**電腦視覺**

**Homework 5**

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Description

This is the report for the fifth homework for Computer Vision 2019. It is completed in full.

The environment is Windows, with the code (for all parts) being written in Python 3 with the cv2 module.

Methodology

For these parts, the kernel refers to the 3-5-5-5-3 kernel.

1. Dilation
   1. Each pixel (r, c) is treated as its own set (*S* = {(r,c)}) and operated on the kernel K to obtain S⊕K. The **highest** intensity of all pixels in S⊕K is saved as (r,c)’s new intensity.
   2. The resulting image is saved to **dilated.bmp**.
2. Erosion
   1. Each pixel (r, c) is treated as its own set (*S* = {(r,c)}) and operated on the kernel K to obtain S⊕K. The **lowest** intensity of all pixels in S⊕K is saved as (r,c)’s new intensity.
   2. The resulting image is saved to **eroded.bmp**.
3. Opening
   1. The eroded image in (b) is dilated using the same kernel.
   2. The resulting image is saved to **opened.bmp**.
4. Closing
   1. The dilated image in (a) is eroded using the same kernel.
   2. The resulting image is saved to **closed.bmp**.

Code Fragments

The fragment only shows the operations for Dilation and Erosion (of which the other parts are derived from):

1. **def** operate(img, kernel, f):
2. new\_img = img.copy()
3. h, w = img.shape[0], img.shape[1]
4. height, width = range(img.shape[0]), range(img.shape[1])
5. coords = product(height, width)
6. **for** ij **in** coords:
7. i, j = ij
8. # for each pixel, collect all the pixels created by it and the kernel
9. pixel\_kernel = [ (i+k[0], j+k[1]) **for** k **in** kernel **if** 0 <= i+k[0] < h **and** 0 <= j+k[1] < w]
10. new\_img[i, j] = f([ img[p[0], p[1]] **for** p **in** pixel\_kernel]) **if** pixel\_kernel **else** new\_img[i, j]
11. **return** new\_img
13. **def** dilate(img, kernel):
14. **return** operate(img, kernel, max)
16. **def** erode(img, kernel):
17. **return** operate(img, kernel, min)

Images

The images are shown in the following order: Dilation, Erosion, Opening, then Closing.



