

Assignment

Write a program which does:

- (a) Generate noisy images with gaussian noise(amplitude of 10 and 30)
- (b) Generate noisy images with salt-and-pepper noise (probability 0.1 and 0.05)
- (c) Use the 3x3, 5x5 box filter on images generated by (a)(b)
- (d) Use 3x3, 5x5 median filter on images generated by (a)(b)
- (e) Use both opening-then-closing and closing-then opening filter (using the octogonal 3-5-5-5-3 kernel, value = 0) on images generated by (a)(b)

You must calculate the signal-to-ratio (SNR) for each instance(4 noisy images and 24 processed images)

Introduction

B06507002_HW8_ver9.zip contains

- 1. HW8_B06507002.pdf
- 2. HW8_B06507002.py

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

One can reproduce this assignment by putting “lena.bmp” and “HW8_B06507002.py” in the same folder and running “HW8_B06507002.py”. Then, 4 images with noise, 24 denoised images and 4 merged images will be dumped. Also, an excel file that indicates the SNR will be dumped.

Original Lena



Original Lena

Result

I use python 3 as my programming language, where I import numpy, opencv to do matrix calculation and image IO. I import pandas to dump the excel file. Below is the SNR values between different noise and different methods.

filter\ noise image	Gaussian_10	Gaussian_30	SAT_005	SAT_010
No filter	13.603	4.060	0.904	-2.100
Box 3*3	16.397	12.112	9.225	6.252
Box 5*3	13.599	12.405	10.577	8.218
Median 3*3	17.541	10.984	18.419	14.307
Median 5*5	15.834	12.608	15.852	14.196
Opening then Closing	8.604	8.599	4.494	-2.289
Closing then Opening	7.618	6.044	3.956	-2.866

Table: SNR values between different noised images and denoised images

Noise Images (Gaussian Noise with Amplitude 10 -> Gaussian Noise with Amplitude 30 -> salt-and-pepper noise with probability 0.05 -> salt-and-pepper noise with probability 0.10)



The order I display my out image is that:

after box filter 3×3 -> after box filter 5×5 -> after median filter 3×3

after median filter 5×5 -> after opening then closing -> after closing then closing

(from left to right then from top to down)

Gaussian Noise with Amplitude 10



Gaussian Noise with Amplitude 30



Salt and Pepper Noise with Probability 0.05



Salt and Pepper Noise with Probability 0.10

