Classes 5 - Colourmaps, RGB color space

Example 1.

Histogram equalizing.

```
L1=imread('portrait.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.

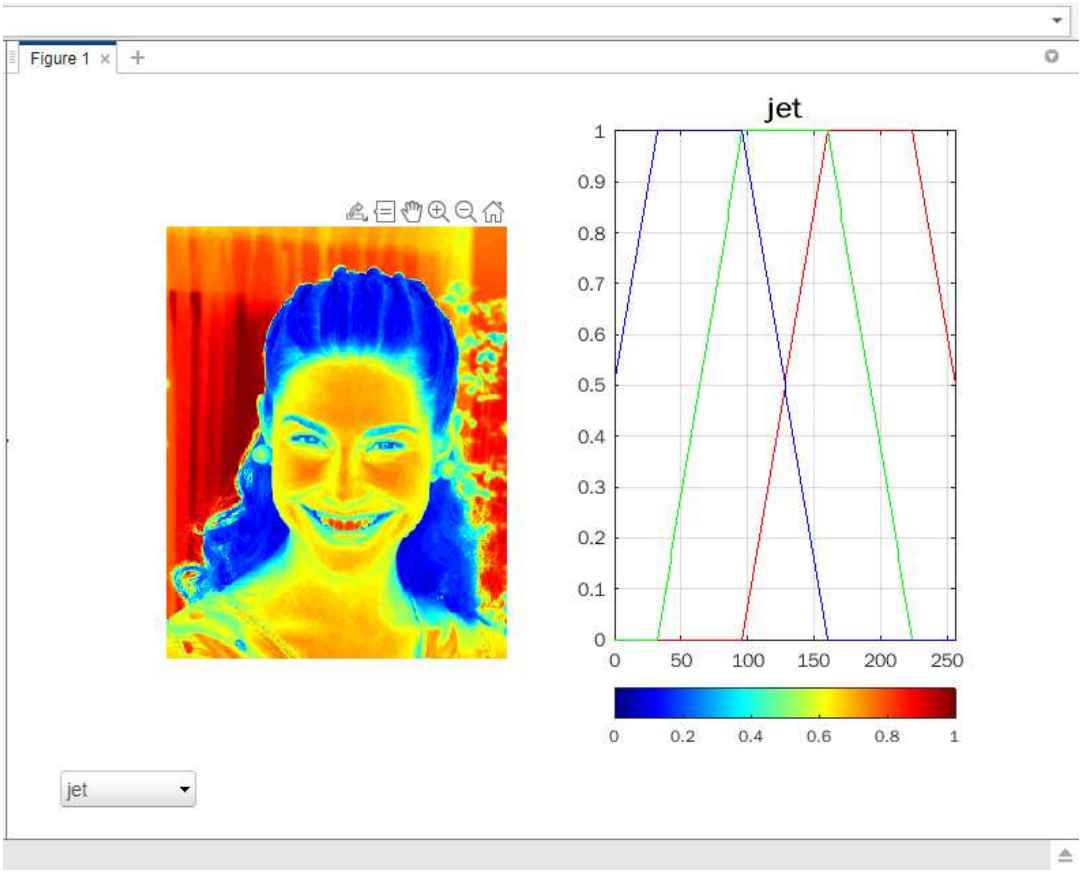
Changing of colormaps controlled by user.

```
L1=imread('portrait.jpg');
figure(1)
imshow(L1)
uicontrol(1,'Style', 'popupmenu',...
 'String', 'jet|hot',...
 'Position', [20 300 100 50],...
 'Callback', @setmap);
function setmap(h,event)
 val = get(h,'Value');
 switch val
 case 1
colormap(jet)
 case 2
 colormap("hot")
 end
end
```

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 contro lis 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.Task on table 5.1.




