

Image Processing Homework #1: Spatial Image Enhancement

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1 Technical Description

本作業使用 Python 實作三種 Spatial Image Enhancement 方法：(1.1) Power-Law (Gamma) Transformation、(1.2) Histogram Equalization、(1.3) Image Sharpening Using the Laplacian Operator。以下分別介紹三者原理與實作細節，並於 (1.4) 說明 Implementation。

1.1 Power-Law (Gamma) Transformation

(撰寫冪次 (伽瑪) 轉換之理論與實作)

1.2 Histogram Equalization

(撰寫直方圖均化之理論與實作)

1.3 Image Sharpening Using the Laplacian Operator

(撰寫拉普拉斯算子銳化之理論與實作)

1.4 Implementation

1.4.1 Platform and Packages

(Python / 套件版本等)

1.4.2 Project Structure

(專案資料夾與檔案說明)

1.4.3 Parameter Settings

(各方法之參數)

1.4.4 Execution Flow

(執行流程圖或步驟)

1.4.5 Usage

(指令與使用說明)

2 Experimental Results

2.1 Power-Law (Gamma) Transformation Results

2.2 Histogram Equalization Results

2.2.1 Histograms (before / after)

2.3 Image Sharpening Results

2.4 Per-Image Observations

2.4.1 Cameraman

2.4.2 Jetplane

2.4.3 Lake

2.4.4 Peppers

3 Discussions

3.1 Comparison of Methods

3.2 Method Analysis

3.2.1 Advantages

3.2.2 Disadvantages

3.2.3 Limitations

3.2.4 Noise Amplification

3.3 Parameter Sensitivity

3.4 Possible Improvements

4 References

References

- [1] R. C. Gonzalez and R. E. Woods, *Digital Image Processing*, 4th ed. Pearson / Prentice Hall, 2018.

5 Appendix

(如有附錄)