ECE 429/529 Digital Image Processing

Fall 2020

Dept. of Electrical and Computer Engineering **Miami University**

Homework 5 Assignment

Weights: 70pts
Due Date: October 14, 2020
Turn in Method: Upload your homework by the midnight of October 14.
Note: Please turn in your programs and a report including original image, ten processed images (one magnitude spectrum, one phase spectrum, two lowpass filter outputs, two images enhanced with lowpass filter results, two highpass filter outputs, and two images enhanced by highpass filters) with appropriate captions and descriptions of your four filters.

1. Get an image you would like to use. Covert it to a gray-level image if it is a color image.
    a. Follow the instruction summarized in slide #40-41 of lecture note #9 to zero-pad image. Process the padded image so that when you plot its spectrum (magnitude and phase), the DC component will be at the center. Calculate the 2D-DFT of the processed and padded image and display its magnitude and phase spectrum (**10**pts)
    b. Use Butterworth and Gaussian lowpass filter described in lecture note #10 to process the 2D-DFT result you get in part (a). You will determine D_0 and Butterworth filter order yourself. Do not change the phase of the image. Take 2D-IDFT of the resulting frequency components display your results. Make sure that your image is displayed correctly. Finally, apply the USM technique with the lowpass filter outputs to enhance your original image. (**Note:** Since you zero pad and process your image before taking 2D-DFT, you need to process and cut the 2D-IDFT result to get correct output) (**30**pts)
    c. Use the Butterworth and Gaussian highpass filter described in lecture notes #10 to process the 2D-DFT result you get in part (a). You will determine D_0 and Butterworth filter order yourself. Do not change the phase of the image. Then, take 2D-IDFT of the resulting frequency components and display your results. Make sure that your image is displayed correctly. Finally, use the highpass filter outputs to enhance your original image. (Note: Since you zero pad and process your image before taking 2D-DFT, you need to process and cut the 2D-IDFT result to get correct output) (**30**pts)