

Assignment 4

The purpose of this homework is to experiment with Fourier Transform and frequency filtering [10 points]

- Your program should be able to apply F.T. to an image. No need to implement D.F.T., use OpenCV library which you have used previously. You will need to display absolute value of the amplitude of the Fourier domain as an image (be careful with needed scaling).
Your program should be able to apply inverse D.F.T. and display resulting image. This should work on grey level images (color for extra credit).
NOTE: CSE students: OpenCV is just to be utilized for D.F.T., you do all the filtering in C++
NOTE: non-CSE students: MATLAB calls only used for DFT, just MATLAB (code) for filtering
 - Your program should
 - operate within each of specified ROI, the rest of image should not be affected (three ROI required to be implemented)
 - apply D.F.T. to each ROI and display absolute value of the amplitude of the Fourier domain before and after filtering operation
 - apply inverse D.F.T. and display resulting (combined) image.
 - Add low-pass and high-pass filtering to your choice of options. Assume circular filter and allow user to input one cut-off frequency for low-pass/high-pass (filter does not affect the phase).
 - Test your program on some grey level images, including provided by TA.
 - Add a notch (band-stop) filter by allowing user input for 2 cut-off frequencies.
 - Implement combined low-pass/notch filter via 3 cut-off frequencies.
 - NOTE: within each ROI any of 3 filter operations can be performed
 - EXTRA CREDIT (2 points) Consider image sharpening operation implemented via frequency domain
 - Suggest and test such implementation. Consider enhancing (increasing) magnitude of high frequency components. Test several enhancement functions and describe the results.
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Write a report for this assignment

- It should include input and output images.
 - Experiment with low-pass and high-pass filtering and discuss your results.
 - Compare low-pass filtering with regular smoothing, demonstrate on images.
 - Compare high-pass filtering with expected performance of an edge detector, demonstrate on images.
 - Discuss performance of band-stop and combined filtering; demonstrate on images.
 - Discuss performance of image sharpening (part of extra credit).
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How to submit

- Submit paper report in class on the due date
- See TA help desk for instruction on program submission and testing.