Computer Vision Homework 6 Report B06507002 材料三 林柏勳

Assignment

1. Binarize the benchmark image Lena as in HW2 by 128
2. using 8x8 blocks as a unit, take the topmost-left pixel as the down-sampled data, Down-sample Lena from 512x512 to 64x64
3. Count the Yokoi connectivity number
4. Result of this assignment is a 64x64 matrix. Please align the matrix within 1 single A4 page (using 4-connected).

Introduction

B06507002_HW6_ver2.zip contains

1. HW6_B06507002.pdf
2. HW6_B06507002.py

where 1. is the report and 2. is my source code.

One can reproduce this assignment by putting “lena.bmp” and “HW6_B06507002.py” in the same folder and running “HW6_B06507002.py”. Then, “yokoi.txt” will be dumped, which is equivalent to the image in this report.

Original Lena

Original Lena

Result (at the next page)

I use python 3 as my programming language, where I import numpy, opencv to do matrix calculation and image IO.

Since binarization part is the same as hw2 and down-sample part is trivial, I will only talk about the Yokoi connectivity number.

In the slide of chapter 6, we know that for 4-connectivity,

$$h(b,c,d,e) = \begin{cases} q & if\ b = c\ and\ (d \neq b\ \vee e \neq b) \\ r & if\ b = c\ and\ (d = b \wedge e = b) \\ s & if\ b \neq c\ and\ (d = b \wedge e = b) \end{cases}$$

Besides, for the four corner at a given point in the image: a_1,a_2,a_3,a_4.

$$a_1 = h(x_0, x_1, x_6, x_2) \quad a_2 = h(x_0, x_2, x_7, x_3)$$
$$a_3 = h(x_0, x_3, x_8, x_4) \quad a_4 = h(x_0, x_4, x_5, x_1)$$

For a pixel centered at (1,1) the labels of its neighbors will be:

x_7 (0,0)	x_2 (0,1)	x_6 (0,2)
x_3 (1,0)	x_0 (1,1)	x_1 (1,2)
x_8 (2,0)	x_4 (2,1)	x_5 (2,2)

Then, the output will be

$$f(b,c,d,e) = \begin{cases} 5 & if\ a_1 = a_2 = a_3 = a_4 = r \\ n & where\ n = \#\{a_k | a_k = q\}, else \end{cases}$$