Thierry Cantenot

Report

Digital Image Processing

« Assignments »

2014-2015

Summary

A. Histogram Equalization

A.1 Problem statement

1. Write a computer program for computing the histogram of an image.
2. Implement the histogram equalization technique.
3. Your program must be general to allow any gray-level image as its input.

A.2 Python implementation

Usage : **python problem1.py [-h] image_path**

A.3 Figure 1

A.3.1 Histogram

Original image : A.1 | Original image's histogram : A.2

A.3.2 Histogram equalization

Enhanced image : A.3 | Enhanced image's histogram : A.4

A.4 Figure 2

A.4.1 Histogram

Original image : A.5 | Original image's histogram : A.6

A.4.2 Histogram equalization

Enhanced image : A.7 | Enhanced image's histogram : A.8

FIGURE A.1 – Original *Fig1.jpg*

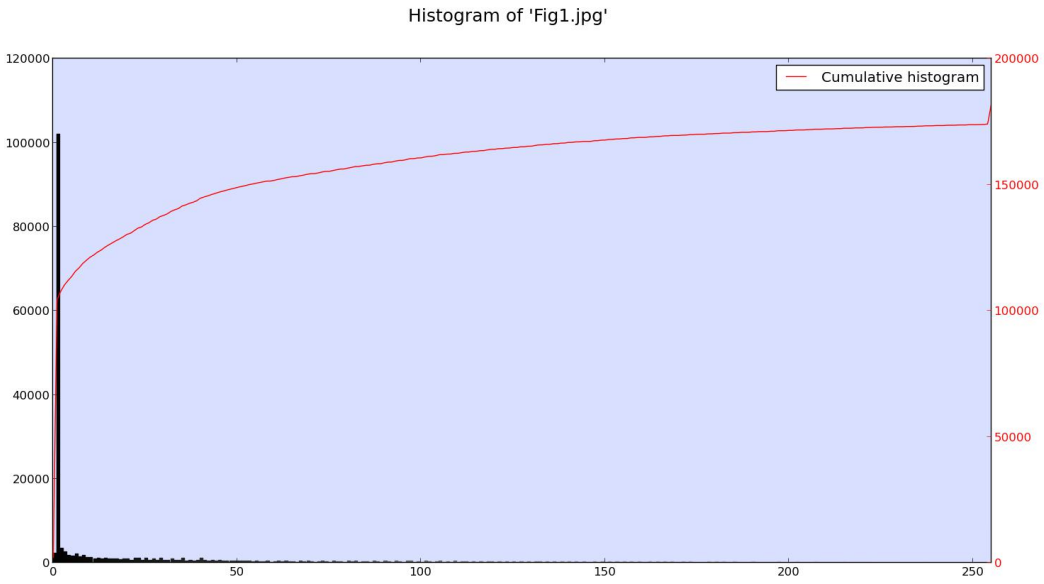

FIGURE A.2 – Histogram of *Fig1.jpg*

FIGURE A.3 – Enhanced *Fig1.jpg*

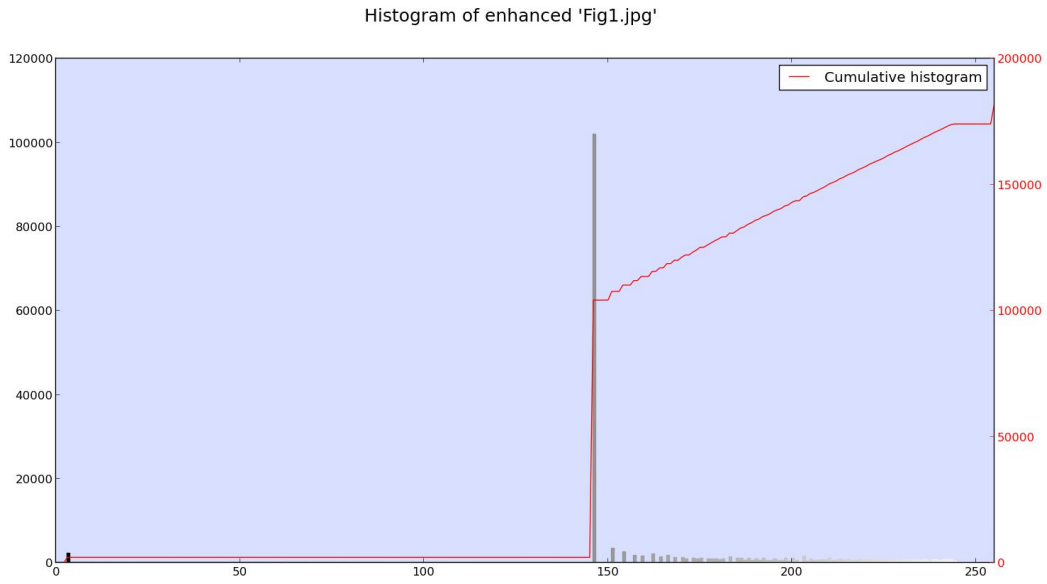

FIGURE A.4 – Equalized histogram of *Fig1.jpg*

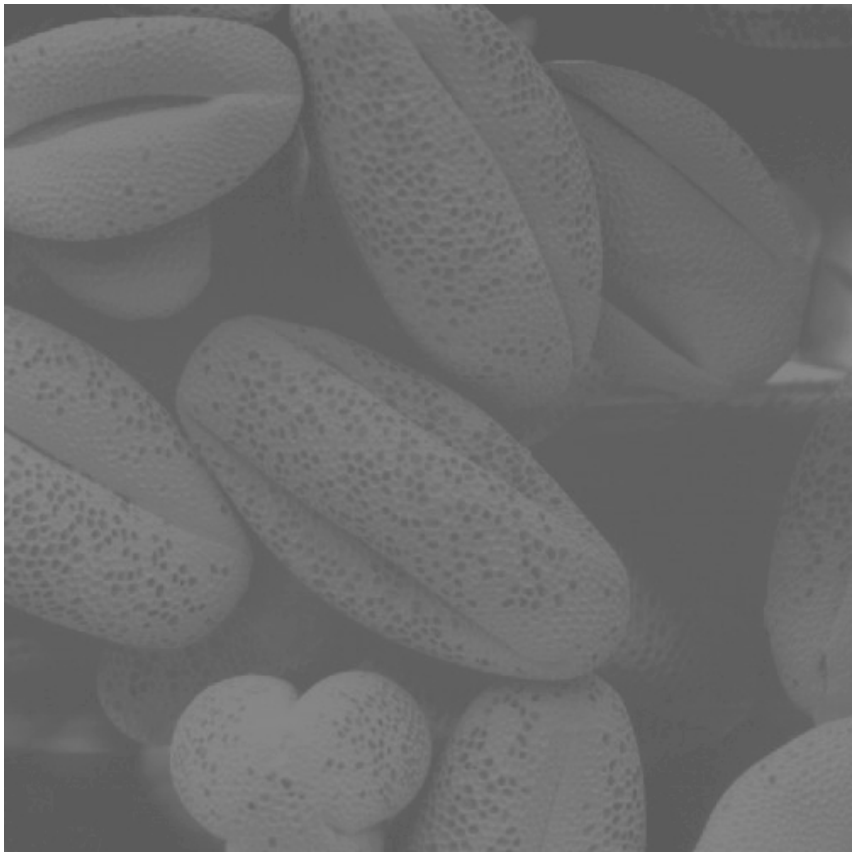

FIGURE A.5 – Original *Fig2.jpg*

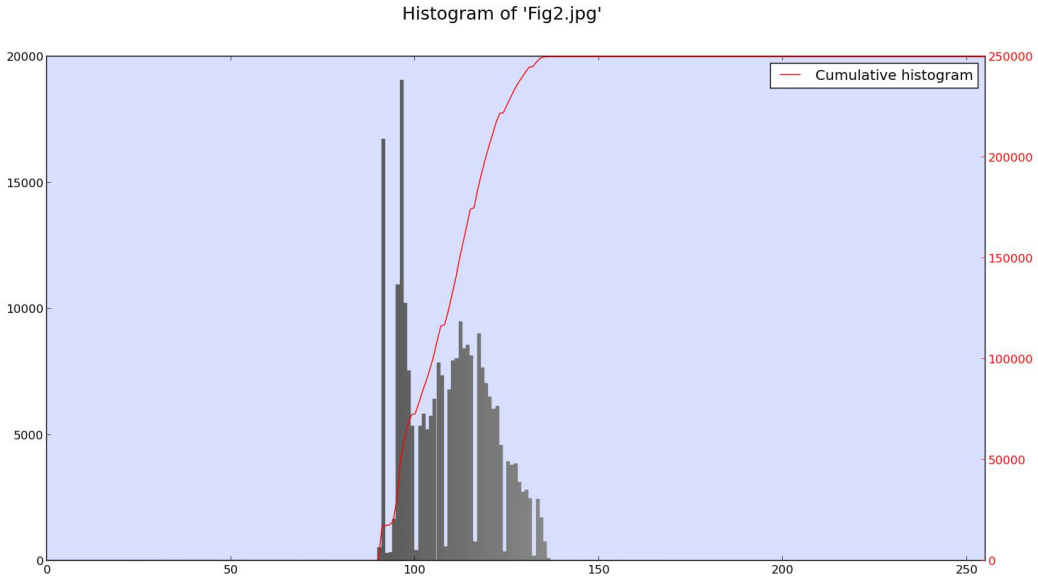

FIGURE A.6 – Histogram of *Fig2.jpg*

FIGURE A.7 – Enhanced *Fig2.jpg*

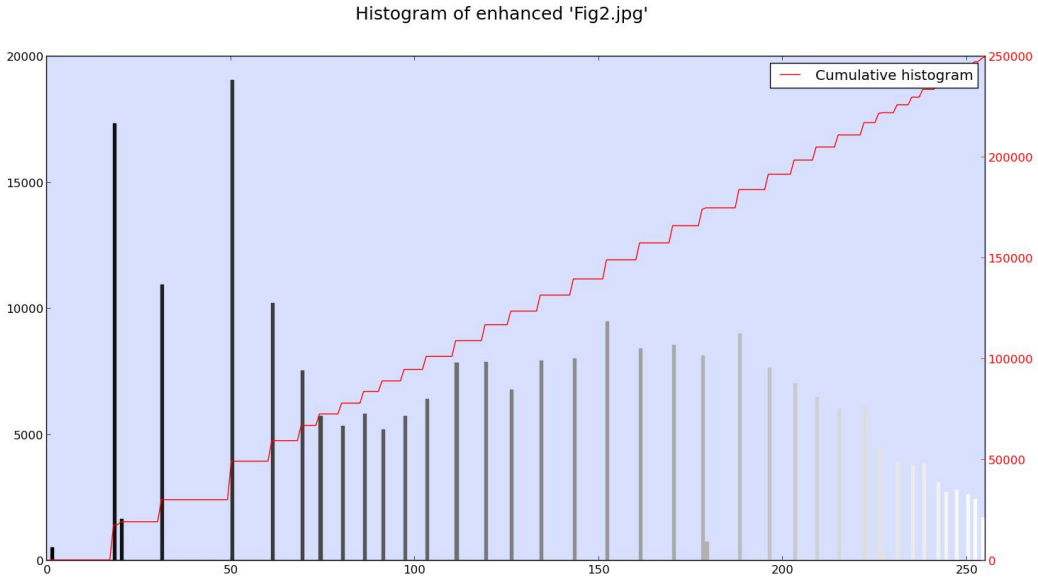

FIGURE A.8 – Equalized histogram of *Fig2.jpg*

B. Spatial enhancement methods

B.1 Problem statement

Implement the image enhancement task of Section 3.7 (Fig 3.43) (Section 3.8, Fig 3.46 in our slides).
The image to be enhanced is *skeleton_ orig.tif*.
You should implement all steps in Figure 3.43.
(You cannot directly use functions of Matlab such as imfilter or fspecial, implement all functions by yourself).

B.2 Python implementation

Usage : **python problem2.py [-h] [–laplacian] [–sobel] [-a A] image_path**

For example, to use a 3x3 Laplacian filter with A = 1.7, and then a Sobel, type :

python problem2.py –laplacian -a 1.7 –sobel skeleton_orig.tif

The original image, its Laplacian, its sharpened (Laplacian) and its Sobel will be displayed.

