

ELEC 431
Digital Signal Processing
Homework 7

Due Monday, February 10, 2003

Note: Homework, tests and solutions from previous offerings of this course are off limits, under the honor code.

Write a Matlab function to compute the 2d convolution between an image and a point spread function (PSF). The function should be general purpose enough to handle arbitrarily sized images and PSFs. Compare the performance of your function with Matlab's built-in `conv2` function.

Test your convolution function with the image `camera.mat`, which can be downloaded from www.ece.rice.edu/~nowak/elec431. Apply each of the PSFs below to the image. Plot, discuss, and interpret the action of each. Hand-in your code as well.

$$\mathbf{h}_1 = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} / 4$$

$$\mathbf{h}_2 = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} / 25$$

$$\mathbf{h}_3 = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix} / 16$$

$$\mathbf{h}_4 = \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix}$$

$$\mathbf{h}_5 = \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}$$

$$\mathbf{h}_6 = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 4 & -2 \\ 1 & -2 & 1 \end{bmatrix}$$