Digital Image Processing (1121)

Homework #1 (DUE: 2023.10.11)

(Please note that you have to upload your source codes (and a brief description about your codes or algorithms, optional) to the server before the deadline. Please check the course website for more details.)

Construct a simple image processing tool with a graphic user interface (GUI), providing the following functionalities:

1. Open/save/display 256-gray-level images in the format of JPG/TIF.
2. Adjust the contrast/brightness of images by changing the values of "a" and "b" in 3 different methods:
   (A) linearly (Y = aX +b);
   (B) exponentially (Y = exp(aX+b));
   (C) logarithmically (Y = ln(aX+b), b > 1).
3. Zoom in and shrink with respect to the images' original size by using bilinear interpolation.
4. Rotate images by user-defined degrees.
5. Gray-level slicing: display images from a certain range of gray levels given by users. Requirements: (1) users can define the range of gray levels to be displayed; (2) users can choose either preserve the original values of unselected areas or display them as black color.
6. Display the histogram of images. An "auto-level" function by using histogram equalization should be provided.
7. Bit-Plane images: display the bit-plane images for the input image. Requirements: users should be able to select which bit-plane image to be displayed.
8. Smoothing and sharpening: providing smoothing and sharpening options for the input images by using spatial filters. Requirements: the levels of smoothing and sharpening should be defined by users via GUI.