

Digital Image Processing (1091)

Homework #2 (DUE: 2020.11.04)

(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 GUI, providing the following functionalities:

(you can either use the one you constructed in HW#1 or create a new one.)

1. Gray-level slicing : display images from certain range of gray levels given by users. Requirements: (1) users can define the range of gray level to be displayed; (2) users can choose either preserve original values of unselected area or display them as black color.
2. 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.
3. Smoothing and sharpening: providing smoothing and sharpening options for the input images by using spatial filters. Requirements: users should be able to decide the degree of smoothing/sharpening from GUI.
4. Display the Fourier Transformed images by taking " $\log|F(u,v)|$ ".
(Bonus: if you write the FFT function on your own instead of using built-in functions, you will get extra points.)
5. Amplitude and Phase images: Do 2D-FFT to obtain the amplitude and the phase of the image. Display its "amplitude-only image" and "phase-only image" by applying inverse 2D FFT.
6. Apply the homomorphic filter function modified from Gaussian high-pass filter function as shown in the textbook (e.q. 4-147) with $\gamma_L = 0.4$, $\gamma_H = 3.0$, $c = 5$, and $D_0 = 20$ to the image "Fig0460a.tif" to see if you can get the identical result as shown in Figure 4.60(b).

Bonus: design a GUI or integrate to the one you constructed earlier to display this function, and filter parameters (γ_L , γ_H , c and D_0) can be dynamically set by users.