B.3 Results

B.3.1 Original image

FIGURE B.1 – Original *skeleton_ orig.tif*

B.3.2 3x3 Laplacian (A = 0)

FIGURE B.2 – Laplacian (A=0)

FIGURE B.3 – Sharpened image

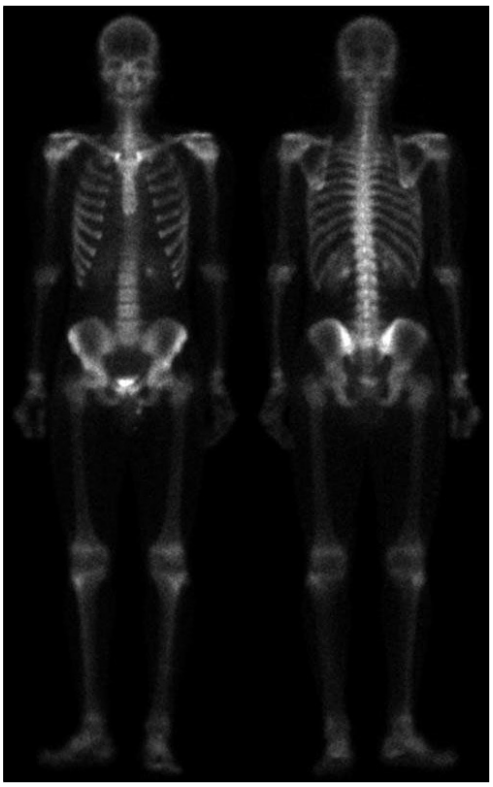

FIGURE B.4 – Original image

B.3.3 3x3 Laplacian (A = 1)

FIGURE B.5 – Laplacian (A=1)

FIGURE B.6 – Sharpened image

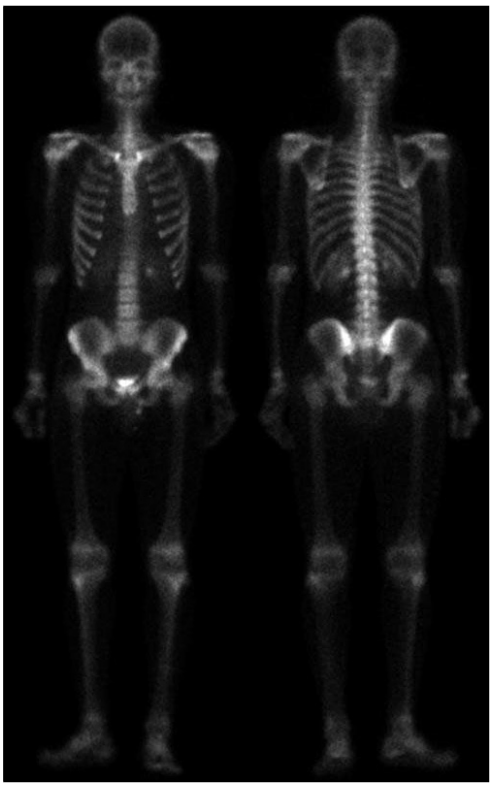

FIGURE B.7 – Original image

B.3.4 3x3 Laplacian (A = 1.7)

FIGURE B.8 – Laplacian (A=1.7)

