

Computer Projects # 1

[1] Reducing the Number of Gray Levels in an Image

(a) Write a computer program capable of reducing the number of gray levels in an image from 256 to 2, in integer powers of 2. The desired number of gray levels needs to be a variable input to your program.

(b) Download Fig2.21(a).jpg. Display this image in 128, 64, 32, 16, ..., 2, intensity levels.

[2] Histogram Equalization

(a) Write a computer program for computing the histogram of an image.

(b) Implement the histogram equalization technique discussed in the course

(c) Download Fig. 3.8(a) (the MRI of a fractured human spine) and perform histogram equalization on it.

As a minimum, your project solution should include the original image, a plot of its histogram, a plot of the histogram-equalization transformation function, the enhanced image, and a plot of its histogram. Use this information to explain why the resulting image was enhanced as it was.

[3] Spatial Filtering

Write program to perform spatial linear filtering of an image. You can fix the size of the spatial mask at 3 x 3, but the coefficients need to be variables that can be input into your program. This project is generic, in the sense that it will be used in other projects to follow. Think about how to handle the boundary (apply the filter only for the interior pixels; assume that the image has been extended by zero-padding, periodicity or by reflection).

[4] Enhancement Using the Laplacian

(a) Use the programs developed in Project [3] to implement the Laplacian enhancement technique $g(x, y) = f(x, y) - \Delta^2 f(x, y)$

(b) Download Fig3.40(a).jpg (the North Pole of the moon) and apply the enhancement function to this image. Visualize the input and output images.