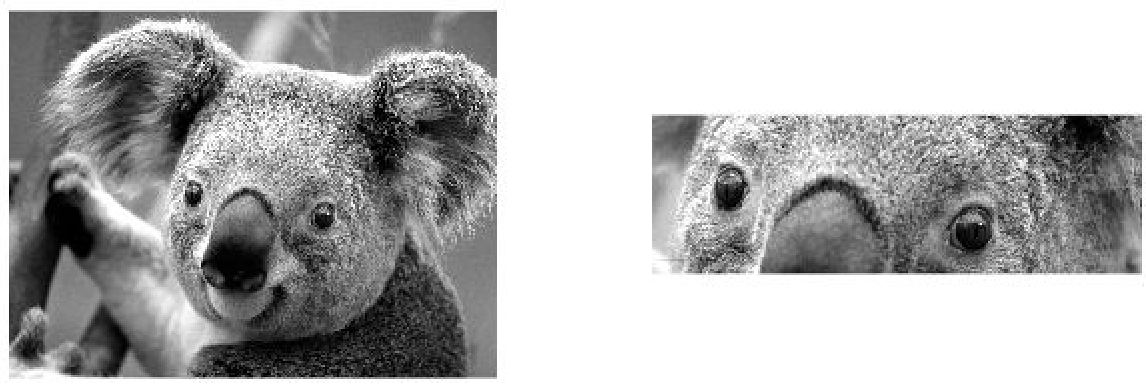
```
% vykresleni vice obrazku
% do noveho okna figure, imshow()
imshow(I);
```

```
figure, imshow(J);
```

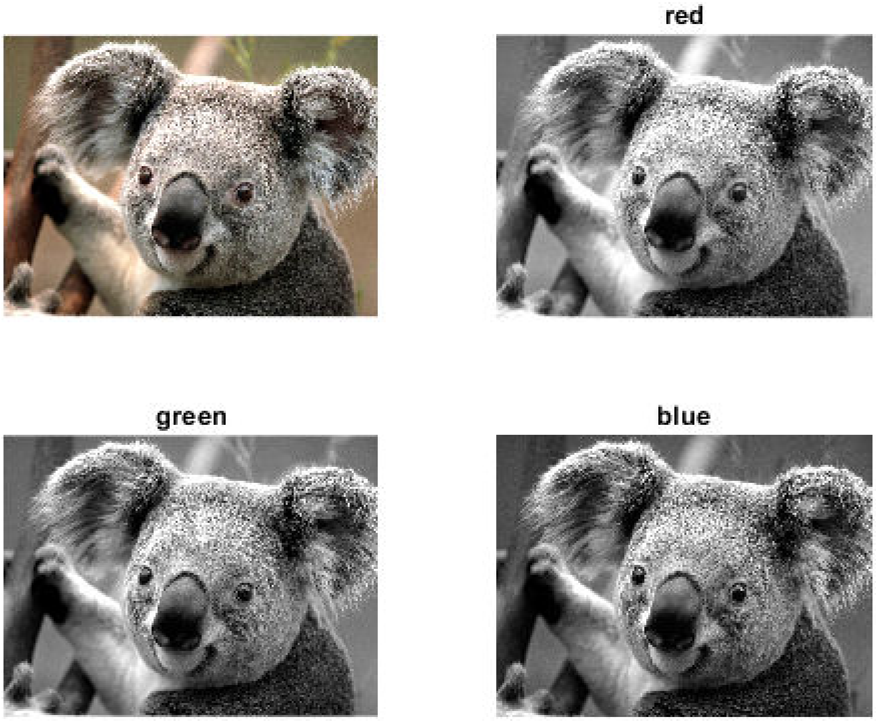


```
```

```
% vykresleni vice obrazku do jednoho
% subplot(pocetx, pocety, pozice), imshow()
subplot(1,2,1), imshow(I);
subplot(1,2,2), imshow(J);
```

