Computer Image Processing

Classes 5 - colormaps, RGB color space

Example 1

Histogram equalizing.

```
L1=imread('portrait1.jpg');
figure;
imshow(L1);
figure;
imhist(L1);
L2=histeq(L1);
figure;
imshow(L2);
figure;
imhist(L2);
```

Example 2

Colormaps in Matlab.

```
figure('Color','w');
rgbplot (hsv);
axis([0 256 0 1]);
grid;
colormap (hsv);
colorbar ('horiz');
ylabel('Intensity of RGB channels,  'FontSize',  15,...
    'FontName',  'ArialCE');
title('hsv','FontSize',15)
```

Example 3

Changing of colormaps controlled by user.

```
L1=imread('portrait.jpg');
figure(1)
imshow(L1)
uicontrol(1,'Style', 'popupmenu',...
           'String', 'jet|hsv',...
           'Position', [20 1 100 50],...
           'Callback', @setmap);

function setmap(h,event)
    val = get(h,'Value');
    switch val
        case 1
            colormap(jet)
        case 2
            colormap(hsv)
    end
end
```

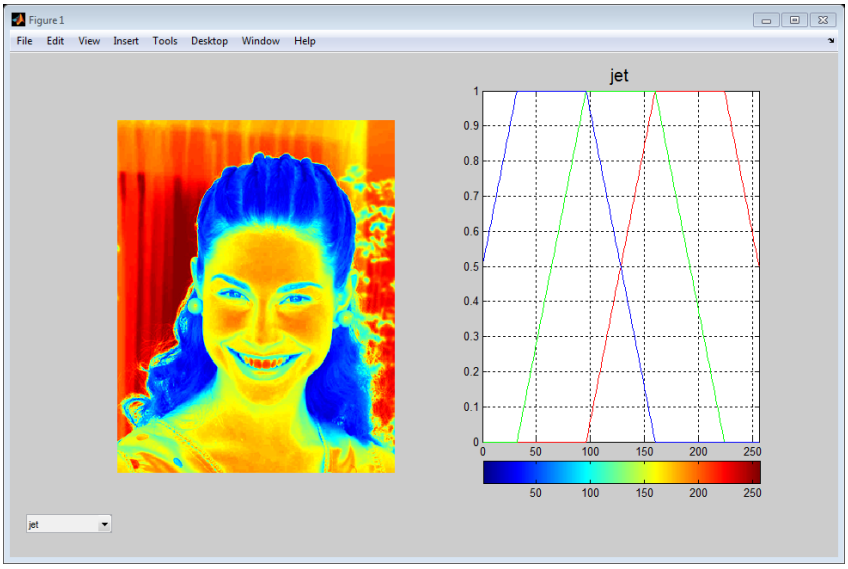
Be careful! In older versions of Matlab function *should be placed in a separate file!*

uicontrol(1,'Style', 'popup',... – 1 handle to figure, style of the control - popumenu (list of choices)
'String', 'jet|hsv',... – list of available options
'Position', [20 1 100 50],... – position of the control in Cartesian [left bottom width height]
'Callback', @setmap); - what to do when the control is changed (here - external function)

function setmap(h,event) – h handle to the control (not figure!)
val = get(h,'Value'); - catching a value set in control

Exercise 1

Create a figure consisting of two parts: one will display a *portrait.jpg* picture with an imposed colormap, the other - a plot of this colormap, properly signed (as in the picture below). The user should be able to switch between colormaps using the drop-down menu in the bottom left corner. Use the following colormaps: autumn, bone, cool, copper, hot, hsv, jet, pink, prism, spring, summer, winter.



Exercise 2

A color map is a matrix consisting of three columns, each containing 256 elements within the range [0,1]. Create your own colormap, display its plot, and impose it on the *portrait.jpg*

```
L1=imread('portret.jpg');
x = (1:128)'/128;
y = (1:64)'/64;
z = (1:256)'/256;
r = [x; flipud(x)];
g = [y; flipud(y); y; flipud(y)];
b = z;
map = [r g b];
figure;
imshow(L1);
colormap(map);
figure;
rgbplot(map);
colorbar('horiz');
colormap(map);
```

Try to change values in *r, g* and *b*. Remember that each vector should have exactly 256 elements.

Example 4

Customizing colormap of the current figure.

```
L1=imread('portrait.jpg');
imshow(L1);
colormapeditor
```

In colormapeditor *click below colour grid to place a marker, then double click on it to change its colour.*

Exercise 3

With the use of colormap editor, try to create your own colormap in the way that the teeth can be distinguished in the *face.jpg* image. You can use the *imtool* tool to accurately determine pixel values.

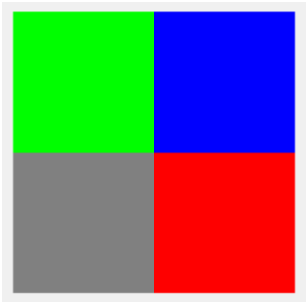
Example 5

Image in the indexed color and RGB color space.

```
L1=randi(256,3)
figure
imshow (L1, hsv(256), 'InitialMagnification','fit')
title('Image in the indexed color');
L2 = ind2rgb (L1, hsv)
figure
imshow (L2, 'InitialMagnification','fit')
title('Image in the RGB color space');
figure
imshow (L2(:,:,1), 'InitialMagnification','fit')
title('Contribution of RED channel');
figure
imshow (L2(:,:,2), 'InitialMagnification','fit')
title('Contribution of GREEN channel');
figure
imshow (L2(:,:,3), 'InitialMagnification','fit')
title('Contribution of BLUE channel');
```

Exercise 4

Create two images, size 2 x 2 pixels in RGB color space, and the given layout:



RGB matrix is a matrix with 3 pages. On first page intensities of red color are written, on second - green, on third - blue. Start with matrix containing only zeros of the size 2x2x3: m = zeros(2,2,3). Then, put 1 where it is necessary, for example on "blue" page: m(1,2,3) = 1.