Computer Vision Homework 2 Report B06507002 材料二 林柏勳

Assignment

Write a program to generate:
(a) a binary image (threshold at 128)
(b) a histogram
(c) connected components (regions with + at centroid, bounding box)

Introduction

B06507002_HW2_ver2.zip contains

1. HW2_B06507002.pdf
2. HW2_B06507002.py

where 1. is the report and 2. is my source code.
One can reproduce this assignment by putting “lena.bmp” and “HW2_B06507002.py” in the same folder and running “HW2_B06507002.py”. Then, three image data :“Lena_t.bmp”, “Lena Histogram.png”,“OutImage.bmp” can be dumped in the same folder.

Original lena.

lena.bmp

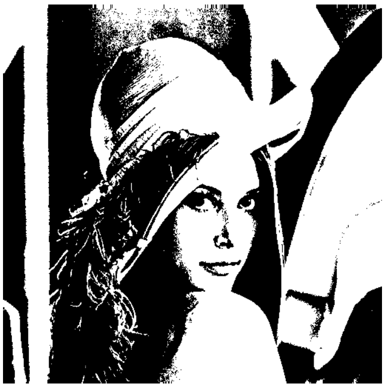
Tools

Language: Python3

Package	Purpose
numpy	Matrix calculation
matplotlib	Plot histogram
opencv	Reading and Writing image Adding “+” at centroid and bounding boxes in the image

Solution

(a)



Lena_t.bmp

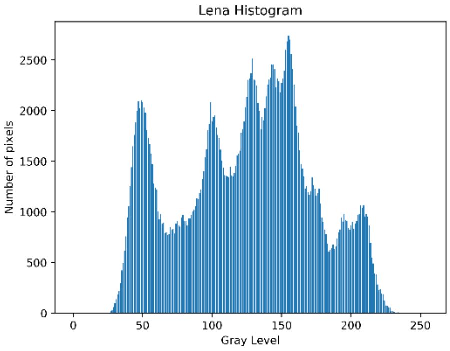
This part can be done by function *f*, where

$$f(x) = \begin{cases} 0\,, x < 128 \\ 255, x \geq 128 \end{cases}$$

We can transform every pixel in the image by using function *f* to get the thresholding effect.

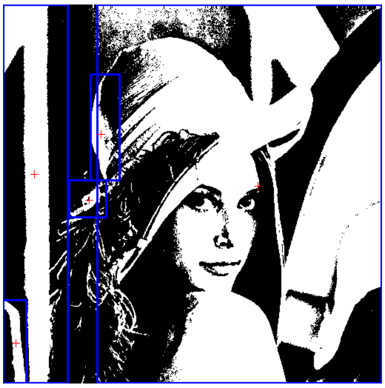
(b)

I count the number of each brightness, and plot them into “Lena Histogram.png”



Lena Histogram.png

(c)



OutImage.bmp

I use “4-connected” to classify the connected components. The method I adopt is modified classical method.

Alg *Modified Classical Method (Input: a binarized image)*

Go through the image in the order of from left to right and then from up to down. If the brightness of the pixel is not 0, check its upper neighbor and left neighbor’s brightness, if both are not 0, select the one whose set has the lower index of the two, add the pixel in that set, record the neighboring relation of the two set. Else if one of which is not zero, add the pixel in that neighbor’s set. Else, create a new set, name the set using iterable index, add the pixel into the set.

After running through the whole image, then

a. select one set out,

    A. pop out one of its neighbor, union the present’s set and its neighbor’s set, change the neighboring relationship (the neighbor set’s neighbor will be the present set’s neighbor)

    B. Doing a-A until the set has no neighbors

b. Do a. for all existing set that has not been selected out yet.

Output: a set of sets having pixels in them.{set1,set2,……}

From the output, we can count the number of pixels in each set.

If the number is not less than 500, we can calculate the set’s centroid using the formula taught in class and find the edge point to plot the bounding box.

I use cv2.rectangle() to draw the bounding box and cv2.line() to draw the centroid.