FIGURE B.9 – Sharpened image

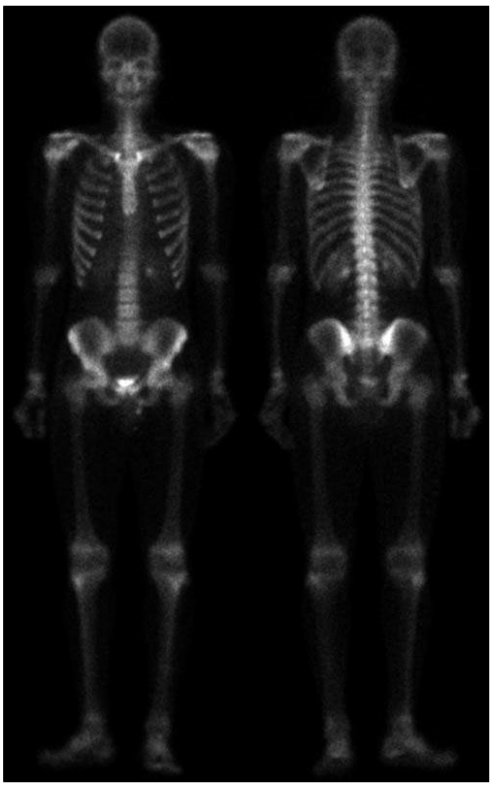

FIGURE B.10 – Original image

B.3.5 Sobel

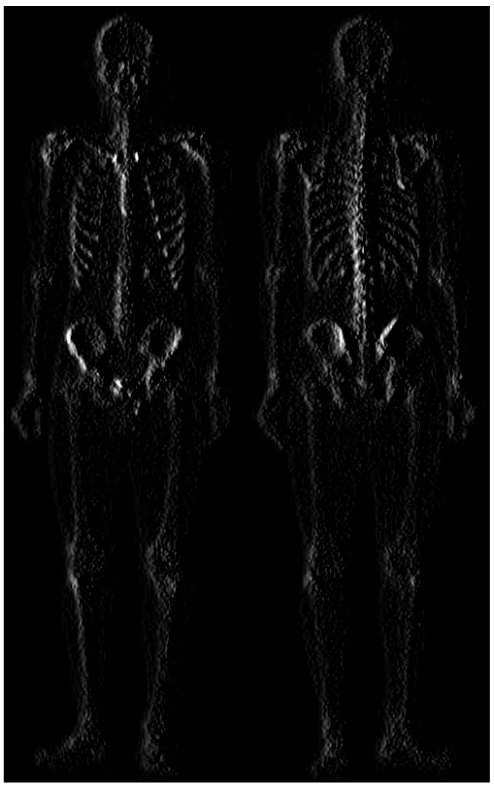

FIGURE B.11 – Sobel x-gradient

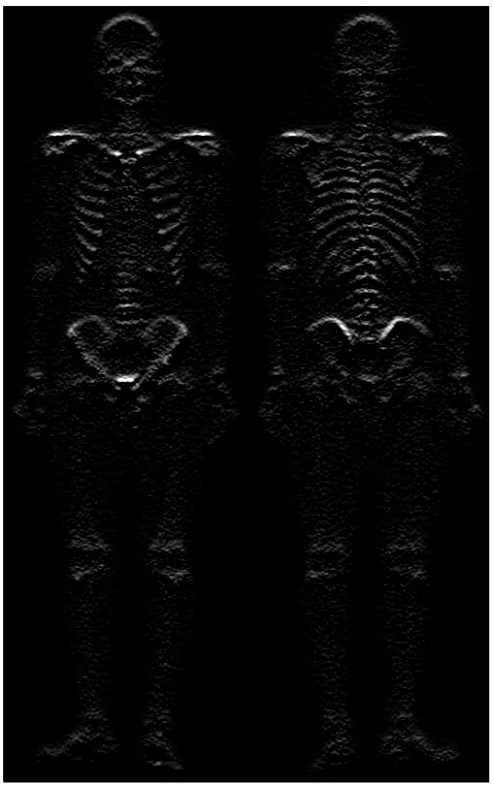

FIGURE B.12 – Sobel y-gradient

FIGURE B.13 – Sobel image

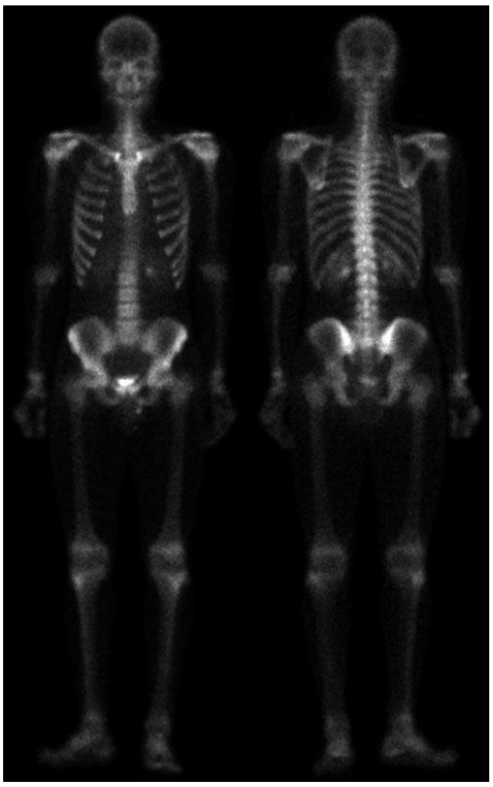

FIGURE B.14 – Original image