Homework #2 Image Enhancement in the Spatial Domain

We have learned spatial-domain several image enhancement techniques, including gray-level transformations (power-law and log-law), histogram processing, and Laplacian-based sharpening. In this project, you need to implement suitable algorithms to improve the visual quality of some images which have low contrast or blurred structure.

(1) Develop a power-law transformation function to enhance the following two images. Plot image histograms before and after the transformation (Matlab function IMHIST). You are encouraged to try different parameters for optimal results. Also, please find a couple of low-contrast color images online that can be enhanced by applying the power-law transformation to three channels (e.g., RGB).

Figure 1.

Figure. 2

(2) Develop a histogram equalization algorithm to enhance the following three images. Plot image histograms before and after equalization. Also, find a couple of low-contrast color images that can be enhanced by the histogram equalization. Discuss your findings.

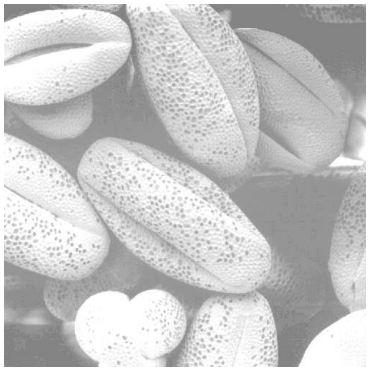

Figure 3.

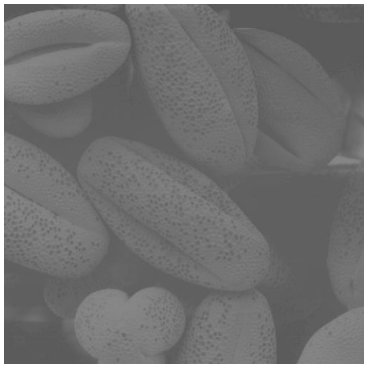

Figure 4.

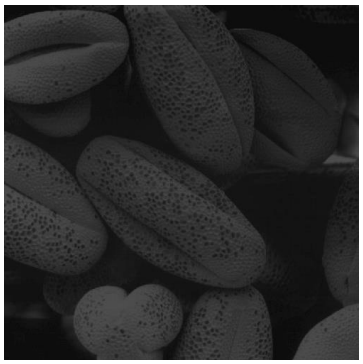

Figure 5.

(3) Develop a histogram specification (match) algorithm to enhance the following image (Fig. 6). You need create an expected histogram first (like Fig. 3.25(a) in the textbook, page 138) first. Plot image histograms before and after histogram specification. Please also apply your algorithm to two color images for color transfer (like Slide 10 in Lecture 9). Discuss your findings.

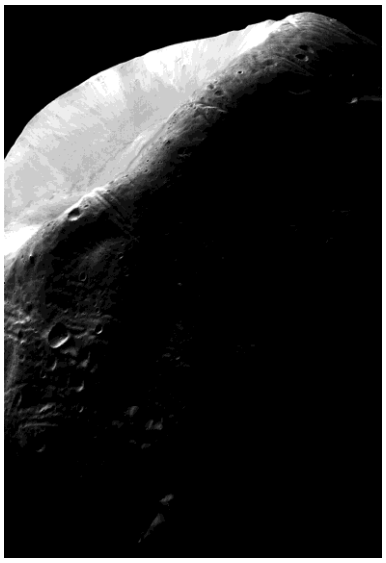

Figure 6.

(4) Implement the combined image enhancement technique to enhance the following Bone scan image according to the procedure given in Slides 3-5 of Lecture 12 (or pages 169-172 in the textbook).

Figure 7.