Image Processing

Homework 1: Image Enhancement Using Spatial Filters

Due Date: 2024/11/1 23:59

Introduction

In this assignment, you will implement two types of spatial filters used in image processing: smoothing and sharpening filters. These filters are crucial for improving image quality by reducing noise and enhancing important details such as edges.

You will implement these filters from scratch using only Numpy and Python standard libraries. The goal is to understand how spatial filters work and how they affect image quality.

Implementation(70%)

Part 1: Smoothing Spatial Filters

- Implement Gaussian filter and median filter
- Gaussian filter
    - Try three different σ and compare the results in the report.
    - Try three different filter sizes and compare the results in the report.
- Median filter
    - Try three different filter sizes and compare the results in the report.

Part 2: Sharpening Spatial Filters

- Implement two types of Laplacian filter for image sharpening and compare the results in the report.

0	-1	0
-1	5	-1
0	-1	0

Filter 1

-1	-1	-1
-1	9	-1
-1	-1	-1

Filter 2

Requirement

- You may only use Numpy and other Python standard libraries for the implementation.
- OpenCV functions can only be used for image I/O.

Report(30%)

- You should write your report following the report template.
- The report should be written in **English**.
- Please save the report as a **.pdf** file.

QA Page

If you have any questions about this homework, please ask them in the following Notion page. We will answer them as soon as possible. Additionally, we encourage you to answer other students' questions if you can.

link

Submission

Due Date: 2024/11/1 23:59

Please compress all your code files and report (.pdf) into {student_id}_hw1.zip.

The file structure should look like:

```
📂{student_id}_hw1.zip
  ├ 📜 main.py
  ├ 📜 (other code files if you have)
  └ 📜 report.pdf
```

Wrong submission format leads to -10 points.

20% off per late day.