Computer Image Processing

Classes 3 - geometric transformations continued

Example 1

Shifting the upper left corner of the image to the point indicated by the user with mouse, with folding elements.

```
L1 = imread('portrait.jpg');
figure;
imshow(L1);
[x,y] = ginput(1)
figure;
L2 = circshift (L1, [round(y) round(x)]);
imshow(L2);
```

[x,y,button] = ginput(1) - returns the x-coordinates, the y-coordinates, and the button or key designation. Button is a vector of integers indicating which mouse buttons you pressed (1 for left, 2 for middle, 3 for right)
circshift (L, [a b]) – circularly shifts the elements in array L by a elements down and b elements right

Exercise 1

Basing on example 1, write a program that will allow shifting the image by the given vector (with folding the image elements). The user first indicates the starting point and then the end point of the vector. The program repeats the operation on the processed image until the right mouse button is pressed.

```
L1 = imread('portrait.jpg');
figure;
imshow(L1);
[x,y,k] = ginput(1)
[x1,y1,k] = ginput(1)
while k~=3
  L1 = circshift (L1, [round(y1-y), round(x1-x)]);
  imshow(L1);
  [x,y,k] = ginput(1);
  [x1,y1,k] = ginput(1);
end
```

Example 2

Displaying several images in one figure

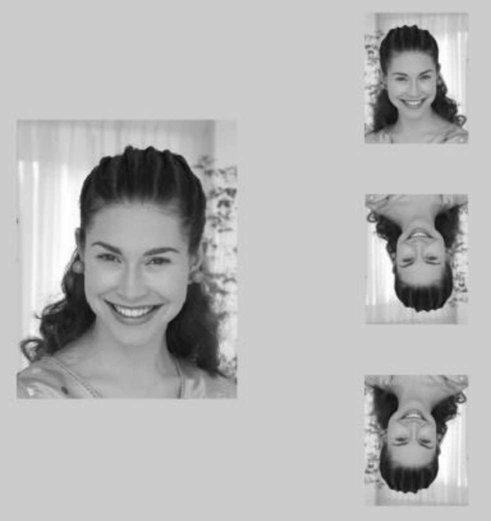
```
L1=imread('portrait.jpg');
figure;
imshow(zeros(500,400));
subplot(2,2,1), subimage(L1);
axis off
title('Original image');
subplot(2,2,2), subimage(imrotate(L1,90));
axis off
title('Rotation 90^o');
subplot(2,2,3), subimage(imrotate(L1,180));
axis off
title('Rotation 180^o');
subplot(2,2,4), subimage(imrotate(L1,270));
axis off
```

```
title('Rotation 270^o');
```

subplot(m,n,p) - divides the current figure into an m-by-n grid and creates axes in the position specified by p.

Exercise 2

Create a figure consisting offour sub images with the given layout:



```
L1=imread('portrait.jpg');
figure;
imshow(zeros(800,800));
L2 = fliplr(L1);
L3 = flipud(L1);
L4 = fliplr(L3);
subplot(3,2,[1 3 5]), subimage(L1);
axis off
subplot(3,2,2), subimage(L2);
axis off
subplot(3,2,4), subimage(L3);
axis off
```

Example 3

Reshape function

```
L1 = imread('portret.jpg');
figure;
imshow(L1);
[r,c] = size(L1)
L2 = reshape(L1, r*2, c/2);
figure;
imshow(L2)
L3 = reshape(L1, r/2, c*2);
figure;
imshow(L3)
```

Example 4

Expanding half of the image while preserving (or not) its original size

```
L1 = imread('portrait.jpg');
figure; imshow(L1)
axis on
[m n]=size(L1);
mid = round(size(L1,2)/2);
L1_l = L1(:,1:mid);
L1_r = L1(:,mid+1:end);
L1_rs = imresize(L1_r,[m mid*4]);
L2 = [L1_l L1_rs];
figure;
imshow(L2);
axis on
L2 = imresize(L2, [m n]);
figure;
imshow(L2);
axis on
```

B = imresize(A,scale) returns image B that is scale times the size of A
B = imresize(A,[numrows numcols]) returns image B that has the number of rows and columns specified by the two-element vector [numrows numcols].

Exercise 3

Create a program that will allow the user to select a part of the image (user indicates the top left and bottom right corner of the rectangle) and display this fragment in a new figure, magnified 10 times. Display the results using three different interpolation methods and describe the figures accordingly.

```
L1 = imread('portrait.jpg');
figure; imshow(L1)
[x,y] = ginput(1);
[x1, y1] = ginput(1);
L2 = L1(fix(y):fix(y1),fix(x):fix(x1));
L3 = imresize(L2,10,'nearest');
figure(2);
imshow(L3);
set(2,'Name','nearest');
L3 = imresize(L2,10,'bilinear');
figure(3);
imshow(L3);
set(3,'Name','bilinear');
L3 = imresize(L2,10,'lanczos2');
figure(4);
imshow(L3);
set(4,'Name','lanczos2');
```