Digital Image Processing, 2024 Spring

Homework 1

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Due 23:59 (CST), Apr. 7, 2024

Problem 1:

(a) Figure 1 is the histogram image of grain.tif.

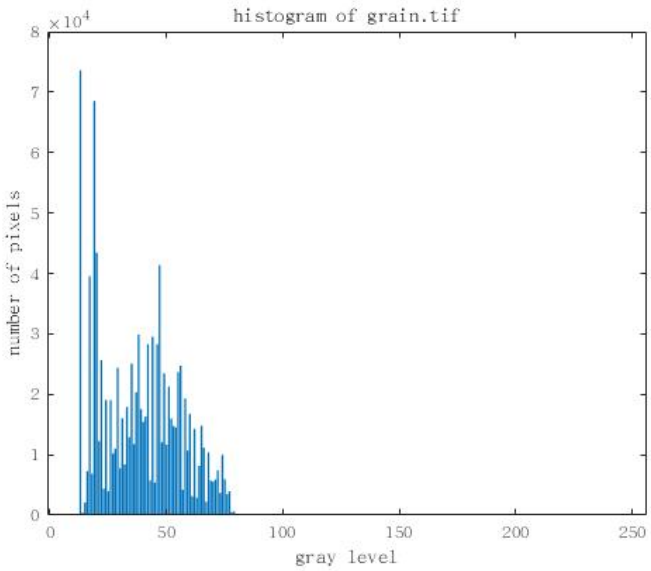

Figure 1. Histogram of grain.tif

(b) The left image of Figure 2 is the histogram equalized image, and the right one is the histogram of that histogram equalized image.

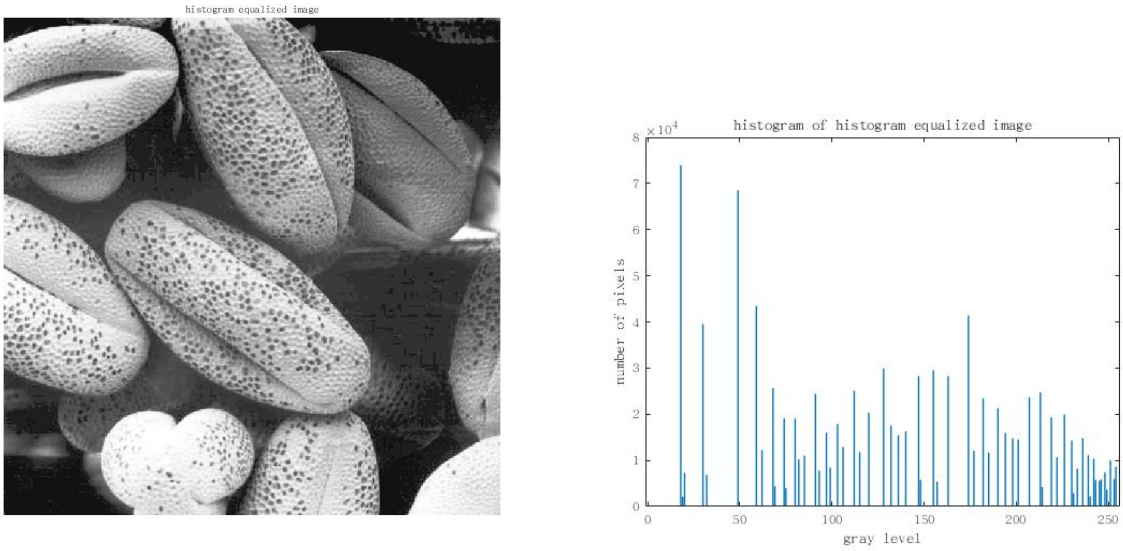

Figure 2. Histogram equalized image and its histogram

(c) The left image of Figure 3 is the CLAHE processed image, and the right one is the histogram of

that CLAHE processed image.

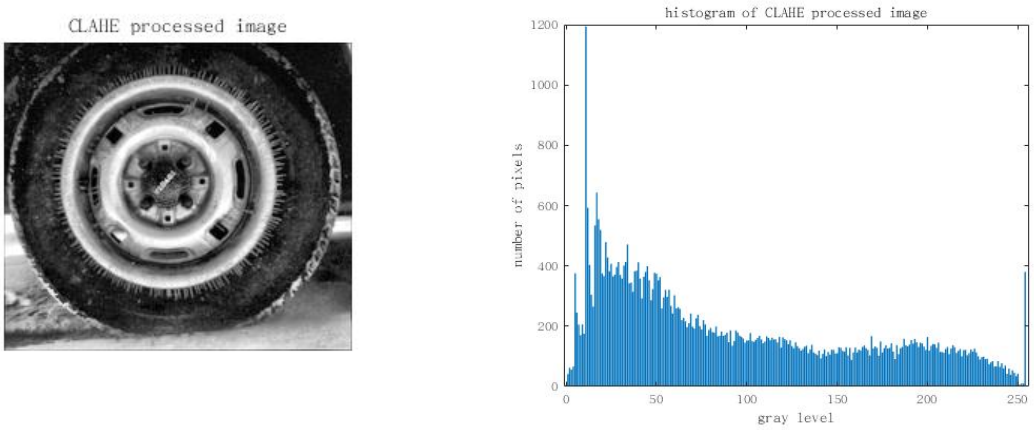

Figure 3. CLAHE processed image and its histogram

Problem 2:

(a) The Laplacian kernel is that:

$$\nabla^2 f = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

The kernel is separable, and the separated kernel is:

$$\begin{bmatrix} 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

The processed image is shown in Figure 4.

Figure 4. Separated Laplacian kernels processed image

(b) Sharpened image with unseparated Laplacian kernel

The processed image is shown in Figure 5.

Figure 5. Unseparated Laplacian kernels processed image

(c) Sharpened image with unsharpen mask

The processed image is shown in Figure 6.

Figure 6. unsharpen mask processed image

Problem 3:

processed by the median filter

cause of the results:

The processed image is shown in Figure 7.

processed by the and Gaussian filter

The processed image is shown in Figure 8.

Figure 7. Median filter processed image

Figure 8. Gaussian filter processed image