CS412 – OpenCV Homework 01

Vo Hoai Viet, Pham Thanh Tung

Assignment 01

Content

In this assignment you need to perform simple image manipulation using OpenCV. The program should load an image by either reading it from a file or capturing it directly from a camera. When the user presses a key perform the operation corresponding to the key on the original image (not the result of the last processing step). The program should satisfy the following specifications:

(a) The image to be processed by the program should be either read from a file or captured directly from a camera. If a file name is specified in the command line, the image should be read from it. Otherwise the program should attempt to capture an image from a camera. When capturing an image from the camera, continue to capture and process images continuously.

(b) The read image should be read as a 3 channel color image.

(c) The program should work for any size image. Make sure to test it on different size images.

(d) Special keys on the keyboard should be used to modify the displayed image as follows

- i - reload the original image (i.e. cancel any previous processing)
- w - save the current (possibly processed) image into the file out.jpg
- g - convert the image to grayscale using the openCV conversion function.
- G - convert the image to grayscale using your implementation of conversion function.
- c - cycle through the color channels of the image showing a different channel every time the key is pressed.
- s - convert the image to grayscale and smooth it using the openCV function. Use a track bar to control the amount of smoothing.
- S - convert the image to grayscale and smooth it using your function which should perform convolution with a suitable filter. Use a track bar to control the amount of smoothing.
- x - convert the image to grayscale and perform convolution with an x derivative filter. Normalize the obtained values to the range [0,255].
- y - convert the image to grayscale and perform convolution with a y derivative filter. Normalize the obtained values to the range [0,255].
- m - show the magnitude of the gradient normalized to the range [0,255]. The gradient is computed based on the x and y derivatives of the image.

- p - convert the image to grayscale and plot the gradient vectors of the image every N pixels and let the plotted gradient vectors have a length of K. Use a track bar to control N. Plot the vectors as short line segments of length K.
- r - convert the image to grayscale and rotate it using an angle of Q degrees. Use a track bar to control the rotation angle. The rotation of the image should be performed using an inverse map so there are no holes in it.
- h - Display a short description of the program, its command line arguments, and the keys it supports.

In this assignment you need to implement ONE of several possible applications as described below. Note: you only need to implement ONE of the options.

- When capturing images from a camera allow the program to capture and process the images continuously.
- The input image should always be converted to grayscale before processing it.
- The main parameters of each algorithm should be made available for interactive manipulation through keyboard/mouse/trackbar interaction.
- You may NOT use the OpenCV function which directly implements the algorithm you choose. You may, however, use it for verification purposes. You may use other OpenCV functions as necessary.
- Your program must include a help key describing its functionality.
- You need to evaluate the performance of the algorithm you choose using test data (e.g. adding noise or occlusions). The results of your evaluation should be included in your report. Try to determine the strengths and weaknesses of the algorithm.
- Your report must include a description of the algorithm you implemented.

Note

Framework: OpenCV (C/C++/Python)