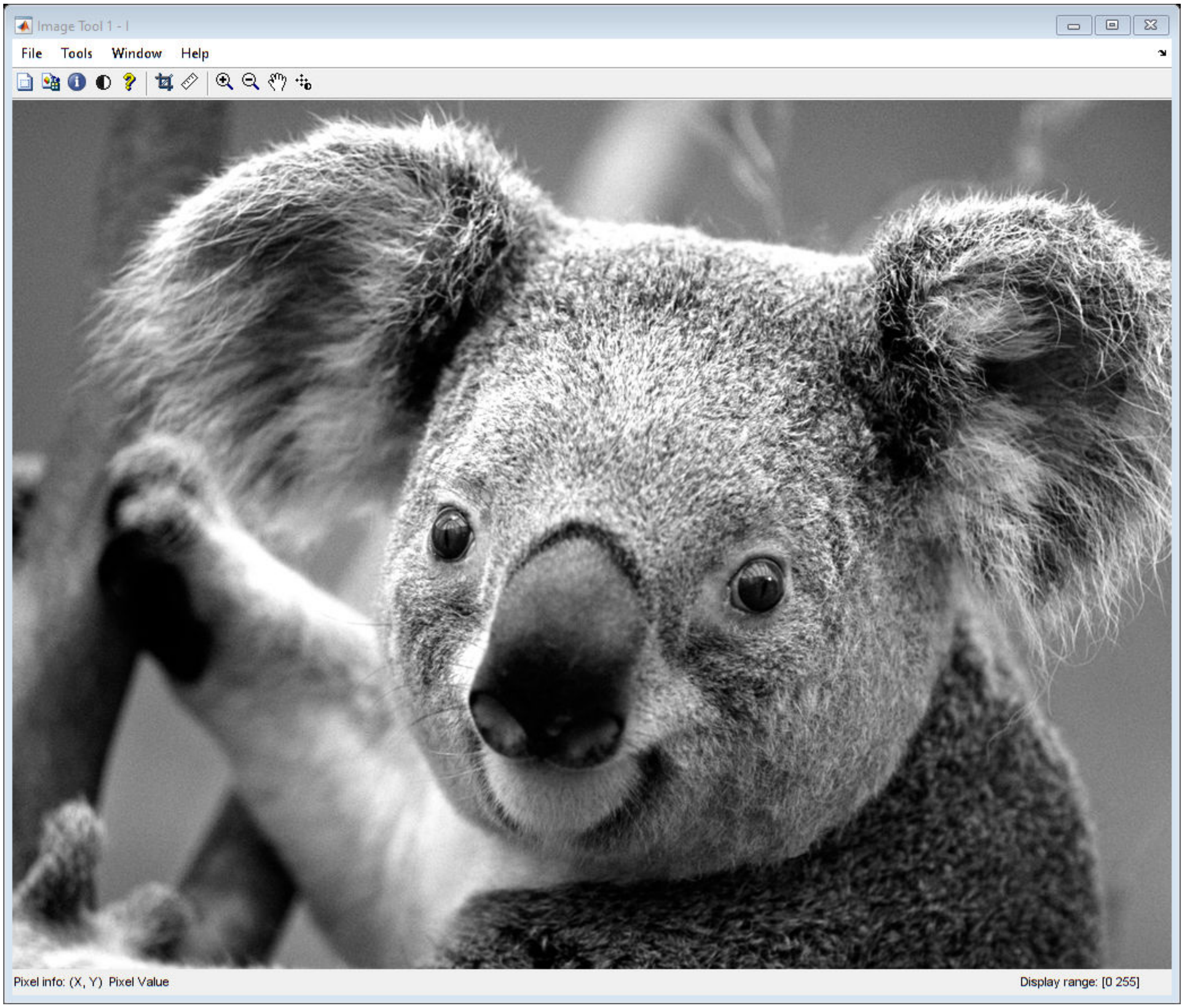


```
% Zobrazeni jednotlivych slozek obrazku

figure;
subplot(2,2,1), imshow(I_rgb);
subplot(2,2,2), imshow(I_rgb(:,:,1));
title('red');
subplot(2,2,3), imshow(I_rgb(:,:,2));
title('green');
subplot(2,2,4), imshow(I_rgb(:,:,3));
title('blue');
```



```
% ulozeni obrazku
% imwrite(obrazek,cesta)
imwrite(J,"picture1small.png");
```

```

% interaktivni prostredi pro praci s obrazky
% napriklad mereni vzdalenosti, prohlizeni hodnot jednotlivych obrazku
imtool(I);
```



```
% cyklus for
for i = 1 : 10
    display(i);
end
```

```
i = 1
i = 2
i = 3
i = 4
i = 5
i = 6
i = 7
i = 8
i = 9
i = 10
```

```
% cyklus while
i = 1;
while(i <= 10)
```

```
    display(i);
    i = i+1;
end
```

```
i = 1
i = 2
i = 3
i = 4
i = 5
i = 6
i = 7
i = 8
i = 9
i = 10
```

