Czestochowa University of Technology

Faculty of Mechanical Engineering and Computer Science

Computer vision, pattern recognition and image retrieval

Laboratory 4

Topic: *Geometric transformations*

Teacher: Joanna Kulawik, PhD

Technical support for Matlab is available on the website: http://www.mathworks.com/

In Lab 04, you are required to create a new application 'Lab04.mlapp' using a graphical user interface similar to the one used in Lab 02. Subsequent tasks will involve adding additional functionalities to this application.

Exercise 1

Create a new application 'Lab04.mlapp'. The form should contain 12 Button objects and 4 Axes objects. The first button 'Close' should close the form. The second button 'Open' should read a colored image (in .jpg, .png, .bmp format) from the selected file and display it in one of the Axes objects. The 'Gray' button should convert the loaded colored image to grayscale and display it in the second Axes object. (Lab02 contains detailed instructions on how to do this).

The program should process the same two images (colored and grayscale) in the subsequent buttons.

Exercise 2

Please program the functionality for the 'Restore' button, which will allow both processed images (colored and grayscale) to be restored to their original versions (as they are when loaded into the application) at any time. Please show both restored images in the consecutive Axes3 and Axes4 windows.

Exercise 3

In the next button 'Brighter', please program the brightening of images. Both images (colored and grayscale) should have their values increased by 10 levels. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Exercise 4

In the next button 'Darker', please program the darkening of images. Both images (colored and grayscale) should have their values reduced by 10 levels. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Exercise 5

In the next button 'Normalization', please program the operation of normalizing images. Both images (colored and grayscale) should undergo the 'imadjust' transformation. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Required commands:

imadjust - Adjust image intensity values or colormap

Exercise 6

In the next button 'Flip vertically', please program the operation of flipping images vertically. Both images (colored and grayscale) should be flipped using the 'fliplr' function. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Required commands:

fliplr - Flip array left to right

Exercise 7

In the next button 'Flip horizontally', please program the operation of flipping images horizontally. Both images (colored and grayscale) should be flipped using the 'flipud' function. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Required commands:

flipud - Flip array up to down

Exercise 8

In the next button 'Cut-out quarter', please program the operation of cropping images. From both images (colored and grayscale), only the upper left quarter of the original image should be retained. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Required commands:

size - Array size
floor - Round toward negative infinity

Exercise 9

In the next button 'Scale', please program the operation of resizing images. Please add three 'Edit Field (numeric)' objects with the following names:

'Row' with a default value of 50,

'Column' with a default value of 50,

'Channel' with a default value of 3.

The colored image should be resized using the 'imresize3' function to the dimensions obtained from the values entered in the fields ['Row', 'Column', 'Channel'] and displayed in Axes3.

The grayscale image should be resized using the 'imresize' function to the dimensions obtained from the values entered in the fields ['Row', 'Column'] and displayed in Axes4.

Required commands:

imresize - Resize image
imresize3 - Resize 3-D volumetric intensity image
get - Query graphics object properties

Exercise 10

Create an additional button 'Rotation' and a 'Edit Field (numeric)' object named 'Angle'. The functionality of the 'Rotation' button is to retrieve the value from the 'Angle' object and then perform a rotation operation on both images (colored and grayscale) by the retrieved angle value. Please display the result: for the colored image in Axes3, and for the grayscale image in Axes4.

Please set the default value of the 'Angle' object to 0, and its range from -360 to 360.

Required commands:

imrotate - Rotate image
get - Query graphics object properties

Please send only the „Lab04.mlapp” file to the moodle platform as an answer.