```
L1=imread('portrait.jpg');
figure(1)
imshow(zeros(500,800));
subplot(1,2,1),imshow(L1)
axis off
uicontrol(1,'Style', 'popup',...
 'String', 'jet|hvs',...
 'Position', [20 1 100 50],...
 'Callback', @setmap);
function setmap(h,event)
 val = get(h,'Value');
 switch val
 case 1
 colormap(jet)
```

```
 map = jet;
 t = 'jet';
 case 2
 colormap("hsv")
 map = hsv;
 t = 'hsv';
 end
 subplot(1,2,2),rgbplot (map),axis([0 256 0 1]),grid,colorbar
('horiz'),title(t,'FontSize',15);
end
```

Table 5.1

Variant number	Colormap
1	jet, autumn
2	jet,bone
3	jet,cool
4	jet,cooper
5	jet,hot
6	jet,hsv
7	jet,pink
8	jet,prism
9	jet,spring
10	jet,summer
11	hsv,autumn
12	hsv,bone
13	hsv,cool
14	hsv,hot
15	hsv,cooper
16	hsv,pink
17	hsv,prism
18	hsv,spring
19	hsv,summer
20	hot,pink

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. Task on table 5.2.

```
L1=imread('portrait.jpg');
x = (1:128)'/256;
y = (1:64)'/256;
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);
```

Table 5.2

Variant number	x y z
1	164 64 256
2	174 64 256
3	180 64 256
4	190 64 256
5	200 64 256
6	210 64 256
7	220 64 256
8	230 64 256
9	240 64 256
10	256 64 256
11	128 64 256
12	128 128 256
13	128 70 256
14	128 100 256
15	256 110 256
16	256 120 256
17	256 130 256
18	256 140 256
19	256 200 256
20	256 256 256

Example 4.

Customizing colormap of the current figure.

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

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

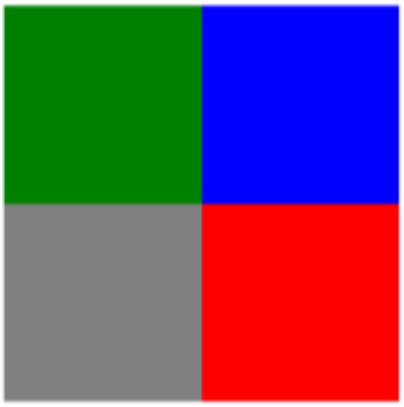
Image in the indexed color and RGB color space

```
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. Task on table 5.3.



```
L1 = zeros(2,2,3)
L1(1,1,2) = 0.5
L1(1,2,3) = 1
L1(2,1,:) = 0.5
L1(2,2,1) = 1
figure
imshow(L1,'InitialMagnification','fit')
L1 = zeros(2,2,3)
L1(1,1,2) = 0.5
L1(1,1,1) = 1
L1(1,2,1) = 0.3
L1(1,2,3) = 1
L1(2,2,3) = 1
L1(2,2,2) = 0.8
figure
imshow(L1,'InitialMagnification','fit')
```

Table 5.3

Variant number	Figure 1	Figure 2
1	1 1 1 1	1 1 1 1 1 1
2	0.1 1 1 1	0.1 1 1 1 1 1
3	0.2 1 1 1	0.2 1 1 1 1 1
4	0.3 1 1 1	0.3 1 1 1 1 1
5	0.4 1 1 1	0.4 1 1 1 1 1
6	0.5 1 1 1	0.5 1 1 1 1 1
7	0.6 1 1 1	0.6 1 1 1 1 1
8	0.7 1 1 1	0.7 1 1 1 1 1
9	0.8 1 1 1	0.8 1 1 1 1 1
10	0.9 1 1 1	0.9 1 1 1 1 1
11	1 0.1 1 1	1 0.1 1 1 1 1
12	1 0.2 1 1	1 0.2 1 1 1 1
13	1 0.3 1 1	1 0.3 1 1 1 1
14	1 0.4 1 1	1 0.4 1 1 1 1
15	1 0.5 1 1	1 0.5 1 1 1 1
16	1 0.6 1 1	1 0.6 1 1 1 1
17	1 0.7 1 1	1 0.7 1 1 1 1
18	1 0.8 1 1	1 0.8 1 1 1 1
19	1 0.9 1 1	1 0.9 1 1 1 1
20	1 1 0.1 1	1 1 0.1 1 1 1