Possible projects for SIMG461-462: DIP

(1) Image frame averaging can reduce the noise, improve visual quality and improve the quality of the image histogram for threshold picking. For this project you can digitize an image that possibly has multimodal histogram. You will have to add a random noise value at pixel location and generate a set of "noisy" images. Then perform frame averaging and demonstrate the improvements.

(2) If you are good at programming, develop a program to calculate two dimensional histogram. You can use (or we can provide) two color image frames or alternatively you can use two images with two different local "features."

(3) Low pass smoothing kernels are generally used to reduce noise in the image, and improve histogram quality for threshold picking. Add noise to a clean image and test the improvement with several different low pass kernels. (different size and weighting for each kernel)

(4) The low pass kernels we have discussed in class all have their corresponding 2-dimensional frequency response or MTF. With zero padding and a suitable canned 2-dimentional canned FFT algorithm, the magnitude of the kernel FFT can be determined. Taylor a program to do this on various kernels.

(5) In ultrasound, development of phantoms is essential for the understanding of scattering structures. In medicine, histology is considered to be the gold standard. We would like to generate a 2-D phantom from a liver tissue histology plate:

(image will be supplied at www.cis.rit.edu/class/simg462/dip/images)

the phantom should show the lobular structure as dark lines and the fiber structures should be filtered out completely. Write a brief report discussing the procedure you chose to accomplish the project’s goal. Include hard-copy images of the processed result in the report.

(6) Develop or obtain a program that can compute the gradient magnitude and possible angle for an image, and use the program to convert a photograph of a friend into a cartoon (black and white line drawing). Write a brief report discussing the procedure. Include hard-copy images of the processed result in the report.

(7) Develop a program for two-dimensional matched filter design. Digitize an images of an assortment of pills, tablets, and capsules of different sizes and
shapes on a contrasting background. Position the objects randomly but not touching, and all aligned the same way. Use your program to pick out all the medications on one type. Write a brief report discussing the procedure you chose to accomplish the project’s goal. Include hard-copy images of the processed result in the report.

(8) Develop a program that implements the discrete cosine transform, and use the program to demonstrate high pass filtering for image enhancement. Write a brief report discussing the procedure you chose to accomplish the project’s goal. Include hard-copy images of the processed result in the report.

(9) Applications of the Laplacian. Replicate the example in the notes pages D-30, 31. I could provide images. Write a brief report discussing the procedure you chose to accomplish the project’s goal. Include hard-copy images of the processed result in the report.

(10) Apply a variance filter to an image with fine structure. (Can use any of the images below)

Look for the actual images at www.cis.rit.edu/class/simg462/dip/images

Threshold the resultant image and process the binary image. Use brightness of the pixel in the original image to classify each grain as either a or b. Generate images of only those line boundaries lying between a and a, b and b, or a and b. Write a brief report discussing the procedure you chose to accomplish the project’s goal. Include hard-copy images of the processed result in the report.

(11) Perform histogram equalization on the Red, Blue, Green components and then combine them, into a composite image. Report on possible color imbalance that results. This project will require some help from the color group.

(12) A given image can have salt and pepper (isolated point) noise or random noise. A medium filter works best on the former while a low pass filter works better on the later. Perform a comparison study with a given image. You should be able to add both type of noise into each image.

(13) A color blind person may not be able to see, for example letters written in Red. With R, G, B channel separation you can work on extracting the letter outline from the Red frame. Process it such that the edges or the interior of the
letter is extracted and positioned at the correct location in the image in Black so that the color blind person can see it.

(14) Use a canned 2-dimensional FFT algorithm to perform low-pass/ high-pass filtering of a given image. If possible design a Butterworth filter. (Check Gonzalez and Woods pg 212)