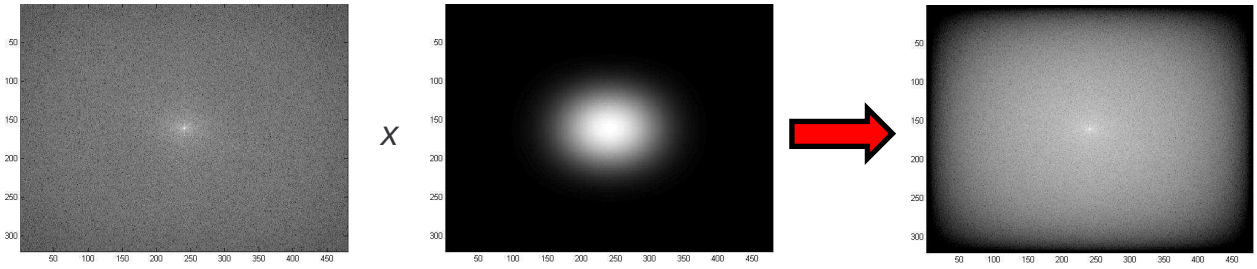
CSE 398/498-010
Real-time Image Processing for Autonomous Robot Systems

Homework 2: Filtering in the Frequency Domain
Report Due Date: Tuesday, 9 Nov 04 at the beginning of class



A. Objective: In this homework, we will perform filtering in both the spatial and frequency domains, and compare the results from the two procedures. This will help demonstrate the duality of convolution and multiplication across the two image representations.

B. Requirements:

1. This assignment is to be completed in Matlab.
2. This is an individual assignment. Each student is required to submit his/her own work in order to receive credit.

C. Instructions:

1. Download the source image from the course home page.
2. Follow the steps outlined in slides 28-35 of Lecture 12.
3. Your submission should contain equivalent images for each step.
4. You should NOT use the `fftshift` function. You need to write your own function for centering the image transform IAW the lecture notes.
5. The DFT values you display on the grayscale images are the spectrum values as defined on slide 21 of the lecture notes.
6. Because of the difference in values of the DFT, it will be helpful when displaying the image to take its log transform (take the log of all DFT image values). NOTE: Since some values may equal zero, you should add 1 to the DFT values before taking the log to prevent $-\infty$ entries.

D. Some Potentially Helpful Matlab Functions/Commands:

1. `imread`
2. double (you will probably need this to transform the images from uchar to float data types)
3. `imagesc`
4. `colormap gray`
5. `fft2`

6. `conv2`
7. `conj`
8. `real`
9. `log`

E. Turn in:

1. A write-up, to include images.
2. Your Matlab/C/C++ source code.