HW SET #9 (DUE BEFORE MIDNIGHT APR 23, FRI)

NOTE: No class on Wed, April 21

Problem 1 (60 points) This is an exercise of POCS (Projection Onto Convex Sets). Suppose we receive a 4×4 image block in which a number of pels are damaged during transmission, as shown below:

180	140	100	60
160	X	80	X
140	X	X	X
120	130	X	150

The pels marked with "X" are the pels that are damaged. Let us begin with an initial solution by replacing all the "X" pels with a certain value, say 128. Then, iterate the following POCS procedure:

1. Apply a lowpass filter to the 4×4 image block. The lowpass filter is defined by the following 3×3 filter that is applied to all the internal pels:

1/16	1/8	1/16
1/8	1/4	1/8
1/16	1/8	1/16

   For all pels on the image boundary, excluding the four corner pels, a 3-tap filter [1/4,1/2,1/4] is applied. No filtering is applied to the corner pels. This lowpass filtering operation represents the projection onto the first set. (Note: For simplicity, assume that pel values are stored as integers. Since all the multipliers of the lowpass filter are powers of two, you can simply use shift operations.)

2. Replace the non-damaged pels with their original values. This represents the projection onto the second set.

3. Stop when the values of all the damaged pels converge. If they do not converge after five iterations, stop after the fifth iteration. Otherwise, go to 1.

Show the resulting pel values as a 4×4 block. Note that the values of non-damaged pels should remain the same as in the original.

Problem 2 (40 points) Write a simple program (Matlab is ok) that read the motion vector files that you created in HW#6 and display them as *needle plots*, one plot for every frame of motion vectors, so nine plots for each sequence. Put your code in `/afs/ece/class/ece796/handin/[your userID]/hw9`. Please submit your plots nicely organized, e.g., nine plots per page with the sequence name clearly labeled. By examining these needle plots visually, please describe the motion of the camera, e.g., pan, zooming, etc., and any object motion, in each sequence.

Note: This is the last homework for the semester. Good luck with it and your final project!