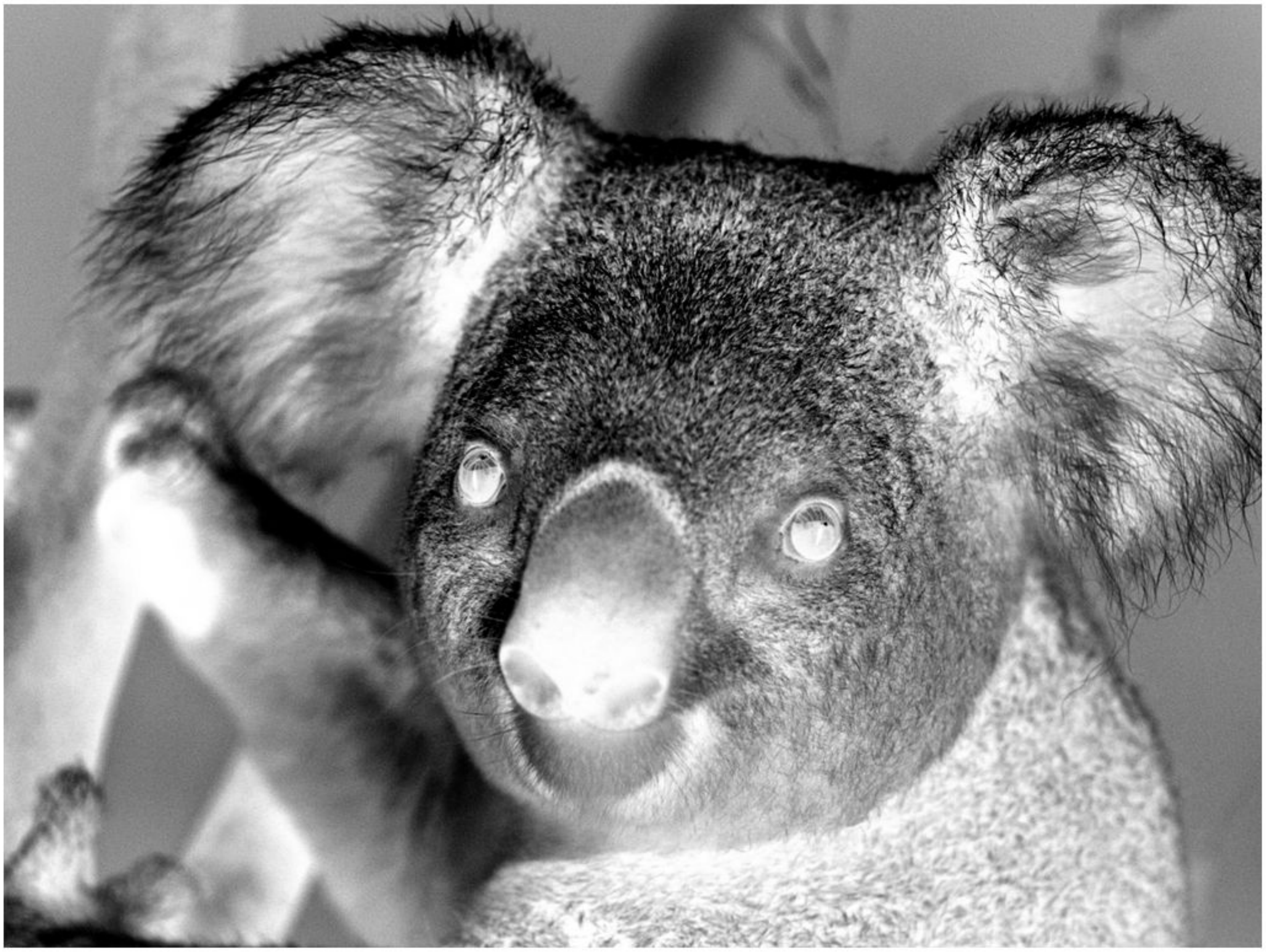
```
% vetveni
i = 20
```

```
i = 20
```

```
if (i > 0)
    display('vetsi');
else
    display('mensi');
end
```

```
vetsi
```

```
% pruchod obrazku pixel po pixelu (2 vnorene cykly)

for i = 1:h
    for j = 1:w
        L = 255-I;
    end
end

figure, imshow(L);
```



```
% funkce

%    function I2 = negativ(I)
%    %NEGATIV Summary of this function goes here
%    %   Detailed explanation goes here
%
%          I2 = 255 - I;
%
%    end

M = negativ(I);
imshow(M);
```

Úkol 1

Načtěte obrázek picture1.png a upravte ho následujícím způsobem:

pro pixely s lichou intenzitou přičtěte k intenzitě 10 (pozor na hodnoty > 255) a od sudých oděčtěte 20 (pozor na hodnoty < 0). Uložte obrázek pomocí imwrite a spolu s kódem odevzdejte.